Everglades Agricultural Area Reservoir A-1

Final Environmental Impact Statement

May 2006

U.S. Army Corp of Engineers
Jacksonville District

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EVERGLADES AGRICULTURAL AREA RESERVOIR A-1

FINAL ENVIRONMENTAL IMPACT STATEMENT

Responsible Agency: The lead agency is the U.S. Army Corps of Engineers, Jacksonville District.

Abstract: The South Florida Water Management District (SFWMD) proposes to construct and operate an above-ground reservoir, with a capacity of 190,000 acre-feet at an approximate depth of 12.5-feet. The reservoir would be constructed on a 16,768-acre parcel of land situated north of Stormwater Treatment Area 3/4 and between the Miami and North New River Canals in the Everglades Agricultural Area (EAA) in Palm Beach County, Florida. As proposed, construction of the project would impact approximately 15,467.48 acres of atypical jurisdictional areas (farmed sugarcane fields), 187.63 acres of jurisdictional nonagricultural wetlands, and 149.83 acres of jurisdictional canals and ditches by dredging, filling, and/or flooding. The SFWMD would need to obtain a Department of the Army permit pursuant to Section 404 of the Clean Water Act. This Final Environmental Impact Statement evaluates the environmental effects of 5 alternatives including the SFWMD's Preferred Alternative, the EAA Reservoir A-1 project, and the no action alternative. The purpose of the EAA Reservoir A-1 is to store water from stormwater runoff and releases from Lake Okeechobee at any given time. Without this project, the 190,000 acre-feet of water will potentially cause flooding in the EAA, and will need to be pumped to Stormwater Treatment Area 3/4, bypassed to tide, or released to the estuaries from Lake Okeechobee. This project will improve timing of water deliveries from the EAA to the Water Conservation Areas, reduce Lake Okeechobee regulatory releases to the estuaries, meet supplemental agricultural irrigation demands, and increase flood protection within the EAA.

THE OFFICIAL CLOSING DATE FOR THE RECEIPT OF COMMENT IS 30 DAYS FROM THE DATE ON WHICH THE NOTICE OF AVAILABILITY OF THIS FINAL EIS APPEARS IN THE FEDERAL REGISTER

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EXECUTIVE SUMMARY

FINAL ENVIRONMENTAL IMPACT STATEMENT

EVERGLADES AGRICULTURAL AREA RESERVOIR A-1
PALM BEACH COUNTY, FLORIDA

A. BACKGROUND

The Water Resources Development Act of 2000, authorized the Comprehensive Everglades Restoration Plan (CERP), which is comprised of 68 major components and grouped into over 40 projects. These projects will ultimately benefit the south Florida ecosystem Everglades ecosystem which is defined by CERP as "the land and water within the boundary of the South Florida Water Management District (SFWMD) in effect on July 1, 1999." Details on CERP projects, studies, and program documents can be found on the Internet at www.evergladesplan.org.

The State of Florida has developed a plan called "Acceler8" for the purpose of accelerating design and construction of a number of projects consistent CERP and concurrent with the development of a Project Implementation Report (PIR) but prior to one or more of the following: Administration approval, congressional committee resolution, congressional authorization, or federal construction funding. On October 14, 2004, a Memorandum of Agreement (MOA) regarding Acceler8 between the Executive Office of the Governor and the SFWMD was signed. (See Annex H for a copy of the MOA.) Acceler8 expedites restoration of the Everglades and attainment of benefits ahead of schedule and serves as the initial foundation for other comprehensive restoration efforts to follow. All Acceler8 projects must be specifically authorized by Congress before becoming a part of the federal CERP. The SFWMD is the lead agency for the State on implementing this plan and will need to acquire the Department of the Army permits under Section 404 of the Clean Water Act (CWA) prior to construction.

As shown in Figure 1, Acceler8 consists of eight projects (some with multiple components) that, when completed, will provide immediate environmental, benefits including both water quality and water quantity benefits. The Acceler8 projects are designed to contribute as much of the benefits from CERP as early as possible. The remainder of the CERP projects will follow as time and resources allow.

The eight Accele8 projects, listed below, are all due to be online by 2011, 11 years ahead of the CERP schedule:

- C-44 (St. Lucie Canal) Reservoir / Stormwater Treatment Area (STA)
- C-43 (Caloosahatchee River) West Reservoir
- Everglades Agricultural Area STA Expansion
- Everglades Agricultural Area Reservoir- Phase 1 (later phase to include Bolles and Cross Canals Improvements)
- Water Preserve Areas

  Includes Site 1, C-9, C-11, Acme Basin B, Water Conservation Area (WCA)-3A/3B Seepage Management Area
- Picayune Strand (Southern Golden Gate Estates) Restoration
- Biscayne Bay Coastal Wetlands - Phase 1
- C-111 Spreader Canal

Seven of the projects and/or project components were initially authorized under WRDA of 2000: C-44 Basin Storage Reservoir, Everglades Agricultural Area (EAA) Storage Reservoir, Site 1 Impoundment, C-11 Impoundment & Canal, Water Conservation Areas 3A and 3B Levee Seepage, C-9 Stormwater Treatment Area Impoundment, and C-111 Spreader Canal; one project component falls under the WRDA 2000 programmatic authority provisions: Acme Basin B; and the final three projects require separate authorization: Biscayne Bay Coastal Wetlands, C-43 Reservoir, and Picayune Strand Restoration project.

A multi-agency Project Delivery Team, led by the U.S. Army Corps of Engineers (USACE), is in the process of preparing the Final Project Implementation Report / Environmental Impact Statement (PIR/EIS), for the federal CERP EAA Storage Reservoirs project as specifically authorized in section 601(b)(2)(C)(ii) of WRDA 2000. The SFWMD proposes to construct the EAA Reservoir project prior to implementation of any federal CERP EAA Storage Reservoirs project. The USACE is proceeding with two separate and independent but related actions, the regulatory evaluation of the SFWMD's proposed Acceler8 EAA Reservoir project and the planning evaluation of the federal CERP EAA Storage Reservoirs project both of which are described in the September 2005 EAA Storage Reservoirs Draft Integrated PIR/EIS. The USACE and SFWMD had anticipated that the SFWMD would accelerate construction and achievement of benefits of certain CERP projects by obtaining required permits and initiating construction upon completion of the Final Integrated PIR/EIS for the federal CERP project with the Final PIR/EIS serving as the NEPA evaluation for both federal actions. Because of delays in completion of the Final Integrated PIR/EIS for the federal CERP EAA Storage Reservoirs project, the SFWMD is pursuing a Department of the Army permit prior to completion of the CERP EAA Storage Reservoirs Final EIS.

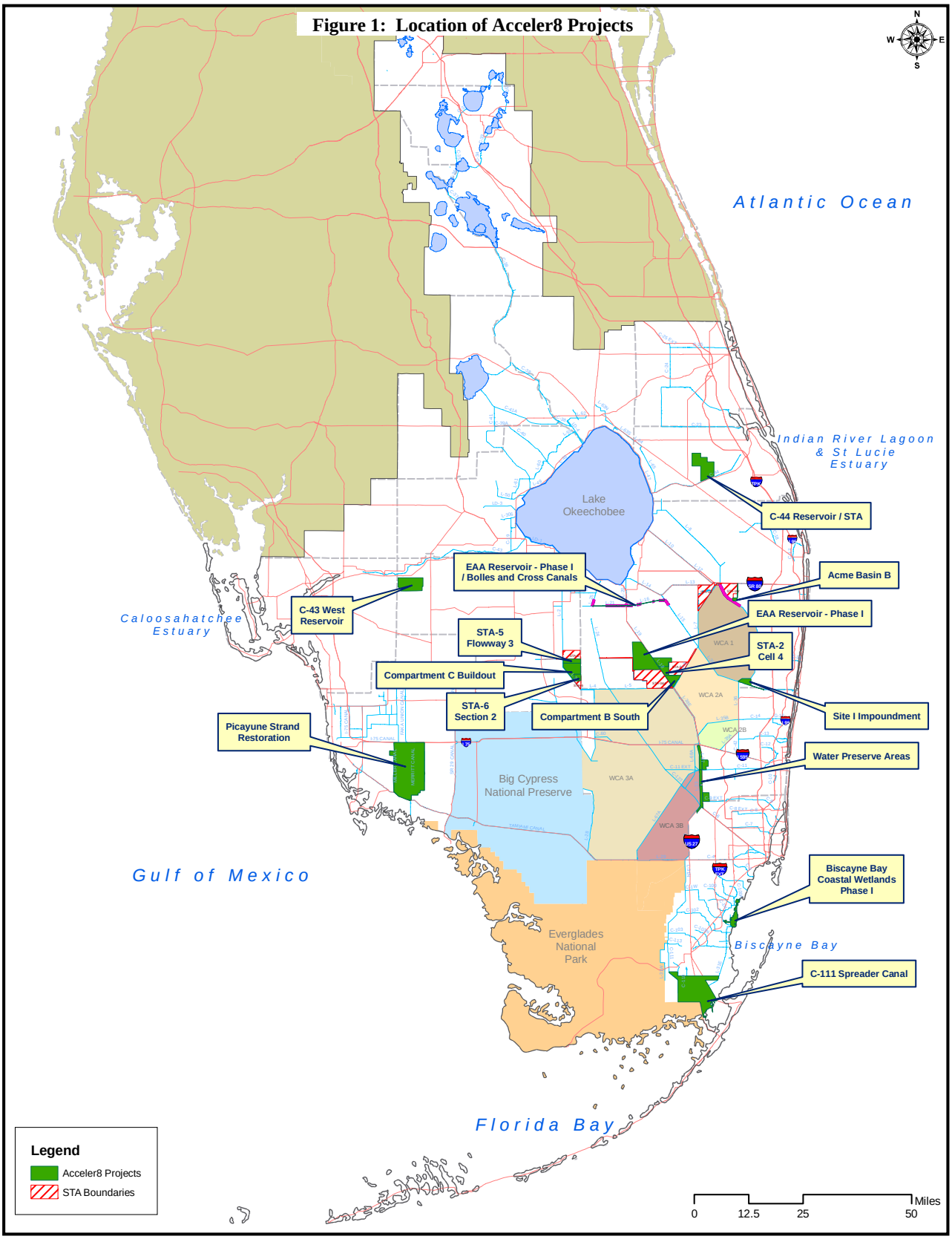


Figure 1: Location of Acceler8 Projects

The SFWMD's decision to pursue a USACE regulatory permit prior to a final PIR/EIS, resulted in the regulatory action diverging from the CERP PIR action. A Draft Supplemental EIS for the regulatory action, i.e., the Acceler8 EAA Reservoir A-1 project, was released on 10 February 2006. The Draft Supplemental EIS supplemented the September 2005 Draft Integrated PIR/EIS and recognized that there would be an independent regulatory action which broke away from the Integrated PIR/EIS process. Accordingly, this separate Final EIS has been prepared by the Regulatory Division to analyze alternatives and to address the environmental impacts of the SFWMD's proposed Acceler8 EAA Reservoir project. The Regulatory Division of the USACE will evaluate the SFWMD's proposed Acceler8 EAA Reservoir project in this Final EIS while the USACE Civil Works Planning Process continues with a separate and independent evaluation of the CERP project. Any regulatory decision on the SFWMD's proposed project will not affect the planning process and consideration of alternatives for the federal CERP EAA Storage Reservoirs project. As well the PIR process for the overall CERP EAA project will not foreclose consideration of alternatives for the SFWMD's proposed Acceler8 project. The SFWMD's Acceler8 project may ultimately be a component of the federal CERP EAA Storage Reservoirs project. If it is not a part of the federal recommended plan, it will be considered as a locally preferred plan.

The SFWMD's proposed EAA Reservoir A-1 project, identified as Cell A-1, is within the footprint of a portion of the USACE's preferred alternative for the EAA Storage Reservoirs project, specifically, Alternative 4 in the Draft Integrated PIR/EIS. The proposed SFWMD EAA Reservoir A-1 project is located in eastern half of Compartment A and borders U.S. 27 and the North New River Canal (NNRC) to the east, STA-3/4 to the south, and the Holey Land Wildlife Management Area to the southwest. The western border is perpendicular to the eastern edge of the Holey Land Wildlife Management Area.

B. NEED FOR PROPOSED ACTION

The purpose of this feature is to improve the timing of environmental deliveries to the Water Conservation Areas, including reducing damaging flood releases from the EAA; reducing Lake Okeechobee regulatory releases to the estuaries; meeting EAA irrigation and Everglades water demands; and increasing flood protection in the EAA. Constructing and operating the reservoir would reduce water demands from Lake Okeechobee, reduce the need to back-pump EAA storm water to the lake, and reduce the damaging pulsed regulatory releases from Lake Okeechobee to the Caloosahatchee River and St. Lucie Canal.

Implementation of the project would restore habitat function and quality in Lake Okeechobee's nearshore zone, the WCAs and the Caloosahatchee River and St. Lucie estuaries (the northern estuaries), and improve native plant and animal species abundance and diversity by retaining natural waters in the system. Benefits to the downstream estuaries are expected as a result of reduction in abrupt and high-volume fresh water flows and pulsed releases from Lake Okeechobee.

The goals and objectives of the SFWMD's proposed EAA Reservoir project will:

- Capture, move and store regulatory releases from Lake Okeechobee, reducing the number/volume of harmful discharges to coastal estuaries
- Capture, move and store agricultural stormwater runoff, reducing the need for emergency flood control back-pumping into Lake Okeechobee
- Provide additional water to meet Everglades and agricultural water demands, improving the timing of environmental deliveries of water to the WCAs and lessening water supply dependency on Lake Okeechobee
- Improve operational flexibility to move water within the EAA, including flow equalization and optimization of STA performance to further reduce phosphorus inflows to the Everglades
- Provide, public access and recreation opportunities

C. SCOPE OF ANALYSIS

The USACE determined that the scope of this Final EIS includes the entire project area of the proposed EAA Reservoir project. The lands that were considered for alternatives for the Acceler8 EAA Reservoir were originally purchased using Department of the Interior's (DOI) Farm Bill funds for the CERP EAA Storage Reservoirs project. In addition, the EAA was historically Everglades wetlands and "navigable waters of the United States" under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbor Act. The farmed sugarcane fields were previously determined by the Natural Resource Conservation Division to be prior converted cropland. Wetland hydrology and hydric soils are persistent throughout the EAA although the natural wetland vegetation has been removed through farming operations. In accordance with USACE's *1987 Wetland Delineation Manual* the agricultural areas are considered jurisdictional atypical wetlands. The extensive network of ditches and canals has also been determined to be navigable waters of the United States subject to regulation under the Clean Water Act. Therefore, the USACE's regulatory jurisdiction includes the entire EAA as well as wetlands and aquatic resources that will be affected as a result of the project. A number of federally listed species utilize the EAA as

well as other natural areas that will be affected by the project. Finally, significant cultural resources are present within a portion of the EAA, particularly the Compartment C lands. Taking these factors into consideration, the proposed project has substantial federal interest.

D. ALTERNATIVES CONSIDERED

The overall goal of Acceler8 is to provide environmental benefits sooner than would occur under CERP and in a cost-effective manner avoiding inevitable increases in construction materials and labor costs due to delay. As a result, construction of a reservoir on lands not identified by the USACE for future reservoirs under CERP will not meet the overall goals of Acceler8, which is to accelerate the funding, design, and construction of planned federal projects within CERP.

The State's Acceler8 Program includes a series of projects with a total budget of 1.8 billon dollars. This limitation was determined based on the SFWMD's ability to obtain debt service and limitations imposed by the State of Florida. The Acceler8 projects were chosen relative to the proportion of system-wide benefits that could be provided throughout the south Florida ecosystem with the specified dollars. As a result, imposition of realistic limitations on the scope of individual Acceler8 projects is crucial in achieving this goal of system-wide benefits. Building the entire CERP EAA Storage Reservoirs project would have eliminated other Acceler8 projects designed to provide system-wide benefits for other areas of the south Florida ecosystem. This careful balance to achieve system-wide benefits throughout the south Florida ecosystem within the economic constraints imposed on the SFWMD is clearly reasonable. Therefore, construction of the entire CERP EAA Storage Reservoirs project i.e., Cell A-1 and Cell A-2 was not considered as a practicable alternative.

Early on CERP identified that construction of a reservoir within Cell A-1 was the most cost effective project for storing water within the EAA. By the State proposing to build a portion of the larger federal project, the benefit of incremental implementation will be obtained through initial operations and adaptive management in order to refine operations as the full federal project comes on line.

The No-Action (No Build) Alternative) and construction of an EAA storage reservoir within Cell A-1 of Compartment A, Cell A-2 of Compartment, A, and Compartments B and/or C were the alternatives that were considered for the SFWMD's Acceler8 project. For the purposes of this Final EIS, construction of a reservoir within Cell A-1, Cell A-2, Compartment B, and/or Compartment C are referred to as Build Alternatives. As a result of the alternative analysis, construction of a reservoir within Cell A-1 of

Compartment A, i.e., the EAA Reservoir A-1, has been selected as the Preferred Alternative. Below are brief summaries of the alternatives.

The No Action Alternative is the future without the project.

Analysis of Compartments B and C indicated that independently or together, these compartments could not meet the Acceler8 project storage goals of 190,000 acre feet at an approximate depth of 12-feet. Together Compartments B (7,500 acres) and C (6,240 acres) would have a storage volume of approximately 165,000 acre-ft (12 ft. deep), in addition, preliminary analysis indicated that it would not be cost effective due to the additional cost for embankments, pumps, and associated water control structures for both compartments. The Compartment B and C alternative benefits to Lake Okeechobee would be less due to the location of Compartment C away from any of the major regional system canals capable of discharging a large volume of water south from Lake Okeechobee. .Furthermore, Compartment C was identified to have environmental issues associated with significant cultural resources. The Draft Integrated PIR/EIS dated September 2005 and the Revised Draft Integrated PIR/EIS dated February 2006 recommend a federal project with a preferred project location in Compartment A. Thus construction of a storage reservoir within Compartment B and/or C would not meet the Acceler8 goal of building what is anticipated to be a federal CERP project. As a result Compartments B and C are now intended for use by the SFWMD to expand the Everglades Construction Project through conversion to stormwater treatment areas (STAs).

The reservoir footprints and storage capacity for Cells A-1 and A-2 was established as a result of the land made available in the Talisman Purchase and in coordination with the Corps during the development of the federal EAA Reservoir Storage Project.

The capacity of 190,000 acre-ft volume and a maximum pool depth of 12 ft were determined to be the most cost effective storage volume on the 16,700 acres of land available for Cell A-1. In addition, the A-1 reservoir was optimized to not exceed the treatment capacity of STA 3/4. On the other hand, the capacity of 170,000 acre-ft volume (12 ft deep) was determined to be the most cost effective storage volume for the 14,000 acres of land available for Cell A-2.

The EAA A-2 Alternative includes construction of reservoir on a 14,000 acre parcel of land situated on the western portion of Compartment A. This alternative consists of the construction of an above-ground reservoir for water storage, with a capacity of 170,000 acre-feet at an approximate depth of 12

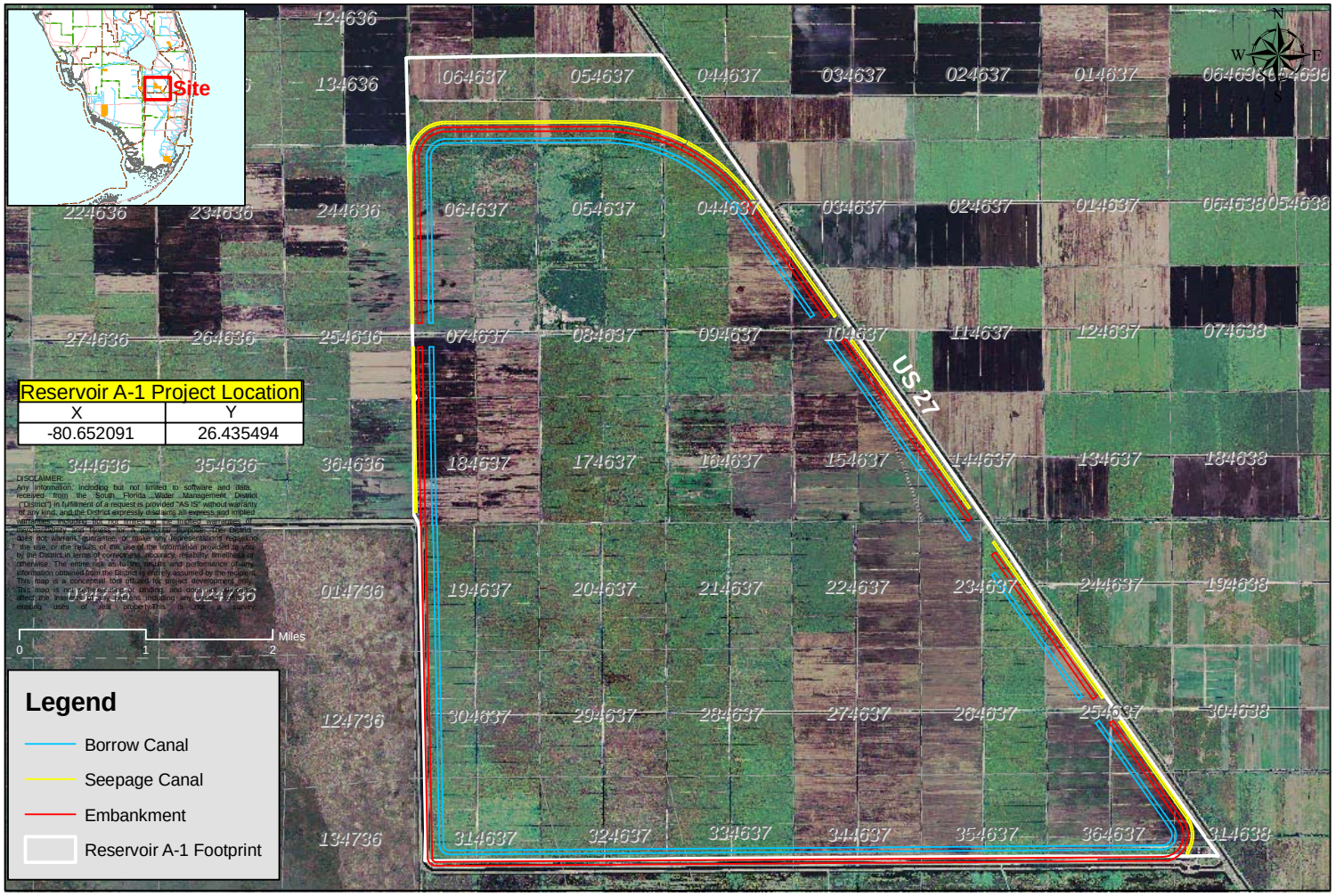
feet. This Alternative is a component (Cell A-2) of the federal CERP EAA Storage Reservoirs project.

The EAA Reservoir A-1 Alternative, or Preferred Alternative, consists of the construction of a component (Cell A-1) of the EAA Storage Reservoirs project. This alternative is an above-ground reservoir for water storage, with a capacity of 190,000 acre-feet at an approximate depth of 12.5 feet. The reservoir will be constructed on a 16,768-acre parcel of land situated on the eastern portion of Compartment A.

Cell A-2 would provide less system-wide benefit because of the overall smaller capacity of the reservoir at this location compared to Cell A-1. Construction of Cell A-2 prior to Cell A-1 would require significant modification of infrastructure when A-1 was built due to the A-2 location being further away from the North New River Canal and STA 3/4.Cell A-1 contains more natural wetlands then Cell A-2, however, Cell A-1 would provide more system-wide benefit because of a larger capacity of 190,000 acre-feet. Cell A-1 is the most cost-effective alternative due to its location directly adjacent to the North New River Canal and Stormwater Treatment Area 3/4. The proposed EAA Reservoir A-1 Alternative (Cell A-1) was selected as the Preferred Alternative based on the features and operation of the existing system in relation to location of Cell A-1.

E. DESCRIPTION OF PREFERRED ALTERNATIVE

The proposed project involves construction of the Everglades Agricultural Area (EAA) Reservoir A-1 project shown in Figure 2. The SFWMD proposes construction of the EAA Reservoir A-1 project to expedite the attainment of environmental benefits in the Everglades ecosystem. The SFWMD's proposed project, identified as Cell A-1, is the same footprint as a portion of the Selected Plan (Alternative 4), identified in the Draft Project PIR/EIS, which features a two-cell reservoir impoundment with a maximum normal pool storage depth of 12 feet at approximately 31,000 acres of above ground surface area storage. The SFWMD identified these two cells as Cell A-1 and Cell A-2 for the purpose of alternative analysis. Cell A-1 and A-2 are approximately 17,000 and 14,000 acres in size respectively, and combined would contain 360,000 acre-feet of water. Both proposed reservoir cells include individual inflow pump stations, discharge structures, emergency overflow spillways, and seepage control canals with associated structures. The SFWMD Cell A-1 and A-2 alternatives differ from the plan recommended in the Draft PIR/EIS due to requirements to build approximately 3 miles of 25-foot high levee to dam safety standards, whereas this same segment of levee described in the Draft PIR/EIS is 21 feet high and serves only to separate the two reservoir cells providing operational flexibility and a wave break function.



Acceler8
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West Palm Beach, FL 33409
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Figure 2

EVERGLADES AGRICULTURAL AREA
RESERVOIR A-1
PROJECT LOCATION MAP

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The proposed Acceler8 EAA Reservoir A-1 project will store up to 190,000 acre-feet of water from stormwater runoff and releases from Lake Okeechobee at any given time. Without this project, the 190,000 acre-feet of water will potentially cause flooding in the EAA, and will need to be pumped to STA-3/4, bypassed to tide, back-pumped to Lake Okeechobee, or released to the estuaries from Lake Okeechobee. Therefore, with this project, there will be a reduction in the potential for flooding and releases to the estuaries once the project is implemented.

As proposed, construction of the project would impact approximately 15,467.48 acres of atypical jurisdictional areas (farmed sugarcane fields previously determined by the Natural Resource Conservation Division to be prior converted cropland), 187.63 acres of jurisdictional nonagricultural wetlands, and 149.83 acres of jurisdictional canals and ditches by dredging, filling, and/or flooding. A Department of the Army permit, pursuant to Section 404 of the Clean Water Act (CWA), is required prior to construction. A Public Notice describing this regulatory action was circulated on October 12, 2005. A revised Public Notice was circulated on February 13, 2006, concurrent with noticing of a Draft Supplemental EIS for the proposed Acceler8 EAA project on February 10, 2006.

Design of the Preferred Alternative in this Final EIS differs from the Preferred Alternative in the Draft Supplemental EIS and Public Notice due to changes in the construction footprint. As a result of concerns expressed by the U.S. Fish and Wildlife Service regarding the potential for toxaphene contamination on Woerner Farm 3, the SFWMD made the decision to exclude a portion of the parcel from the wetted footprint of the project. Therefore, the southern edge of the northern embankment was realigned to run parallel with the southern boundary of the Woerner tract. This realignment leaves approximately 650 acres of the Woerner tract outside of the reservoir footprint. The remaining acreage (approximately 330 acres) will have the muck soils scrapped down for the construction of the northern alignment of the embankment. The excess muck that is scrapped down will be used to dress the external face of the embankment. The exclusion of this acreage from within the wetted footprint of the reservoir required that the average pool elevation be raised 5 inches from 12 ft to 12.5 ft in order to still attain the 190,000 acre-feet storage capacity.

The operational goals of the EAA Reservoir A-1 are to capture and store Lake Okeechobee Regulatory releases (model results indicate approximately 281,000 acre-feet annual average) and EAA basin runoff (estimated at 227,000 acre-feet annual average); to deliver water from the reservoir (estimated at 332,000 acre-feet annual average) to downstream natural areas via STA-3/4 at times of natural system need; and to deliver water from the reservoir to meet local agricultural water supply demands (estimated at

171,000 acre-feet annual average) that would otherwise be met via deliveries from Lake Okeechobee. The hydrologic conditions for Lake Okeechobee and the EAA will be assessed to determine which area has the greatest need for runoff or discharge removal. This will depend on the regional drainage system's capability to convey water to the reservoir while maintaining existing levels of flood protection and water supply within the basin.

F. ENVIRONMENTAL IMPACTS

The environmental impacts attributable to the EAA Reservoir A-1 Alternative are summarized below and are discussed in more depth in Chapter 4 of this document and in the Annex A, the 404(B)(1)Guidelines Evaluation.

Land Use (Agriculture)
About 16,253.68 acres of agricultural lands will be permanently removed from production due to the construction of the proposed above-ground storage reservoir. This includes direct impact by dredging, flooding, and/or filling to 15,467.48 and 844 acres that would be incorporated into the project area through avoidance of the Woerner Farm 3 as well as inclusion of perimeter buffer areas but not directly impacted. All of the agricultural lands within the project footprint have been determined to be jurisdictional atypical wetlands.

Wetlands
Approximately 187.63 acres of natural low quality wetlands located within the project footprint as well as approximately 149.83 acres of jurisdictional canals and ditches will be impacted by the proposed action. An additional 13.17 acres of jurisdictional canals/ditches are within the project footprint but not within the proposed construction area.

Uplands
No natural uplands are located within the project footprint. A total of 119.06 acres of uplands in the form of roads and levees and/or an agricultural industrial site will permanently be altered within the boundaries of the above-ground storage reservoir. An additional 45.53 acres of uplands are within the project footprint but not the proposed construction area.

Water quality
Temporary increases in turbidity of local waters are expected from the deepening of canals and by the construction of the components of the above-ground storage reservoir.

Air quality
Fugitive dust and vehicle exhaust from vehicular traffic and earth moving will be unavoidable.

Soils
Temporary disruption of soils is expected from most construction activities.

Essential Fish Habitat (EFH)
The USACE determined that the proposed action would not have an impact on EFH or federally managed fisheries for which the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) is responsible. The regulatory determination for the SFWMD's proposed EAA Reservoir A-1 project was based on coordination efforts that had occurred between the USACE and NMFS for the potential CERP EAA Storage Reservoirs project. By letter dated November 17, 2005, the Habitat Conservation Division of the NMFS concurred with the USACE's proposal to construct the EAA Storage Reservoirs project stating reducing high-volume freshwater pulsed releases from Lake Okeechobee should have a positive effect on essential fish habitat and other trust resources present in the St. Lucie and Caloosahatchee River estuaries, and the Indian River Lagoon. The NMFS has indicated that the conclusion for the federal CERP EAA Storage Reservoirs project also applies to the SFWMD's proposed Acceler8 EAA Reservoir A-1 project since the goals and objectives of the two projects are consistent.

Threatened / Endangered Species
The USACE made a determination that the federal CERP EAA Storage Reservoirs project and the SFWMD's proposed Acceler8 EAA A-1 Reservoir project would not affect nesting leatherback, hawksbill, green and loggerhead sea turtles and the Audubon's crested caracara; may affect, but is not likely to adversely affect the West Indian manatee, Everglade snail kite, wood stork, bald eagle, eastern indigo snake, sea turtles in the marine environment, smalltooth sawfish, opossum pipefish, Johnson's seagrass, and the Okeechobee gourd; and may adversely affect the Florida panther. In a letter dated December 14, 2005 the United States Fish and Wildlife Service (USFWS) concurred with USACE's determination that the project will have "no effect" on the leatherback, hawksbill, green and loggerhead sea turtles, and the Audubon's crested caracara. USFWS also concurred with USACE's determination that the project "may affect, but not likely to adversely affect" the West Indian Manatee, the Everglade snail kite, Eastern Indigo snake and Okeechobee gourd. By letter dated March 24, 2006, the USFWS concurred with the USACE's "may affect not likely to adversely affect" determination for the wood stork and bald eagle. By letter dated April 11, 2006, the NMFS Protected Resources Division concurred with the USACE's determination for sea turtles in the marine environment, smalltooth sawfish, opossum pipefish, and Johnson's seagrass. Formal consultation for the Florida panther was concluded on April 14, 2006, with a Biological Opinion from the USFWS that construction of the EAA project is not likely to jeopardize the continued existence of the Florida panther.

Wildlife
Localized disturbances to fish and wildlife are expected from deepening of canals and construction of levees and other structures.

G. AREAS OF CONTROVERSY

This Acceler8 project is being developed with input and consensus from federal and state agencies, county officials and the public. There is currently ongoing coordination with the USACE, the USFWS, the U.S. Environmental Protection Agency (USEPA), the Florida Game and Freshwater Fish Commission (FWC), and the Florida Department of Environmental Protection (FDEP) to address their concerns regarding impacts such as wetlands, water quality, flood protection, wildlife and habitat, and threatened and endangered species. Numerous meetings have occurred with the various agencies and the public in the context of the CERP EAA planning process and the SFWMD's Acceler8 Program.

H. LIST OF OTHER GOVERNMENT ACTIONS REQUIRED

The SFWMD will be responsible for obtaining federal, state and local permits, licenses, or other consultation requirements for the EAA Reservoir A-1 project, as described in this section.

The USACE's permitting decision on the EAA Reservoir A-1 project is required to comply with many federal requirements including the National Environmental Policy Act (NEPA), Clean Water Act (CWA), Endangered Species Act (ESA), Rivers and Harbors Act, Coastal Zone Management Act (CZMA), Fish and Wildlife Coordination Act of 1958, Magnuson-Stevens Fishery Conservation and Management Act, and the National Historic Preservation Act. The USACE will consider other relevant environmental laws as well as protection of wetlands, floodplain management, environmental justice, and invasive species.

State requirements that will need to be satisfied for this project includes Comprehensive Everglades Restoration Plan Regulation Act (CERPRA) permit, a consumptive use evaluation during the CERPRA Permitting process, Florida Department of Transportation Access Permit, Clean Air (Title V) Permit, Petroleum Storage Tanks Permit, Hydrostatic Testing Permits, National Pollution Discharge Elimination System (NPDES) Permits for construction, and a Dam Safety Permit.

Local permitting authority for the EAA Reservoir A-1 project resides with several county Departments and Divisions. Primary coordination of local permit review will be administered by the County's Planning, Zoning and Building (PZB) Division. Following is a list of County Departments and Divisions which will be involved in the review of the EAA Reservoir A-1

project: PZB Division – Development Review; Palm Beach County Fire Rescue; Palm Beach County Health Department; a Well Construction Permit; and Palm Beach County Department of Environmental Resources Management Vegetation Preservation and Protection.

I. UNRESOLVED ISSUES

There are no unresolved issues related to the Acceler8 EAA Reservoir A-1 project.

J. PROBABLE ADVERSE ENVIRONMENTAL EFFECTS

The following is a brief summary of adverse environmental effects of the Recommended Alternative, EAA Reservoir A-1:

i IRRETRIEVABLE AND IRREVERSIBLE COMMITMENT OF RESOURCES

Construction of the EAA Reservoir A-1 project will include features considered permanent and may be deemed irreversible. This will include construction of a 16,768-acre reservoir. The construction proposed is on a scale that represents an irreversible and irretrievable commitment of resources.

Committed resources include state and federal funding to purchase lands and labor, energy and project materials to build, operate, and maintain the project. Fish and wildlife habitat will be permanently altered (converted to open water, particularly in the case of a storage reservoir). These lands will likely be inundated for much of the year. Another resource that may be impossible to replace is the cap rock which is the top of the limestone formation underlying the soils in the area of the EAA Storage Reservoir project. It is proposed to be broken during the construction of required canal improvements and borrow areas.

ii FEASIBLE MEASURES TO AVOID OR MINIMIZE POTENTIAL ADVERSE IMPACTS TO THE HUMAN ENVIRONMENT

The SFWMD's proposed EAA Reservoir A-1 project would be constructed and operated in conjunction with the other Acceler8 projects pending Department of the Army authorization. Operated together as a system, the Acceler8 projects are anticipated to provide environmental benefit to the south Florida ecosystem consistent with the goals and objectives of CERP. Specifically, Acceler8 will improve water deliveries, through better timing and distributions of flows dictated by the natural system, and help maintain natural salinity balance in the estuaries. In addition, restoration through improvements in hydrology to wetland habitats will occur by reducing

extreme high and low water level events, restoring sheet flow and controlling seepage. Furthermore, there will be improvements in water quality as a result of water diversions and storage in STA 3/4 prior to discharging into the natural system, as well as, reductions in back pumping to Lake Okeechobee and eliminating regulatory releases from the lake to the Everglades. Independently, the EAA Reservoir A-1 will provide benefits to Lake Okeechobee, the Caloosahatchee and St. Lucie Estuaries and within portions of the Greater Everglades. The benefits provided by the EAA Reservoir A-1, stand alone, would progress towards achieving the expected Acceler8 system-wide environmental benefits. Construction of the proposed EAA Reservoir A-1 project, taken together with the other proposed Acceler8 projects, is anticipated to result in net positive environmental benefit. The benefits of the proposed EAA Reservoir A-1 project with interdependencies of the other proposed Acceler8 projects are expected to compensate for unavoidable adverse impacts to wetlands and other aquatic resources as a result of construction and operation of the proposed project.

The SFWMD commits to avoiding, minimizing, or mitigating for adverse effects during construction activities and during reservoir operations by adhering to environmental commitments, engineering and design commitments, and operational commitments. In addition, given that Acceler8 is an advancement by the State of planned federal projects within the CERP, the State of Florida has agreed with the Federal government to design, construct, and operate the Acceler8 projects consistent with requirements of the Water Resources Development Act of 2000, applicable federal and state law, and the Central and Southern Florida Project purposes as a whole. As such, the State will be in full compliance with the Programmatic Regulations and Section 601 of WRDA 2000, at such time that a Project Cooperation Agreement is executed on an authorized CERP project, which includes the Acceler8 project feature.

iii SHORT-TERM IMPACTS VERSUS LONG-TERM BENEFITS TO THE HUMAN ENVIRONMENT

The SFWMD's proposed EAA Reservoir A-1 project may become a component of the CERP EAA Storage Reservoirs project. Project features will cause some adverse consequences to agricultural land uses - permanently removing approximately 17,000 acres from agricultural production. These impacts may be felt locally and/or regionally as the economic base derived from agriculture is incrementally reduced relative to other sectors of the economy. However, construction, operation, and maintenance of a storage reservoir will generate demand for workers. This will have a positive impact through direct employment and spin-off service employment within the region. The overall benefit to the regional ecosystem is expected to be far greater than the localized adverse effects. As these features occur disparately across the

landscape within different hydrologic basins, and as distinct units rather than multiple features within a single watershed, they will not likely result in a significantly detrimental cumulative effect.

The SFWMD's proposed EAA Storage Reservoir A-1 project is anticipated to be used to increase water storage for the overall gain and long-term benefit of the regional system. The project will provide important storage functions consistent with those identified in the Central and Southern Florida (C&SF) Project Comprehensive Review Study (Restudy) and Final Integrated Feasibility Report and Programmatic Environmental Impact Statement, dated April 1999, deemed essential to the overall restoration of the Everglades. As part of Acceler8, the proposed EAA Reservoir A-1 project will benefit south Florida ecosystems. Specifically, the proposed project will benefit the St. Lucie and Caloosahatchee Estuaries and Lake Okeechobee, as well as improve the quality and timing of water delivery to the STAs for improved water treatment within the STAs. In addition, some improvement to lake water quality will occur as a result of the proposed project by redirecting nutrient rich EAA drainage to the reservoirs rather that directly to Lake Okeechobee.

Improvements to the water quality entering the WCAs will result from the ability to more effectively store water within the proposed EAA reservoir by metering peak flows in the STAs. Creation of the reservoir will provide the needed storage function, allowing the STAs primary use as water treatment facilities. Increased residence times of water within the STAs will ensure better treatment of waters released to the WCAs and have beneficial water quality effects on all downstream ecosystems.

System-wide modeling assuming a 2010 condition, the timeframe for completion of project construction, provides an indication of the significant environmental benefits that are expected as a result of the Acceler8 projects. Although the full suite of benefits will not be achieved until such time, areas have been identified where subsets of system-wide benefits as a result of the construction and operation of the EAA Reservoir would be felt. Acceler8 system-wide benefits ascribable to the EAA A-1 Reservoir include the following:

- The frequency of emergency flood control back pumping from the EAA to Lake Okeechobee is reduced by 33% annually and 30% during wetter years, thus reducing nutrient loading to the lake.

- Lake Okeechobee regulatory releases directly to the Everglades are eliminated.

- In the Caloosahatchee and St. Lucie Estuaries, the number of high flow months resulting from Lake Okeechobee regulatory discharges is decreased by approximately 15% and 21% respectively, increasing the frequency of maintaining the salinity envelope.

- Improvements to inundation patterns, timing and distribution of flows as well as reductions in low and high events, towards defined Natural System Model depth targets in extreme dry and wet years were in: Water Conservation Area 1, Water Conservation Area 2A, Water Conservation Area 3A North, Water Conservation Area 3A Northeast, S-9 areas of Water Conservation Area 3A and Water Conservation Area 3A South in the driest years, and Shark Slough and the Marl Marsh Areas in Everglades National Park during the driest and wettest years.

- Increased ability to treat water entering the Everglades Protection Area from STA 3/4 based on a 16% Phosphorus reduction in water conveyed to STA 3/4 from the EAA A-1 Reservoir, by metering peak flows to the STA thereby increasing residence time within the STA, ensuring better water quality treatment.

K. COORDINATION

Throughout the evolution of project design alternates, federal and state agencies, county officials, and the public have been kept informed through meetings, newsletters and a public information workshop designed to inform, gather input, and respond to questions regarding the proposed project.

A reservoir for water storage in the Everglades Agricultural Area has been consistently included as a component of CERP since 1999. Multiple formal scoping initiatives to meet NEPA requirements have been undertaken for prior federal water resources studies in the Study Area (C&SF Project Comprehensive Review Study Reconnaissance Report, C&SF project Comprehensive Review Study Feasibility Study, and Water Preserve Areas Feasibility Study). In addition, several other related planning initiatives have been undertaken by non-federal entities to identify general planning objectives and constraints for environmental restoration and water resources development projects in the study area (National Audubon Society, Water Supply Preserves [1993], South Florida Water Management District, East Coast Buffer Project [1996], Governor's Commission for a Sustainable South Florida, Conceptual Plan [1996], South Florida Water Management District, Lower East Coast Regional Water Supply Plan [2000]). Cumulatively, these prior planning efforts have produced substantial background information, while at the same time providing multiple opportunities for public, federal, and non-federal agency involvement in the development of objectives and

constraints associated with implementing a water storage project at this location. A more detailed discussion of agency coordination and public involvement conducted for the project can be found in Chapter 7 of this document.

Through the Acceler8 design process the public and government agencies are afforded the opportunity to provide input regarding this project through a series of public workshops and stakeholder meetings have been held for the Basis of Design Report (BODR) and the Preliminary Design Report including Water Resources Advisory Commission (WRAC) Issue Workshops, SFWMD's monthly Governing Board meetings, quarterly meetings of the South Florida Ecosystem Restoration Task Force and the South Florida Ecosystem Restoration Working Group . Project information, schedules, documents, and presentations to the Public are also kept updated and available on the Acceler8 website, http://www.evergladesnow.org.

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ACRONYMS

A

AQI	Air Quality Index
ASR	Aquifer Storage and Recovery

B

BEBR	Bureau of Economic and Business Research
BGS	Below Ground Surface
BMP	Best Management Practices
BO	Biological Opinion
BOD	Biochemical Oxygen Demand
BODR	Basis of Design Report

C

C&SF	Central and Southern Florida
CAA	Clean Air Act
CCMP	Comprehensive Conservation and Management Plan
CERP	Comprehensive Everglades Restoration Plan
CERPRA	Comprehensive Everglades Restoration Plan Regulation Act
CEM	Conceptual Ecological Models
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CFRD	Concrete-Faced Rockfill Dam
CFS	Cubic Feet per Second (cfs)
CGM	CERP Guidance Memorandum
CMSA	Combined Metropolitan Statistical Area
CO	Carbon Monoxide
COC	Constituents of Concern
CRM	Cultural Resources Management
CSSS	Cape Sable Seaside Sparrow
CWA	Clean Water Act
CZMA	Coastal Zone Management Act

D

DDT	Dichlorodiphenyltrichloroethane
DO	Dissolved Oxygen
DOI	U.S. Department of the Interior

E

EAA	Everglades Agricultural Area
ECP	Everglades Construction Project
EFA	Everglades Forever Act
EFH	Essential Fish Habitat
EFH-HAPC	Essential Fish Habitat-Habitat Areas of Special Concern
EIS	Environmental Impact Statement
ENP	Everglades National Park
EPA	Everglades Protection Area
ERA	Environmental Risk Assessment
ESA	Endangered Species Act

ESAs	Environmental Site Assessments

F

F.A.C.	Florida Administrative Code
FCI	Functional Capacity Index
FDEP	Florida Department of Environmental Protection
FDOH	Florida Department of Health
FDOT	Florida Department of Transportation
FNAI	Florida Natural Areas Inventory
F.S.	Florida Statutes
FWC	Florida Fish & Wildlife Conservation Commission
FSQM	Field Sampling Quality Manual
FY	Fiscal Year

G

GFC	Florida Game and Freshwater Fish Commission
GMFMC	Gulf of Mexico Fishery Management Council
GPM	Gallons per Minute (gpm)

H

HA	Hectare
HHD	Herbert Hoover Dike
HTRW	Hazardous, Toxic and Radioactive Waste
HUC	Hydrologic Unit Code
HUD	Housing and Urban Development

I

IMC	Interagency Modeling Center
IRL	Indian River Lagoon

J

K

L

LEC	Lower East Coast
LIMS	Laboratory Information Management System
LOWP	Lake Okeechobee Watershed Project
LWDD	Lake Worth Drainage District

M

MeHg	Methyl Mercury
MFL	Minimum Flow and Level
MG/L	Milligrams per Liter
MGTS	Managed Growth Tier System
MOA	Memorandum of Agreement
MODFLOW	Modular Three-Dimensional Finite-Difference Ground-Water Model
MSA	Metropolitan Statistical Area

N

N	Nitrogen
NAAQs	National Ambient Air Quality Standards
NAVD88	North American Vertical Datum of 1988 (vertical datum)
NEPA	National Environmental Policy Act
NFA	No Further Action
NFPA	National Fire Protection Association
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
NNRC	North New River Canal
NO2	Nitrite
NO_2	Nitrogen Dioxide
NO3	Nitrate
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRDC	Natural Resources Defense Council
NRHP	National Register of Historic Places
NSM	Natural System Model
NTU	Nephelometric Turbidity Units

O

O_3	Ozone
oP	Ortho Phosphate

P

P	Phosphorus
PAHs	Polynuclear Aromatic Hydrocarbons
PB	Lead
PBC	Palm Beach County
PCA	Project Cooperation Agreement
PDT	Project Delivery Team
PIR	Project Implementation Report
PL	Public Law
PM	Performance Measure
$PM_{2.5}$	Particulate Matter 2.5 Microns or Less in Diameter
PM_{10}	Particulate Matter 10 Microns or Less in Diameter
PO4	Ortho Phosphate
POM	Project Operating Manual
PZB	Planning, Zoning & Building

Q

QASR	Quality Assurance Systems Requirement

R

RCC	Roller Compacted Concrete
RECOVER	Restoration Coordination and Verification
RGL	Regulatory Guidance Letter

S

SAFMC	South Atlantic Fishery Management Council
SAV	Submerged Aquatic Vegetation
SCGCF	Sugarcane Growers Cooperative of Florida
SHPO	State Historic Preservation Office or Officer
SFWMD	South Florida Water Management District
SFWMM	South Florida Water Management Model
SO_2	Sulfur Dioxide
SPCC	Spill Prevention Control and Countermeasures
S.R.	State Road
SRCO	Site Rehabilitation Completion Orders
STA	Stormwater Treatment Area
SWPPP	Stormwater Pollution Prevention Plan

T

TDP	Total Dissolved Phosphorus
TMDL	Total Maximum Daily Load
TP	Total Phosphorus

U

UG/L	Micrograms per Liter
UMAM	Uniform Mitigation Assessment Method
US	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USCA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish & Wildlife Service
USGS	United States Geological Survey
US/CM	MicroSiemens per Centimeter

V

W

WCA	Water Conservation Area
WMA	Wildlife Management Area
WQC	Water Quality Certification
WRAC	Water Resources Advisory Commission
WRAP	Wetland Rapid Assessment Procedure
WRDA	Water Resources Development Act

X

Y

Z

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CHAPTER 1
PURPOSE OF AND NEED FOR ACTION

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1.0 PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

This document is an Environmental Impact Statement that provides a comprehensive environmental analysis to aid in the decision making process regarding whether to issue a permit to the SFWMD for their proposal to construct and operate a reservoir in the Everglades Agricultural Area (EAA) in Palm Beach County, Florida. This Final EIS has been prepared to analyze the SFWMD's proposed EAA Reservoir A-1 project. The USACE is preparing this EIS in accordance with the Council of Environmental Quality (CEQ) Regulations (40 Code of Federal Regulations [CFR] 1500-1508), which implement the procedural provisions of the National Environmental Policy Act (NEPA) (42 United States Code [USC] 4321 et seq.). The NEPA is the "basic national charter for protection of the environment" and requires federal agencies to be fully informed about the environmental consequences of their decision to provide financial assistance, exercise permit or regulatory authority, or to conduct an action that may significantly affect the environment. In addition, NEPA mandates that the public be informed of the proposed actions, the consequences of the actions, and the ultimate agency decision.

The SFWMD's proposed EAA Reservoir A-1 project would result in dredging and filling in waters of the United States, including wetlands. Section 404 of the Clean Water Act (CWA) (33 USC 1344) prohibits the discharge of dredge and fill material into waters of the United States without a permit. Under Section 404 of the CWA, the USACE is responsible for regulating the placement of fill and discharge of dredged material in the waters of the United States, including primary tributaries to those waters, as well as wetlands adjacent to those waters. Therefore, because the SFWMD is seeking approval of a permit from the USACE, a federal agency, the project involves a federal action. Because any environmental consequences of SFWMD's proposed project are essentially products of the USACE permit action, the scope of the federal permitting action includes all of the SFWMD project components (33 CFR 325). During the federal permit review process, the USACE determined that an EIS would be necessary to address the environmental consequences of the proposed project and to aid in the decision to issue, modify, condition, or deny a permit for the proposed project. The USACE is the lead federal agency and responsible for preparation of the EIS. The USACE originally proposed to use the PIR/EIS that is being completed for the Comprehensive Everglades Restoration Plan (CERP) EAA Storage Reservoirs project as the NEPA document for a regulatory action authorizing a component of the selected plan in the federal PIR/EIS. The SFWMD, however, has decided to pursue construction of a reservoir, and requisite permitting, ahead of the schedule for completing the PIR/EIS; therefore, a

separate draft supplemental EIS on the regulatory action on the SFWMD's proposed EAA Reservoir A-1 project was prepared and a separate Final EIS is being completed. Meanwhile, the USACE continues with evaluation and completion of the PIR/EIS for the EAA Storage Reservoirs project which may or may not include the SFWMD's Acceler8 project. The SFWMD has assisted the USACE in providing information for preparation of this EIS.

This chapter describes the purpose of and need for the proposed action.

1.2 DESCRIPTION OF PROPOSED ACTION

The proposed EAA Reservoir A-1 project is an above-ground reservoir for water storage, with a capacity of 190,000 acre-feet at an approximate depth of 12-feet. The reservoir will be constructed on a 15,200 acre parcel of land situated on the eastern portion of Compartment A of the EAA (Figure 1-1).

The key features of the EAA Reservoir A-1 project include the following:

- Approximately 190,000 acre-feet reservoir with a perimeter dam and seepage canals
- Northeast pump station that pumps from North New River Canal (NNRC) (3,600 cubic feet per second (cfs))
- Connector canal from the NNRC to the new northeast pump station
- Seepage pump stations
- Gated discharge structures
- New four lane bridge on U.S. 27 across the new connector canal

The proposed EAA Reservoir A-1 is intended to store water from the S-2, S-6, and S-7 Basins, by collecting water from the NNRC. The reservoir also intends to release the water to STA-3/4 for treatment before being released to Water Conservation Area - 3A (WCA-3A).

1.3 PROPOSED PROJECT BACKGROUND

1.3.1 Memorandum of Agreement (Acceler8)

On October 14, 2004, a Memorandum of Agreement (MOA) regarding acceleration of the Comprehensive Everglades Restoration Plan between the Executive Office of the Governor and the SFWMD was signed (Acceler8). Acceler8 expedites restoration of the Everglades and attainment of benefits ahead of the CERP schedule and serves as the initial foundation for other comprehensive restoration efforts to follow. Acceler8 consists of eight projects (some with multiple components) that, when completed, will provide immediate environmental benefits including both water quality and water

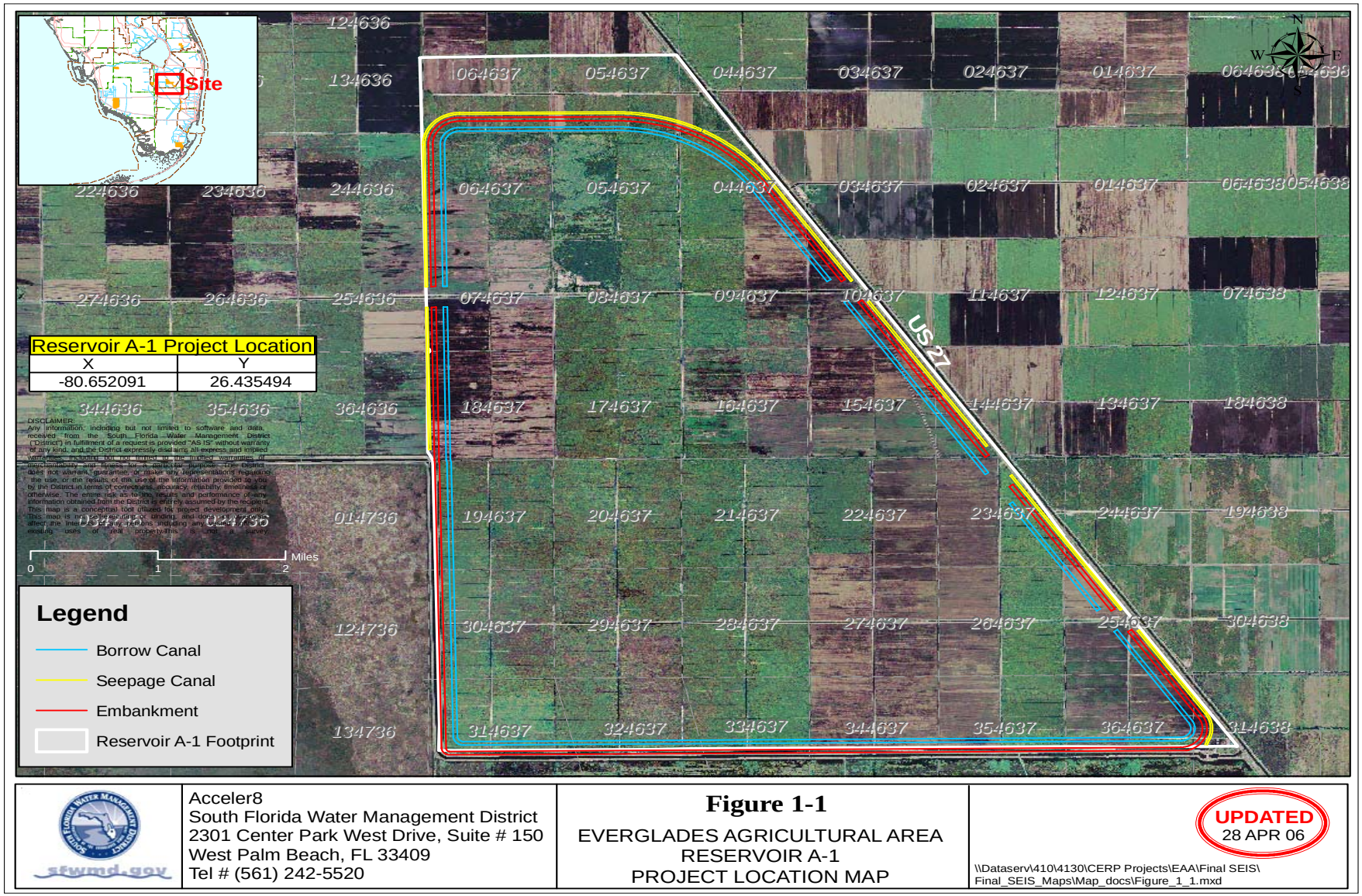

FIGURE 1-1: EVERGLADES AGRICULTURAL AREA RESERVOIR A-1

quantity benefits, flood control and water supply benefits. The projects listed below, are all due to be online by 2011, 11 years ahead of the CERP schedule. See Figure 1-2 for the location of the Acceler8 projects.

- C-44 (St. Lucie Canal) Reservoir/Stormwater Treatment Area (STA)
- C-43 (Caloosahatchee River) West Reservoir
- Everglades Agricultural Area Reservoir A-1 and Bolles & Cross Canals Improvements as a later phase
- Everglades Agricultural Area STA Expansion
- Water Preserve Areas
    - Site 1
    - C-9
    - C-11
    - Acme Basin B
    - WCA-3A/3B
- Picayune Strand (Southern Golden Gate Estates) Restoration
- Biscayne Bay Coastal Wetlands - Phase 1
- C-111 Spreader Canal

These Acceler8 projects are designed to contribute to as many of the benefits from CERP as early as possible. The remainder of the CERP projects will follow as time and resources allow. See Annex H for a copy of the MOA which also contains the list of Acceler8 projects.

1.3.2 Project Background

Following the MOA, the SFWMD, and the USACE began to pursue a "Dual Track" process for the EAA Storage Reservoirs Project. While the multi-agency Project Delivery Team, led by USACE, continues to develop the PIR/EIS, the SFWMD is proceeding with the design and construction of the EAA Reservoir A-1 subject to requisite permitting.

Detailed design and engineering analysis in support of initiation of construction activities commenced in 2005 under the Acceler8 program with survey and subsurface geotechnical investigations. Detailed design of the Acceler8 project is being accomplished by SFWMD with coordination and review by USACE under the Acceler8 program. All project features are being designed in accordance with USACE regulations and standards.

Under the Acceler8 program, SFWMD has prepared a Basis of Design Report (BODR) for the EAA Storage Reservoir A-1 project. The BODR includes all engineering assumptions and conceptual designs for the Acceler8 project

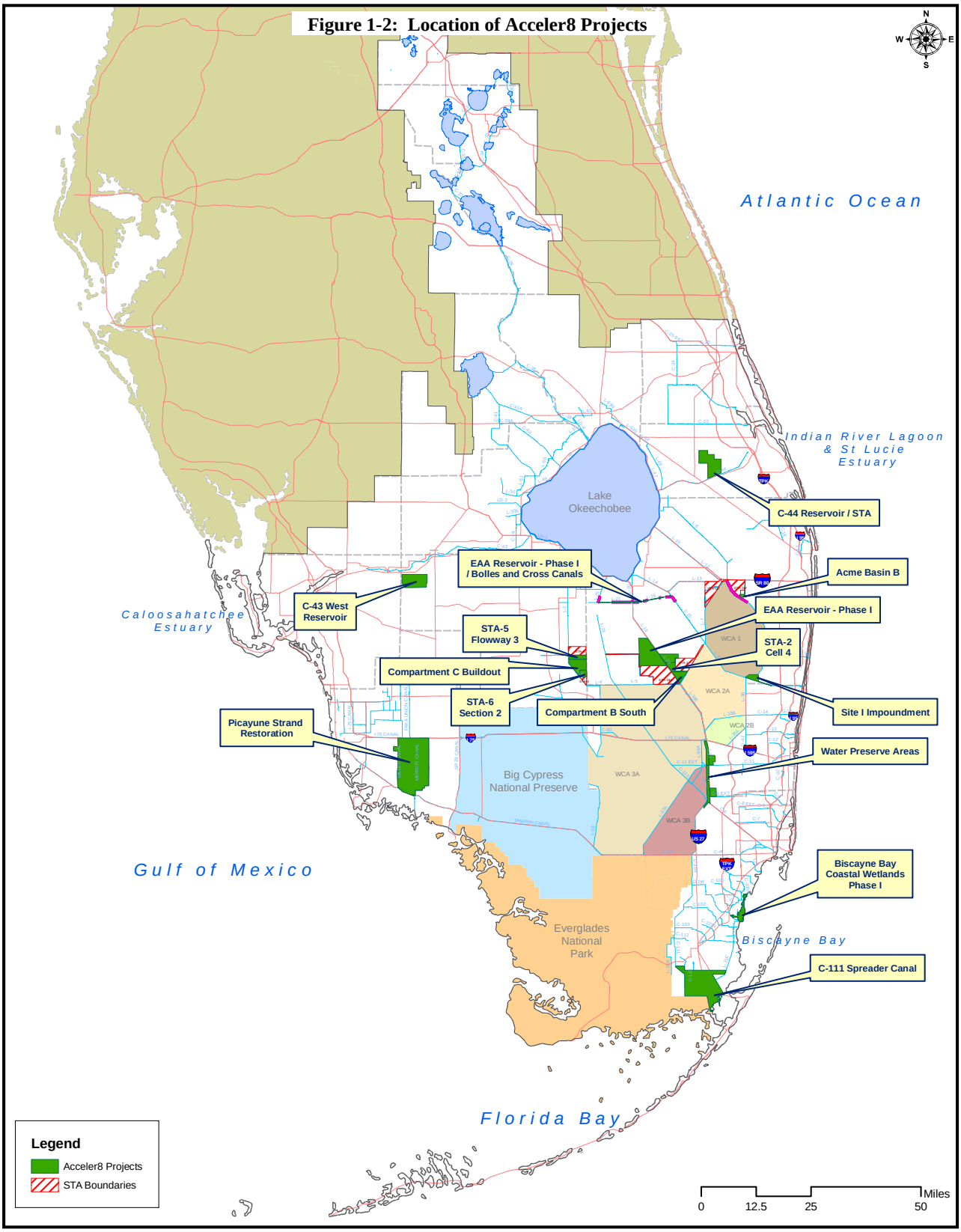

FIGURE 1-2: LOCATION OF ACCELER8 PROJECTS

features. The BODR can be found on the following website: http://www.evergladesnow.org

Upon completion of the BODR, SFWMD will prepare initial, intermediate, and final plans and specifications for construction contract award.

Subject to receipt of all required authorizations, the SFWMD proposes to begin construction on the EAA A-1 Reservoir project in July 2006. The EAA Reservoir A-1 Acceler8 project is expected to be completed in 2009. Construction activities for the Acceler8 project will be in accordance with the Acceler8 program and will be the responsibility of SFWMD. Crediting for work performed by SFWMD toward any CERP project will be subject to authorization of a CERP project, execution of a PCA, adherence to USACE design standards and regulations, and determination that work to be credited was necessary and integral to the CERP project and performed for a reasonable cost.

The CERP EAA Storage Reservoir Final PIR/EIS with a recommended plan is currently scheduled for January 2007. Upon approval and authorization, construction of the Federal project is currently scheduled to begin in 2007, and is to be completed in 2010.

1.3.3 Proposed EAA Reservoir A-1 Project

The SFWMD's proposed EAA Reservoir A-1 project, identified as Cell A-1, is within the footprint of a portion of the USACE's preferred alternative for the EAA Storage Reservoirs project, specifically, Alternative 4 in the Draft PIR/EIS. The proposed SFWMD EAA Reservoir A-1 project is located in eastern half of Compartment A and borders U.S. 27 and the NNRC to the east, STA-3/4 to the south, and the Holey Land Wildlife Management Area to the southwest (See Figure 1-1 and Figure 1-3). The western border is perpendicular to the eastern edge of the Holey Land Wildlife Management Area. The SFWMD's proposed EAA Reservoir A-1 project covers approximately 16,768 acres and is designed to store stormwater originating within the S-2/7, S-3/8, S-236 and C-139 basins and releases from Lake Okeechobee, all located generally north of the Project site. A schematic of the EAA Reservoir A-1 and its relationship to the other EAA infrastructure is shown in Figure 1-3.

The CERP EAA Storage Reservoirs project Alternative 4, the preferred alternative that is not yet an authorized project, features a two-cell reservoir impoundment with a maximum normal pool storage depth of 12 feet at approximately 31,000 acres of above ground surface area storage. The SFWMD has identified these two cells as Cell A-1 and Cell A-2, approximately 17,000 and 14,000 acres in size respectively, and combined

would contain 360,000 acre-feet of water. Presently, only the EAA Reservoir A-1 is proposed as part of the Acceler8 program. It is anticipated that the construction of EAA Reservoir A-2 will follow EAA Reservoir A-1 in a few years. See Figure 1-1 for location of the EAA Reservoirs A-1 project.

The EAA A-1 Reservoir project a SFWMD Acceler8 project. The purpose of the State of Florida's Acceler8 initiative is to accelerate the funding, design, and construction of projects consistent with CERP in order to experience positive environmental benefits sooner and in a cost-effective manner avoiding inevitable increases in construction materials and labor costs.

1.4 PURPOSE OF AND NEED FOR PROPOSED PROJECT

1.4.1 Project Purpose

The Central and Southern Florida (C&SF) Project Comprehensive Review Study (Restudy) and Final Integrated Feasibility Report and Programmatic Environmental Impact Statement, dated April 1999, identified the need to improve timing of water deliveries from the EAA to the Water Conservation Areas (WCAs). Other needs included reducing damaging flood releases from the EAA, reducing Lake Okeechobee regulatory releases to the estuaries, meeting agricultural irrigation and Everglades water demands, and improving flood protection within the EAA. Construction and operation of reservoirs in the EAA would reduce water demands from Lake Okeechobee, reduce the need to back-pump EAA stormwater to the lake, and reduce the damaging pulse regulatory releases from Lake Okeechobee to the Caloosahatchee and St. Lucie Estuaries. Additional storage is needed to reverse declines of ecological function and productivity in Lake Okeechobee and the estuaries of the St. Lucie and Caloosahatchee Rivers.

For the purpose of this EIS, the USACE has determined that the basic project purpose of the proposed action is to construct and operate a reservoir in the EAA in Palm Beach County, Florida. The overall project purpose of the reservoir is to provide water storage in order to improve timing of water deliveries from the EAA to the Water Conservation Areas (WCAs), reduce Lake Okeechobee regulatory releases to the estuaries, meet supplemental agricultural irrigation demands, and increase flood protection within the EAA.

The EAA A-1 Reservoir project is identified as an Acceler8 project. The purpose of the State of Florida's Acceler8 initiative is to accelerate the funding, design, and construction of projects consistent with CERP in order to experience environmental benefits sooner and in a cost-effective manner avoiding inevitable increases in construction materials and labor costs.

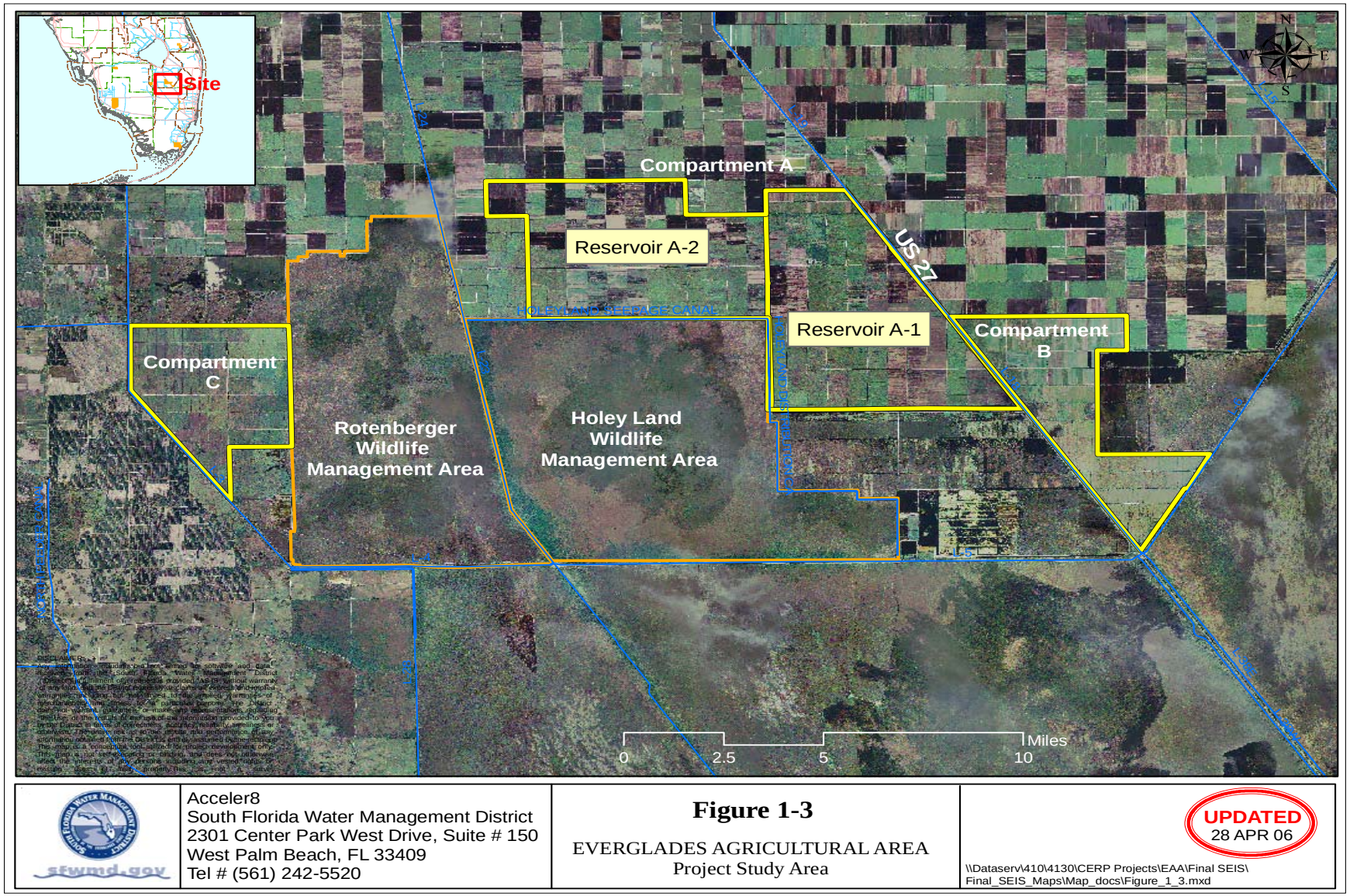

FIGURE 1-3: EVERGLADES AGRICULTURAL AREA PROJECT STUDY AREA

1.4.2 Proposed Project Need

The SFWMD's proposed EAA Reservoir A-1 will store up to 190,000 acre-feet of water from stormwater runoff and releases from Lake Okeechobee at any given time. Without this project, that water will potentially cause flooding in the EAA, will need to be pumped through STA-3/4 at higher rates than can effectively provide desired water quality treatment, or will potentially be bypassed to tide, or will potentially be released to the estuaries from Lake Okeechobee. Thus there will be a reduction in the potential for flooding and damaging releases to the estuaries once the project is completed.

The goals and objectives of the SFWMD's proposed EAA Reservoir A-1 will:

- Capture, move and store regulatory releases from Lake Okeechobee, reducing the number/volume of harmful discharges to coastal estuaries.
- Capture, move and store agricultural stormwater runoff, reducing the need for emergency flood control (backpumping) into Lake Okeechobee.
- Provide additional water to meet Everglades and agricultural water demands, improving the timing of environmental deliveries of water to the WCAs and lessening water supply dependency on Lake Okeechobee.
- Improve operational flexibility to move water within the EAA, including flow equalization and optimization of STA performance to further reduce phosphorus inflows to the Everglades.
- Provide public access and recreation opportunities.

Achievement of these goals and objectives should enhance habitat quality in Lake Okeechobee's littoral zone, the Caloosahatchee and St. Lucie estuaries (the northern estuaries) and the WCAs, and improve native plant and animal species abundance by retaining natural waters in the system. Benefits to downstream estuaries are expected as a result of reduction of abrupt and high volume freshwater discharges and pulse releases from Lake Okeechobee.

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CHAPTER 2
ALTERNATIVES

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2.0 ALTERNATIVES

The proposed action of this EIS was developed to improve timing of water deliveries from the EAA to the Water Conservation Areas (WCAs), reduce damaging flood releases from the EAA, reduce Lake Okeechobee regulatory releases to the estuaries, meet agricultural irrigation and Everglades water demands, and improve flood protection within the EAA.

Three different types of alternatives have been analyzed for the Acceler8 project: flowway, aquifer storage and recovery (ASR), and construction of a reservoir. Based upon the preliminary screening analysis, the flowway, and ASR were eliminated. Alternatives considered in detail include construction of a reservoir at Compartment B, Compartment C, Cell A-1 and Cell A-2 (Figure 1-1). Although water storage might be accommodated in Lake Okeechobee by adjusting the lake regulation schedule, this option was rejected because of resultant harmful impacts. For purposes of this action, this alternative was screened out and is not considered in this document. The reader is referred to the Draft Integrated PIR/EIS dated September 2005, for preliminary screening of this alternative.

2.1 PRELIMINARY SCREENING OF ALTERNATIVES

In addition to the above ground storage reservoir alternatives, flow-ways and aquifer storage and recovery (ASR), and the No Action Alternative were also considered. The flow-way alternative is a broad shallow marsh area for free flow of water from Lake Okeechobee to WCAs, and ASRs could enhance stormwater storage for environmental, urban, and agricultural uses by storing water underground.

2.1.1 Flow-way

A flow-way is a passive measure generally described as a broad, shallow marsh area that is used to freely-flow water from one area or feature to another. This alternative was developed during the Restudy to restore sheet flow between the EAA and the WCAs. The flow-way would provide for sheet flow and dynamic water storage. Various flow-way designs were considered ranging from 1 to 3 miles wide and varying lengths to identify relative differences in the hydrological and environmental response.

The evaluation of this concept showed a number of problems concerning feasibility, such as soil subsidence, evapotranspiration, seepage management, vegetation management, timing of flows, and lack of flow events. Additional EAA issues included numerous roads, bridges, and railroad relocations that would be required if a flow-way divided the entire EAA.

Soil subsidence in the EAA has substantially reduced ground levels in the southern portions of the EAA and would reduce the hydraulic head that would drive the southward flow of water; hence, velocities and flow rates would be greatly reduced. By spreading the water over shallower areas (as opposed to reservoirs) and because a marsh habitat would have to be kept hydrated, the evapotranspiration loss would be much higher than for reservoirs, thereby significantly reducing the storage value of this area. A long, rectangular configuration would have a 75% longer levee than a traditional storage reservoir, thus increasing environmental impacts, project cost, and the area devoted to seepage management features. Because nutrient-laden soil would be flooded for this project, the vegetation most likely to dominate would be cattails and other invasive exotics that would degrade the Everglades habitat.

Flow-ways would not "hold back" water going to the STAs and the delivery of that water would exacerbate the already high stages in the northern parts of the WCAs. Thus, the timing of flows from flow-ways would not be manageable or beneficial for the remaining Everglades. Perhaps the most crucial element, water flowing from the lake to the WCAs, is not present in dry or even normal years. For example, during long periods from 1970-1982 or 1985-1994, no significant excess lake water was available for the flow-way. Only demand releases to the Everglades were made from the lake during those periods. Water delivered to the Everglades on a demand basis, through a flow-way, would not be effective with increased travel times and increased evapotranspiration losses. The only years where water could flow for long duration were wet periods like 1969-1970, 1982-1983, and 1994-1995. In those years, the stages in the WCAs were already too high and additional flow from flow-ways would have been damaging, not beneficial. Perhaps the most important reason why flow-ways were not included in the Comprehensive Plan was because of the significant water losses that would be unacceptable in an ecosystem in which dry season performance was already impacted. Flow-ways would place an additional hydrological burden on the system. Therefore, flow-ways were screened from further analysis.

2.1.2 Aquifer Storage and Recovery

In terms of acre-feet of storage, each well in the ASR system could have the capacity to inject 5,601 acre-feet of water into the Upper Floridan Aquifer (for later retrieval) on an annual basis, provided enough water was available to do so.

Additional water stored in underground ASR systems within the EAA could meet the following Acceler8 objectives:

1) Reduce regulatory releases of water from Lake Okeechobee to the St. Lucie and Caloosahatchee Estuaries. The ASRs could withdraw water from the lake. This could reduce the need to make lake regulatory releases to the east and west estuaries in such large volumes that their natural salinity regimes are harmed.
2) Reduce Lake Okeechobee regulatory releases of water to the WCAs. The ASRs could withdraw water from the lake reducing the need to make lake regulatory releases southward to the WCAs when the WCAs already have too much water.
3) Improve the timing of environmental deliveries of water to the WCAs. Water could be stored in ASRs moved through the EAA to the WCAs to meet the needs of the natural system.
4) Meet agricultural demands within the EAA. The ASRs could withdraw water from the lake and it could be used subsequently to meet the needs of agriculture.

Storing additional water in ASR systems rather than in reservoirs raises a high level of technological and regulatory uncertainty. There is an ongoing ASR pilot project and regional studies to address these uncertainties. While the uncertainties will likely be reduced and managed as a result of the pilot project results, they nevertheless play a role in the inability to water quality treatment technologies and recovery efficiencies (currently, only 70% of the water injected into ASRs is assumed to be recoverable) also greatly affect ASR project cost estimates.

Further, ASR as an alternative to above ground storage, has a slower rate of water capture and discharge. The rate of capture (from Lake Okeechobee or a canal) is limited at each well site to a maximum of 15 acre-feet per day, as compared to 6,942 acre-feet per day on average for each pump at above ground storage reservoirs to capture from the lake or a canal. This would significantly limit the system's ability to store regulatory releases from the lake needed to keep the lake below its maximum allowable level. Therefore, ASR was screened from further analysis.

2.1.3 Reservoir

Creating an above ground reservoir within the EAA could meet all the objectives of the proposed Acceler8 project which are shown below:

1) Capture, move and store regulatory releases from Lake Okeechobee, reducing the number/volume of harmful discharges to coastal estuaries.

2) Capture, move and store agricultural stormwater runoff, reducing the need for emergency flood control back-pumping into Lake Okeechobee.

3) Provide additional water to meet Everglades and agricultural water demands, improving the timing of environmental deliveries of water to the WCAs and lessening water supply dependency on Lake Okeechobee.

4) Improve operational flexibility to move water within the EAA, including flow equalization and optimization of STA performance to further reduce phosphorus inflows to the Everglades.

5) Provide public access and recreation opportunities.

The above ground storage option has the advantage of robust hydraulic connections with both the lake and the EAA through the existing canals. They also have the advantage of potential enhancement of STA operation by intercepting peak flows and retaining water during wet periods and providing more moderated flows of water to the STAs during dry periods.

Depending upon placement and the size of the reservoir, this alternative may remove property from the tax roles in Palm Beach County, with its associated negative impacts on the socioeconomic components of the environment in this county. According to the Palm Beach County Property Appraiser, the value of land in the EAA decreases with distance from Lake Okeechobee. Land near the STAs and WMAs, at the south end of the EAA, was valued at a little more than 40% of the value per acre of the land next to the lake. Apparently, this is related to the relatively poor agricultural productivity of this land when compared to the land adjacent to the lake.

2.2 DESCRIPTION OF ALTERNATIVES

The SFWMD and the Federal Government have been acquiring lands needed for CERP implementation in advance of completion of a PIR, based on the April 1999 "Final Integrated Feasibility Report and Programmatic Environmental Impact Statement". Large acreages of land have been acquired in the southern end of the EAA for the purposes of Everglades' restoration. These parcels which include Compartment A (Cell A-1 and Cell A-2), Compartment B and Compartment C are also adjacent to the existing STAs and the canals that connect with Lake Okeechobee therefore reducing the need to construct significant additional canal infrastructure. For CERP projects, the USACE's policy in plan formulation is to consider lands that have already been acquired for Everglades' restoration purposes. Because the Acceler8 projects are an advancement of CERP, only lands already acquired for Everglades Restoration were considered in the alternatives analysis in order to control costs associated with implementation of the projects.

As a result of the State of Florida's Acceler8 initiative, which was discussed in Chapter 1 of this document, the SFWMD and the USACE began to pursue a "Dual Track" process for the EAA Storage Reservoirs project. While the multi-agency Project Delivery Team (PDT), led by USACE, continues to develop the Integrated PIR/EIS, the SFWMD is proceeding with the implementation of Acceler8, including construction and design of the EAA A-1 Reservoir. The SFWMD's Acceler8 EAA A-1 Reservoir project is being considered for purposes of this regulatory action.

One of the most studied and computer modeled components in the Central and South Florida Project Comprehensive Review Study (Restudy) was the storage reservoir in the EAA. Several models were used to evaluate various storage volumes within the EAA and based upon a system-wide perspective, that is all CERP components working together, it was determined that 360,000 acre-feet of storage was sufficient. The final storage volume is not a stand-alone figure but represents a balance with all of the other CERP components operating together to provide the benefits described in the Restudy. The fact that there is a balance to the plan is very significant since there were other plans that captured more water, but had unintended adverse impacts in some areas.

Because of the central location of the planned EAA Storage Reservoir, and the ability of other CERP components to compensate for limitations within the system (the relative robustness of the plan), system flow variations due to changes in EAA storage are difficult to characterize in environmental terms. As a result, alternatives involving variations in EAA storage may not have a significant impact on stages at any one place, or significant flow changes to any one place. For an alternative analysis that spreads water in many places (none of which has a significant change) the obvious conclusion would be that the least-cost alternative should be selected. That most likely means the smallest size considered would be selected.

The size of the storage area is also a function of how much water is available to be stored. A storage area that is too large for the amount of inflows available would result in unused storage area (wasted space and money). A storage area that is too small will not capture all the excess water that is available (wasted water and benefits). This relationship is complicated by the fact that the amount of water to store varies from year to year. Taking all of these factors into consideration, the USACE determined the need to affirm the Restudy goal of 360,000 acre-feet without seeking to reformulate the size of the reservoir.

The CERP EAA project draft PIR/EIS recommends the construction of storage reservoir(s) which can provide 360,000 ac-ft of water storage. Various configurations, sizes and maximum pool depths (6, 10, 12, and 14 ft) for the

federal project have been considered to meet the 360,000 ac-ft capacity. The Draft Integrated PIR/EIS dated September 2005 and the Revised Draft Integrated PIR/EIS dated February 2006 recommend a federal project with a preferred project location in Compartment A and construction of both Cell A-1 and Cell A-2.

The overall goal of Acceler8 is to provide environmental benefits sooner than would occur under CERP and in a cost-effective manner avoiding inevitable increases in construction materials and labor costs due to delay. As a result, construction of a reservoir on lands not identified by the USACE for future reservoirs under CERP will not meet the overall goals of Acceler8, which is to accelerate the funding, design, and construction of planned federal projects within CERP. This crucial element of Acceler8 was considered in identifying the final alternative as a part of the considerations (See Table 2-1 below).

Notably, projected costs to implement CERP have increased since 1999 from $8 billion to approximately $10.5 billion. This significant inflation has been exacerbated by the limitations on the Federal Government's ability to fund CERP projects. The State's Acceler8 Program includes a series of projects with a total budget of 1.8 billon dollars. This limitation was determined based on the SFWMD's ability to obtain debt service and limitations imposed by the State of Florida.

The Acceler8 projects will provide system-wide benefits throughout the south Florida ecosystem. As a result imposition of realistic limitations on the scope of individual Acceler8 projects is crucial in achieving this goal of system-wide benefits. Building the entire CERP EAA Storage Reservoirs project would have eliminated other Acceler8 projects designed to provide system-wide benefits for other areas of the south Florida ecosystem. This careful balance to achieve system-wide benefits throughout the south Florida ecosystem within the economic constraints imposed on the SFWMD is clearly reasonable, and therefore, the SFWMD did not consider construction of the entire preferred alternative for the CERP EAA Storage Reservoirs project (both Cell A-1 and Cell A-2).

Furthermore, the State's proposal to build a portion of what it expects to be included in the larger federal project will provide a significant portion of the system-wide benefits expected from the implementation of the full scale two cell reservoir anticipated under CERP. This will also provide important experience and information that can be applied through the adaptive management process to improve and optimize the operations of the full scale reservoir when it is constructed through the CERP process. The SFWMD considered construction of Cell A-1 as the most practicable alternative to achieve immediate environmental benefits and fulfill the Acceler8 purpose and goal.

The Alternatives considered for this regulatory action were scored on a scale of zero to three with three being highest based on ability to meet project objectives, desirable storage capacity, desirable location, ability to avoid/minimize environmental and socioeconomic impacts, and least amount of construction features (See Table 2-1). Although construction costs estimates were not scored, higher project costs are directly related to the extent and number of construction features.

2.2.1 No Action Alternative

The No-Build or no action alternative is always a consideration in NEPA analysis. The objective of this project is to provide water storage to attain environmental benefits in the EAA. It has been concluded that the No-Build alternative would not achieve the project purposes. If a storage reservoir in the EAA is not built, then additional storage and early environmental benefits would not be realized until construction of the CERP EAA Storage Reservoirs project.

2.2.2 Compartments B and C

The SFWMD considered the use of other lands within the EAA i.e., the Talisman lands, specifically Compartments B and C for construction of a storage reservoir. The reservoirs on Compartment B would be a two separate reservoirs north and south of STA 2, directly east of the North New River Canal. The total acreage available for a reservoir on Compartment B is approximately 7,500 acres. A reservoir 12-ft deep would yield a storage volume of approximately 90,000 acre feet. A reservoir on Compartment C would be located between STA 5 to the north, STA 6 to the south, Rotenberger WMA to the east and the L-3 to the west. The total acreage available for a reservoir on Compartment C is approximately 6,240 acres. A reservoir 12-ft deep would yield a storage volume of approximately 75,000 acre feet.

Compartments B and C considered separately would produce significantly less benefit than either Cell A-1 and A-2, therefore, further evaluation considered Compartment B and C together.

Table 2-1: Alternative Evaluation Matrix

	Alternative							
Evaluation Criteria	**No Action**	**Pts.**	**Compartments B & C**	**Pts.**	**Cell A-1**	**Pts.**	**Cell A-2**	**Pts.**
Project Objectives								
Ability to capture LOK regulatory releases	Did not meet objective	0	Canal capacity from LO very limited to Compartment C. Canal capacity from NNR available for Compartment B	1	Largest capacity alternative-Canal capacity from NNR available for Compartment A-1	3	Canal capacity from NNR available, however, greater distance to convey from NNR to compartment A-2	2
Ability to capture EAA stormwater runoff	Did not meet objective	0	Compartment C limited due to location away from primary regional canals and location on far western portion of EAA. Compartment B has good access to the NNR	1	Largest capacity alternative-Compartment A-1 has good access to NNR	3	Compartment A-2 has access to NNR however, greater distance to convey from NNR to Compartment A-2	2
Ability to provide water to Everglades (EPA)	Did not meet objective	0	Compartment C limited due to location away from primary regional canals and location on far western portion of EAA, located adjacent to STA 5 and 6. Compartment B located adjacent to STA 2	1	Largest capacity alternative-Compartment A-1 has good access to NNR for supply from LO and EAA runoff also directly north of STA 3/4 for flows to WCA 3A.	3	Compartment A-2 has access to NNR however, greater distance to convey from NNR to Compartment A-2. Water from A-2 would then need to be routed via canal to STA 3/4 for flows to WCA 3A	2
Ability to provide water to meet EAA agricultural needs	Did not meet objective	0	Compartment C limited due to location in far southwestern corner of EAA. Compartment B located adjacent to NNR, however the southern cell is a significant distance from agricultural areas	1	Largest capacity alternative-A-1 located adjacent to NNR, good location to provide water supply needs	3	A-2 located midway between Miami and NNR if canals constructed for discharge, good location for water supply	2
Improve water management flexibility within the EAA including flow equalization and optimization of existing STAs	Did not meet objective	0	Compartment C limited due to location away from primary regional canal system	1	A-1 located adjacent to NNR, good location to improve water management flexibility	3	A-2 located midway between Miami and NNR if canals constructed for discharge, good location to improve water management flexibility	2
Provide public access and recreation opportunities	Did not meet objective	0	Compartment C road access from county roads. Compartment B access from US 27	2	Access from US 27	3	Access via agricultural roads and levees	1
Environmental Impacts								
Wetland Impacts	No wetlands impacts	3	288.88	0	194	1	18.25	2
Cultural Resource Impacts	No change in cultural resource impacts	3	Compartment C has significant issues if used as a deep reservoir. Compartment B no cultural resources present	0	not present	2	not present	2
Socio/Economic Impacts								
Flood Protection impact to adjacent property	No effect on flood protection	3	Compartment B need to minimize seepage along northern boundary due to private ownership. Compartment C need to minimize seepage along western boundary due to private ownership and along eastern boundary due to Rotenberger.	2	Need to minimize seepage to east due to US 27, Seepage south STA 3/4 and limited area adjacent to Holeyland acceptable	1	Need to minimize seepage along northern and western boundary due to private ownership and southern boundary due to Holeyland	0
Storage Capacity	No storage provided	0	165,000 ac-ft (B= 90,000 ac-ft; C=75,000 ac-ft)	1	190,000 ac-ft	3	170,000 ac-ft	2
Location								
Access to water supply	No change	0	Compartment C limited due to location away from primary regional canals, Compartment B adjacent to North New River	1	North New River Canal directly adjacent to Cell A1	3	Canal construction required to convey water to and from either Miami and/or North New River Canal	2
Connectivity with STAs	No change	0	Adjacent to STAs 2,5,6	2	Adjacent to STA 3/4	2	No direct connectivity	1
Accessability for construction	No change	0	Access via county roads and project levees	2	Access from US 27	3	Access via agricultural roads and project levees	1
Construction Features								
Ability to utilize existing pumps to fill reservoir	No change	0	Partially fill Compartment B using STA 2 pump stations, partially fill Compartment C using STA 5 pump station. Two pumps necessary due to two cell configuration	2	Partially fill Compartment A1 using STA 3/4 pump station	3	Limited ability to fill Compartment A2 with STA3/4 pump station, requires additional infrastructure for even limited capacity	1
Miles of embankments	No change	3	30 miles	0	21 miles	2	24 miles	1
Total Pts.		12		17		38		23

Compartments B and C were eliminated from further consideration for the following reasons:

- The Central and South Florida Project Comprehensive Review Study (Restudy) recommended that a total reservoir storage capacity of a least 360,000 acre-feet be provided by the EAASR project. Upon further development, the USACE determined the multi-agency team need only affirm the Restudy goal of 360,000 acre-feet without seeking to provide additional storage. The project team subsequently screened out alternatives providing larger storage volumes and provided a draft plan providing 360,000 acre-feet in Compartment A. Therefore, the federal CERP EAA Storage Reservoirs project does not include Compartments B and C. Construction of a reservoir within these lands would not meet the overall goal of Acceler8 which is to accelerate the funding, design, and construction of planned federal projects within the CERP in order to provide environmental benefits sooner and in a cost-effective manner avoiding inevitable increases in construction materials and labor costs.
- Phase I and Phase II Cultural Resources Surveys that were conducted in STA-5, Flow-way-3 and STA-6, Section-2 of Compartment C directly to the north and south of the portion of Compartment C considered for a reservoir site. These surveys identified four sites potentially eligible for listing in the National Register of Historic Places. These sites would likely be adversely affected by deep water conditions that would occur with a 12-foot deep reservoir. See Chapter 3, Section 3.17 for a more detailed description of these sites). On the remaining portion of Compartment C considered for a reservoir site, there are eight known cultural resource sites and approximately 800 acres of high probability area which will need additional cultural resource survey investigations. Comprehensive site evaluation work would be necessary to determine the significance of impacts by reservoir construction and operation on the known sites, including other sites that may be identified in the 800 acres of high probability area. However, based on the analyses and mitigation measures taken to protect sites in the STA 6, Section 2 which will have a depth ranging from 0.5 to 4 feet, it appears that sites within the remaining Compartment C area could not be protected in a reservoir with a maximum depth of 12 feet.
- Compartment C has the largest acreage of existing natural, nonagricultural wetlands, 288.35, that would be impacted as a result of project construction of all the alternatives considered other than No Action.

- Utilizing the remaining land available in Compartment B would require the construction of two separate reservoirs due location of STA 2, Cell 4. The two reservoirs would need two separate pump stations reducing the cost effectiveness of the facility
- Together Compartments B (7,500 acres) and C (6,240 acres) would provide a storage capacity of 165,000 ac-ft. In addition, preliminary analysis indicated that building two separate reservoirs on these parcels would not be cost effective due to the additional cost for embankments, pumps, and associated water control structures for both constructing three separate reservoirs on the two compartments.
- The geographical location of Compartment C away for the regional canal conveyance system used to convey Lake Okeechobee water south would limit the use of Compartment C's ability to accept Lake Okeechobee regulatory releases which is an important project purpose.
- Compartments B and C are now intended for use by the SFWMD to expand the Everglades Construction Project Stormwater Treatment Areas. When the project team screened out alternatives providing larger storage volumes and provided a plan exclusively in Compartment A, this left the remaining lands purchased with Department of the Interior funding open to diversion from the EAA Storage Reservoirs project to Everglades Construction Project (ECP) i.e., STAs as presently proposed. The proposed STAs expansions are shown in Figure 1-2 as the Acceler8 Everglades Agricultural Area STA Expansion. STAs naturally reduce stormwater runoff pollution levels flowing from the Everglades Agricultural Area before entering the Everglades. Compartment C is contiguous with STA-5, Flowway-3 to the north and STA-6, Section-2 to the south. Compartment B is contiguous with STA-2 to the east. Siting of additional STAs within Compartments B and C will allow the STA expansion areas to be incorporated into current operational regime of existing STAs. Construction of additional STAs are needed to further reduce phosphorus levels and help achieve state water quality standards for the Everglades, improve existing STAs' ability to remove pollutants prior to discharge into the Everglades, and provide operational flexibility for directing flows to optimize STA performance in improving water quality entering the Everglades. Construction of STAs in lieu of open water reservoirs has less impact on cultural and wetland resources. Adverse impacts to cultural resources can often be avoided through implementation of engineering measures that are compatible with STA construction and operation. STAs are also operated in a manner such that wetland habitat is present year round.

2.2.3 Cell A-1 and Cell A-2 of Compartment A

The following features and operations were used to analyze constructing a reservoir within Cell A-1 or Cell A-2:

2.2.3.1 Available Lands and Storage Capacity

The reservoir footprints and storage capacity for Cells A-1 and A-2 was established as a result of the land made available in the Talisman Purchase and in coordination with the USACE during the development of the federal EAA Storage Reservoirs project.

The capacity of 190,000 acre-ft volume and a maximum pool depth of 12 ft were determined to be the most cost effective storage volume on the approximate 16,700 acres of land available for Cell A-1. In addition, the A-1 reservoir was optimized to not exceed the treatment capacity of STA 3/4. The capacity of 170,000 acre-ft volume (12 ft deep) was determined to be the most cost effective storage volume for the 14,000 acres of land available for Cell A-2.

2.2.3.2 S-2, S-6 and S-7 Basin - North New River Canal

The North New River Canal (NNRC) is located along the eastern border of the proposed EAA Reservoir A-1. It provides drainage to the area extending from pump station S-2 to pump station S-7. Pump station S-2 is a 3600 cubic feet per section (cfs) pump station which currently pumps NNRC drainage into Lake Okeechobee. Pump Stations S-6 and S-7 have 2925 cfs and 2490 cfs capacity respectively.

The G-370 pump station is a three-unit pumping station located on the west side of U.S. 27 and the NNRC, about 25 miles south of Belle Glade. It provides flood protection to the upstream agricultural basins that total approximately 222 square miles. While the removal of stormwater runoff from the upstream basins is the primary function of the pump station, it is also used to convey regulatory releases and supplemental flows from Lake Okeechobee and releases sent to STA-3/4 to maintain minimum depth in the treatment cells.

2.2.3.3 S-3, S-8 Basin - Miami Canal

The Miami Canal carries flows between pump stations S-3 at Lake Okeechobee, and S-8 at the southern edge of the EAA. Pump station S-3 is a 2,580 cfs pump station which currently pumps Miami Canal drainage into Lake Okeechobee.

G-372 pump station is a four-unit pumping station located about 25 miles southwest of Belle Glade, and 7 miles north of S-8 pump station. It provides flood protection to upstream agricultural basins along the Miami Canal totaling approximately 277 square miles. Similar to G-370 pump station, the primary function of the pump station is the removal of stormwater runoff from the upstream basins. In addition, it conveys regulatory releases and supplemental flow from Lake Okeechobee and releases sent to STA-3/4 to maintain minimum depth in the treatment cells. G-372 pump station can also be used to release water into the Holey Land WMA at the SFWMD's discretion.

Normal operations include agricultural/drainage phases, similar to G-370 pump station, which indicate if the dominant agricultural activity is agriculture or drainage. The operating goal is to hold stages in the Miami Canal at a constant level, although during the agricultural phase, the canal water level may fall below the desired level.

2.2.3.4 Stormwater Treatment Area 3/4

The STA-3/4 Supply Canal conveys discharges from G-370 and G-372 pump stations to the inflow structures for the three flow-ways comprising STA-3/4. STA-3/4 is a wetlands treatment system for the removal of Phosphorus. The inflow to the northern STA cells is controlled by a series of gated hydraulic structures. Discharge from the STA is controlled by similar structures on the southern end of the area. The treated water from STA-3/4 passes south to WCA-3A.

The STA-3/4 is currently undergoing enhancements, including the construction of an internal levee in Cell 3 with associated structures, small forward pumping stations in Cells 1, 2 and 3, and a demonstration project in Cell 2B. These enhancements are scheduled for completion in 2006.

2.2.3.5 EAA Reservoir A-1 Alternative

Construction of reservoir within Cell A-1 of Compartment A consists of the construction of an above-ground reservoir for water storage, with a capacity of 190,000 acre-feet at an approximate depth of 12-feet. The reservoir would be constructed on a 16,768 acre parcel of land situated on the eastern portion of Compartment A.

The A-1 alternative includes the following components:

- Approximately 190,000 acre-feet reservoir with a perimeter embankment and seepage canals

- Construction of a northeast pump station (3,600 cfs capacity that pumps from NNRC)
- A connector canal from the NNRC to the new northeast pump station
- Evaluation of potential modifications to the existing G-370 pump station, (a 2,775 cfs pump station that currently pumps from the NNRC to the STA-3/4 Supply Canal)
- Evaluation of potential modifications to the existing G-372 pump station, (a 3,700 cfs pump station that currently pumps from the Miami Canal to the STA-3/4 Supply Canal)
- Gated discharge structures
- Seepage pump stations
- Gated culvert structures
- New four lane bridge (two parallel two-lane bridges) on U.S. 27 across the new connector canal
- Improvements to conveyance capacity in the NNRC

2.2.4 EAA Reservoir A-2 Alternative

The EAA Reservoir A-2 alternative consists of the construction of an above-ground reservoir for water storage, with a capacity of 170,000 acre-feet at an approximate depth of 12-feet. The reservoir would be constructed on a 14,000 acre parcel of land situated on the western portion of Compartment A.

The EAA Reservoir A-2 alternative includes the following components:

- Approximately 170,000 acre-feet reservoir with a perimeter embankment and seepage canals
- Seepage collection canal and cut off wall along entire North, East and West sides to protect adjacent properties, i.e. the Holey Land
- A canal from the N NRC pump station to the reservoir
- The construction of a pump station at the NNRC
- A bridge at US 27 for the new pump station
- Modifications to existing G-370 pump station and G-372 pump station
- A discharge structure to NNRC
- Canal and discharge structure to Miami Canal
- A discharge structure to STA-3/4 inlet canal

2.3 SELECTED SITE

The EAA Reservoir A-1 Alternative (Cell A-1) was selected for further study based on the features and operation of the existing system in relation to location of Cell A-1. EAA Reservoir A-1 Alternative was selected over the EAA Reservoir A-2 Alternative for the following reasons:

- EAA Reservoir A-1 is adjacent to the NNRC and STA-3/4, geographically, for easier construction access.
- EAA Reservoir A-1 can utilize existing G-370 pump station as inflow pump station, which is a major cost savings.
- EAA Reservoir A-2 has over three times the amount of embankment along private property. This will create a need for more cut-off wall to protect these properties.
- EAA Reservoir A-1's seepage south to the STA is a benefit and provides a cost savings by eliminating the need for a deep cut off wall and seepage canal on the south side.
- Construction of EAA Reservoir A-2 prior to EAA Reservoir A-1 would require removal of new features when A-1 was constructed in the future, these include hydraulic connections of EAA Reservoir A-2 to STA-3/4 and add additional costs to construction of EAA Reservoir A-1.
- Construction of EAA Reservoir A-1 prior to EAA Reservoir A-2 would not require the removal of hydraulic connections it to STA-3/4.
- EAA Reservoir A-2 would require a canal to be constructed from the North New River Pump Station to the Reservoir. EAA Reservoir A-1 is adjacent to the NNRC.
- EAA Reservoir A-2 is currently leased land under active agricultural cultivation. The process of notification to lease holders to vacate the land would delay project implementation.
- EAA Reservoir A-2 capacity is only 170,000 ac-ft of water versus the 190,000 ac-ft A-1 capacity.
- Detailed subsurface investigations have not been conducted on the EAA Reservoir A-2 site while these investigations have been conducted for EAA Reservoir A-1. This additional work would delay the detailed design and implementation of this project.

2.4 ALTERNATIVE CONSIDERED FOR FUTURE STUDY

Based on the alternatives' analysis, which included an evaluation of the environmental effects (natural and cultural resources effects) and the construction associated with the alternatives, the Acceler8 EAA Reservoir A-

1 Alternative (Preferred Alternative) was selected by the SFWMD to be the preferred alternative. The Preferred Alternative consists of the construction of an above-ground reservoir for water storage, with a capacity of 190,000 acre-feet at an approximate depth of 12-ft. The reservoir will be constructed on a 16,768-acre parcel of land situated on the eastern portion of Compartment A. Construction of this reservoir is anticipated to be completed in approximately five phases.

The A-1 alternative design was evaluated further based on seepage control measures, embankment design, pump stations, discharge structures and cost. Below is the detailed formulation that resulted in the selection of the final design for the EAA Reservoir A-1 alternative.

2.4.1 Seepage Control

Seepage will occur from EAA Reservoir A-1 because the soil, to approximately 200 feet below the surface of the site, is permeable. Although quite effective at reducing seepage, cutoff walls of practical depth cannot completely eliminate seepage from EAA Reservoir A-1. Additional seepage control measures were considered, including the effect of lowering the water level in the seepage canal as a way to draw seepage to the surface and the use of pressure-relief wells to intercept deep seepage before it migrates to surrounding areas. Five seepage control alternatives were evaluated with Modular three-dimensional finite-difference ground-water model (MODFLOW).

- Alternative #1 - 34-ft cutoff wall and 13.5-ft seepage canal around entire EAA Reservoir A-1, seepage canal held 3.5 feet below level in farm land
- Alternative #2 - 34-ft cutoff wall and 10-ft seepage canal around west, north, and east sides; 10-ft cutoff wall and no seepage canal along STA-3/4 and Holey Land; seepage canal held at level in farm land
- Alternative #3 - 34-ft cutoff wall and 13.5-ft seepage canal around west, north, and east sides; 10-ft cutoff wall and no seepage canal along STA-3/4 and Holey Land; seepage canal held 3.5 feet below level in farm land
- Alternative #4a - Pressure-relief wells spaced at 100 feet linked together in sets with a total of 21 pump stations of 3,900 gallons per minute (gpm) each; 34-ft cutoff wall and 10-ft seepage canal around west, north, and east sides; 10-ft cutoff wall and no seepage canal along STA-3/4 and Holey Land; seepage canal held at level in farm land. Alternative #4b includes separate pumps in each well, each with a capacity of approximately 150 gpm, which discharge to the seepage canal.

- Alternative #5a - Pressure-relief wells spaced at 200 feet linked together in sets with a total of 23 pump stations of 3,300 gpm each; 34-ft cutoff wall and 10-ft seepage canal around west, north, and east sides; 10-ft cutoff wall and no seepage canal along STA-3/4 and Holey Land; seepage canal held at level in farm land. Alternative #5b includes separate pumps in each well, each with a capacity of approximately 275 gpm, which discharge to the seepage canal.

2.4.2 Groundwater Modeling Evaluation

Both two-dimensional and three-dimensional modeling of potential impacts to groundwater from the construction of the EAA Reservoir A-1 were performed to evaluate seepage for a large number of combinations of EAA Reservoir A-1 water depth; cutoff wall depth and location; seepage canal depth, location, and operation; and other seepage control alternatives such as pressure-relief wells. The computer models provide a great deal of assistance in understanding the interaction of the proposed EAA Reservoir A-1 with the surrounding areas and provide direction in designing the EAA Reservoir A-1 and associated facilities.

The groundwater models were used to evaluate the following major issues:

- The effect of seepage on embankment stability
- The amount of water the EAA Reservoir A-1 loses to seepage
- The percentage of seepage that is collected and returned to the EAA Reservoir A-1
- The effectiveness of various seepage control alternatives
- The amount of unrecoverable seepage, if any, that migrates to surrounding areas for the various seepage control alternatives
- The effect of any unrecoverable seepage on groundwater levels in the surrounding areas

The surrounding areas include 1) farmland to the north and west of the EAA Reservoir A-1 and to the east of the NNRC, 2) U.S. 27 immediately east of the EAA Reservoir A-1, 3) STA-3/4 to the south of the EAA Reservoir A-1, and 4) the Holey Land to the southwest of the EAA Reservoir A-1.

Although quite effective at reducing seepage, cutoff walls constructed to these depths cannot completely eliminate seepage from EAA Reservoir A-1. Additional seepage control measures were considered, including the effect of lowering the water level in the seepage canal as a way to draw seepage to the surface, then use pressure-relief wells to intercept deep seepage before it migrates to surrounding areas. The five seepage control alternatives described above were evaluated with MODFLOW. The model results for

these alternatives are based on the assumption that the surrounding areas such as the farms, STA-3/4, and the Holey Land would not need to be operated to offset the rise in groundwater levels. In reality, the groundwater levels could be controlled through additional pumping from the agricultural drainage canals or managing surface water control structures to distribute and divert flows.

Alternative #1, including a 34-ft cutoff wall and a 13.5-ft seepage canal surrounding the entire EAA Reservoir A-1 and maintaining the water level of the seepage canal below the level in the surrounding farm lands, would be the most effective of the five alternatives evaluated. Alternative #1 prevents migration of seepage to the farmlands, STA-3/4 and the Holey Land, and prevents impacts to U.S. 27. However, this alternative includes a significantly higher present worth cost of between $134 to $181 million more than the other alternatives evaluated. This is mainly due to the additional cutoff wall depth and additional pumping over the life of the project.

The other seepage control alternatives allow migration of seepage to the Holey Land and STA-3/4, but essentially eliminate impacts to farms and U.S 27. It is estimated that the total volume of seepage that would impact STA-3/4 and the Holey Land is on the order of one to 10 percent of the volume of water for which these areas were designed, if no seepage control measures were implemented other than a cutoff wall.

Alternative #2 allowed seepage into the farmland and estimated a cost for the seepage to be pumped off the land by the farmers.

Modeling results for Alternative #3 indicate that maintaining the water level of the seepage canal below the water levels in the farmlands effectively prevents offsite migration of seepage. The installation of pressure-relief wells as described by Alternatives #4 and #5 is predicated upon capturing deep seepage at the point where water passes beneath the bottom of the cutoff wall. The pressure-relief wells would be screened below the bottom of the cutoff wall, providing capture of seepage at depth. Alternatives #4 and #5 include higher present costs for pressure-relief wells, pipes, and pumps than Alternative #3 of approximately $15.5 to $30.5 million over the 50-year design life of the project.

2.4.3 Recommended Seepage Control Alternative

Seepage Control Alternatives #2 and #3 are the lowest cost alternatives. Alternative #3 was chosen which allows the SFWMD more control of the pumping rates in the seepage canal than Alternative #2, which relies on the farmers to pump the seepage.

This alternative includes a 34-foot deep cutoff wall and a seepage canal with a bottom depth of 13.5 feet around the northwest, north, and east sides of the EAA Reservoir A-1. Also there is a 10-foot deep cutoff wall and no seepage canal along STA-3/4 and the Holey Land. In addition, there is an existing seepage canal along the north side of the Supply Canal, which is adjacent to the Holey Land. This seepage canal controls seepage into the farmland north of the Holey Land. The water level in the seepage canal is held 3.5 feet lower than the water level in the surrounding farmlands. The water collected by the seepage canal is pumped back into the EAA Reservoir A-1. Groundwater model results indicate that the total seepage from EAA Reservoir A-1 is approximately 269 cfs at an average EAA Reservoir A-1 depth of 8.8 feet based on the 35-year period of simulation from the water balance model. The model estimates that 249 cfs is collected by the seepage canal for this alternative. This alternative eliminates migration of seepage to the farmlands, causing a water level increase of less than 0.3 feet at an average EAA Reservoir A-1 depth of 8.8 feet. The seepage to STA-3/4 plus the seepage to the Supply Canal (which is assumed to be released to STA-3/4) is estimated to be approximately 10 percent (63,000 acre-feet per year) of the STA-3/4 treatment capacity of 600,000 acre-feet per year. The additional flow to the Holey Land is estimated to be approximately 3,600 acre-feet per year. Groundwater levels in STA-3/4 and the Holey Land would rise by up to two feet when the EAA Reservoir A-1 is at its average water depth of 8.8 feet. The increases in groundwater levels could be reduced by proper management of existing surface water control structures in the Supply Canal and within STA-3/4.

A monitoring program of groundwater levels in the farmland will be initiated during the construction of the EAA Reservoir A-1 and continued after construction is completed. This will provide information to the SFWMD for evaluating the effectiveness of the seepage control. The monitoring program is a means to document whether flood protection has been maintained as required by the project assurances. Please refer to Section 4 of the September 2005, Basis of Design Report (BODR).

Seepage Control Alternative #3 and Impact on Groundwater Levels at the Average EAA Reservoir A-1 Depth of 8.8 Feet* (Figure 2-1*)

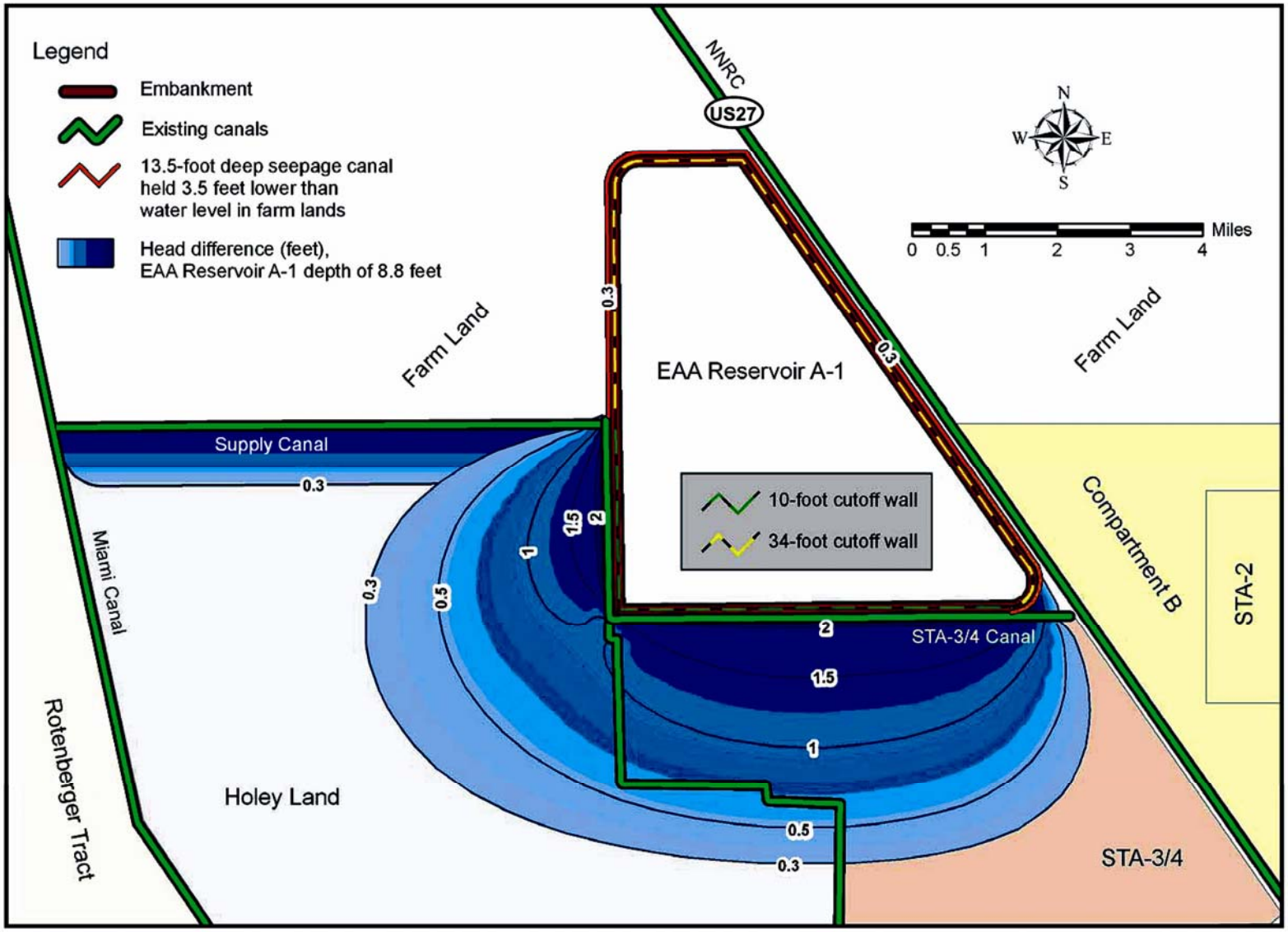
Configuration:

- EAA Reservoir A-1 at average depth of 8.8 feet
- 34-foot cutoff wall and seepage canal around northwest, north, and east sides of EAA Reservoir A-1; 10 foot cutoff and no seepage canal along STA-3/4 and Holey Land
- Seepage canal held 3.5 feet below farm water levels. Assumes STA and Holey Land are not operated to offset the rise in groundwater levels

Results:

- This alternative keeps rise in groundwater levels in farms less than 0.3 feet
- This alternative causes a rise in groundwater levels of up to 2 feet in STA-3/4 and Holey Land. Keeps groundwater at acceptable levels beneath U.S. 27. Some seepage will migrate to the Holey Land during periods of the year when the water level in the Supply Canal is elevated to fill the EAA Reservoir A-1. Seepage to the north of the Supply Canal will be controlled by an existing seepage canal.
- Total EAA Reservoir A-1 seepage = 269 cfs (~194,700 acre-feet per year)
- Seepage canal collects 249 cfs (~180,300 acre-feet per year)
- Total additional volume to STA-3/4 is approximately 10,900 acre-feet per year with a maximum additional flowrate of approximately 29 cfs when Supply Canal is floated to 8 feet
- Net additional volume to the Supply Canal is approximately 30,100 acre-feet per year. Maximum flow into Supply Canal is approximately 84 cfs when EAA Reservoir A-1 is full of water. Maximum flow out of Supply Canal to surrounding areas is approximately 60 cfs when Supply Canal is floated to 8 feet.
- Total additional volume to Holey Land is approximately 9,900 acre-feet per year with a maximum additional flowrate of approximately 39 cfs when Supply Canal is floated to 8 feet
- Seepage control cost to the project for Alternative #3 = $64,590,000

Figure 2-1: Seepage Control Alternative #3 and Impact on Groundwater Levels at the Average EAA Reservoir A-1 Depth of 8.8 Feet



Seepage Control Alternative #3 and Impact on Groundwater Levels at the Full EAA Reservoir A-1 Depth of 12 feet (*Figure 2-2*)

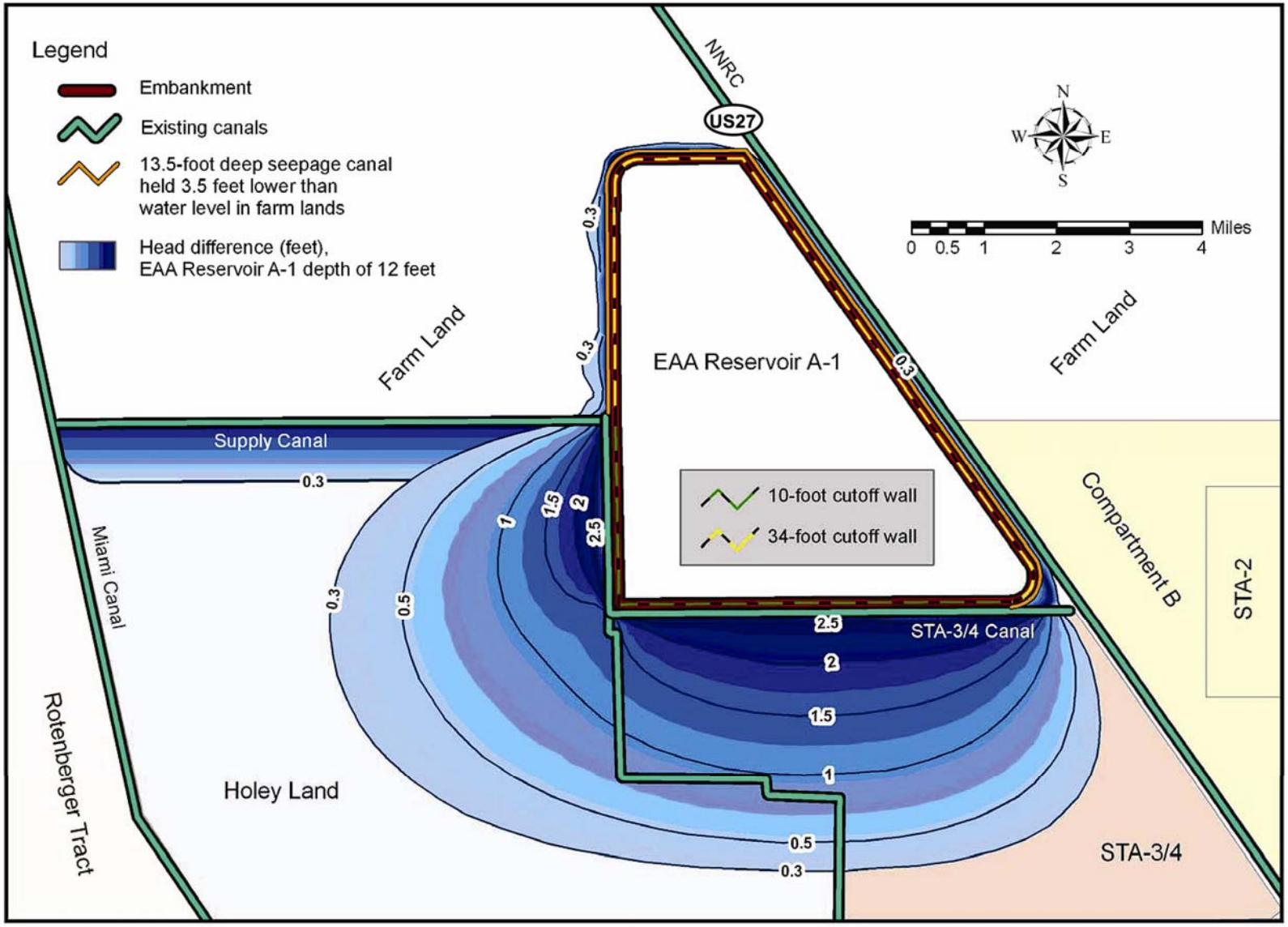
Configuration:

- EAA Reservoir A-1 at full depth of 12 feet
- 34-foot cutoff wall and seepage canal around northwest, north, and east sides of EAA Reservoir A-1; 10 foot cutoff and no seepage canal along STA-3/4 and Holey Land
- Seepage canal held 3.5 feet below farm water levels. Assumes STA and Holey Land are not operated to offset the rise in groundwater levels

Results:

- This alternative keeps rise in groundwater levels in farms less than 0.3 feet
- This alternative causes a rise in groundwater levels of up to 2.5 feet in STA-3/4 and Holey Land. Keeps groundwater at acceptable levels beneath U.S. 27. Some seepage will migrate to the Holey Land during periods of the year when the water level in the Supply Canal is elevated to fill the EAA Reservoir A-1. Seepage to the north of the Supply Canal will be controlled by an existing seepage canal.
- Total EAA Reservoir A-1 seepage = 346 cfs (only when EAA Reservoir A-1 is full)
- Seepage canal collects 290 cfs
- Total additional volume to STA-3/4 is approximately 10,900 acre-feet per year with a maximum additional flowrate of approximately 29 cfs when Supply Canal is floated to 8 feet
- Net additional volume to the Supply Canal is approximately 30,100 acre-feet per year. Maximum flow into Supply Canal is approximately 84 cfs when EAA Reservoir A-1 is full of water. Maximum flow out of Supply Canal to surrounding areas is approximately 60 cfs when Supply Canal is floated to 8 feet.
- Total additional volume to Holey Land is approximately 9,900 acre-feet per year with a maximum additional flowrate of approximately 39 cfs when Supply Canal is floated to 8 feet
- Seepage control cost to the project for Alternative #3 = $64,590,000

Figure 2-2: Seepage Control Alternative #3 and Impact on Groundwater Levels at the Full EAA Reservoir A-1 Depth of 12 Feet



2.4.4 Embankments

Two fundamental types of embankments were considered for this site:

- A concrete gravity type dam using roller compacted concrete (RCC)
- A zoned embankment dam

Each type was considered in detail. A number of alternative arrangements for each type were considered and an opinion of probable cost prepared to evaluate the cost effective aspects of each alternative. The advantages, disadvantages, and risks of each section were considered.

The evaluation of alternatives considered initial and long-term stability, seepage control, foundation conditions, and probable costs with appropriate allowances for risks, uncertainties and the cost of mitigation measures. The construction sequence and requirements for each alternative were considered in detail. The most favorable concrete dam and embankment sections are presented below:

The roller compacted concrete gravity dam section alternative is composed of a three stepped RCC section with a vertical face on the interior of the dam. The advantages and disadvantages of the RCC dam are presented in Section 8 of the BODR. The cross-section for the RCC dam is shown in Figure 2-3 below.

A zoned embankment concept has been developed to utilize materials from the required seepage collection canal excavations and available on-site borrow resources, and to minimize sorting and processing of the excavated materials for embankment construction. The rockfill zone material will be produced from the caprock providing structural stability to the upstream slope. The cross-section for the zoned embankment is shown in Figure 2-4, and the cross section for the zoned embankment along STA-3/4 is shown in Figure 2-5.

Figure 2-3: Cross Section of Roller Compacted Concrete Dam

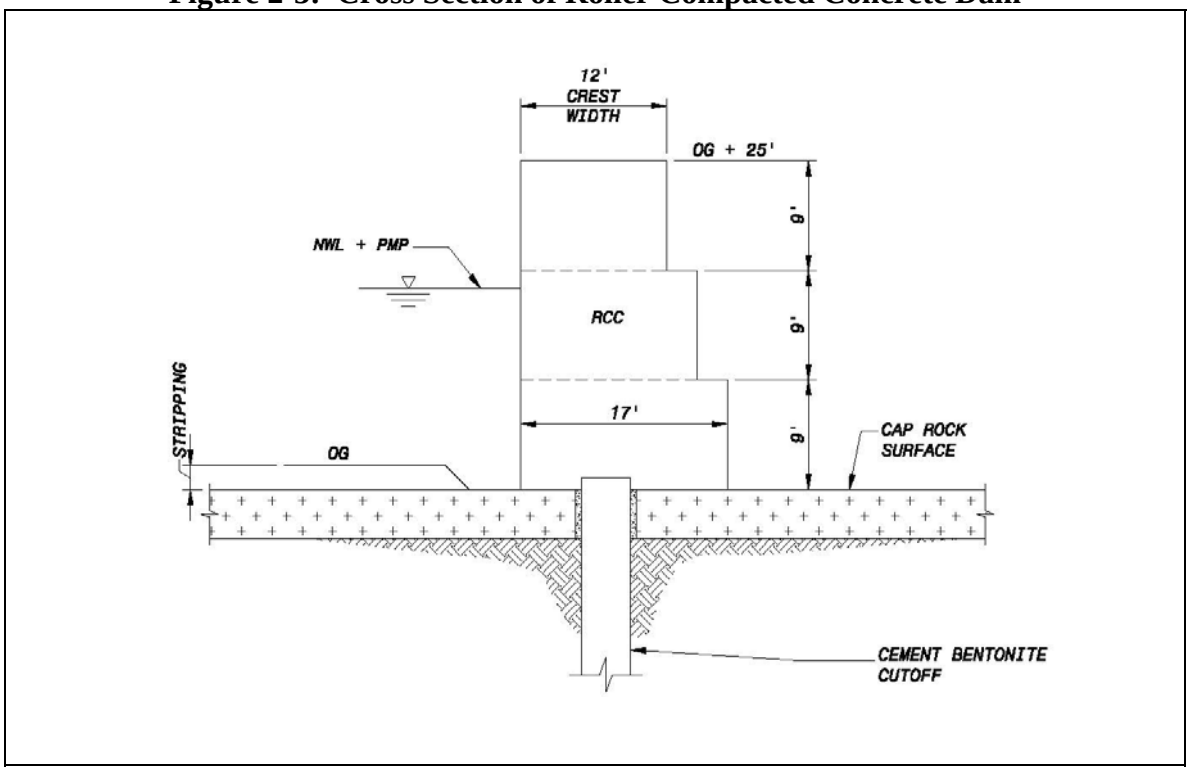


Figure 2-4: Zoned Embankment Cross-Section

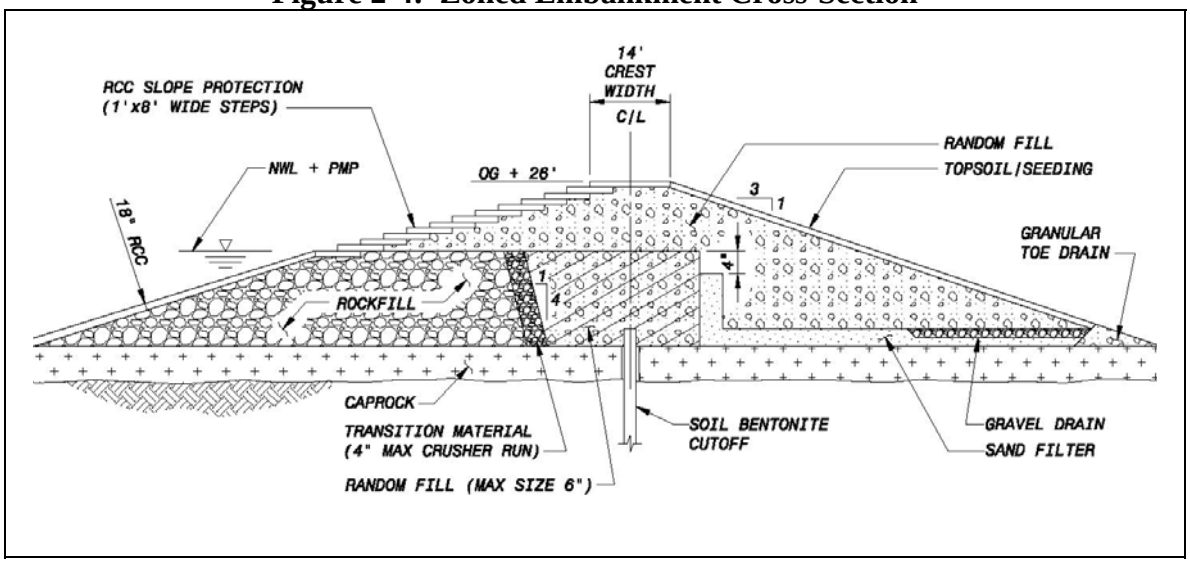
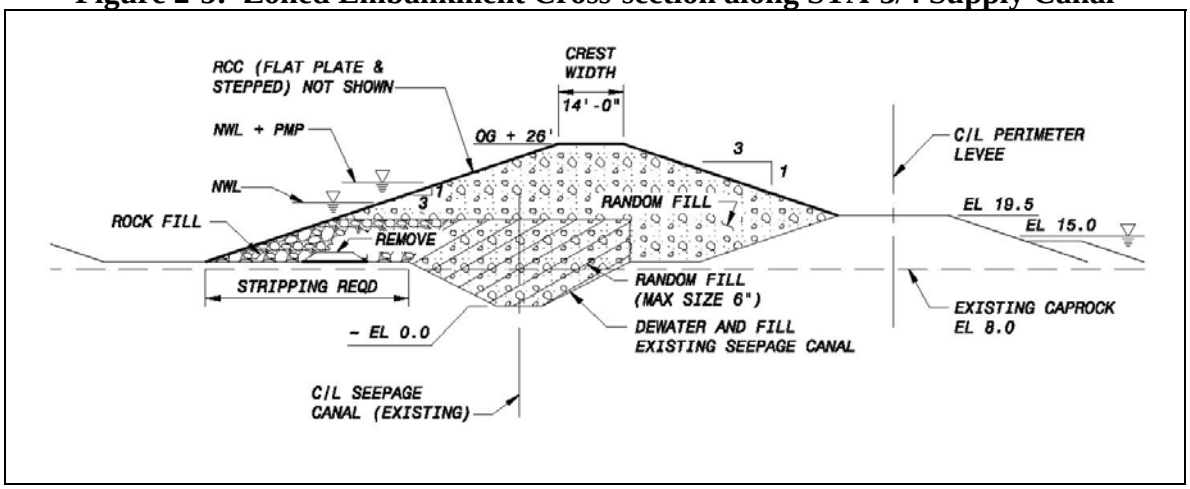


Figure 2-5: Zoned Embankment Cross-section along STA-3/4 Supply Canal



The purpose of the foundation seepage control alternatives is to mitigate seepage losses from the EAA Reservoir A-1, protect the foundation from possible damage by piping, and minimize excess uplift pressures to enhance stability. With higher head in the EAA Reservoir A-1, foundation stability issues are more critical and economic impacts due to pumping will be experienced on a long-term basis. Several different configurations to mitigate seepage from the EAA Reservoir A-1 and control exit pressures were evaluated: adequately sized key trench, cut-off wall or upstream blanket, and increasing distance between the EAA Reservoir A-1 and seepage collection canal. In view of the potential for piping, a foundation cutoff wall to a minimum depth of 34 feet or the base of the Fort Thompson Formation is being recommended for seepage control.

The embankment alternatives were screened considering embankment design standards and probable costs. These alternatives are:

- Embankment with rockfill upstream section (crest at OG+26 feet)
- Embankment with geomembrane
- Embankment with central core
- RCC gravity dam
- Concrete-faced rockfill dam (CFRD)

Based on the evaluation of probable construction costs, the zoned embankment dam with the upstream internal rockfill section represents the least cost alternative. This alternative includes a 34-foot cutoff for a distance of 12.95 miles of the perimeter. The embankment section parallels the existing Supply Canal embankment for the remaining 8.75 miles of the perimeter. Based on the results of the technical and cost evaluation, the

least cost alternative shown in Figure 2-4 and Figure 2-5 is the preferred alternative to be advanced to 30 percent design.

2.4.5 Pump Station

Figure 2-6 and Figure 2-7 show potential layouts for gates and pump stations at the EAA Reservoir A-1. Seven pumping and discharge alternatives were selected for preliminary consideration. In general, all alternatives except one were based on the addition of a new northeast pump station located adjacent to the NNRC in the northeast corner of the EAA Reservoir A-1 site.

The operating level of the EAA Reservoir A-1 will fluctuate between elevation 8.6 and 20.6 NAVD88. The normal and maximum operating elevations of the STA-3/4 Supply Canal are about 13.6 and 16.6 NAVD88 respectively. Both G-370 and G-372 pump stations are designed to pump to a water elevation of 13.6 NAVD88 in the STA-3/4 Supply Canal. Pumping to higher water elevations will rapidly diminish their respective capacities. While it is possible to partially supply the EAA Reservoir A-1 from G-370 and G-372 pump stations without modifications to the pump stations, significant modifications would be required to pump to the full EAA Reservoir A-1 elevation.

Figure 2-6: Pumping and Discharge Facilities - Alternative No. 2

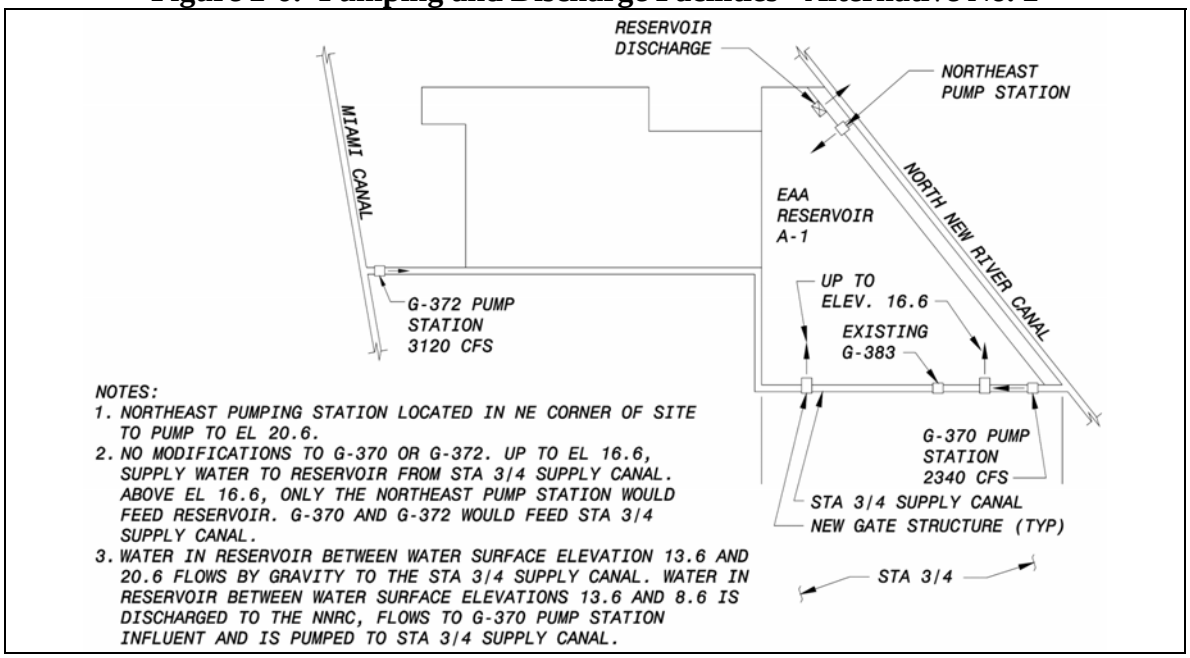
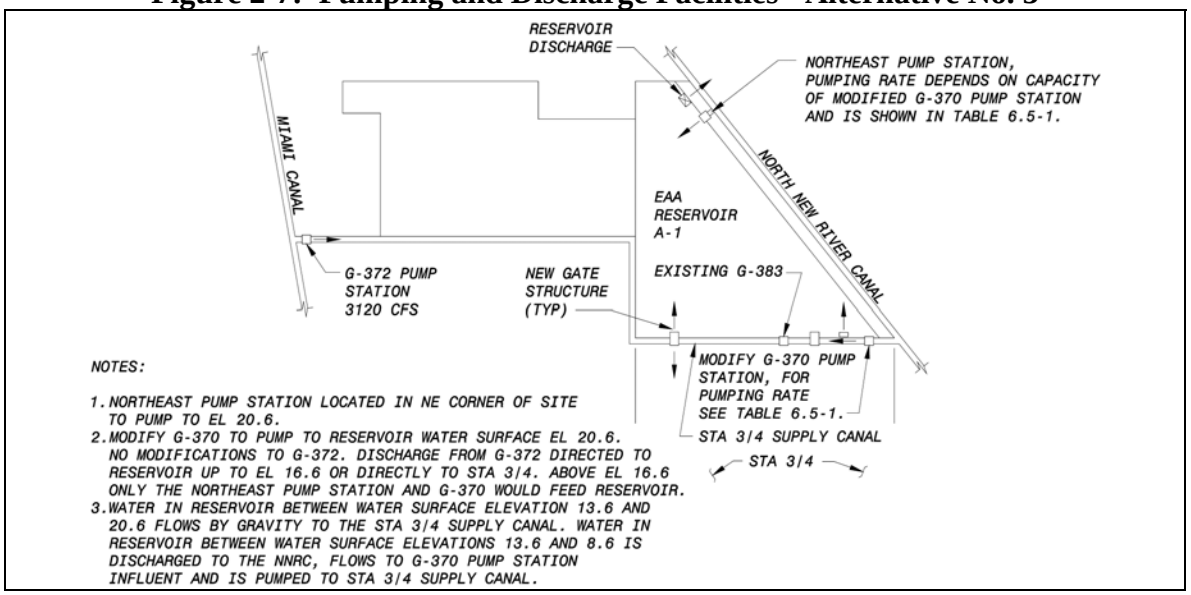


Figure 2-7: Pumping and Discharge Facilities - Alternative No. 3



Further evaluations were completed using the Water Balance Model in an effort to optimize the performance of the pump stations and EAA Reservoir A-1. Two fundamental optimization criteria were considered:

- Optimization based on effectiveness in supplying environmental and agricultural deliveries.
- Optimization based on effectiveness in capturing priority water sources. Listed in order of descending priority, the water sources are runoff from the EAA back-pumping to Lake Okeechobee, and Lake Okeechobee releases.

Optimization was considered to be achieved when further increasing of the size of the northeast pump station no longer provided significant benefit. Numerous combinations of northeast pump station sizes and modifications to existing G-370 and G-372 pump stations were evaluated.

Evaluations found that the optimization goal of installing the most cost effective pump capacity to meet maximum deliveries opposed the objective of maximizing pump capacity to capture local runoff, pump backs, and Lake Okeechobee regulatory releases:

- A northeast pump station sized for 1,500 cfs working with G-370 and G-372 pump stations unmodified would provide sufficient capacity during the first phase of operation to provide the maximum delivery percentages that can be expected with an EAA Reservoir A-1 of 190,000 acre-feet of storage volume. Further modifications to the NNRC and to G-370 and G-372 pump stations to allow pumping capacities of 2,220 and 3,700 cfs respectively to full EAA Reservoir A-1

water depth would provide the additional capacity needed for the second phase of operation. A conveyance capacity of up to 6,400 cfs would be required in the NNRC depending on the alternative selected.

- A northeast pump station sized for 3,500 to 4,000 cfs working with G-370 and G-372 pump stations unmodified would be required to provide sufficient capacity during the first phase to maximize local runoff and pump back capture. NNRC modifications would also be required to increase conveyance capacity. Further modifications to G-370 and G-372 pump stations to allow pumping capacities to full EAA Reservoir A-1 water depth would provide the additional capacity needed for the second phase of operation.

The second alternative has several advantages over the first:

- The larger pump station can meet all of the delivery goals that a 1,500 cfs station would meet but the smaller station could not provide the same priority removal levels.
- A 3,500-4,000 cfs pump station would provide a significant increase in flood protection capacity.
- Having a substantial pumping capability in the northeast pump station will ease the disruption that will be experienced during the phase two modifications of G-370 and G-372 pump stations.
- The larger pump station allows for capture of most storm related peak flows.

The primary disadvantage for the larger pump station alternative is cost (about $15.4 million). In addition to the costs associated with a smaller pump station, the 1,500 cfs pump station can provide the optimum deliveries without canal modification for the first phase, and minimal canal modification for the second phase. To be effective, the larger pump station would require canal modifications that coincide with the first phase of construction.

Northeast pump station recommendation:

- Construction of a 3,600 cfs northeast pump station concurrent to the construction of EAA Reservoir A-1.
- Use of the G-370 and G-372 pump stations unmodified during phase one operation to pump into the EAA Reservoir A-1 when its water levels are less than 8 feet and directly to the STA Supply Canal when EAA Reservoir A-1 water levels are greater than eight feet.

- Modification of the G-370 and G-372 pump stations to pump 2,220 and 3,700 cfs capacity to full EAA Reservoir A-1 depth as part of the EAA Reservoir A-2 construction.
- Canal modifications to provide matching conveyance capacity, with an associated cost of up to $37 million depending on the alternative selected.

2.4.6 Discharge Structures

Three gate structures are required for implementation of the recommended alternative as shown on Figure 2-6 and Figure 2-7. Two structures located in the southern embankment would be required to provide a dual function of EAA Reservoir A-1 filling and environmental deliveries from the EAA Reservoir A-1. Some studies have suggested that a water quality benefit may result from passing water through EAA Reservoir A-1 prior to discharging to STA-3/4. Additional structures would be required in order to achieve the potential water quality benefit. Implementation of the latter alternative would increase the project cost by approximately $26 million. Because of the added cost and a relatively small (13 to 17 percent reduction in phosphorus loading) water quality benefit, the three gate structure option is recommended. Even with the recommended alternative, operational strategies can be implemented to achieve the goal of routing much of the water through the EAA Reservoir A-1 before passing through to the STA-3/4.

In addition to the gate structure the EAA Reservoir A-1 will be equipped with an orifice-type spillway which will guard against overfilling. The spillway will be designed to limit overflow discharges to less than 500 cfs during rainfall events with less than a 100 year recurrence interval.

This evaluation resulted in the selection of the most feasible design features as mentioned in Section 2.5 below.

2.5 PREFERRED ALTERNATIVE

Based on the environmental effects evaluation and the costs associated with the alternatives, a Preferred Alternative was selected, i.e., the Acceler8 EAA Reservoir A-1 Alternative. The Preferred Alternative consists of the construction of an above-ground reservoir for water storage, with a capacity of 190,000 acre-feet at an approximate depth of 12.5 feet. The reservoir will be constructed on a 16,768-acre parcel of land situated on the eastern portion of the Draft PIR/EIS Selected Plan Alternative.

As a result of concerns expressed in response to the Draft Supplemental EIS regarding the potential for toxaphene contamination on Woerner Farm 3 the SFWMD made the decision to exclude a portion of the parcel from the wetted

footprint of the project. Therefore, the southern edge of the northern embankment was realigned to run parallel with the southern boundary of the Woerner tract. This realignment leaves approximately 650 acres of the Woerner tract outside of the reservoir footprint (see Figure 2-8). The remaining acreage (approximately 330 acres) will have muck soils scrapped down for the construction of the northern alignment of the embankment. The excess muck that is scrapped down will be used to dress the external face of the embankment. The exclusion of this acreage from within the wetted footprint of the reservoir required that the average pool elevation be raised 5 inches in order to still attain the 190,000 acre-feet storage capacity.

2.5.1 Design Components

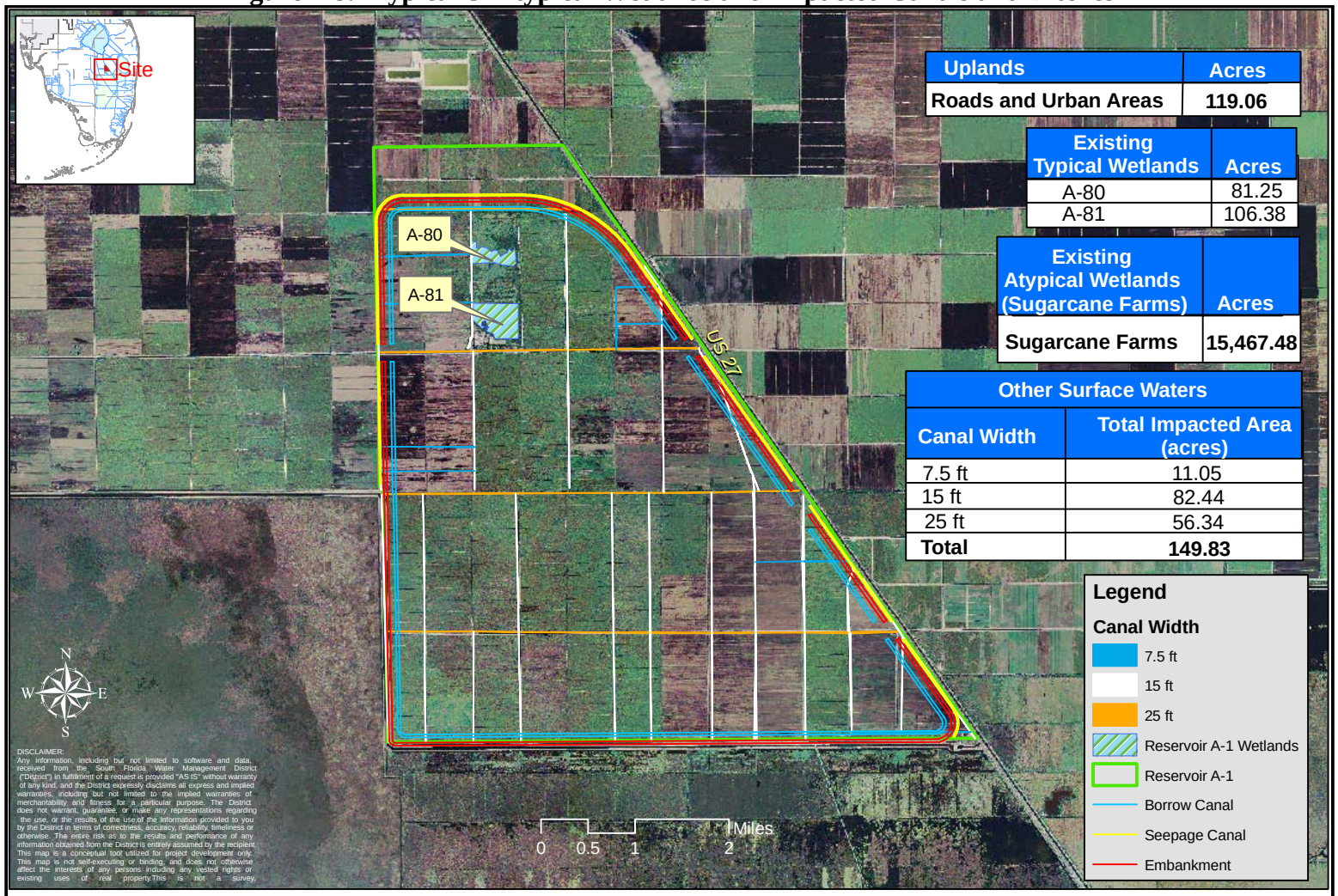
The Acceler8 EAA Reservoir A-1 Alternative (Preferred Alternative) includes the following components:

- Approximately 190,000 acre-feet EAA Reservoir A-1 with a perimeter embankment and seepage canals
- Creation of a northeast pump station (3,600 cfs capacity that pumps from NNRC)
- A connector canal from the NNRC to the new northeast pump station
- Gated discharge structures
- Seepage pump stations
- Gated culvert structures
- New four lane bridge (two parallel two-lane bridges) on U.S. 27 across the new connector canal
- Improvements to conveyance capacity in the NNRC

2.5.1.1 Pump Stations

The S-610 pump station is the reservoir inflow pump station with a total pumping capacity of 3,600 cfs and is located on the east side of Reservoir A-1 on the NNRC. The pump station is designed to capture runoff and Lake Okeechobee releases in the NNRC. S-610 is a pump station with diesel and electric motor driven pumps for seepage. All diesel engine driven pumps are used during maximum flood control operations. The pumps can be used to back-pump seepage and maintain the perimeter seepage canal levels during non-runoff event times. Although electric motor driven pumps are presented for seepage pumping, for operational flexibility, any combination of pumps can be used to maintain optimum seepage canal levels.

Figure 2-8: Typical & Atypical Wetlands and Impacted Canals and Ditches



Uplands	Acres
Roads and Urban Areas	119.06

Existing Typical Wetlands	Acres
A-80	81.25
A-81	106.38

Existing Atypical Wetlands (Sugarcane Farms)	Acres
Sugarcane Farms	15,467.48

Other Surface Waters	
Canal Width	Total Impacted Area (acres)
7.5 ft	11.05
15 ft	82.44
25 ft	56.34
Total	149.83

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Figure 2-8
EAA Reservoir A-1
Typical & Atypical Wetlands
And
Impacted Canals and Ditches

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2.5.1.2 Gated Culverts

The S-602 and S-603 gated box culvert structures are the outlet for Reservoir A-1 into STA-3/4. The design flow is approximately 3,000 cfs. The culvert barrels are typical box culverts with dimensions of 10 ft in height, 10 ft in width and 200 ft in length. S-602 and S-603 are located on the southern Reservoir A-1 embankment just north of the STA-3/4 Supply Canal. The structures will discharge into the STA-3/4 Supply Canal and then into STA-3/4 via existing gated structures G-374 A-F, G-377 A-E and G-380 A-F. The asset numbers and detailed design will be determined in the final design.

The S-605 gated culvert structure is an inlet structure from the NNRC into Reservoir A-1. Pump Station G-370 will pump from NNRC into the reservoir.

The S-609 gated culvert structure is recommended to be a bridge in the EAA Reservoir A-1 alternative.

2.5.1.3 Existing Structures

G-370 is an existing pump station that is currently being used as the STA-3/4 inflow. Stormwater runoff and Lake Okeechobee releases in the NNRC pass through this pump station and into the STA-3/4 distribution system. This pump station will be used as Reservoir A-1 inflow as well as inflow to STA-3/4. This is a six bay pump station with three 925 cfs diesel pumps and three 75 cfs electric driven seepage pumps. The total flood control capacity is 2,775 cfs. The pump station is located at the southeastern corner of Reservoir A-1 adjacent to U.S. Highway 27 and the NNRC.

G-372 is an existing pump station that is currently being used as the STA-3/4 inflow. Stormwater runoff and Lake Okeechobee releases in the Miami Canal pass through this pump station and into the STA-3/4 distribution system. For the EAA Reservoir A-1, this pump station would also be used as the reservoir Cell 2 inflow structure pending construction of the federal EAA Storage Reservoirs project. This is a seven bay pump station with four 925 cfs diesel engine driven pumps and three 75 cfs electric driven seepage pumps. The total flood control capacity is 3,700 cfs. The pump station is located at the southwestern end of Cell 2 adjacent to the Miami Canal.

Existing control structures G-374 A-F, G-377 A-E and G-380 A-F are a series of six, five, and six barreled gated box culvert structures, respectively. Flows from the Miami Canal and the NNRC are conveyed through the STA-3/4 Supply Canal and distributed through these control structures into STA-3/4. The total capacity for these structures is approximately 6,000 cfs. The structures are double-barreled stop log riser structures. For the EAA Reservoir A-1 these structures will continue to function as the STA-3/4 inflow

structures. These structures are located along the northern boundary of STA-3/4.

2.5.1.4 Canals

The function of the perimeter canal, C-601, is for seepage collection and conveyance of reservoir outlet flows. The canal is also required as a borrow source for construction of levees. The new perimeter canal will capture seepage to the western, northern, and eastern boundaries. Seepage along the reservoir's southern boundary will be captured by the existing STA-3/4 Supply Canal.

Canal C-601 is the Reservoir A-1 perimeter seepage canal. The canal is located along the Reservoir A-1 northern and eastern boundaries. The eastern reach of C-601 is used for seepage collection. Seepage flows in the canal are collected by the S-610 pump station and returned to the reservoir.

2.5.1.5 Canal Modifications

The design capacity of the NNRC is approximately 4,000 cfs. The conveyance capacity of the NNRC would have to be increased by approximately 150% as determined by the hydraulic analysis. The increase in capacity requirements necessitated an enlargement of an approximate 22.5 mile section of canal between the reservoir and Lake Okeechobee. The NNRC channel improvement is constrained by U.S. 27 on the west bank. All of this work may not be performed within the existing SFWMD right of way of the NNRC.

2.5.1.6 Embankments

The reservoir has a perimeter embankment, L-601, with a minimum height of 23 feet above average ground for both earthen and RCC designs. The height of the internal levee L-601i is 21 and 19.2 ft above average ground for the earthen and RCC designs, respectively.

Cut-off walls will be installed as part of the levee or embankment construction. For earthen embankments, the estimated depth of the cut-off wall is 34 feet along the east, north, west, and along the Holey Land area. There will be no cutoff wall installed along the STA-3/4 sides of the reservoir.

2.5.1.7 Bridges

The S-609 box culvert structure is recommended to be a bridge.

2.5.1.8 Other Features

Wetlands Buffer

The proposed EAA A-1 Reservoir includes a 150-ft buffer between the embankment and the seepage canal. The purpose of the seepage canal is to control seepage out of the project area and prevent flooding of adjacent lands. As such, hydraulic conditions within the seepage buffer will be contingent on operation of the reservoir. A portion of the buffer, must remain clear and dry in order that visual inspection of the embankment and its stability can be made. A 50-ft maintenance corridor is needed to allow access of larger equipment in case of storm-induced failure modes. During construction, the top soil i.e., muck, would be scraped from an area extending from the proposed seepage canal to the proposed outer toe of embankment (varies from 128 ft to 228 ft). Please see Figure 2-9 and Figure 2-10 for the proposed project cross sections including the seepage buffer. A total of 477 acres of top soil would be available to spread along 198 acres of the exterior slope of the embankment and the 205 acres potential wetland buffer area. Natural recruitment of wetland vegetation within the wetland buffer appropriate to the hydro-period attained at that elevation is anticipated. Figure 2-11 shows the potential seepage buffer that would be created for the EAA A-1 Reservoir project.

Littoral Shelves

Construction of a contoured littoral area with a specific slope design was considered, however this feature was eliminated as it would be difficult to manage the material being excavated, due to it's composition, for constructing the littoral areas. Such construction will also result in higher costs. Removal of the caprock to form the seepage canal will result in approximately 13 acres of incidental littoral habitat along the top banks of the seepage canal. This littoral habitat will be more indicative of natural conditions. Figure 2-11 shows potential littoral habitat created within seepage canals of the EAA Reservoir A-1 project.

Deep-water Refugia

Currently, the proposed deep water refugia will include approximately 150 acres of existing agricultural ditches, 648 acres of proposed borrow canal and 81 acres of proposed borrow pits. The area of the proposed borrow pits and borrow canal may change during construction based on the need for embankment material. The approximately 879 acres of deep water refugia would provide fish refuge during periods when the reservoir pool elevations approaches average ground elevation.

Recreation

Recreational features are currently being coordinated with the appropriate regulatory agencies and will be included in the final design.

Figure 2-9: Everglades Agricultural Area Reservoir A-1 Cross Sections

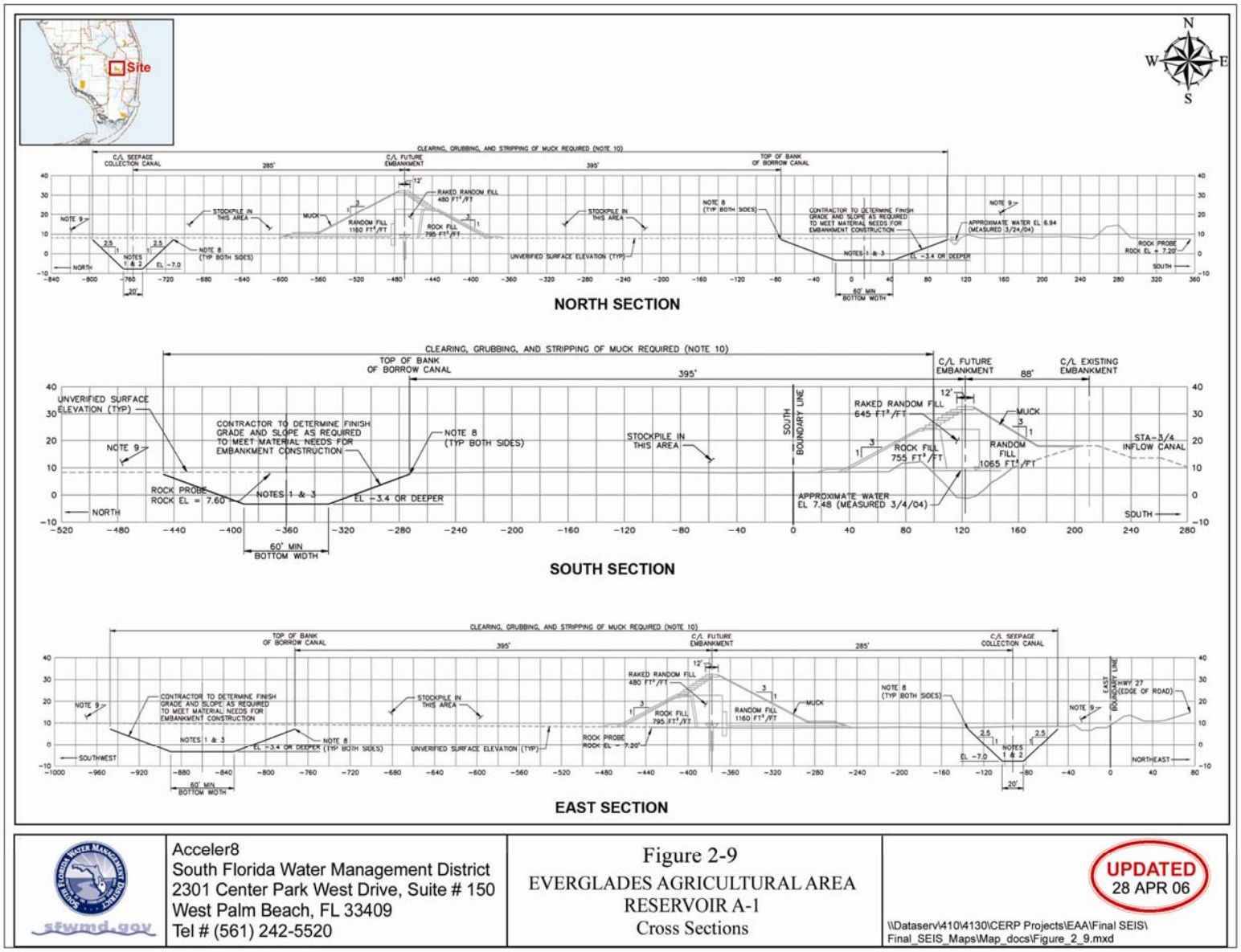

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Figure 2-9
EVERGLADES AGRICULTURAL AREA
RESERVOIR A-1
Cross Sections

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Figure 2-10: Everglades Agricultural Area Reservoir A-1 Cross Sections

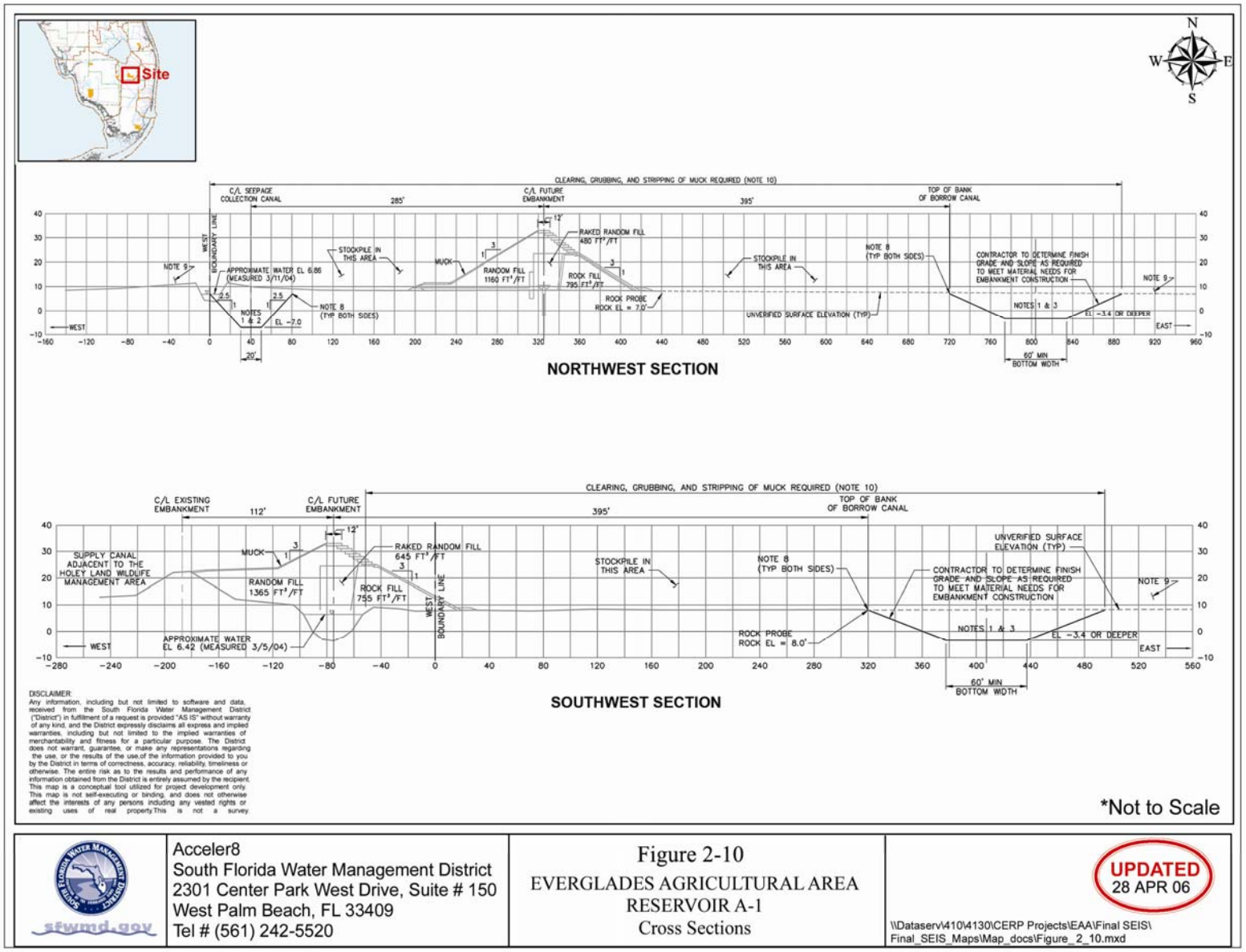
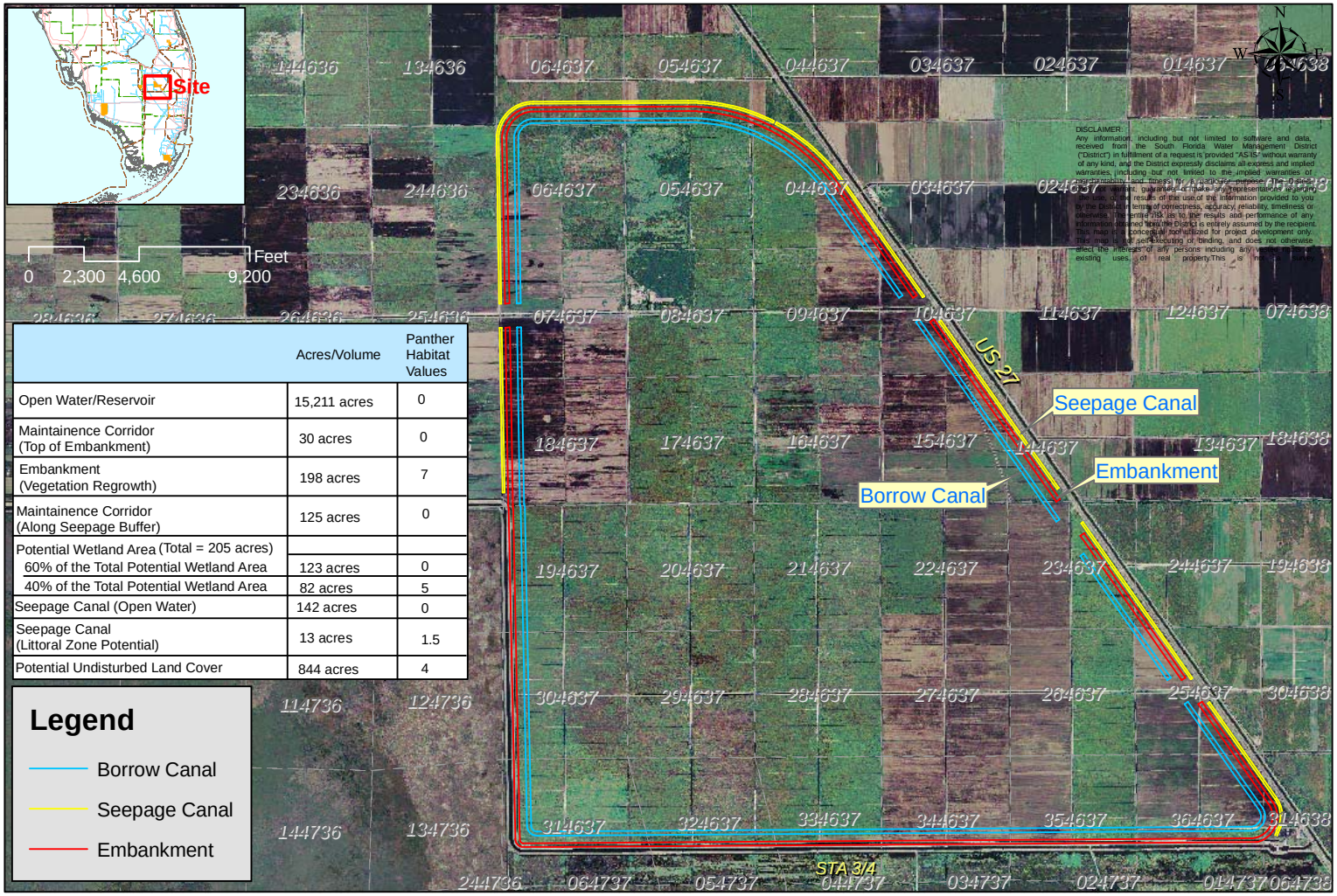


Figure 2-11: Everglades Agricultural Area Reservoir A-1 Panther Habitat Values



	Acres/Volume	Panther Habitat Values
Open Water/Reservoir	15,211 acres	0
Maintainence Corridor (Top of Embankment)	30 acres	0
Embankment (Vegetation Regrowth)	198 acres	7
Maintainence Corridor (Along Seepage Buffer)	125 acres	0
Potential Wetland Area (Total = 205 acres)		
60% of the Total Potential Wetland Area	123 acres	0
40% of the Total Potential Wetland Area	82 acres	5
Seepage Canal (Open Water)	142 acres	0
Seepage Canal (Littoral Zone Potential)	13 acres	1.5
Potential Undisturbed Land Cover	844 acres	4

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Figure 2-11
EVERGLADES AGRICULTURAL AREA
RESERVOIR A-1
PANTHER HABITAT VALUES

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2.5.2 Operations

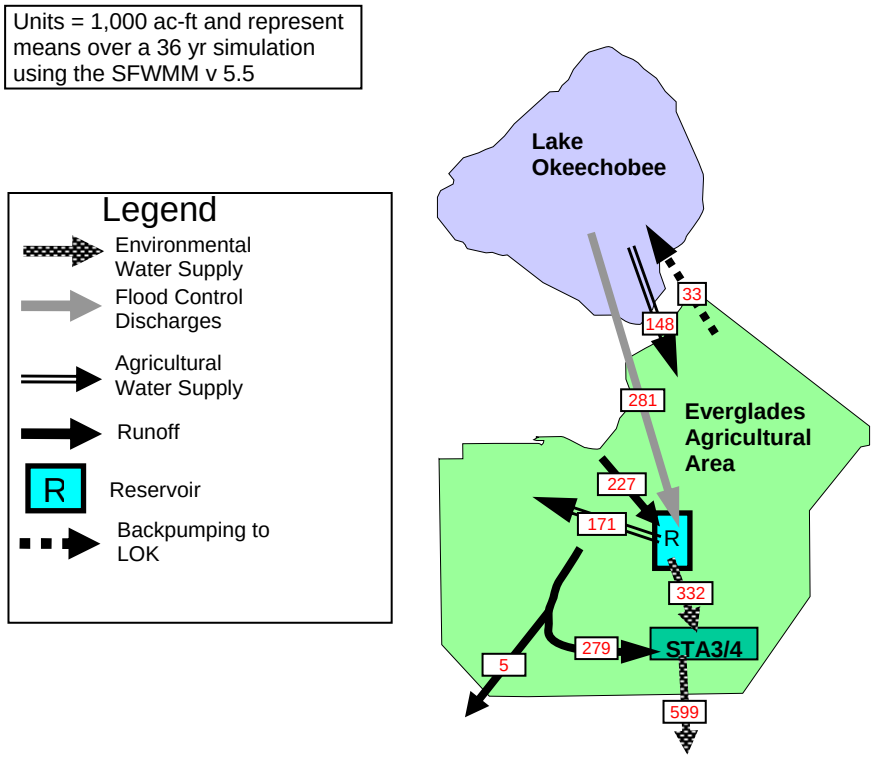
The operational goals of the EAA A-1 Reservoir are to capture and store Lake Okeechobee Regulatory releases (model results indicate approximately 281,000 acre-feet annual average) and EAA basin runoff (estimated at 227,000 acre-feet annual average); to deliver water from the reservoir (estimated at 332,000 acre-feet annual average) to downstream natural areas via STA-3/4 at times of natural system need; and to deliver water from the reservoir to meet local agricultural water supply demands (estimated at 171,000 acre-feet annual average) that would otherwise be met via deliveries from Lake Okeechobee. The hydrologic conditions for Lake Okeechobee and the EAA will be assessed to determine which area has the greatest need for runoff or discharge removal. This will depend on the regional drainage system's capability to convey water to the reservoir while maintaining existing levels of flood protection and water supply within the basin.

Water will be released from the reservoir to meet environmental demands identified based on natural system targets in the Everglades. Releases from the reservoir into STA-3/4 would not result in failure to meet legal requirements including NPDES discharge criteria. The simulated range of STA 3/4 inflow volumes (approximately 599,000 ac-ft average annually), associated outflow volumes, and resulting nutrient concentrations from the combined EAA A-1 Reservoir and STA 3/4 are projected to be within the design tolerances and ranges of the performance projections per the Long-Term Plan for Achieving Water Quality Goals (Burns & McDonnell, 2003) and the EAA Regional Feasibility Study (Burns & McDonnell, 2005). The SFWMD has demonstrated using the Dynamic Model for Stormwater Treatment Areas located in Annex D that inflows and associated nutrient loading rates (based on existing water column concentrations in Lake Okeechobee and EAA basin runoff) can be tolerated by STA3/4 without compromising its ability to meet/exceed the State's existing and planned future performance expectations. Environmental releases from the reservoir through STA-3/4 will be made with the intent to meet environmental needs identified in the Everglades; however, these releases will be limited to avoid creating undesirable impacts due to constraints of the existing C&SF project that maybe present when the project becomes operational.

Releases may be made into the NNRC to provide water supply for other water related needs when there is water remaining in the reservoir after demands of the Everglades have been met. Otherwise deliveries for other water related needs, including consumptive use, will continue to be provided via deliveries from Lake Okeechobee. Water remaining in the reservoir may also be provided for other water related needs when it is necessary to create storage capacity for additional Lake Okeechobee regulatory releases.

A summary mean annual water budget, based upon a 36 year simulation for the South Florida Water Management Model version 5.5, for areas where operations of the C&SF Project are affected by the implementation of the reservoir is shown below in Figure 2-12. Climatic conditions vary from year to year which will affect inflows and outflows of the reservoir thus affecting the reservoir water budget. Other areas that are impacted as result of the reservoir, but have no operational changes are described in Chapter 4.

Figure 2-12: 2010A1 Selected Components of the Water Budgets for Lake Okeechobee, the EAA and A-1 Reservoir, in relationship to each other (1965-2000)



2.5.2.1 Project Operating Manual

The Project Operating Manual will be developed by the SFWMD and approved by the USACE, to ensure consistency with current USACE Engineering Regulations and the requirements of the C&SF Project as modified i.e., the goals and objectives of CERP. The SFWMD will provide a

draft operating manual to the USACE for approval at a minimum of six months prior to projected initial start-up and operational testing of the reservoir. This manual will give guidance for the start-up and operational testing. Upon completion of this initial start-up phase it will be determined if refinement of the final operational criteria for the reservoir is needed.

It is recognized that this project is one component of a much larger and complex environmental restoration program that will involve revisions to the operating manual to allow for the interrelationship of the other components. Prior to revising the interim operations plan to include long-term operations and/or other interrelated projects, the USACE will re-evaluate downstream effects to determine if additional analyses are needed. Specifically, the USACE will evaluate effects of the American crocodile and the Cape Sable seaside sparrow to determine if re-initiation of Section 7 consultation is necessary.

The operating manual will include a water budget that estimates the appropriate volume and distribution of water necessary to achieve the system-wide environmental benefits identified in Chapter 5. Operations for the project may be modified through the USACE approval process as necessary to incorporate changing operations in other areas of the project or when modifications in operations are identified through the adaptive management process. Until such time that the Acceler8 EAA A-1 Reservoir project, as anticipated, becomes a Congressionally authorized federal CERP project, a Project Cooperation Agreement is signed, and a CERP operating manual is in existence, the State's operating manual(s), including modifications to the manual, will be reviewed by the USACE for approval prior to implementation. (See Annex G which includes a Draft Permit Template with specific conditions addressing operation of the proposed facility.)

2.5.2.2 Reservoir Inflows

Regulatory releases from Lake Okeechobee and runoff generated from the NNRC and Miami Canal watersheds will be pumped into the reservoir via the existing G-370 and G-372 pump stations and/or the proposed new Northeast Pump Station, designated S-610. It is anticipated, based upon system-wide modeling, that approximately 281,000 acre-feet per year (annual average) of regulatory releases from Lake Okeechobee can be processed by the A-1 Reservoir. Modeling also shows that the Reservoir can temporarily detain about 227,000 acre-feet (annual average) of stormwater runoff from the EAA per year. The existing pump stations are capable of filling the reservoir up to eight feet of depth without structural modification. The proposed S-610 pump station will be capable of filling the reservoir up to its

twelve-foot design depth. See Figure 2-13 for structural operating relationships.

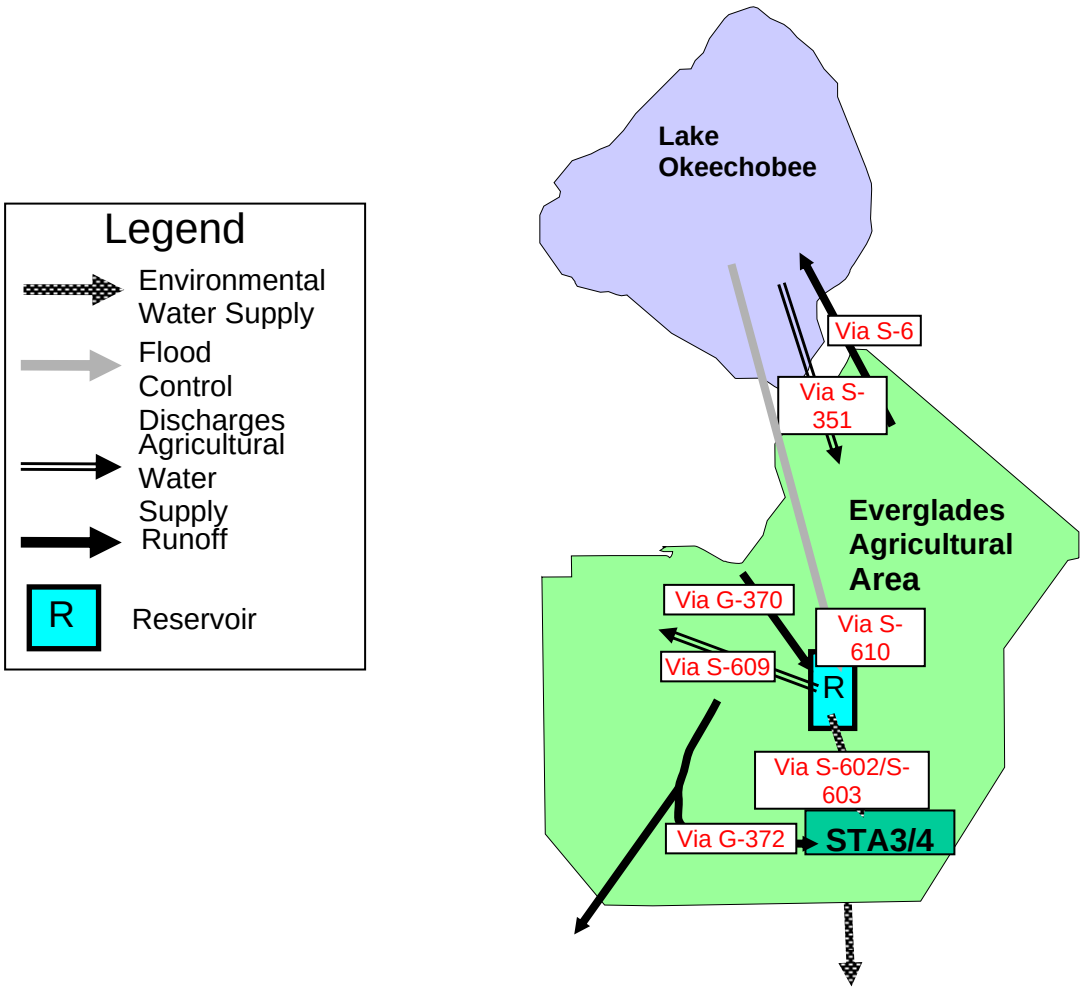
Details on reservoir start-up, operational testing, and operating rules (i.e. gate openings, control elevations, etc.) will be identified in the approved Project Operating Manual which will be completed prior to the initial start-up of the reservoir. The initial start-up will be accomplished in accordance with the criteria for the protection of threatened and endangered species and other wildlife. In order to maintain existing flood protection level of service and water supply in the NNRC and Miami Canal basins, canal levels in the NNRC and the Miami Canal will be made consistent with existing operating rules before regulatory releases are made from Lake Okeechobee and pumped into the reservoir.

2.5.2.3 Reservoir Releases

Water will be released from the reservoir through any of three proposed control structures dependent upon the release criteria. Proposed structure S-609 will be constructed adjacent to the new Northeast Pump Station, S-610, and will be used to release water into the NNRC for irrigation and water supply purposes within the NNRC basin. Proposed structures S-602 and S-603 will be constructed through the south embankment of the reservoir and be used to release water into the existing Supply Canal of STA 3/4. S-602 will be constructed just west of the existing G-370 pump station and will allow releases to the eastern cells, east of G-383. S-603 will be located west of G-383 and will allow releases to the western cells of STA 3/4.

Detailed operational criteria for reservoir releases will be identified in the Project Operating Manual which will be completed prior to the initial start-up of the reservoir. Priority of releases for water supply will be for environmental deliveries first and then for other water related needs, including consumptive use. Long-term system modeling indicates that, on average, approximately 332,000 acre-feet of water per year can be released from the A-1 Reservoir for environmental purposes. In order to maintain the status of existing legal uses of water, existing consumptive use demands will be met from Lake Okeechobee as they are currently when water in the reservoir is not available for these uses. Modeling indicates that, on average, approximately 148,000 acre-feet per year will be released from Lake Okeechobee to meet water supply needs with the completion of the A-1 Reservoir.

Figure 2-13: Structural and Operational Relationships Associated with the EAA Reservoir A-1



CHAPTER 3
AFFECTED ENVIRONMENT

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3.0 AFFECTED ENVIRONMENT

This section describes the physical, biological, and human environments of those areas to be affected by the alternatives under consideration. The existing conditions are presented in either a regional or area specific context depending on the nature of the resource or the anticipated effect to that resource. Somewhat greater detail is provided for the EAA to allow evaluation of the alternatives. Within the EAA, south of Lake Okeechobee, five parcels were originally identified as possible locations for the proposed reservoirs. Two adjacent parcels totaling 31,494 acres were identified as Compartment A. Two other adjacent parcels totaling 9,302 acres became Compartment B. The last parcel of 8,884 acres was identified as Compartment C. Three other areas affected by the proposed project include: 1) within Lake Okeechobee or the basin; 2) the Northern Estuaries Area (St. Lucie Estuary and Caloosahatchee River Estuary); and, 3) Water Conservation Areas (WCAs).

3.1 GENERAL ENVIRONMENTAL SETTING

The EAA basin is located south of Lake Okeechobee in western Palm Beach County (Figure 1-3) and encompasses approximately 620,797 acres of highly productive agricultural land comprised of rich organic peat or muck soils. A small portion of the Study Area includes mucklands located in western Martin County. Approximately 77% of the Study Area (553,000 acres) is in agricultural production; now considered one of Florida's most important agricultural regions for cultivation of sugar cane.

The basin extends south from Lake Okeechobee to WCAs 1, 2A, 2B, 3A, and 3B on the east and south borders and to the C-139 Basin on the western border.

The EAA contains an extensive network of canals. For the purpose of this report, these canals are divided into three types:

1. Primary - canals that convey water generally from Lake Okeechobee through the EAA to coastal waters. Primary canals include the West Boundary Canal, Miami, Hillsboro, West Palm Beach, L-8 Borrow, and North New River Canals.
2. Secondary - canals that interconnect the primary canals. Secondary canals include the L-1 East, Bolles, Cross, and Ocean Canals.
3. Agricultural - canals that provide water management and control within specific farming operations. Agricultural canals are very numerous and generally unnamed.

The canals within the EAA serve multiple purposes including water routing for water supply for agriculture, flood protection, and water supply for environmental needs. Figure 1-3 shows the system of primary and secondary canals that presently exist within the EAA. The Rotenberger and Holey Land Wildlife Management Areas (WMA), as well as the STAs, are also contained within the EAA. The reservoir location in the Restudy is within the southern portion of the EAA, north of the Holey Land WMA and SFWMD's STA 3/4.

Surface waters adjacent to the EAA include Lake Okeechobee to the north and the Everglades Protection Area (EPA) to the south and east. Lake Okeechobee is a 730-square mile (1,891 km2) shallow natural lake that was formerly the headwaters of the Everglades. Lake Okeechobee is now entirely enclosed within a water control levee and most surface inflows and outflows, with the exception of precipitation and evapotranspiration, receive some human regulation. There are interior and exterior canals and ditches along almost the entire length of this encircling levee. The WCAs are Everglades wetlands surrounded by levees and water stages are highly managed. These WCAs typically include a rim canal located on the inside of the levees next to the largely undisturbed peat soils and wetland plant communities.

3.2 SOILS AND GEOLOGY

The EAA is primarily underlain by peat and muck although much of the peat has been altered to muck by oxidation processes. The soils are predominantly organic and contain some fine sands. The EAA is part of what was once the largest region of organic soil in the world with a thickness up to 17 feet. The organic soil is composed of brown to black peat and muck and currently has a maximum thickness of approximately eight feet. The peat was formed primarily from the detritus of native sawgrass. This region of organic soil was formed in a limestone basin, which accumulated layers of peat from sawgrass and mud brought in by fresh water flows from Lake Okeechobee. The peat in the Everglades area ranges in age from approximately 3,600 to 5,250 years (McDowell, et. al., 1969). Wetlands within the EAA contain calcitic mud (marl) soils. This calcitic mud is exposed to short periods of standing water and is often associated with thick algal mats and periphyton.

According to the U.S. Department of Agriculture (USDA) and Natural Resources Conservation Service (NRCS) Soil Survey, 88% of the EAA is comprised of Terra Ceia Muck, Pahokee Muck, Lauderhill Muck and Torry Muck. The remaining 12% contains 44 different types of soils. Eighty-four percent of Compartment A is comprised of Pahokee Muck and Lauderhill Muck. The remaining 16% is comprised of 19 different types of soils.

The agricultural productivity of the soil is affected by subsidence. Peat soils are subjected to subsidence and surface elevation loss when drained. Oxidation is caused by compaction and is the conversion of organic carbon in the soil to carbon dioxide gas and water. It is an irreversible process. Until natural drainage was disrupted, the EAA experienced an annual hydrocycle of 9 to 12 months of flood and 0 to 3 months of slight drainage. The historical sawgrass peat accretion rate is estimated at 0.03 inches per year. Currently, instead of accretion, there has been subsidence at a long-term average rate between 1 and 1.2 inches per year. In the 1900s, soil loss was attributed to aggressive water management. Seven hundred thousand acres of the EAA were drained to facilitate agricultural production. Currently, this area is Florida's most important agricultural region with approximately 77% of the EAA devoted to agriculture production.

Studies from 1946 and 1996 suggest that in some areas of the Everglades, one-half of the soil has been lost. The EAA lost up to 28% of its soils. WCA-3, which had 3 to 5 feet of peat in 1946, showed only 1 to 3 feet of peat present in 1996, and some areas had less than one foot. Uncultivated areas have experienced up to three feet of subsidence, which occurs when drainage desaturates the peat soil (Shih, et. al., 1997). The resulting surface soil becomes less organic which slows the rate of subsidence. The differential rate of subsidence in the past years has altered the slope of the land, which hinders restoration of the natural flow system.

The flat topography, cohesiveness of the peat, and the levee systems allow for little water erosion of the soils in the EAA. In addition, current agricultural practices promote accumulation of chemicals in the soil.

The soils at the SFWMD's proposed EAA Reservoir A-1 project site include the Pahokee muck (primarily in the southern portion of the site) and Lauderhill muck (primarily in the northern portion of the site). Based on geotechnical borings at the proposed EAA Reservoir A-1 project site, the muck ranges in thickness from less than one foot to approximately five feet. According to the NRCS, the soils located beneath the former Talisman Sugar Corporation processing facility are classified as urban land. Urban land soils are those which have been disturbed due to development. See Figure 3-1, EAA Reservoir A-1 Soils Map.

Numerous soil borings, taken from 50 to 100 feet below ground surface, were completed within the proposed project footprint in December 2004 and January 2005. The borings generally penetrated through approximately one half to two feet of surficial peat/muck and marl, then through 22 to 26 feet of primarily carbonate sand and limestone, and then into primarily shelly quartz sand with sparse limestone to their completed depths. The marl beneath the peat and muck is known by some authors as the Lake Flirt Marl

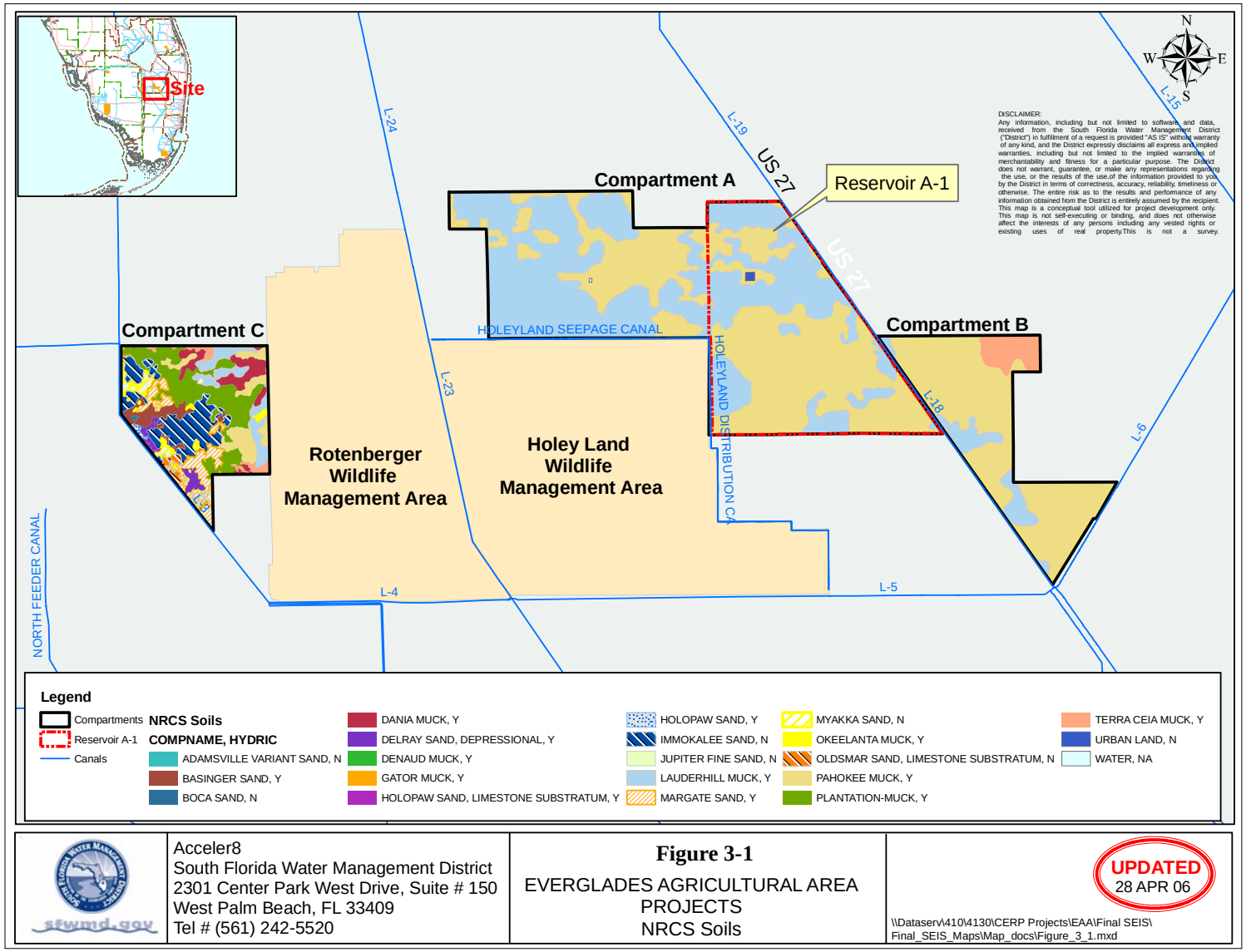

FIGURE 3-1: EVERGLADES AGRICULTUREAL AREA PROJECTS NRCS SOILS

(Reese and Cunningham, 2000; Harvey et. al., 2002), but is undifferentiated from the peat and muck layer for this report. The upper carbonate sand and limestone constitutes the Fort Thompson Formation at the site. Below this, the shellysand and sparse limestone constitutes the Caloosahatchee Formation and possibly part of the Tamiami Formation.

The top of the Fort Thompson Formation consists of a hard limestone layer about four and a half to five feet thick, which is locally called caprock. The caprock is generally white, light gray, tan or yellowish brown. The caprock is underlain by silty carbonate sand extending to about 23.5 to 24.5 feet deep, where another hard limestone layer one and a half feet to three feet thick is encountered. A thinner, hard limestone layer about one half foot to one foot thick is often encountered at around 16 to 17 feet deep. The sand and lower limestone layers are generally white to very pale brown. Laboratory testing of the sand sampled in the borings averaged 84.2 percent calcium carbonate content with an average of 22 percent passing the #200 sieve in gradation tests. Visual inspection of the sand samples from the borings revealed that they include shell fragments, and tend to be angular and platy.

All the Fort Thompson Formation limestone layers exposed in core or in excavations at the proposed EAA Reservoir A-1 project site are very fossiliferous. The sand exposed in the seepage collection canals and dewatering sumps was abundantly fossiliferous with gastropods, pelecypods, corals, and echinoderms.

The top of the Caloosahatchee Formation is composed of fine grained, subrounded, shelly quartz sand that is mixed with shelly carbonate sand similar to that in the Fort Thompson Formation. The Caloosahatchee Formation at the site is 30 to 60 feet thick; however, the interface between this formation and the underlying Tamiami Formation is difficult to define. The proportions of carbonate to quartz sand vary. Laboratory testing on the sampled sand indicated an average calcium carbonate content of 40.1 percent and an average of 12.1 percent of material passing through the #200 sieve. The primary color of the geologic material in the Caloosahatchee Formation is light greenish gray.

Other geologic information may indicate that the Caloosahatchee Formation is not present at the EAA Reservoir A-1 project site. For instance, recent geological work (Reese and Cunningham, 2000) has redefined the stratigraphy of the area. Presently, the Tamiami Formation has several recognized named and unnamed geologic members including the Ochopee Limestone Member and the Pinecrest Sand Member. Both Tamiami Formation members contain sandy strata, but the Pinecrest Sand Member is principally shelly, fine grained, quartz sand. The sands in the Caloosahatchee and Tamiami Formations are generally differentiated based

on the fossil assemblages observed in outcrops, but key indicator fossils are typically not recovered in borings (Scott, 2005). Therefore, interpretation of the contact between the Caloosahatchee Formation and Tamiami Formation at the proposed EAA Reservoir A-1 project site is not possible.

3.3 VEGETATION AND COVER TYPES

Within this section, the documentation of resources is segregated as in Section 3.1, by geographic area, with somewhat greater detail provided for the EAA. Common names are used throughout the text, where possible.

3.3.1 Lake Okeechobee

The vegetation and cover types within the Lake Okeechobee region have been greatly altered during the last century. Historically, the natural vegetation was a mix of freshwater marshes, hardwood swamps, cypress swamps, pond apple forests, and pine flatwoods. The freshwater marshes were the predominant cover type throughout, especially along the southern portion of the lake where it flowed into the Everglades. These marshes were vegetated primarily with sawgrass and scattered clumps of Carolina willow, sweetbay, and cypress. Hardwood swamps dominated by red maple, sweetbay, and sweetgum occurred in riverine areas feeding the lake, while cypress swamps were found in depressional areas throughout the region. Pine flatwoods composed of slash pine, cabbage palm, and saw palmetto were prevalent in upland areas especially to the north.

3.3.1.1 Aquatic

The majority of the surface of Lake Okeechobee is not vegetated and provides open water (pelagic) habitat. Open water habitat within Lake Okeechobee covers about 75% of the lake's surface area.

The submergent vegetation of Lake Okeechobee is composed almost entirely of hydrilla (an invasive exotic species), pondweed, bladderwort, and vallisneria. The natant, or floating, component of the littoral zone consists of lotus lily, fragrant water lily, water hyacinth, water lettuce, duckweed, Cuban bulrush, coinwort, and ludwigia.

3.3.1.2 Wetlands

Lake Okeechobee has a diverse and extensive emergent littoral zone that occupies approximately 400 km2 (about 25%) of the lake's surface (Milleson, 1987). Littoral vegetation occurs along much of the lake's perimeter, but is most extensive along the southern and western borders (Milleson, 1987). The littoral zone plant community is composed of a mosaic of emergent, submergent, and natant plant species. A total of 30 distinguishable

vegetative community types are documented in a digital cover study (Richardson and Harris, 1995). Emergent vegetation within the littoral zone is dominated by herbaceous species such as cattail, spike rush, and torpedograss (an invasive exotic species). Many of the native aquatic plant species have been adversely impacted, particularly on the north end of the lake due to prolonged high water on the lake over the last couple of years.

3.3.1.3 Exotic Plants

The most recent vegetation mapping of the western Lake Okeechobee littoral zone and marsh, conducted by SFWMD, clearly depicts the dynamic state of vegetative succession within the littoral zone and the spread of less desirable and invasive exotic species into new areas. Results of this vegetation mapping show extensive areas of melaleuca along the rim canal and near shore; spike rush particularly in the Moonshine Bay area; cattail mostly interspersed in smaller stands; hydrilla where large monotypic floating and submergent mats dominate in Fisheating Bay; and, large stands of torpedograss, which largely out compete other species at most water levels.

3.3.2 Northern Estuaries

Seagrasses are undoubtedly among the most important vegetation of the St. Lucie and Caloosahatchee River Estuaries as well as the Indian River Lagoon. Seagrass meadows improve water quality by removing nutrients, dissipating the effects of waves and currents, and by stabilizing bottom habitats thereby reducing suspended solids. Seagrass beds support some of the most abundant and diverse fish populations in the Indian River Lagoon. Seagrass and macroalgae (collectively referred to as submerged aquatic vegetation, or SAV) are highly productive areas and are perhaps the most important habitat of the Indian River Lagoon (IRL CCMP, 1996).

In the St. Lucie Estuary, the predominant species of seagrass is shoalgrass. Shoalgrass often occurs in shallower areas and is commonly used as an indicator species for salinity tolerance ranges and general ecosystem health. Johnson's seagrass, listed as a threatened plant species by the National Oceanic and Atmospheric Administration (NOAA Fisheries), may also occur in the vicinity of the St. Lucie Estuary or Indian River Lagoon. In the Indian River Lagoon, turtlegrass occurs in waters generally deeper than 1-2 feet and is often associated with manateegrass.

In the Caloosahatchee River, the primary species of importance is *Vallisneria* spp. Like the seagrasses of the St. Lucie Estuary and Indian River Lagoon, *Vallisneria* spp. is used extensively as an indicator species for a wide variety of other biota for this area. *Vallisneria* spp. is a valuable food source for waterfowl and is considered an important spawning habitat for fish. In some

areas, *Vallisneria* spp. is declining due to competition with hydrilla and Eurasian watermilfoil, an invasive exotic species (USACE, 1988).

The SAV communities have experienced substantial declines in acreage and quality in recent years. An estimated 30% of the seagrass communities have been destroyed in Florida's estuaries since the 1940s. The Indian River Lagoon and Charlotte Harbor have each lost about 30% of their seagrass beds. Since 1987, more than 59,000 acres of seagrasses have been affected by several factors including degraded water quality, dredging from boat propellers, freshwater management, severe temperature variability, and others, resulting in a massive die-off (Haddad and Sargent, 1994). The relationship between seagrass growth and sustainability and light transparency has been well documented (Duarte, 1991; Kenworthy and Haunert, 1991; Goldsborough and Kemp, 1988; Stevenson, et al., 1993; Dennison, et al., 1993). Discharges from Lake Okeechobee, with its associated load of suspended and dissolved constituents such as sediments, chlorophyll, and dissolved organic matter, may be impacting the riverine and estuarine seagrass communities and the animals that depend on this habitat.

3.3.3 Everglades Agricultural Area

The diverse South Florida vegetation reflect the influences of the subtropical and south temperate region of North America, as well as the endemic species that have evolved in this unique environment. Currently, much of the native South Florida landscape has been destroyed or substantially reduced by development, hydrologic change, increased nutrients, and the invasion of exotic plants. South of Lake Okeechobee, the historic pond apple swamps and sawgrass marshes have been converted to agriculture. As a result, the only remnants of native plant communities remain in the EAA and even those are highly disturbed.

The types and distribution of vegetation communities within the EAA are based on FWC land cover data for 601,654 acres using 1999 and 2000 Landsat satellite data. Twenty-five land cover classes are present within the entire EAA. However, Land cover information was not available for 19,143 acres in the northeastern portion of the EAA.

Habitat types are divided into five general groups: aquatic, wetland, upland, disturbed (mostly agricultural), and urban/extractive. Each of these general habitat types is further separated to provide more detailed information on the nature of the land cover. Based on the FWC land cover data, Parcels A, B, and C encompass a total of 53,655 acres (approximately 9% of the entire EAA) and include 18 land cover classes, comprised primarily of sugarcane (74%) and bare soil/clearcut (22%) as shown in the Table 3-1 below.

Table 3-1: Land Cover Classes in Compartments A, B, and C.

Class	Class Code	Habitat Type	No. Grid Cells	Acres in Parcels A, B, and C	Percent Land Cover Class in Parcels A, B, and C
Sugarcane	193	Disturbed	178,563	39,711	74%
Bare Soil/Clearcut	40	Urban & Extractive	54,040	12,018	22%
Row Crops	195	Disturbed	2,857	635	1%
Freshwater marsh and wet prairie	11	Wetland	1,318	293	0.5%
High Impact Urban	221	Urban & Extractive	1,114	248	0.5%
Low Impact Urban	222	Urban & Extractive	994	221	0.4%
Other Agricultural Land	196	Disturbed	752	175	0.3%
Shrub and brushland	20	Disturbed	438	97	0.2%
Shrub swamp	15	Wetland	354	79	0.1%
Dry prairie	2	Upland	313	70	0.1%
Hardwood hammocks and forests	8	Upland	123	27	0.1%
Hardwood swamp	13	Wetland	99	22	0.04%
Open water *	18	Aquatic	81	10	0.03%
Cattail Marsh	112	Wetland	81	18	0.03%
Pinelands	3	Upland	81	18	0.03%
Sawgrass Marsh	111	Wetland	42	9	0.02%
Cypress swamp	12	Wetland	7	2	0.004%
Wetland Forested Mixed	34	Wetland	3	1	0.002%
Total			**241,260**	**53,655**	**100%**

*** The "Open Water" acreage reported here for Parcels A, B, and C does not include agricultural canals located within the parcels. The 10 acres reported refers only to an ~9.51 acre inundated borrow pit in the western section of Parcel B. Information provided by the SFWMD and USACE indicate 907 acres of agricultural canals resulting in a total of 925 acres of open water in all parcels including 583 acres in Parcel A, 159 acres in Parcel B (including the 10 acre borrrow pit), and 183 acres in Parcel C.**

Notes:

Total acres were calculated by multiplying the total number of grid cells for each land cover class by the area of each grid cell. Each grid cell is 30 meters by 30 meters (900 meter sq) which is approximately 0.22 acres.

Land cover information was not available for 19,143 acres of the EAA. Habitat types are divided into five general groups: aquatic, wetland, upland, disturbed (mostly agricultural), and urban/extractive. Each of these general habitat types is further separated to provide more detailed information on the nature of the land cover.

3.3.3.1 Aquatic

The aquatic communities within the EAA include both natural and man-made areas of open water such as canals, ditches, and ponds. Open water areas cover 1.7% of the area. The primary canals include Bolles, Cross, Hillsboro, Miami, NNRC, and West Palm Beach. The FWC land cover data did not include canals; therefore, no areas of open water habitat are represented in the data total for Compartment A. Based on USACE and SFWMD estimates, Compartment A contains 583 acres of aquatic habitat associated with agricultural canals, Compartment B contains approximately 159 acres of canals/ditches including a 9.51-acre borrow pond, and Compartment C contains 183 acres of canals/ditches.

3.3.3.2 Wetlands

The vast majority of the agricultural lands within the EAA are considered to be atypical jurisdictional wetlands based on the presence of hydric soils and hydrology. Wetland vegetation is anticipated to return to the site should agricultural practices cease. The verification of natural or typical wetland coverage was conducted for Compartments A, B, and C. These functional wetlands were described in six categories based on the presence of native or exotic/nuisance vegetation and the percentage of herbaceous or shrub vegetation using the Wetland Rapid Assessment Procedure (WRAP). Table 3-2 outlines the wetland categories and provides equivalent FWC land cover types as described previously from field surveys in 2003. WRAP scores for natural wetlands within Compartments A, B, and C ranged from 0.31 to 0.50 indicative of reduced function and value with no difference in quality and scores between compartments. Natural wetlands throughout the compartments are dominated by exotic and nuisance plant species. Acreages of natural, nonagricultural wetlands for the compartments are as follows: Compartment A contains 205.88 acres, Compartment B contains 76.97 acres, and Compartment C contains 315.62 acres of wetlands. Portions of Compartments B and C are currently under construction as STA expansions. Within the remaining available lands there are no natural wetlands within Compartments B and 288.35 acres of natural wetlands within Compartment C.

Table 3-2: Results of wetland extent field survey of Compartment A by interagency ecological team.

			Acres of Wetlands (Number of Wetlands)		
Category	Description	Example	Compartment A	Compartment B	Compartment C
1	Native Herbaceous Dominated (<20% Shrub)	maidencane, saggitaria, pickelweed	13.07 (1)	67.46	5.52
2	Native Mixed Herbaceous (20% to 49% Shrub)		0	0	6.03
3	Exotic/Nuisance Shrub (<20% Herbaceous)	primrose willow, Brazilian pepper, baccharis	1.73 (1)	0	16.18
4	Exotic/Nuisance Mixed Shrub (20%-49% Herbaceous)		0	9.51	41.32
5	Exotic/Nuisance Herbaceous (<20% Shrub)	torpedograss, paragrass and limpo grass	3.45 (1)	0	85.92
6	Exotic/Nuisance Mixed Herbaceous (20%-49% Shrub)		187.63 (2)	0	160.66
	Total for all Wetland Categories		205.88 (5)	76.97	315.62

Source: USFWS, 2003

3.3.3.3 Uplands

Upland communities were characterized by using FWC land cover data. Uplands cover 486 acres or 0.08% of the entire EAA. Upland land cover classes include dry prairie, hardwood hammock and forests, pinelands, and mixed hardwood pine forests in descending order of abundance. Based on FWC land cover data, dry prairie comprises approximately 70 acres (0.1 percent) of the land cover in Compartments A, B, and C and is located in the central portion of Compartment B and the central and western portions of Parcel C. Hardwood hammocks and forests comprise approximately 27 acres (0.1%) of the land cover in Compartments A, B, and C and are located in the central portion of Compartment B. Pinelands comprise approximately 18 acres (less than 0.1%) of the land cover in Compartment A, B, and C and exist in the central portion of Compartment B and in the central and western portions of Compartment C.

3.3.3.4 Disturbed Communities

Disturbed communities consist of mostly agricultural lands including pasture (improved and unimproved), row crops, sugarcane, citrus, and other agricultural lands. Included in this general habitat type are two other cover classes: shrub and brushland, and exotic plant communities. The disturbed habitat types cover 69.5% of the total EAA area with the vast majority of disturbed cover being sugarcane. Within parcels A, B, and C, the total disturbed communities land cover comprises of 39,711 acres (74%) of

sugarcane, 635 acres (1%) of row crops, 167 acres (less than 1%) of other agricultural land, and 97 acres (less than 1%) of shrub and brushland.

Within Compartment A, 79% of the area is classified as disturbed with sugarcane also being the dominant cover. Compartment B and Compartment C are both primarily out of agricultural production except for an area leased for sod production in the northern portion of Compartment B.

3.3.3.5 Urban and Extractive Communities

The urban and extractive cover communities encompass 14% of the EAA land area and consist of bare soil/clearcut areas (12%), low impact urban land (1%), high impact urban land (less than 1%), and extractive areas (substantially less than 1%). Most of the urban and extractive lands are concentrated around the Belle Glade area. Bare soil/clearcut areas are associated with a recent timber cutting operation, natural bare soils, and bare soil exposed due to clearing vegetation. Low impact urban areas consist of either vegetated or non vegetated lands within areas such as lawns, golf courses, road shoulders, and grassy areas surrounding development. High impact urban areas are non vegetated sites such as buildings, roads, and parking lots. Extractive cover areas consist of surface mining operations such as limestone quarries, phosphate mines, and sand pits as well as the associated industrial complexes.

Within Parcels A, B and C, urban and extractive communities form approximately 12,487 acres (23%) of the land cover, bare soil/clearcut land cover class comprises approximately 12,018 acres (22%), low impact urban land cover class comprises approximately 221 acres (less than 1%), and high impact urban land cover class comprises approximately 248 acres (less than 1%).

3.3.4 Water Conservation Areas 2 and 3

Almost all of the WCAs are grass-dominated wetlands interspersed with tree islands (hammocks) and willow strands. Tree islands are a unique feature of the Everglades ecosystem. Tropical hardwoods are found on some of the relatively unaltered tree islands in the southern portion of the area.

The basin marsh community type develops in broad, shallow to intermediate depth basins with peat substrate. The dominant plant cover is sawgrass and/or buttonbush and/or mixed emergents. In general, there are three recognizable types of basin wetland communities present in the WCAs:

1. Sawgrass marsh composed of sawgrass with cattail, maidencane, arrowhead, pickerelweed, willow, buttonbush, wax myrtle, and saltbush.

2. Wet prairie, composed of beak rush, spike rush, maidencane, string lily, and white water lily.
3. Aquatic slough composed of white water lily, floating heart, spatterdock, bacopa, and bladderwort.

Forested wetlands in the WCAs include both strands and hydric hammocks. A strand is a broad, shallow channel with peat over a mineral substrate that is seasonally inundated by flowing water. Fire is occasional or rare in this wetland community and dominant vegetation is cypress and/or willow. The following vegetation species are associated with this community: pond cypress, bald cypress, willow, buttonbush, wax myrtle, sawgrass, and royal fern.

A subtropical hydric hammock is a wetland forest community occurring in the WCAs in lowlands over sandy, clay organic soil, often over limestone. Its water regime is mesic to hydric and fire is rare or not a major factor. The following species are associated with this community: sweet bay, red bay, cocoplum, strangler fig, wax myrtle, willow, elderberry, hackberry, cabbage palm, red maple, false nettle, water oak, hornbeam, and needle palm.

Major plant communities in WCA-2A now consist of remnant drowned tree islands, open water sloughs, large expanses of sawgrass, and sawgrass intermixed with dense cattail stands. Remaining tree islands are found primarily at higher ground level elevations, located in the northwest corner of WCA-2A. Remnant (drowned) tree islands, dominated primarily by willow, are found scattered throughout the central and southern sections of WCA-2A. Cattail distribution in WCA-2 reflects 4,400 acres in which cattails represent more than 50% of the vegetation coverage and 24,000 acres of mixed or scattered cattail (<50% coverage) present in the northeast portion of WCA-2A.

Several studies conducted within WCA-2A show that cattail out-compete sawgrass in their ability to absorb nutrients. There is increased cattail production during years of high nutrient inflows (Toth, 1988; Davis, 1991). Cattail is considered a high nutrient status species that is opportunistic and highly competitive, relative to sawgrass, in nutrient-enriched situations (Toth, 1988; Davis, 1991). Davis (1991) concluded that both sawgrass and cattail increased annual production in response to elevated nutrient concentrations, but that cattail differed in its ability to increase plant production during years of high nutrient supply.

The community structure and species diversity of Everglades vegetation located north of I-75 (WCA-3A North) is very different from the wetland plant communities found south of I-75 (WCA- 3A South). Improvements made to the Miami Canal and impoundment of WCA-3A by levees have over-drained

the north end of WCA-3A and shortened its natural hydroperiod. These hydrological changes have increased the frequency of severe peat fires that have resulted in loss of tree islands, aquatic slough, and wet prairie habitat that were once characteristic of the area. Today, northern WCA-3A is largely dominated by sawgrass and lacks the natural structural diversity of plant communities seen in southern WCA-3A.

Over-drainage of the northwestern portion of WCA-3A has allowed the invasion of a number of terrestrial species such as saltbush, dog fennel, and broomsedge. Melaleuca has become well-established in the southeastern corner of WCA-3A North, and is spreading to the north and west.

Vegetation located in the central and southern portion of WCA-3A probably represents some of the best examples of original, undisturbed Everglades habitat left in South Florida. This region of the Everglades appears to have changed little since the 1950s, and contains a mosaic of tree islands, wet prairies, sawgrass stands, and aquatic sloughs similar to those reported by Loveless (1959).

The majority of vegetation within WCA-3A South can be described as typical Everglades habitat with some exceptions due largely to the construction of canals and levees which compartmentalize the WCAs.

3.4 FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES.

Table 3-3 contains a compilation of listed species potentially occurring within the EAA or other affected areas. This sub-section will state the federally-listed species that occur in each of the geographic regions affected by this project; following that will be a description of the listed species.

3.4.1 Lake Okeechobee

Even with habitat fragmentation and degraded ecological communities, Lake Okeechobee provides habitat for a diversity of wildlife including federally and state listed plants and wildlife. Species covered in this sub-section include only those species occurring within or using the lake's open water habitat, SAV, or fringing littoral marshes, rather than the entire watershed.

The lake and its associated wetlands provide habitat for federally protected species including the bald eagle, wood stork, snail kite, West Indian manatee, American alligator, and the Okeechobee gourd. Bald eagle nests are found along or near Lake Okeechobee. The wood stork uses a variety of wetlands to forage for small invertebrates that are found concentrated in receding water levels. Snail kites prey exclusively on apple snails that have been historically abundant in and around the Lake Okeechobee and its marshes. Portions of the lake and surrounding areas are designated as critical habitat. The West

Indian manatee can access the lake from either the east or west through either the Caloosahatchee River or the St. Lucie Canal. The Okeechobee gourd occurs in shrubby locations along the southern shore of the lake.

Table 3-3: List of Protected Species in the Affected Area.

Group	Scientific Name	Common Name	Listed Status
Mammals	*Felis concolor coryi*	Florida panther	FE, SE
	Trichechus manatus latirostris	West Indian manatee	FE, SE
Birds	*Ajaia ajaja*	Roseate spoonbill	SSSC
	Aramus guarauna	Limpkin	SSSC
	Caracara plancus audubonii	Crested caracara	FT, ST
	Egretta caerulea	Little blue heron	SSSC
	Egretta thula	Snowy Egret	SSCC
	Egretta tricolor	Tricolored heron	SSCC
	Eudocimus albus	White ibis	SSCC
	Flaco peregrinus	Peregrine falcon	SE
	Falco sparverius paulus	South American kestrel	ST
	Grus canadensis pratensis	Florida sandhill crane	ST
	Haliaeetus leucocephalus	Bald eagle	FT, ST
	Mycteria americana	Wood stork	FE, SE
	Rostrhamus sociabilis plumbeus	Everglades snail kite	FE, SE
	Rynchops niger	Black skimmer	SSSC
	Speotyto cunicularia floridana	Florida burrowing owl	SSCC
	Sterna antillarum	Least tern	ST
Reptiles and Amphibians	*Alligator mississippiensis*	American alligator	FT (S/A), SSC
	Caretta caretta	Loggerhead sea turtle	FT, ST
	Chelonia mydas	Green sea turtle	FT, SE
	Drymarchon coaris couperi	Eastern indigo snake	FT, ST
	Dermochelys coriacea	Leatherback sea turtle	FE, SE
	Eretmochelys imbricata imbricata	Hawksbill sea turtle	FE, SE
	Gopherus polyphemus	Gopher tortoise	SSSC
	Lepidochelys kempii	Kemp's ridley sea turtle	FE, SE
Fishes	*Microphis brachyurus lineatus*	Opossum pipefish	FSSC
	Pristis pectinata	Smalltooth sawfish	FE, SE
Plants	*Cucurbita okeechobeensis*	Okeechobee gourd	FE, SE
	Halophila johnsonii	Johnson's seagrass	FT

Listed Status Key: F=Federal; S=State; E=Endangered;
T= Threatened; SSC=Species of Special Concern;
S/A=Similarity of Appearance

3.4.2 Northern Estuaries

Many of the protected species known from the EAA or Lake Okeechobee also occur in the northern estuaries. These include various wading birds (including the federally endangered wood stork), American alligator, West Indian manatee, and bald eagle. Manatees are an opportunistic herbivore that feed on a wide variety of plants including vallisneria, an important food resource in the Caloosahatchee Estuary. They are also known from the St. Lucie Estuary and venture up river through the locks of the St. Lucie Canal.

Species that occur occasionally in both estuaries include five species of sea turtles, two species of fish, and Johnson's seagrass. The turtle species are protected under both state and federal law and include the Atlantic loggerhead, Atlantic green turtle, leatherback turtle, Atlantic hawksbill, and Kemp's ridley turtle. The two protected fish species that occur are the opossum pipefish and smalltooth sawfish.

3.4.3 Everglades Agricultural Area

Although the EAA is predominantly agricultural land, with remnant pockets of natural wetlands and a network of canals, it provides habitat for the following federally-listed species: Florida panther, West Indian manatee, wood stork, bald eagle, American alligator, and Eastern indigo snake. Although Audubon's crested caracaras have not been documented within the EAA Project footprint, individuals may pass through, forage, or even nest in the area periodically.

3.4.4 Water Conservation Areas

Federally protected species occurring both in the EAA and WCAs include many of the protected species in the South Florida region including the American alligator, bald eagle, wood stork, Audubon's crested caracara, Everglades snail kite, Florida panther, and possibly the Eastern indigo snake. The WCAs also have designated critical habitat for the Everglades snail kite in WCA-2 and WCA-3A.

3.4.5 Species Descriptions

3.4.5.1 Florida Panther

The endangered Florida panther is one of the most endangered large mammals in the world, being the only extant breeding puma population east of the Mississippi River and presently only found in Florida. The panther prefers native upland forests to the wetlands and disturbed habitats types found in Compartment A (USFWS 1999). Although the core population is currently located southwest of the EAA project footprint, panthers range throughout central and southern Florida. Existing data was searched to document panther use of the habitat or movement through the region. The Florida panther was monitored from February 1981 to June 2001 using radio telemetry from aircraft by the FWC, ENP, and Big Cypress National Preserve. The data, maintained by the FWC, was searched and documented for panther occurrences within the EAA. In addition, panther road kill data was searched; however, no road kills occurred within the EAA, with the closest road kill located two miles west of the EAA boundary.

The EAA is included in the panther's range and three Florida panthers (numbers 26, 43 and 90) have been documented in the EAA. Panther No. 26 was located in the southwestern portion of the EAA by two radio telemetry points in March and April of 1990. Both data points indicate the panther was in a swamp thicket and inactive. This specimen was killed by intraspecific aggression on July 18, 2004. Panther No. 43 was documented along the Miami Canal between the EAA southern boundary to the Holey WMA between June and September 1991. This panther most frequently occurred in swamp thickets. This specimen was also killed by intraspecific aggression on November 1, 1991. Panther No. 90 occurred between March and April of 2001 and was documented from widely spaced locations, including the southeastern corner of the EAA, along the southern boundary, and next to the Miami Canal. This panther most frequently occurred in swamp thicket, but was documented in other wetlands and agricultural lands as well. Panther FP90 was killed by vehicle injury on April 26, 2001.

No Florida panther occurrences within the Compartments A, B or C have been documented to this date (Figure 3-2).

3.4.5.2 West Indian manatee

The endangered West Indian manatee is a large, aquatic mammal that migrates along the Florida coast through fresh, brackish, and marine waters, and exhibits a seasonal distribution based on water temperatures. Waters colder than 20 degrees Celsius increase the manatee's susceptibility to cold-stress and cold-induced mortality. Distribution is also controlled by aquatic vegetation availability, proximity to water channels of at least 2 meters in depth, and location of fresh water sources (USFWS, 1999). Manatees are currently able to access some canals within the EAA.

Manatees are also found in other inland fresh waters that may be affected by the EAA Project, such as Lake Okeechobee and the St. Lucie and Calossahatchee Estuaries. This slow-moving aquatic mammal is an opportunistic herbivore feeding on a variety of submergent, emergent, or floating aquatic vegetation including bank grasses and overhanging plants. A study is currently underway to document the use of canals by the manatee (Ferrell, D. [personal communication] USFWS, 2004). Watercraft collisions, water control structures, and navigational locks are principal hazards to manatees.

A survey of manatee accessibility performed by the CERP Interagency Manatee Task Force (Manatee Task Force), consisting of representatives from the USFWS, FWC, USACE, SFWMD, U.S. Geological Survey, National Park Service, and the Miami-Dade Department of Environmental Resources Management, shows that manatees access canals within the EAA basin by

Figure 3-2: Florida Panther Occurences Within the EAA

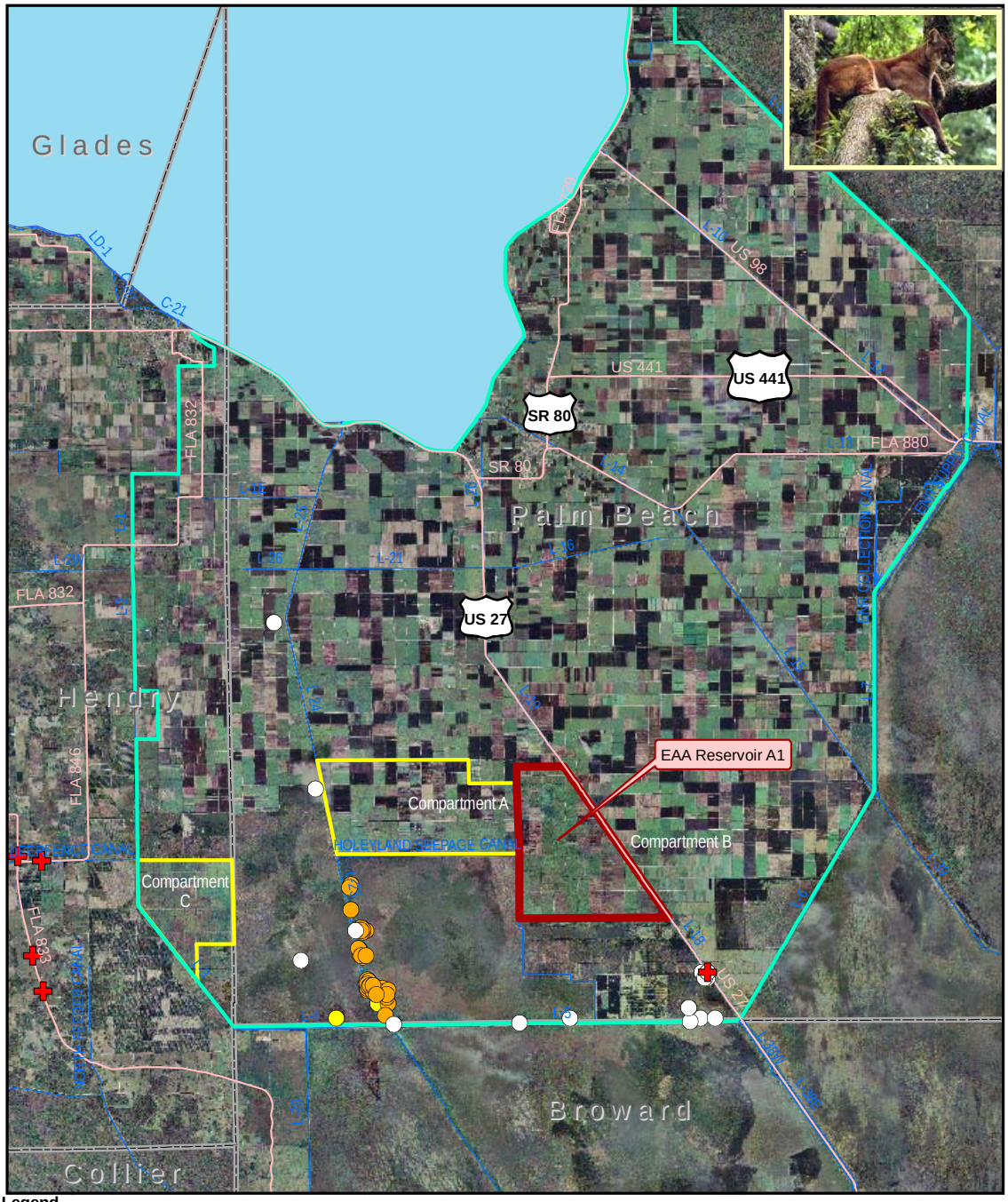

FIGURE 3-2: FLORIDA PANTHER OCCURENCES WITHING THE EAA

navigating from the Okeechobee Waterway through the gates at structures S-351, S-352, or S-354. A manatee habitat suitability survey was also performed in 178 miles of canals within the EAA. The survey was conducted using the following criteria: canal configuration, forage availability, refugia, temperature, presence of structures, mortality/rescue incidents, boat ramps, watercraft, and structure accessibility. The Manatee Task Force concluded the risks of manatee entrapment/mortality in the EAA canals outweigh the availability of suitable manatee habitat (CERP Interagency Manatee Task Force, 2004).

3.4.5.3 Wood Stork

The endangered wood stork typically forages in freshwater marshes, ponds, ditches, tidal creeks and pools, impoundments, pine/cypress depressions, and swamp sloughs (USFWS, 1999). The wood stork has been documented in EAA wetlands, temporarily flooded fields, and in associated canals and ditches. In addition, wood stork nesting colonies are within foraging range of the project footprint and occur adjacent to Lake Okeechobee and downstream in the EPA.

Wood storks are large, long-legged wading birds. They have a heavy bill that is used to locate prey items, mostly fish and crustaceans, by touch in shallow water. Prey must be concentrated in high densities to forage effectively; therefore, wood storks frequent drying wetland pools. Nesting occurs in trees-typically cypress-and communal nest sites occur or have occurred in all South Florida counties.

3.4.5.4 Bald Eagle

Although the threatened bald eagle has been proposed for delisting under the ESA (64 FR 36453), it is still protected under the ESA, the Bald and Golden Eagle Protection Act (16 U.S.C. § 668 *et seq*.), and Migratory Bird Treaty Act (16 U.S.C. § 703 *et seq*.). The Bald eagle is the largest raptor in the eastern United States and is known to breed throughout Florida. Nest sites are usually located near large rivers, lakes, or estuaries where they feed primarily on fish and water-dependent birds. Bald eagle distribution is influenced by the availability of suitable nest and perch sites near large open water bodies, typically with high amounts of water-to-land edge (USFWS, 1999).

Bald eagle nests have been documented within the EAA basin and around Lake Okeechobee and the St. Lucie and Caloosahatchee Estuaries; however no known active or inactive nest sites are located adjacent to the SFWMD's proposed EAA Reservoir A-1 project footprint. The FWC Bald Eagle Nest Locator Database was checked for the presence of eagle nests. This data uses annual aircraft surveys to develop their information. Five eagle nests are

located in the Palm Beach County portion of the EAA and are shown in Figure 3-3. Two nests (PB001 and PB010) were reported as active in the most recent 2002 survey and have been active annually since 1998. The closest documented nest to the proposed EAA Reservoir A-1 project site is located in STA-2 adjacent to the southeastern side of Compartment B. This nest, however, was destroyed by the hurricanes of September 2004.

3.4.5.5 Audubon's Crested Caracara

The threatened Audubon's crested caracara is a large raptor that was once a common resident from northern Brevard County south to Hendry County, although sporadic sightings throughout peninsular Florida have occurred. The caracara is listed as threatened by the federal government and by the State of Florida. The greatest abundance of breeding and nesting activities is in a five county area north and west of Lake Okeechobee (Glades, Desoto, Highlands, Okeechobee and Osceola Counties). This species generally favors dry or wet prairies with scattered cabbage palms. The caracara also now uses improved or semi-improved pasture with seasonal wetlands as habitat. They prefer to nest in cabbage palms surrounded by low ground cover. Caracaras are opportunistic feeders eating carrion or live prey. Prey items include small mammals (rabbits, opossums, rats, mice squirrels), frogs, lizards, fish, young birds, and insects (USFWS, 1999). Average home range is 1,552 hectare (HA), although juvenile caracaras are nomadic and numerous sightings occur outside the five-county core area.

Within the EAA basin, sparse sightings of the caracara are noted. One observation of a caracara was documented by the Florida Natural Areas Inventory (FNAI) along L-3 in 1978. Another observation was made by the USFWS. However, the location within the EAA was noted only as a roadside survey. There are no known nests sites located on or in close proximity to the SFWMD's proposed EAA Reservoir A-1 project footprint, and are not expected once construction is complete (USFWS, 2005).

3.4.5.6 Everglade Snail Kite

The endangered Everglade snail kite is a medium sized raptor and food specialist that feeds almost entirely on apple snails (*Pomacea paludosa*) which are found in palustrine emergent, long hydroperiod wetlands (USFWS, 1999). It is restricted to clear, calm waters of freshwater marshes and edges of lakes in South and Central Florida including Palm Beach and Hendry Counties. Nearly continuous flooding is required to sustain apple snail populations. Snail kites require small trees or shrubs near foraging areas as nest sites. The existing wetlands and canals within the proposed project footprint do not provide suitable habitat for apple snails and snail kites and suitable habitat is not expected within the project reservoir footprint if

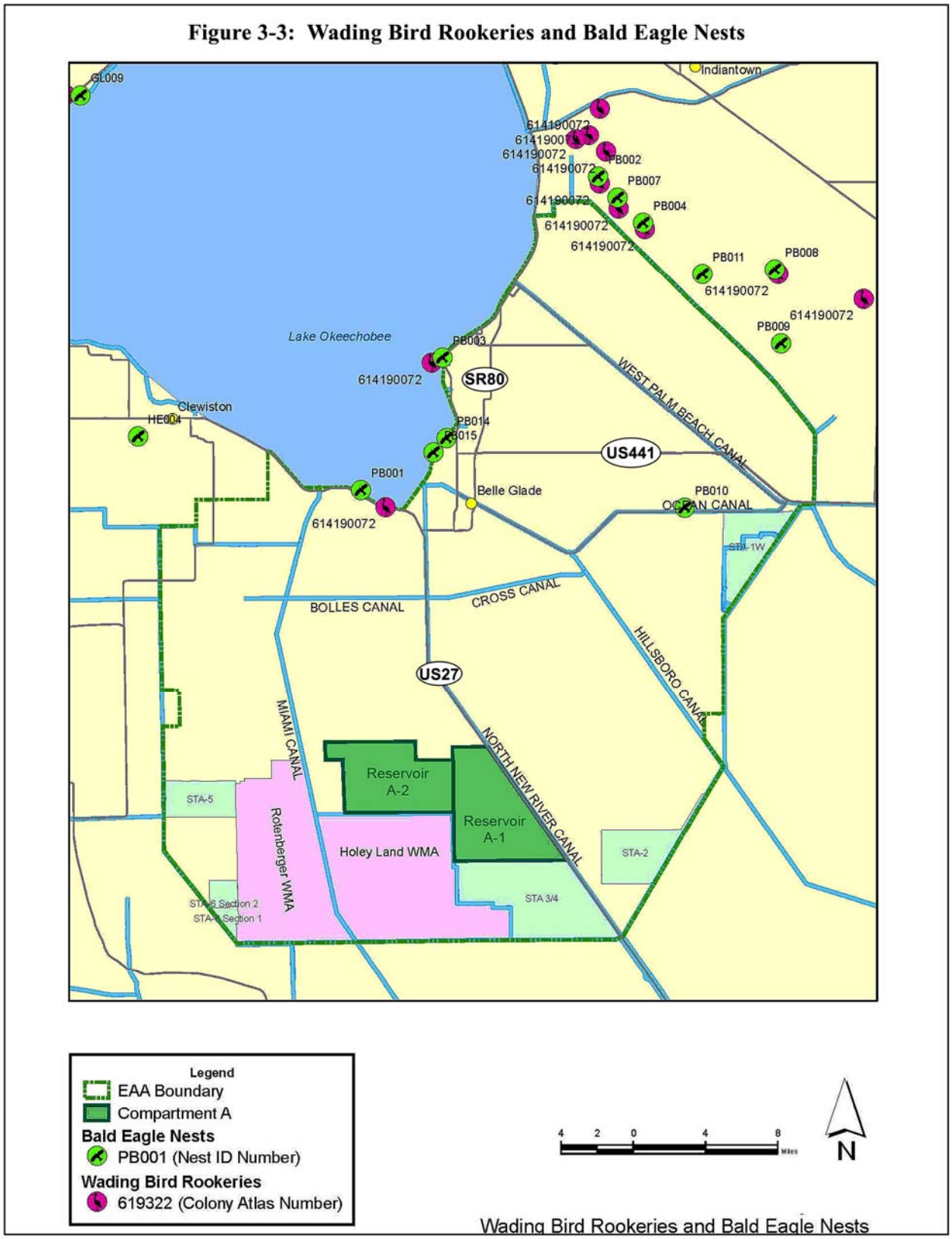

FIGURE 3-3: WADING BIRD ROOKERIES AND BALD EAGLE NESTS

constructed. The project footprint is not within a designated critical habitat for the snail kite.

Designated critical habitat for the snail kite exists on the western side of Lake Okeechobee and portions of the EPA downstream, including WCA 2 and 3A. They were also sighted in the Holey Land WMA. Wood storks and snail kites have overlapping ranges, but different feeding mechanisms and require different hydrologic conditions for optimum feeding. Historically, both have survived with the hydrologic variability characteristic of the natural system. The reduced heterogeneity and extent of natural area of the present system make the snail kites more vulnerable to natural and human-caused threats (USFWS, 1999). The critical habitat on Lake Okeechobee tends to have suitable habitat even during wet and dry years, whereas water stages in WCA-3A fluctuate greatly during wet and dry years.

3.4.5.7 Eastern Indigo Snake

The historical range of the threatened eastern indigo snake was throughout Florida, and the coastal plain of Georgia, Alabama, and Mississippi. Today, it is present only in Georgia and throughout Florida, but its abundance is reduced to a point where it is uncommon. Habitat for the indigo snake includes pine flatwoods, scrubby flatwoods, high pine, dry prairie, tropical hardwood hammock, edges of freshwater marshes, agricultural fields, coastal dunes, and human-altered habitats (USFWS, 1999). The snake inhabits primarily drier areas including agricultural fields and the margins of freshwater marshes, and may be present within the SFWMD's proposed EAA Reservoir A-1 footprint and along the canals and ditches slated for expansion.

The milder climate of Central and South Florida may not require indigo snakes to have underground thermal refugia as they do farther north; yet they frequently use natural holes, gopher tortoise burrows, trash piles and the like even in warmer South Florida. They use a variety of food sources including fish, frogs, toads, lizards, turtles and their eggs, small alligators, birds and small mammals (USFWS, 1999).

The eastern indigo snake is not documented by the FWC or FNAI to be specifically in the EAA, but it likely is found in the uplands and margins of wetlands or agricultural areas. They typically range over large areas with adult males traveling as much as 158 HA to 224 HA in the summer.

3.4.5.8 American Alligator

The American alligator is a common inhabitant of freshwater and estuarine lakes, ponds, sloughs, swamps, and canals throughout South Florida. It is protected as a threatened species by the federal government due to its similarity of appearance to other endangered crocodilian species. The

American alligator is commonly found in aquatic habitats within the EAA. This project is not likely to have an effect on the alligator, and as such, will not be addressed any further in alternatives analysis.

3.4.5.9 Sea Turtles

The endangered leatherback sea turtle is the largest of the sea turtles. The leatherback turtle regularly nests on the east coast of Florida, with the nesting and hatching season lasting from mid-February to mid-November. The adults are highly migratory and spend the most time in the pelagic zone compared to the other sea turtles. They have been found to exhibit broad thermal tolerances (NOAA Fisheries & USFWS, 1995). Nesting females prefer high-energy beaches with deep, unobstructed access. Based on surveys of nests in South Florida, they nest mainly in Palm Beach County, and secondly Martin County. Leatherback turtles appear to feed primarily on jellyfish. The status of leatherback populations in the U.S. is not known; intensive studies of nesting leatherback turtles have occurred at Sandy Point National Wildlife Refuge in U.S. Virgin Islands (USFWS, 1999).

The endangered hawksbill sea turtle is commonly found in the Caribbean Sea and waters on either side of Florida. In particular, they are regularly seen in the waters of the Florida Keys and reefs off Palm Beach County. In contrast to the green and loggerhead sea turtles, the hawksbill sea turtle nests in low densities on South Florida beaches, with aggregations typically in the range of a few dozen individuals. Hawksbill turtles inhabit the pelagic zone in their early years, then come closer to shore near coral reefs, but may also inhabit mangrove-fringed bays and estuaries. In the near-shore habitat, they primarily feed on sponges (USFWS, 1999).

The endangered Kemp's ridley sea turtle is the smallest and most endangered (in the western hemisphere) of the sea turtles, and is extremely rare in Florida. Juvenile turtles may be found along the eastern seaboard and in the Gulf of Mexico. Nesting in Florida is very rare, with only five reported occurrences. Kemp's ridley turtles are mostly carnivorous, eating mainly crabs and other shallow, benthic organisms. The current estimate of nesting females, based on nest surveys and various factors for clutch size and average number of nests, ranges between 509-740 females (NOAA Fisheries & USFWS, 1995; USFWS, 1999).

The threatened green sea turtle nests regularly in South Florida where the nesting and hatching season lasts from May to November. Important feeding areas for the green sea turtle include Indian River Lagoon, Florida Keys, Florida Bay, Homosassa River, Crystal River, and Cedar Key. Green sea turtles occupy three habitat types: high-energy oceanic beaches, convergence zones in the open ocean, and benthic feeding grounds in shallow, protected

waters. A survey of green sea turtle nests conducted from 1985 to 1995 showed that Palm Beach County has the second highest percentage of green sea turtle nests in Florida (USFWS, 1999). Green sea turtles are primarily herbivorous, eating seagrasses and algae in the benthic feeding grounds. While in the pelagic zone, they may also eat shellfish, jellyfish, and other organisms (NOAA Fisheries & USFWS, 1995).

The threatened loggerhead sea turtle is the most common sea turtle in South Florida. The geographic range of its habitat is temperate and tropical waters worldwide. Within Florida, 80% of the nesting occurs on the east coast of Florida, especially from Brevard through Broward Counties. The nesting and hatching season occurs from mid-March to November. Nesting females prefer moderate to high-energy beaches with steep slopes. Loggerhead turtles inhabit a variety of habitats, from turbid, muddy-bottom bays along the northern Gulf of Mexico coast, to clear, sandy-bottom reefs and shoals of the Caribbean. Upon hatching, juveniles swim out to Sargassum areas in the pelagic zone, and stay there until they reach sub-adulthood. At that point, they migrate to nearshore and estuarine waters. Loggerhead turtles primarily eat benthic invertebrates, such as snails, bivalve mollusks (e.g., clams), and crabs (USFWS, 1999). Loggerhead monitoring suggests that population levels in Florida have remained stable (NOAA Fisheries & USFWS, 1995).

Environmental threats to sea turtles in the marine environment include: gas and oil drilling; loss of seagrass habitat; development; pollution; fishing-related activities; underwater explosions; dredging; boat collisions; entanglement; ingestion of debris; and poaching. Nesting-related threats include: artificial lights; beach nourishment activities; human presence; poaching; recreational equipment; and habitat loss (USFWS, 1999).

3.4.5.10 Smalltooth Sawfish

The endangered small-toothed sawfish is one of two species of sawfish that inhabit U.S. waters. Smalltooth sawfish commonly reach 5.5 meters in length, and may grow to 7 meters. Little is known about the life history of these animals, but they may live up to 25-30 years and mature after about 10 years. Like many elasmobranches (e.g., sharks), smalltooth sawfish are ovoviviparous, meaning the mother holds the eggs inside of her until the young are ready to be born; although there are no studies on actual litter size, its similarity in size and habitat to the largetooth sawfish suggests litter size may be in the range of 1-13 individuals. Sawfish species inhabit shallow coastal waters of tropical seas and estuaries throughout the world. They are usually found in shallow waters very close to shore over muddy and sandy bottoms. They are often found in sheltered bays, on shallow banks, and in estuaries or river mouths. Sawfish are among the few elasmobranchs that

are known from freshwater systems in many parts of the world (National Marine Fisheries Service (NMFS), 2000).

Smalltooth sawfish have been reported in both the Pacific and Atlantic Oceans, but the U.S. population is found only in the Atlantic. Historically, the U.S. population was common throughout the Gulf of Mexico from Texas to Florida, and along the east coast from Florida to Cape Hatteras; historical records also indicate the smalltooth sawfish were found in the lower reaches of the St. Johns River and Indian River lagoon. The current range of this species has contracted to peninsular Florida, and smalltooth sawfish are relatively common only in the Everglades and Florida Keys; the presence of this species appears to have been abolished from Indian River lagoon. No accurate estimates of abundance trends over time are available for this species. However, available records, including museum records and anecdotal fisher observations, sawfish have declined dramatically in U.S. waters over the last century (NMFS, 2000).

Smalltooth sawfish generally eat whatever small schooling fish may be abundant locally, such as mullet. They may also feed on crustaceans and other benthic organisms. The sawfish has been seen as "stirring the mud with its saw" to locate its prey, or attacking schools of small fish by slashing sideways with its saw and eating the wounded fish (NMFS, 2000).

3.4.5.11 Opossum Pipefish

The opossum pipefish a species of special concern and candidate species, is a circumtropical species and is mainly found in southeast Florida and the Rio Grande River, Texas. In southeast Florida, the opossum pipefish typically inhabits dense emergent bank vegetation usually dominated by *Panicum* spp. and *Polygonum* spp. (Gilmore and Gilbert 1992). The species has consistently been collected only from the Loxahatchee River drainage, St. Lucie River, Sebastian Creek, the St. Lucie Canal at Lake Okeechobee (Gilmore and Hastings 1983), and in relief canals associated with tributaries. It is able to negotiate its way through canal locks, as evidenced by its occurrence in Lake Okeechobee (Gilmore and Gilbert 1992). The opossum pipefish matures, mates, and releases its progeny in fresh water in dense emergent bank vegetation. Egg brooding is performed exclusively by the males, with the number of eggs carried being a function of the size of the individual (Gilmore and Gilbert 1992). Newly released larvae must have brackish oligohaline-mesohaline conditions (18 ppt salinity) to survive, and are adapted for downstream transport to estuarine and marine environments during the wet season (Frias-Torres, 2002). Juveniles subsequently move offshore, where they become associated with pelagic rafts of floating vegetation, in which they remain for an indeterminate length of time. Opossum pipefish are

carnivorous, preying on crustaceans and small fish as ambush predators in dense vegetation.

Major threats to the opossum pipefish are habitat destruction, declining water quality, and an increase in disease. Vegetation elimination destroys adult pipefish breeding and feeding habitat.

3.4.5.12 Okeechobee Gourd

The Okeechobee gourd is the only federally-listed plant species occurring in the vicinity of the EAA. This endangered plant once grew extensively in the pond apple swamps south of Lake Okeechobee; however, conversion of these habitats for agriculture has eliminated most (95%) of the natural habitat. The vine is restricted to eleven sites along the southern shore of Lake Okeechobee in Palm Beach County and nine sites in Volusia County. Lake level fluctuations seem to be required to facilitate dispersal and destroy competition from weed species. The Okeechobee gourd requires trees or shrubs (typically pond apple, but also willow or cypress) to support vines above rising water levels during the wet season. The gourd also occurs on elevated, sunny alligator nests along Lake Okeechobee. The occurrence of gourds is temporary; therefore, they may disappear from a known location and reoccur when suitable conditions occur.

3.4.5.13 Johnson's Seagrass

The threatened Johnson's seagrass has been found growing only along approximately 200 km of coastline in southeastern Florida from Sebastian Inlet, Indian River County to northern Key Biscayne. This narrow range and apparent endemism indicates that Johnson's seagrass has the most limited geographic distribution of any seagrass in the world.

Johnson's seagrass occurs in dynamic and disjunct patches throughout its range. Growth appears to be rapid and leaf pairs have short life spans while horizontally spreading from dense apical meristems (Kenworthy 1997). Kenworthy suggested that horizontal spreading rapid growth pattern and a high biomass turnover could explain the dynamic patches observed in distribution studies. New information reviewed in Kenworthy (1999, 1997) confirms H. johnsonii's limited geographic distribution in patchy and vertically disjunct areas between Sebastian Inlet and northern Biscayne Bay.

Within its range, Johnson's seagrass critical habitat designations have been designated for 10 areas: a portion of the Indian River Lagoon, north of the Sebastian Inlet Channel; a portion of the Indian River Lagoon, south of the Sebastian Inlet Channel; a portion of the Indian River Lagoon near the Fort Pierce Inlet; a portion of the Indian River Lagoon, north of the St. Lucie Inlet; a portion of Hobe Sound; a site on the south side of Jupiter Inlet; a site in

central Lake Worth Lagoon; a site in Lake Worth Lagoon, Boynton Beach; a site in Lake Wyman, Boca Raton; and a portion of Biscayne Bay.

The essential features of habitat appear to be adequate water quality, salinity, water clarity and stable sediments free from physical disturbance. Important habitat characteristics include shallow intertidal as well as deeper subtidal zones (2-5 m). Water transparency appears to be critical for Johnson's seagrass, limiting its distribution at depth to areas of suitable optical water quality (Kenworthy 1997). In areas in which long-term poor water and sediment quality have existed until recently, such as Lake Worth Lagoon, H. johnsonii appears to occur in relatively higher abundance perhaps due to the previous inability of the larger species to thrive. These studies support unconfirmed previous observations that suspended solids and tannin, which reduce light penetration and water clarity, may be important factors limiting seagrass distribution. Good water clarity is essential for Halophila johnsonii growth in deeper waters.

Johnson's seagrass occurs over varied depths, environmental conditions, salinities, and water quality. In tidal channels H. johnsonii is found in coarse sand substrates, although it has been found growing on sandy shoals, in soft mud near canals and rivers where salinity many fluctuate widely (Virnstein et al. 1997). Virnstein has called Johnson's seagrass a "perennial opportunistic species." Within study areas in the Indian River Lagoon, H. johnsonii was found by itself, with other seagrass species, in the intertidal, and (more commonly) at the deep edge of some transects in water depths of up to 180 cm. H. johnsonii was found shallowly rooted on sandy shoals, in soft mud, near the mouths of canals, rivers and in shallow and deep water (Virnstein et al. 1997). Additionally, recent studies have documented large patches of Johnson's seagrass on flood deltas just inside Sebastian Inlet, as well as far from the influence of inlets (reported at the workshop discussed in Kenworthy, 1997).

These sites encompass a wide variety of salinities, water quality, and substrates. Areas of concern include seagrass beds located in proximity to rivers and canal mouths where low salinity, highly colored water is discharged. Freshwater discharge into areas adjacent to seagrass beds may provoke physiological stress upon the plants by reducing the salinity levels. Additionally, colored waters released into these areas reduce the amount of sunlight available for photosynthesis by rapidly attenuating shorter wavelengths of Photosynthetically Active Radiation.

Continuing and increasing degradation of water quality due to increased land use and water management threatens the welfare of seagrass communities. Nutrient over enrichment caused by inorganic and organic nitrogen and phosphorous loading via urban and agricultural land run-off stimulates

increased algal growth that may smother Johnson's seagrass, shade rooted vegetation, and diminish the oxygen content of the water. Low oxygen conditions have a demonstrated negative impact on seagrasses and associated communities.

3.4.6 State-Listed Species

Many wading birds that utilize the marsh zone and adjacent wetlands are listed by the State of Florida as threatened species (e.g. Florida sandhill crane) or species of special concern (snowy egret, little blue heron, limpkin, tricolored heron, white ibis). These species frequently forage along the lake margins or canals.

The FWC compiles wading bird rookery data within the State of Florida. Three wading bird rookeries were identified within the EAA basin, but no rookeries were identified within Compartment A, B and C (Figure 3-3). However, under appropriate conditions, wading birds inhabiting rookeries located in natural areas near the EAA such as WCA-1, WCA-2, and WCA-3A, may forage on EAA lands during nesting season. One rookery was located west of the North New River Canal and contained two state-listed species, little blue heron and tri-colored heron, based on a survey in the spring of 1999. In another rookery, located south of the Hillsboro Canal, just east of the North New River intersection, three state-listed wading bird species (little blue heron, tri-colored heron and white ibis) were observed, also during the 1999 survey. The third rookery, located along the southern shore of Lake Okeechobee, did not contain listed wading birds.

Several state listed species were observed on the project site during field surveys of Compartment A (USFWS 2005). Specifically, the Florida burrowing owl, which is also guaranteed protection under the Migratory Bird Treaty Act, was observed. Although burrows were not observed, suitable habitat for the owl may exist on agricultural lands and canal banks.

3.5 FISH AND WILDLIFE

3.5.1 Lake Okeechobee

The area around Lake Okeechobee includes a wide variety of habitat opportunities for wildlife, including wading and migratory birds, many mammals, amphibians, and reptiles, as well as prey species such as crayfish, prawns, apple snails, and aquatic insects. The USACE conducted a wildlife survey within the western littoral zone of the lake gathering baseline data for key habitat types for reptiles, amphibians, and migratory, and resident birds (USACE, 1999).

Lake Okeechobee is home to a large number of fish species, some of which are valued as commercial and sportfish, and others a key part of the littoral zone food web. The USACE found numerous small fish species, including the Cyprinodontids such as the golden topminnow, the least killifish, and the Florida flagfish which are important food resources for wading birds, amphibians, and reptiles. Over a five year period (1987-1991), mean annual commercial harvest was 2,008 metric tons (Fox, et al., 1992, 1993). Commercially important fish species included white catfish, bluegill, and red-ear sunfish.

Trawl samples taken by the Florida Game and Fresh water Fish Commission (GFC) from 1987 to 1991 included 25 fish species from the limnetic zone. Threadfin shad were most abundant, and black crappie, most abundant in terms of biomass. These two species, and Florida gar, gizzard shad, white catfish, redear sunfish, and bluegill represented 98% of the total catch in terms of number and weight in the trawl study (Bull, et al., 1995).

Additionally, Furse and Fox (1994) revealed that numerous sportfish occur in the littoral zone. The largemouth bass is one of the most popular gamefish in the State of Florida, and is a major predator of small fish, amphibians, birds, and reptiles. Additionally, the black crappie, bluegill, and redear sunfish are sportfish found in high numbers in the littoral zone.

Macroinvertebrate species found by the USACE include the apple snail, an important food resource of the snail kite, crayfish, grass shrimp, and Dytiscid beetles.

Significant changes have been observed on the lake. Valuable fish habitat including bulrush, spike rush, and SAV has been lost and/or replaced by exotic species such as torpedograss and hydrilla. Reports of muddy, turbid water and drowned vegetation are not uncommon among the public and fisherman. Fishing guides report fish spawning has been poor for the last five years. Others report that shiners (an important bait fish) are becoming increasingly difficult to find and more and more fisherman are forced to the same areas to fish for them. Peppergrass, a floating, leafed aquatic species, important as fish habitat, occurs in deeper water. Once abundant on the lake, it has been severely impacted and is observed mostly in isolated parts of the south end of the lake, notably South Bay. In many people's opinion, these adverse effects are largely due to the sustained high water events persistent on the lake.

A major area of concern to the life cycle of fish and wildlife species is the western littoral zone and marsh, which is representative of similar littoral resources around the lake. The western littoral zone provides tremendous foraging and nesting habitat for a wide range of avifauna. Previous studies

(Smith and Collopy, 1995; David, 1994) have documented birds (including state and federally-listed species) such as wood stork, snail kite, great blue heron, white ibis, pied-billed grebe, great egret, snowy egret, little blue heron, tricolor heron, and common moorhen in the area. Other birds that may utilize the littoral zone include the threatened bald eagle, black skimmer, brown pelican, double-crested cormorant, and anhinga.

According to range maps presented by Conant and Collins (1991), reptile and amphibian diversity should be quite high in littoral and marsh areas of the lake. Studied species on Lake Okeechobee include the American alligator and the Florida soft-shelled turtle. Currently, no published inventories are available on the diversity of reptiles and amphibians inhabiting the western littoral zone of Lake Okeechobee.

The USACE found large numbers of the greater siren along with the green water snake and the banded water snake. Additional common species sampled included frogs such as the southern leopard frog, the green tree frog, and the squirrel tree frog.

Several reports from local residents have confirmed sightings of non-native species of lizards, such as the green iguana, the spiny-tailed iguana, and the brown basilisk. Established populations of such species could be extremely harmful to native reptile and amphibian populations.

Lake Okeechobee also provides major resources for mammals. The Okeechobee Waterway, a designated channel that runs around the perimeter of the lake, as well as across the lake, provides habitat for the endangered West Indian manatee. Additionally, river otters, bobcats, and the Florida water rat, a species of special concern as listed by the Florida Committee for Rare and Endangered Plants and Animals, have been observed within the lake.

3.5.2 Northern Estuaries

The Northern Estuaries refer to the St. Lucie Estuary on the east coast of Florida, which flows into another estuary, the southern end of the Indian River Lagoon, and the Caloosahatchee Estuary on the west coast of Florida. The Indian River Lagoon system is a biogeographic transition zone, rich in habitats and species, with the highest species diversity of any estuary in North America (Gilmore, 1977). Approximately 4,315 different plant and animal species have been identified in the lagoon system. Included are 2,965 species of animals, 1,350 species of plants, 700 species of fish and 310 species of birds (IRL CCMP, 1996). Species diversity is generally high near inlets and toward the south, and low near cities, where nutrient input, freshwater input, sedimentation, and turbidity are high and where large areas of

mangroves and seagrasses have been lost. For biological communities and fisheries, seagrass and mangrove habitats are extremely important (Virnstein and Campbell, 1987). Much of the habitat loss has occurred as a result of the direct effects of shoreline development, navigational improvements, and marsh management practices.

Most of the predominant freshwater fishes recorded from the lagoon system, such as minnows, bullhead catfishes, and sunfishes are found mainly or exclusively in the tributary streams including the streams feeding the St. Lucie. Examples of other species in this habitat include all of the ubiquitous forms mentioned above as well as Florida gar; gizzard shad; flagfish; bluefin killifish; mosquitofish; least killifish; sailfin molly; inland silverside; gulf pipefish; leatherjack gray snapper; Irish pompano; silver jenny; fat sleeper; bigmouth sleeper; and, lined sole. Fish species that specialize in creek-mouth habitats include: yellowfin menhaden, gafftopsail catfish, timucu, needlefish, gulf killifish, striped killifish, mosquitofish, sailfin molly, lined seahorse, chain pipefish, gulf pipefish, tarpon snook, Atlantic bumper, gray snapper, Irish pompano, silver jenny, great barracuda, gobies, sleepers, puffers, filefish, and, many others.

In addition to finfish, the estuaries and Indian River Lagoon support a variety of shellfish. Blue crabs, stone crabs, hard clams, and oysters are important estuarine commercial species. The blue crab accounted for approximately 80% of shellfish landings in the Indian River Lagoon between 1958 and 1988 (IRL CCMP, 1996). Oysters are an important indicator organism and are known to be sensitive to salinity changes in their environment.

The Caloosahatchee River Estuary starts at the Franklin Lock and continues downstream nearly 30 miles to San Carlos Bay. Although various changes have historically occurred in the Caloosahatchee Estuary (channelization, shoreline hardening, point, and non-point source impacts), the estuary sustains numerous and diverse fish and wildlife populations. Important resources within the estuarine portions of the Caloosahatchee are SAV including seagrass, oyster bars, open bottom community, and mangrove-lined shorelines. These communities provide important habitat supporting many wildlife species.

Manatees, waterfowl, and wading birds rely on seagrass communities as foraging area. SAV are an integral nursery area for commercially and recreationally important fish and shellfish. Seagrass communities provide critical refugia for juvenile fish such as redfish, grouper, snook, and spotted seatrout. In addition, the upper and middle portions of the Caloosahatchee River support a blue crab fishery. Oyster bars and open bottoms of sand mud, shell, and bedrock provide important habitat and food for other

estuarine species. They harbor a rich macro invertebrate community that is utilized by wading and shorebirds and fish.

In the Caloosahatchee Estuary, mangroves support fish and macro invertebrate communities by providing a protected nursery area. Important marine and estuarine species that spend part of their life cycle in the mangrove community include snook, snapper, tarpon, jack, sheepshead, red drum, ladyfish, blue crab, and shrimp. Mangroves forests also provide important foraging and nesting habitat for diverse populations of birds.

3.5.3 Everglades Agricultural Area

Altered native habitats dominate the EAA; however, remaining wetlands offer some native habitat for fish and wildlife species. Although there are few published fish and wildlife studies available for the area, lists of potentially occurring and confirmed species have been compiled from a variety of sources including: the FWC 1987-1993 Wildlife Observation Database, the FNAI Element Occurrence Database (through 2002), the FWC Breeding Bird Atlas, and the FWC Wading Bird Rookery data. Table 3-4 includes wildlife observations documented for Compartments A, B, and C as part of field surveys of wetlands.

General wildlife use of the area can be derived from information about the present vegetation communities. The following sub-sections briefly discuss typical wildlife use based on FWC land cover data of habitat types.

3.5.3.1 Aquatic

The distinction between wetland and aquatic habitat is sometimes not apparent; however, aquatic habitat typically represents deeper, permanent water bodies with little or no emergent vegetation. Similarly, aquatic fauna often move between deeper water areas and wetlands depending upon habitat requirements. Fish are the most common vertebrate found in aquatic habitats. Typical species include largemouth bass, bowfin, Florida gar, and sunfish. Mammals that are typically in aquatic habitat include the West Indian manatee and river otter. Manatees are found in canals that interconnect with coastal water bodies, whereas river otter may be found in all aquatic habitats as they are capable of traversing some distance over land to reach water bodies where they feed. Birds using aquatic habitats include ducks, wading birds (great blue heron, great egret), aquatic birds (terns, cormorant, anhinga), and osprey. The most conspicuous reptile observed in open water areas is the American alligator.

3.5.3.2 Wetlands

Herbaceous wetlands (sawgrass marsh, freshwater marsh, wet prairie) provide habitat for a variety of birds due to the diversity of vegetation in adjacent habitats. Examples of some of the many types of birds include: songbirds (common yellowthroat, red-winged blackbird, boat-tailed grackle); marsh and wading birds (least bittern, king rail, sora, green-backed heron, great blue heron, great egret, limpkin); ducks and aquatic birds (American coot, common moorhen, anhinga); and, birds of prey (osprey, red-shouldered hawk, Everglades kite). Mammals that utilize these habitats include river otter, marsh rabbit, and raccoon. Fish typical of these areas include mosquitofish, Florida gar, and bluefin killifish. Reptiles and amphibians common to herbaceous wetlands include: American alligator, water moccasin, water snake, Florida cooter, southern leopard frog, and green tree frog.

Forested and shrub swamp fauna are home to a variety of mammals such as white-tailed deer, marsh rabbit, Florida panther, cotton mouse, raccoon, fox squirrel, and Florida black bear. These woody swamps are habitat for birds such as barred owl, pileated woodpecker, red-bellied woodpecker, white-eyed vireo, yellow-rumped warbler, and red-shouldered hawk. Reptiles and amphibians such as the rough green snake, eastern indigo, water moccasin, and southern toad are often found in these areas.

3.5.3.3 Uplands

Upland communities consist of relatively open, herbaceous habitat such as dry prairie to forested communities of varying vegetation composition such as hardwood hammocks, pinelands, and a mixture of hardwoods and pine. Dry prairies provide habitat for raccoon as well as the wide-ranging Florida panther. Birds typical of this open habitat include common ground dove, eastern meadowlark, and crested caracara.

3.5.3.4 Disturbed and Urban/Extractive Communities

Wildlife species that may be found in agricultural, urban or mining lands are typically tolerant of open conditions, a certain amount of human activity, and are not restricted to specialized habitats. Species found in these habitats include: raccoon, boat-tailed grackle, bobwhite, cattle egret, black vulture, turkey vulture, crested caracara, eastern meadowlark, northern mockingbird, red-winged blackbird, white ibis, box turtle, and green anole. Some species that require open habitat, such as burrowing owls, may make use of this habitat in addition to dry prairie.

Table 3-4: Fish and Wildife Observed in Compartments A, B, and C.

Group	Common Name	Scientific Name	A	B	C
Mammals	Bobcat	*Lynx rufus*			x
	Eastern cottontail	*Sylvilagus floridanus*	x		
	Grey fox	*Urocyon cinereoargenteus*			x
	Marsh rabbit	*S. palustris*	x	x	x
	Racoon	*Procyon lotor*			x
	River Otter	*Lutra canadensis*			x
	White tailed deer	*Odocoileus virginianus*		x	x
Birds	Anhinga	*Anhinga anhinga*	x		x
	Barn owl	*Tyto alba*	x	x	
	Barn swallow	*Hirundo rustica*	x	x	x
	Belted kingfisher	*Cercyle alcyon*		x	
	Black-necked stilt	*Himantopus mexicanus*	x	x	x
	Boat-tailed grackle	*Quiscalus major*	x	x	x
	Burrowing owl	*Athene cunicularia floridana*	x	x	
	Cattle egret	*Bubulcus ibis*	x	x	
	Common grackle	*Quiscalus quiscula*		x	
	Common ground dove	*Columbina passerina*		x	x
	Common moorhen	*Gallinula chloropus*	x		
	Common nighthawk	*Chordeiles minor*	x	x	x
	Common yellowthroat	*Geothlypis trichas*	x	x	x
	Crested caracara	*Caracara cheriway*			x
	Double-crested cormorant	*Phalacrocorax auritus*	x		
	Eastern meadowlark	*Sturnella magna*		x	
	Eastern towhee	*Pipilo erythropthalmus*		x	
	Glossy ibis	*Plegadis falcinellus*		x	
	Great blue heron	*Ardea herodias*		x	x
	Great egret	*Ardea alba (Casmerodius albus)*	x	x	x
	Green heron	*Butorides virescens*	x	x	x
	Killdeer	*Charadrius vociferus*	x	x	x
	Limpkin	*Aramus guarauna*		x	x
	Little blue heron	*Egretta caerulea*	x	x	
	Loggerhead shrike	*Lanius ludovicianus*		x	x
	Mottled duck	*Anas fulvigula*		x	x
	Mourning dove	*Zenaida macroura*	x	x	x
	Northern bobwhite	*Colinus virginianus*		x	x
	Northern cardinal	*Cardinalis cardinalis*		x	x
	Northern mockingbird	*Mimus polyglottos*		x	
	Osprey	*Pandion haliaetus*			x
	Red-shouldered hawk	*Buteo lineatus*	x	x	x
	Red-tailed hawk	*Buteo jamaicensis*			x
	Red-winged blackbird	*Agelaius phoeniceus*	x	x	x
	Roseate spoonbill	*Ajaia ajaja*	x		
	Snowy egret	*Egretta thula*			x
	Tricolored heron	*Egretta tricolor*	x	x	x
	Turkey vulture	*Cathartes aura*	x	x	x
	White ibis	*Eudocimus albus*	x	x	
	White-eyed vireo	*Vireo grisseus*		x	x
	White-tailed kite	*Elanus caeruleus*		x	
	Wood stork	*Mycteria americana*	x		
	Yellow-crowned night-heron	*Nyctanassa violacea*		x	
	Yellowlegs	*Tringa* sp.		x	x

Table 3-4: Fish and Wildife Observed in Compartments A, B, and C (cont.).

Group	Common Name	Scientific Name	A	B	C
Reptiles and Amphibians	American alligator	*Alligator mississippiensis*	x	x	x
	Cottonmouth	*Agkistodon piscivorus*			x
	Pig frog	*Rana grylio*	x		x
	Southern cricket frog	*Acris gryllus dorsalis*			x
	Southern leopard frog	*Rana sphenocephala*			x
	Tree frogs	*Hyla* spp.	x	x	x
	Turtle	Family *Emydidae*			x
	Two-toed amphiuma	*Amphiuma means*			x
Fishes	Bluegill	*Lepomis macrochirus*		x	x
	Florida gar	*Lepisosteus platyrhincus*	x	x	
	Largemouth bass	*Micropterus salmoides*	x	x	
	Mosquitofish	*Gambusia affinis*	x	x	x
	Redear sunfish	*Lepomis microlophus*	x	x	x
Invertebrates		**Phylum *Arthropoda***			
		Class *Insecta*			
	Dragonflies and Damselflies	Order *Odonata*	x	x	x
	Grasshoppers	Order *Orthoptera*	x	x	x
	Spittlebugs	Order *Hemiptera*			x
	Stink bug				x
	Water boatman	Order *Homoptera*			x
	Praying mantis	Order *Dictyoptera*			x
	Beetles	Order *Coleoptera*			x
	aquatic beetle	*Cybister* sp.			x
	aquatic beetle	*Hydrocanthus*sp.			x
	Butterflies and Moths	Order *Lepidoptera*	x	x	x
	Cloudless sulphur		x	x	x
	Gulf fritillary			x	
	Peacock		x	x	x
	Queen				x
	Skipper				x
	Swallow-tailed				x
	Viceroy		x	x	x
	Lovebugs	Order *Diptera*			x
	Mosquitoes		x	x	x
	Bees	Order *Hymenoptera*			x
	Fire ants		x	x	x
	Wasps				x
	Grass shrimp	**Class *Crustacea***			x
	Millipedes	**Class *Diplopoda***			x
	Centipede	**Class *Chilopoda***			x
	Spiders	**Class *Arachnida***	x	x	x
		Phylum *Mollusca*			
	Melanoides sp.	**Class *Gastropoda***		x	x
	Planorbidae sp.			x	
	Seminole ramshorn snail	*Planorbella duryi*			x
		Class *Bivalvia*		x	
	Asian clam	*Corbicula fluminea*		x	

* Fish and wildlife species were observed directly or were detected by observing sign such as tracks, vocalizations, scat, exoskeletons, etc.

3.5.4 Water Conservation Areas

The WCAs as a whole contain a number of important species whose existence, population numbers, and sustainability are markedly influenced by water levels. The American alligator, a keystone Everglades species, has rebounded in terms of population numbers since the 1960s when the reptile was placed on the endangered species list by the USFWS. Alligators, it is believed, play an important ecological function by maintaining "gator holes", or depressions, in the muck which are thought to provide refuge for aquatic organisms during times of drought and concentrates food sources for wading birds. High water during periods of nest construction, which occurs from June to early July (Woodward, et al., 1989), decreases the availability of nesting sites. If conditions become too dry, either naturally or through water management practices, water levels may fall too low to maintain gator holes, forcing the animal to seek other areas to survive.

Other important reptile species commonly encountered within the Study Area include a number of species of turtles, lizards, and snakes. Turtle species include the snapping turtle, striped mud turtle, mud turtle, cooter, Florida chicken turtle, and Florida softshell turtle. Lizards such as the green anole are found in the central Everglades, and several species of skinks occur more commonly in terrestrial habitats. Numerous snakes inhabit the wetland and terrestrial environments. Drier habitats support such species as the Florida brown snake, southern ringneck snake, southern black racer, scarlet snake, and two rattlesnake species. The eastern indigo snake, a Federally listed threatened species, and the Florida pine snake, a state species of special concern, may also exist in drier areas of the Study Area. Wetter habitats support more aquatic species such as the water snake, the green water snake, mud snake, eastern garter snake, ribbon snake, rat snake, and the Florida cottonmouth (McDiarmid and Pritchard, 1978).

Important amphibians known to occur in South Florida include the Everglades bullfrog, or pig frog, Florida cricket frog, southern leopard frog, southern chorus frog, and various tree frogs common to tree islands and cypress forests. Salamanders inhabit the densely vegetated, still or slow-moving waters of the sawgrass marshes and wet prairies. They include the greater siren and the Everglades dwarf siren. Toads such as the eastern narrow-mouth toad also occur within the Study Area.

Colonial wading birds are a conspicuous component of the wildlife communities that utilize the WCAs as both feeding and breeding habitat. These include 11 species of herons and egrets, two species of ibis, the wood stork, and the roseate spoonbill (Robertson and Kushlan, 1984). Historically, white ibis has been the most abundant colonial wading bird species within the WCAs. Surveys indicate that the great egret is the second most

abundant species (Frederick and Collopy, 1988). The great blue heron, little blue heron, tricolored heron, green-backed heron, snowy egret, cattle egret, black-crowned night heron, and yellow-crowned night heron, are also common wading bird species found throughout the WCAs. The roseate spoonbill, a state listed species of special concern, and the wood storks, a Federally listed endangered species, both occur within the WCAs. The WCAs support additional aquatic avifauna, such as the limpkin, two species of bitterns, the anhinga, as well as a number of resident and migratory waterfowl.

Aerial surveys indicate that white ibis, great egrets, great blue herons, wood storks, little blue herons, snowy egrets, cattle egrets, and glossy ibis are the most common wading bird species utilizing the WCAs, with populations varying widely in relationship to seasonal water level fluctuations. Peak wading bird use of the WCAs often occurs in January in synchrony with receding water levels, with over 121,000 birds being observed at times. Lowest counts have occurred during August with less than 15,000 birds counted. The white ibis is typically the most abundant wading bird observed, with total monthly counts varying as the birds move in and out of the WCAs in response to changing water levels. Great egrets represented the second most abundant species of wading birds observed.

The Everglades fish community is composed of a variety of forage fish important in the diet of many wading birds, sport fish, native species, and exotics introduced partly through aquacultural practices and the aquarium trade. Forage species include the Florida flagfish, bluefin killifish, least killifish, shiners, mosquito fish, and sailfin molly.

Generally, Everglades sportfish are harvested from the borrow canals that surround the marsh. As water levels in the canal and marsh rise, fish populations disperse into the interior marsh and reproduce with minimum competition and predation. As water levels recede, fish concentrate into the deeper waters of the surrounding canals, where they become available as prey for wildlife and fishermen. In some instances, the canal fishery has experienced major fish kills due to overcrowding and oxygen depletion. The WCAs provide a valuable sport fishery for South Florida. Many of the canals, notably along U.S. 41, I-75, and in the L-35B and L-67A, provide valuable recreational fishing for largemouth bass, sunfish, oscar, gar, bowfin, catfish and other species.

Besides supporting a valuable recreational fishery for the region, WCA fish communities provide a major food source for Everglade wading birds, alligators, and other carnivorous reptiles and mammals. Fish community structure and abundance is highly dependent on water levels. Consequently, fishing success by humans or wildlife is also dependent on water levels

(Dineen, 1974). For a more complete listing of common Everglades fishes, reference Gunderson and Loftus (1993).

Several game and non-game wildlife species occur within the WCA system including: white-tailed deer, common snipe, and marsh rabbit. Blue-winged teal, mottled ducks, and other game waterfowl are found in the sloughs of the northeast corner. Feral hogs may also be present in drier areas or on tree islands.

3.6 ESSENTIAL FISH HABITAT

The Magnuson-Stevens Fishery Conservation and Management Act, 16USC 1801 et seq. Public Law 104-208 reflects the Secretary of Commerce and Fishery Management Council authority and responsibilities for the protection of Essential Fish Habitat (EFH). Federal agencies that fund, permit, or carry out activities that may adversely impact EFH are required to consult with the National Marine Fisheries Service (NMFS) regarding the potential effects of their actions on EFH. In conformance with the 1996 amendment to the Act, the information provided in this Integrated Environmental Impact Statement (EIS) will comprise the required EFH assessment and has been coordinated with NMFS.

The EFH located within the area affected by the EAA Storage Reservoir occur within the St. Lucie River Estuary and Southern Indian River Lagoon on the Atlantic coast and the Caloosahatchee River Estuary on the Gulf coast.

The St. Lucie River Estuary and the Southern Indian River Lagoon are within the jurisdiction of the South Atlantic Fishery Management Council (SAFMC) and are located in areas designated as EFH for wormrock, live bottom habitat, red drum, shrimp, spiny lobster, and the snapper-grouper complex. In addition, the nearshore hardbottom habitat outside of the St. Lucie and Ft. Pierce Inlets areas is designated as Essential Fish Habitat-Habitat Areas of Special Concern (EFH-HAPC) for the snapper-grouper complex.

The Caloosahatchee River Estuary is within the jurisdiction of the Gulf of Mexico Fishery Management Council (GMFMC). In the estuary EFH is defined as all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the sub-tidal vegetation (seagrasses and algae) and the adjacent inter-tidal vegetation (marshes and mangroves). The estuary provides EFH for adult and juvenile brown shrimp (*Penaeus aztecus*), pink shrimp (*Penaeus duorarum*), white shrimp (*Penaeus setiferus*), gray snapper (*Lutjanus griseus*), red drum (*Sciaenops ocellatus*), Spanish mackerel (*Scomberomorus maculates*), spiny lobster (*Panulirus*

argus), stone crab (*Menippe mercenaria*), and gulf stone crab (*Menippe adina*).

3.7 CLIMATE

The climate of the Everglades is characterized by two seasons: the dry and wet seasons. The dry season extends from November to April. The winter weather cold air fronts that often pass through the region weekly bring cool, but rarely freezing, temperatures. At this time of the year, there is low intensity, moderate rainfall with about 25% of the area's annual rainfall of 53 inches occurring during the dry season.

During the wet season, the region experiences daily thunderstorms, intense solar radiation, and high humidity. Seventy-five percent of the rain occurs in the wet season and can include a variable number of extreme rainfall conditions such as hurricanes and tropical storms. The wet season has a bimodal rainfall pattern with the first peak between May and June and the second peak between September and October. Every 10 years or so, the region alternates between flood and drought conditions. Annual rainfall, while averaging 53 inches, has ranged from a low of 36 inches to a high of 100 inches.

Mean annual temperature for the south Florida ecosystem ranges from 72°F (22°C) in the northern Everglades to 76°F (24°C) in the south (Thomas, 1974). Mean monthly temperatures range from a low of 63°F (17°C) in January to a high of 85°F (29°C) in August (Thomas, 1974). Infrequently, freezing temperatures and frost occur when arctic air masses follow winter cold fronts into the area.

3.7.1 Hurricanes

South Florida has been struck by more hurricanes and tropical storms than any other equal-sized area in the United States (Gentry, 1974). The EAA was affected by 138 tropical storms between the periods 1871-1981 (Duever, et. al., 1994). Hurricanes strike most frequently during August, September, and October with a return frequency of approximately every three years (Gentry, 1974). Their primary effect in the EAA is rainfall (flooding), although there may be destruction from winds, storm surges, and tornadoes. The hurricanes of 1926, 1928, 1935, 1947, 1960, 1962, 1965, 1992, 1999, 2004 and 2005 caused loss of life and/or major damage to the region. The earlier storms were responsible in part for additional water management and drainage efforts in the Everglades.

3.7.2 Evapotranspiration

Evapotranspiration plays an important role in the climate of the South Florida ecosystem and removes between 70% and 90% of the rainfall in undisturbed South Florida wetlands (Duever, et. al., 1994). Evaporation, from open water surfaces, peaks annually in the late spring when temperatures and wind speeds are high and relative humidity is low. Evaporation is lowest during the winter when the temperatures and wind speeds are low (Duever, et. al., 1994).

3.8 SEISMICITY

The EAA is located in a non-active seismic zone. The 2002 United States Geological Survey (USGS) earthquake hazard map for the central and eastern United States indicates that South Florida has the lowest probability for earthquake activity for at least the next 50 years.

3.9 HYDROLOGY

3.9.1 Surface Water Hydrology

Lake Okeechobee provides water south to the Everglades Agricultural Area through three structures, S-351, S-354, and S-352. Structure S-354 supplies the Miami Canal, which can flow south past the Bolles Canal, down to the G-372 pump station, and then continue south to structure S-8 and on into the Everglades Protection Area. The G-372 pump station pumps water into the STA-3/4 Supply Canal which currently feeds the Holey Land Wildlife Management Area (WMA) and STA-3/4. S-351 supplies the North New River Canal (NNRC) and the Hillsboro Canal. The NNRC flows south past the Bolles and Cross Canal confluences to G-370 pump station, continues on south to structure S-7 and into the Everglades Protection Area. The NNRC is the source for the G-370 pump station and will be the source for the proposed northeast pump station. Its major sources of water are from Lake Okeechobee, Bolles Canal, Cross Canal, and local farm permitted pump discharges. The Hillsboro Canal also supplied from structure S-351 where the discharge flows south, past the Ocean Canal confluence, and then past the Cross Canal confluence. The Hillsboro Canal continues south to structure S-6 and then into the Everglades Protection Area. Structure S-352 discharges into the West Palm Beach Canal. The West Palm Beach Canal flows south past the Ocean Canal confluence and into structure S-5A, it then continues east into the C-51 Canal (Figure 3-4, Structures and Canal Locations).

The Bolles and Cross Canals flow east and/or west; water can flow in either direction. However, the most common flow pattern is the Bolles Canal flowing east, and the Cross Canal flowing west, both discharging at a

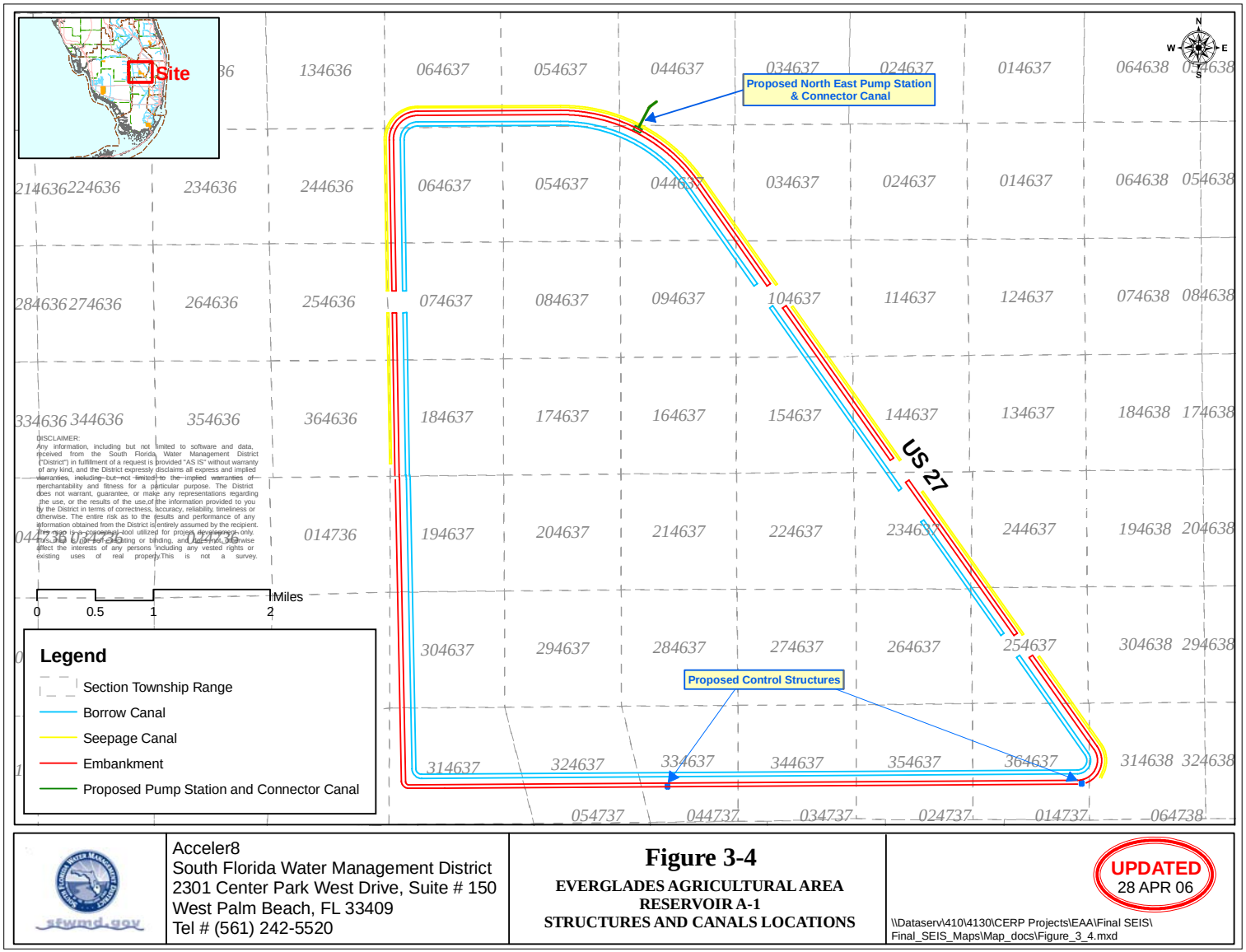

FIGURE 3-4: EVERGLADES AGRICULTURAL AREA RESERVOIR A-1 STRUCTURES AND CANALS LOCATIONS

common location; into the NNRC. There are numerous secondary agriculture canals that are responsible for north-south water movement. The secondary canals connect to the major canals. Seepage ditches are common outside the levees.

3.9.2 Groundwater Hydrology

The Lake Okeechobee area contains a surficial aquifer system consisting of all the rocks and sediments from land surface to the top of the limestone. In the EAA, the high organic content of the soil makes the surficial groundwater generally undesirable for domestic use except close to Lake Okeechobee. This aquifer is recharged directly by two sources: Lake Okeechobee and rainfall. Lake Okeechobee provides water for a variety of consumptive demands, including urban drinking water, irrigation for agricultural lands, and recharge for wellfields.

Beneath the surficial aquifer is the Floridan aquifer system. It is the largest aquifer in Florida and the most productive in the world. This system underlies an area of approximately 100,000 square miles (258,999 km2) in Florida, southeastern Alabama, southern Georgia, and southwestern South Carolina. This aquifer is composed of a thick sequence of limestone layers and is divided into Upper Floridan and Lower Floridan, by a less permeable middle confining unit of carbonates. In the EAA, the water of the Floridan aquifer is rather salty, particularly in the Lower Floridan (Sprinkle, 1989).

The intermediate confining unit is located approximately 200 to 250 feet below ground surface (bgs) and will restrict any seepage from the proposed EAA Reservoir A-1 project that might reach this depth. There is a high degree of communication between groundwater and surface water in the area, the groundwater gradient in the surficial aquifer system is controlled, to a large extent, by the operation of the hundreds of canals throughout the region. Therefore, even though the general regional gradient in the surficial aquifer system is believed to be southward, localized gradients may actually be in other directions in portions of the area surrounding the proposed EAA Reservoir A-1 project site due to the operation of canals and wells in the region.

3.10 WATER MANAGEMENT

This section summarizes the existing water management system in the EAA and addresses the status of the Everglades Program, as defined in the 1994 Everglades Forever Act (EFA), and its implications for the Project. Also covered are hydrography, drainage basins, water management practices, and the major groundwater/hydrogeologic features in the EAA.

Currently, water levels in Lake Okeechobee are regulated by a complex system of pumps and locks. The regulation schedule attempts to achieve the multiple-use purposes as well as provide seasonal lake level fluctuations. The schedule maintains a low lake stage to provide both storage capacity and flood protection for surrounding areas at the beginning of the summer wet season. At the end of the wet season, the beginning of winter, lake levels are higher to store water for the upcoming spring dry season. The general plan of operation for Lake Okeechobee is based on the following: 1) flood protection from lake waters and water driven by hurricane winds on lands adjacent to the lake; 2) maintenance of an eight-foot navigation channel across Lake Okeechobee, as part of the Okeechobee Waterway; and 3) storage of water to supply needs of the Lake Okeechobee service area.

Flood control improvements around Lake Okeechobee consist of a system of approximately 1,000 miles (1,600 km) of encircling levees, designed to withstand a severe combination of flood stage and hurricane occurrence, plus the regulatory outlets to the St. Lucie Canal and the Caloosahatchee River. The design discharge of Moore Haven Spillway to the Caloosahatchee River is 9,300 cubic feet per second (cfs) [260 cubic meters (m^3)/second (sec)]; that of St. Lucie spillway is about 16,000 cfs (450 m^3/sec). Following removal of local runoff from the agricultural areas south of the lake, an additional regulatory capability of several thousand cfs is available through the Miami, North New River, Hillsboro, and West Palm Beach Canals by pumping into the three WCAs.

The EAA is located south of Lake Okeechobee within a belt of highly organic hydric soils originally deposited by the historic Everglades wetland called the "River-of-Grass." The organic soils have served as a fertile agricultural area since they were initially drained. Over-drainage and environmental impacts eventually led to the completion of the C&SF Project. The C&SF Project's intention was to provide water storage in the WCAs and to better control water levels in the Everglades for multiple purposes. As a result, the EAA contains an elaborate canal system. The construction of canals, levees, and roads has eliminated the historical freshwater sheet flow and resulted in changes in the timing and quantity of flow within the system that have influenced water quality conditions and impacted the downstream Everglades Protection Area (EPA).

The revised water management system allowed extensive agricultural development in the EAA. However, environmental effects continued to be observed in the downstream areas of the remaining Everglades ecosystem. Increased loading of phosphorus from the EAA was found to be causing unacceptable ecological changes to the WCAs and the ENP, which comprise the EPA. The Everglades Forever Act required that all waters discharged to the EPA meet applicable water quality standards. Phase I water quality

measures included design and construction of a number of STAs by SFWMD. These STAs were intended to provide an interim reduction in the observed phosphorus loads. In addition, a broad suite of agricultural best management practices (BMPs) were implemented to further lower phosphorus discharges to the EPA. Based on a phosphorus water quality criterion of 10 µg/L, additional activities were determined necessary to ensure eventual compliance within the EPA. A long-term plan for achieving this compliance was published by SFWMD in October 2003 (Burns & McDonnell, 2003).

Currently, when the Lake Okeechobee elevation is in zone A, B, C, or D, regulatory releases are made through the St. Lucie Canal and the Caloosahatchee River which flow to estuaries downstream. These releases from Lake Okeechobee have resulted in declines in aquatic vegetation and oyster populations.

Upon completion of EAA Reservoir A-1, a portion of the flow that would otherwise have gone to the St. Lucie Canal and the Caloosahatchee River will be sent to EAA Reservoir A-1. When water levels in the primary canals reach predetermined levels, the G-370 and G-372 pump stations, and the new northeast pump station will be operated to pump the released waters in the EAA Reservoir A-1. Stored water can later be released to the Supply Canal for environmental deliveries when the EAA Reservoir A-1 level exceeds the minimum Supply Canal level. When the EAA Reservoir A-1 water level is below the minimum water level for the Supply Canal, water may be released through the northeast gate structure into the NNRC from where it can be lifted into the Supply Canal by G-370 pump station. When appropriate, G-370 and G-372 pump stations can also pump Lake Okeechobee releases directly to the Inflow and Supply Canals for environmental deliveries.

Operation of the WCA's would presumably be the same for future without project conditions as it is today, unless the regulation schedules change at some point. The current operation of the WCA's receives primarily flows from STA 3/4 and in some instances flow bypass if the STA is too full.

3.11 FLOOD PROTECTION LEVEL OF SERVICE

The EAA depends on the flood storage capacity of the WCAs, and to a lesser extent, on Lake Okeechobee, as a means to remove water from the basin. In the case of extreme events such as a hurricane, flood storage in Lake Okeechobee becomes more important. Flood control works on Lake Okeechobee consist of a system of about 150 miles (240 km) of encircling levees, designed to withstand a severe combination of flood stage and hurricane occurrence, plus the regulatory outlets of St. Lucie Canal and the Caloosahatchee River.

3.12 WATER QUALITY

3.12.1 Overview

Water quality information focuses upon the EAA as the area of expected primary impacts. However, the water quality of the larger area is dependent on Lake Okeechobee water quality to the extent that these waters are released to the various receiving waters. Lake Okeechobee water is conveyed to receiving water bodies by canals and primary and secondary tributaries. Receiving waters are St. Lucie and Caloosahatchee River Estuaries, including Indian River Lagoon and Charlotte Harbor, and the northern WCAs.

Nutrients such as phosphorous and nitrogen compounds are a concern in the WCAs and EPA. When there are sufficient levels of both nutrients present, cattails and other invasive species displace native sawgrass. There are many natural and human sources of nitrogen compounds. However, vegetation growth is limited by the comparative lack of phosphorous compounds. These come primarily from agricultural fertilizers and decomposition of the peat soils in the area. Decomposition of peat soils in the EAA is accelerated by continued agricultural use. Thus, phosphorous is a parameter of particular concern regarding water from Lake Okeechobee and the EAA.

Agricultural BMPs were implemented in the EAA in 2000, with the result of improving water quality. However, this area remains a primary source of pollutants for the WCAs. The WCAs form the remnant wetland communities for the northern section of the Everglades system. These areas have been isolated from contiguous lands by a series of levees and pump stations. Water moving south from the lake and EAA is pumped through the WCAs, thereby making these areas nutrient filters for downstream basins. A highly altered hydroperiod results from the presence of various levees and pumping schedules. These factors may worsen water quality conditions in the WCAs and are consistent with the general degradation of water quality in areas along the canals and pump stations when compared to conditions in the central portions of the basins. Construction of STAs upstream of the WCAs will serve to improve water quality conditions through time; however, other problems may persist.

The L-8, West Palm Beach, Hillsboro, North New River, and Miami Canals from Lake Okeechobee to the L-4, 5, 6, and 7 Canals, which roughly define the EAA, have poor water quality with extremely high nutrient and low dissolved oxygen levels. Other problems include pesticides, biological oxygen demand, bacteria, and suspended solids. Fish kills occur periodically in the West Palm Beach Canal after heavy rains drain from the Chemair Spray hazardous waste site.

3.12.2 Monitoring Programs

SFWMD maintains a water quality monitoring network for surface waters within and at the boundaries of the EAA. These surface water samples have been analyzed for multiple constituents. The samples have been acquired at various frequencies from a variety of sampling stations over the years. These water quality data are compiled in SFWMD's database DBHYDRO and available through Internet search (http://www.sfwmd.gov/org/ema/dbhydro/). Additional data sources include: USEPA, the USGS, FDEP, and numerous public and private research and monitoring efforts.

FDEP has defined most of the primary and secondary canals within the EAA (Miami, Hillsboro, North New River, West Palm Beach, Bolles and Cross Canals) as Class III Waters with a designated use of "recreation, propagation and maintenance of healthy, well-balanced population of fish and wildlife." Agricultural canals are regulated as Class IV Waters designated for "agricultural water supply." A summary of applicable water quality criteria for Class III and IV Waters of the state is defined in Section 62-302.530, FAC.

While most of the surface water quality monitoring has been performed by SFWMD, other agencies have cooperated in the monitoring effort, including USEPA, USGS, FDEP, and the USACE. Surface water samples and field measurement data were collected near the water surface. Samples and data generally were collected at routine frequencies so they were not biased by water management practices or season of the year. Analytical procedures were typically USEPA methods that were approved by CERP oversight.

Information in this sub-section is intended to be general summary data. It should be useful in providing a broad understanding of water quality in the various water bodies of interest. It must be noted that any monitoring program has limitations with regard to the detail to which data may be interpreted. For example, water samples and field measurement data were routinely collected near the water surface. Sampling at the surface of a water body may or may not yield analytical data that reflect the water quality of the entire water column. The water columns in some Florida canals have been seen to stratify, allowing substantial water quality (e.g., dissolved oxygen, nutrients) differences to develop in the near-surface water and water closer to the canal bottom.

3.12.3 Water Quality Parameters of Interest

Field measurement parameters include specific conductance, pH, and dissolved oxygen. Specific conductance, the ability of a water sample to carry an electrical current, provides a measure of the dissolved solids such as sodium chloride, calcium carbonate, and sulfate, which have an electrical charge when they dissolve. There are levels of salt that will adversely affect

aquatic plants and animals. This level is different for each species. Measuring pH determines how acidic or basic the water is. Aquatic plants and animals are generally only able to tolerate a narrow range of pH values. Oxygen is necessary for aquatic plants and animals to live and either dissolves into water at the water-and-air interface or during photosynthesis by aquatic plants. Low dissolved oxygen may be an indicator of high organic loadings and is associated with foul smelling water.

Solids and chemical ions are determined during laboratory testing. These tests provide general water quality information. Suspended solids and turbidity are often related. The suspended solids test measures particulates that are in the water column at the time of sampling. These solids may be microscopic plants (algae), fine silt, and/or clay suspended by wave action or water movement. Turbidity measures the light scattering caused by particulates in the water column. Light scattering may limit the amount of light that bottom dwelling plants receive and may reduce the aesthetic appeal of a water body.

Major ions of interest are chloride, sulfate, calcium, sodium, and iron. These chemical constituents are normally present in natural surface waters, but may sometimes limit water use when present in excess, causing problems with water hardness, color and staining, and excessive saltiness. Alkalinity is important for measuring carbonate and other acid and base buffering ions in natural waters.

Nitrogen and phosphorus are typically the most important nutrients with regard to aquatic plant growth. In water, excessive growth of plants cannot be sustained and may act to deplete dissolved oxygen. Nitrogen (N) in the forms of nitrate (NO3) and nitrite (NO2) are commonly analyzed together with a single test and the results are often identified as NOx-N. Ammonia and NOx-N are available for plant uptake. Total Kjeldahl nitrogen measures ammonia nitrogen and nitrogen incorporated into organic compounds and plant and animal cells but not NOx-N. Ortho phosphate (PO4 or oP) and total dissolved phosphorus (TDP) are forms of phosphorus that are not bound in plant and animal cells or water column particulates and may be available for plant uptake. The total phosphorus (TP) test measures oP, TDP, and phosphorus bound in plant and animal cells and water column particulates.

Pesticides and mercury can have detrimental effects on aquatic life. Poisons, such as pesticides and mercury, can also have direct adverse effects on human health. Ametryn, atrazine, simazine, and toxaphene are pesticides of interest in the area. Recent post-remediation testing of the Woerner Farm #3 property located in the extreme northern portion of the Compartment A footprint yielded elevated levels of toxaphene. The USFWS has performed an environmental risk assessment and determined that toxaphene, at possible

action levels, is widely distributed in the shallow soil layer within the Woerner Farm #3 area. In the event that the FDEP affirms that potentially harmful levels of toxaphene are in the soil, it will likely mandate additional remediation (by the responsible party) for site closure and for issuance of a water quality certification (WQC) for operations. However, no determination has been made and the USFWS is presently coordinating directly with the SFWMD in order to achieve resolution to this matter. Additionally, testing for mercury includes total mercury and total methyl mercury, which is more likely to be accumulated in the food chain.

In 1989, the Florida Department of Health (FDOH) and the FWC found high levels of mercury in fish from the Everglades - especially in largemouth bass. Currently, approximately one million acres of the Everglades system contain fish with high mercury levels.

Data indicate that a significant portion of mercury deposition originates from sources located in south Florida. The mercury is emitted to the atmosphere and deposited into the Everglades by air currents or rain. The deposited mercury is converted into methyl mercury (MeHg), a highly toxic form of mercury that accumulates in the food chain. Of particular concern are levels of mercury in fish tissues that may be toxic to humans. According to the 2004 Everglades Consolidated Report, the mercury pollution in the air comes from mining and smelting of mineral ore, burning of fossil fuels, the use and disposal of mercury, and incineration of municipal or medical waste. Ninety-five percent to 98% of the total mercury in the EPA comes from atmospheric deposition. Local sources represent at least half of the total atmospheric mercury contribution to the Everglades (Atkeson, et. al., 2002).

Monitoring data of Everglades' fish and wading birds indicate that levels of mercury have declined since 1994 due to FDEP pollution prevention and emission control. The 1993 Florida Waste Management Act required the elimination of mercury from commercial products, prohibition of the incineration of mercury, and promotion of recycling those products. Also, hazardous waste regulation required strict control of mercury-containing waste and its proper disposal. FDEP has adopted USEPA regulations for medical waste incinerators; therefore the industry has moved away from incineration.

3.12.4 Lake Okeechobee and the EAA

Since algae tend to increase water column pH during the oxygen-forming photosynthesis process, it is common to see higher levels of dissolved oxygen occurring in water with higher pH. Monitoring data indicate that Lake Okeechobee had the highest dissolved oxygen and pH averages for the area waters. The STAs, WMAs, and EPA had lower values, perhaps reflecting

shading of surface water by emergent vegetation that would contribute little oxygen to the water column.

Dissolved solids, as indicated by specific conductance, averaged highest in the secondary and agricultural canals. Nutrients, solids, and ionic chemicals also tended to have the highest concentrations in these canals. These elevated averages may be caused in part by turbulence created during pumping activities in these shallow canals that might re-suspend solids that had previously settled to the bottom. Of all of the parameters shown in the above table, only specific conductance and dissolved oxygen (DO) were found to have averages that exceed Florida water quality standards for their respective classification. Water in the agricultural canals averaged at 1600 uS/cm which exceeds the applicable Class IV criterion of 1275 uS/cm. As stated above, the recorded levels may be caused by pump-related turbulence. For both primary and secondary canals, DO averages fell short of the Class III (minimum) criterion of 5.0 mg/l with readings of 4.87 and 4.06, respectively. These lower levels are likely attributed to biochemical oxygen demand (BOD) resulting from the biological response to organic chemical laden runoff. In an effort to minimize low DO occurrences, the detailed design and long term project operations will investigate and, if practicable, may implement actions to minimize low DO concentrations.

The STAs, WMAs, and EPA averaged lowest for nitrogen and phosphorus forms. Emergent plant communities in these areas appear to effectively reduce the concentrations of nutrients in the water column. Pesticides and mercury were found in most locations where sampling occurred.

3.12.5 Caloosahatchee River Basin

Water quality conditions are degraded in the upper and lower areas of the Caloosahatchee River basin due to agricultural and urban runoff, respectively. The channelized section of the river also shows degraded water quality conditions, due to agricultural inputs, as compared to tributaries lying in less developed areas of the basin. Problems associated with the degraded areas of the basin are typified by low dissolved oxygen levels, elevated conductivity, and decreased biodiversity. Conditions in the urbanized sections of the basin are influenced by non-point stormwater flows, and are manifested in the river by elevated chlorophyll levels, algal blooms, periodic fish kills, and low dissolved oxygen levels. Although wastewater discharges remain a problem, the estuary is presently more seriously affected by high-nutrient waters from the river and tributaries, and stormwater runoff from cities. Nutrient and chlorophyll levels are high, and small algal blooms occur regularly.

3.12.6 St. Lucie River Basin

Water quality conditions along the St. Lucie River are rated as good in less developed areas of the basin. However, conditions are degraded in urbanized areas and along the extensive network of canals that drain this area. The worst water quality conditions in the Martin and St. Lucie County area are reported in the St. Lucie River and the canals leading from the EAA. As described above, the major sources of pollution in this basin are urban runoff, agriculture, rangeland runoff, boat discharge, and sewage overflows. Water quality in the south section of the Indian River Lagoon was rated as fair by a National Estuary Program technical report (Woodward-Clyde Consultants, 1994).

3.12.7 Water Conservation Areas

The 1996 305(b) report classifies water quality conditions as good in the northernmost areas of WCA-2 transitioning to a fair condition throughout most of the remainder of the basin. Poor water quality conditions are shown to exist along the L-38E Canal. Water quality in WCA-3A are rated as fair north of the county line, and are rated as good on the south side of the line. The ten-year trend does not show significant changes have occurred in the basin.

3.13 HAZARDOUS, TOXIC AND RADIOACTIVE WASTE

Over 19 environmental engineering companies and consultants have conducted some type of environmental assessment and/or corrective actions on the tracts of land within Compartments A, B, and C beginning in 1989, with work projected until at least 2007 (URS, 2003). Phase I, Phase II, and Ecological Risk Assessments have been conducted over the 18-year time frame. During this 18-year time frame, 148,160-acres of southern EAA land encompassing the state and federally owned lands and four state-constructed Everglades Construction Project STAs (consisting of over 30 individual tracts of land) were assessed for contamination. When evaluated as a whole unit, the Phase I and Phase II environmental site assessments (ESAs) provide a comprehensive overview of the properties, identify point sources including chemical storage and mixing areas, agrochemical and petroleum storage tanks, refueling and maintenance areas and residual agrochemicals and soil addenda in cultivated areas.

The Phase I (ESAs) identified 193 areas of concern ranging from maintenance areas, to mix and load and staging areas, chemical storage buildings, petroleum storage tanks, pump station, and refueling areas to former airstrips. Of the 193 areas identified, a total of 59 areas warranted no further actions after conducting the Phase II ESA. Additional assessments and/or corrective actions beyond the Phase II ESA were conducted at 117 areas. The

data from these additional assessment/corrective action activities were submitted to the FWS. No Further Actions (NFA), Site Rehabilitation Completion Orders (SRCO), or concurrences were issued to each of the 117 areas by these two regulatory agencies. Only 17 areas remained out of the 193 areas identified requiring additional assessments, completion, or corrective actions.

Three tracts of land were identified within Compartment B with potential Hazardous, Toxic and Radioactive Waste (HTRW) involvement. These tracts are:

- Woerner Farm 2 – Tract No. 100-001
- East Carroll – Tract No. 100-025
- WPM Farms – Tract No. 100-106, 100-107, 100-108

The Woerner Farm 2 property consists of approximately 4,300 acres of land, which was utilized as a vegetable farm from 1972 until 1984. By 1986 sod and sugarcane had replaced vegetable farming. Currently the property is mainly used for sod farming with a portion used for the production of sugarcane.

The following assessments and investigations were conducted for the Woerner Farm 2:

- A Phase I Environmental Site Assessment (ESA) - January 1998
- Phase II ESA investigation - February 1999

Four areas of concern were identified which required additional assessments and/or corrective actions. In 2005, over 15,800 tons of petroleum impacted soils were excavated from the maintainence yard. In addition 22,000 tons of petroleum impacted soils will be excavated over the next two years. An Environmental Risk Assessment (ERA) with a specific target goal of 5.2 mg/kg was proposed for toxaphene at the property. An extensive soil sampling was conducted in the cultivatexd areas in 2003. The ERA is currently submitted to the USFWS for review and concurrence.

The East Carroll property which consists of approximately 1,280 acres of land was utilized as a commercial sod facility between 1964 and 1970, and later used for cattle ranching operations. A Phase I and limited Phase II ESA identified 11 areas of concern. However, these areas did not require any additional assessments, corrective actions, or closures.

The WPM farms property which consists of approximately 4,000 acres of land was formerly utilized for agriculture, aggregate mining, and a small fish

nursery. A Phase I and limited Phase II ESA, conducted in March 1999, identified 2 areas of concern. However, these areas did not require any additional assessments, corrective actions, or closures.

One tract of land was identified within Compartment C with potential HTRW involvement. This tract is:

- U.S. Sugar Corporation – Tract No. 100-101

This tract is also referred to as 'Mott Farm' and formerly uitilized for agriculture, approximately 10,800 acres of sugarcane fields. Currently, the property is vacant and the cultivated fields are overgrown. A Phase I and limited Phase II ESA was conducted in March 1999. This study identified 2 areas of concern that required additional assressment. No additional assessment or corrective actions (pending AST pump station closures) are required on this property.

Three tracts of land were identified within Compartment A with potential HTRW involvement. These tracts are:

- Woerner Farm 3 – Tract No. 100-0039
- Talisman South Ranch Eastern 1/3rd – Tract #100-104
- Cabassa Farm – Tract #100-105

See Figure 3-5, Potential Sites with Potential HTRW Involvement

Woerner Farm 3- Tract # 100-0039

The Woerner Farm 3 property consists of approximately 1,000 acres of land, which was utilized as a sod farm from 1981 until 1996 when sugarcane was added. Currently the property is utilized solely for the production of sugarcane.

The following assessments and investigations were conducted for the Woerner Farm 3:

- A Phase I Environmental Site Assessment (ESA) - November 1994 and January 1998
- Phase II ESA investigation - February 1999
- Supplemental investigations – February 2000 and March 2001

Three areas of concern were identified which required additional assessments and/or corrective actions. In 2005, over 1,880 tons of toxaphene impacted soils were excavated from the cultivated area. A limited soil excavation of pesticide and petroleum impacted soils was conducted at the former shed on the Woerner tract. In addition 130 tons of petroleum impacted soils were

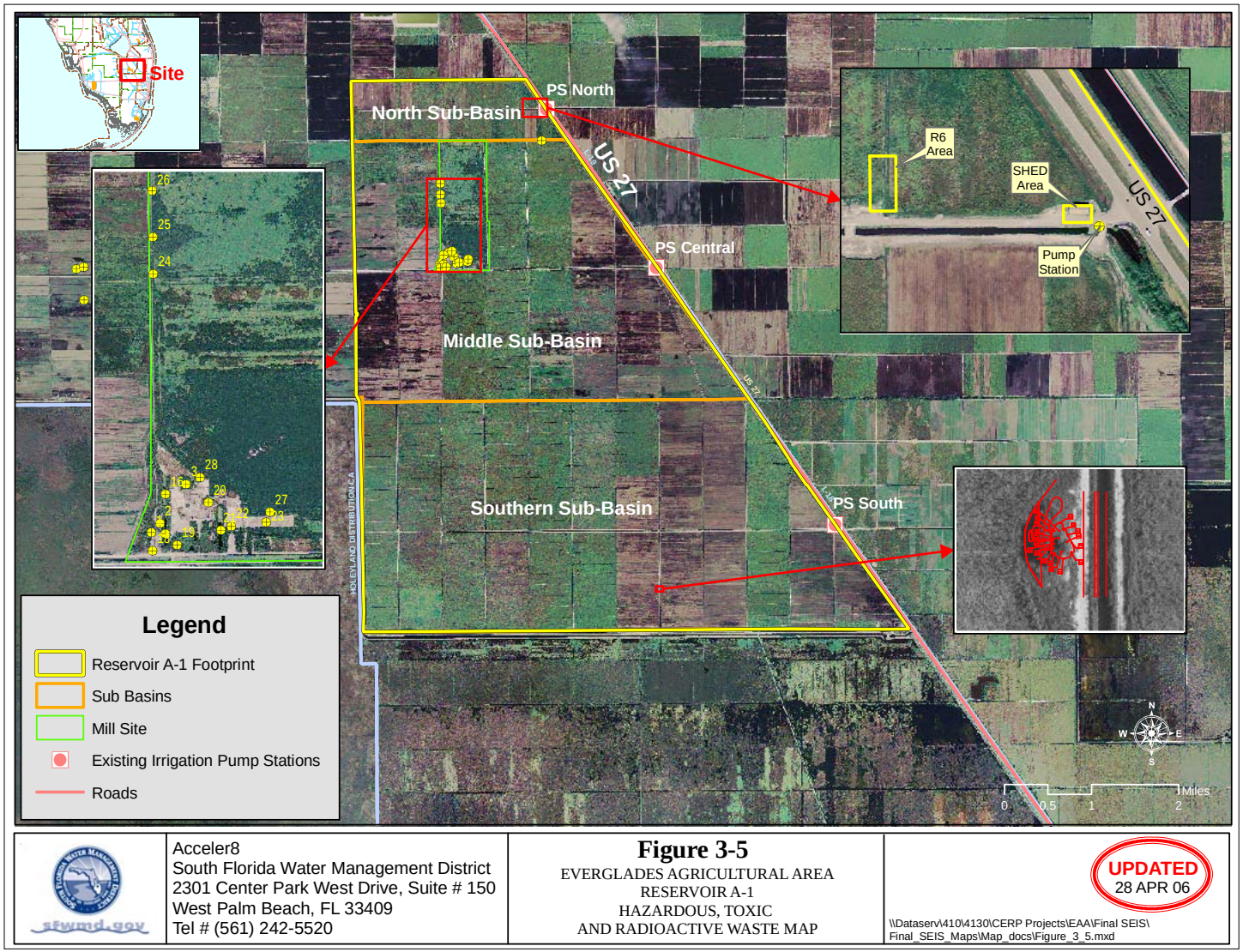

FIGURE 3-5: EVERGLADES AGRICULTURAL AREA RESERVOIR A-1 HAZARDOUS, TOXIC AND RADIOACTIVE WASTE MAP

excavated from the main pump station. An Environmental Risk Assessment (ERA) was formulated and site specific cleanup target goal of 5.2 mg/kg was proposed for toxaphene. The ERA was reviewed by the USFWS and recommendations were made to the SFWMD to (1) scrape the entire Woerner property and dispose of soil, (2) move the north border of the reservoir south, off of the Woerner property, and (3) conduct additional sampling. Based on these options, the SFWMD has modified the design of the Preferred Alternative, EAA A-1 Reservoir, to avoid the subject area of concern.

Talisman South Ranch 1/3rd –Tract #100-104

The eastern one third portion of the Talisman South Ranch, or approximately 7,000 acres will be utilized by the proposed EAA Reservoir A-1. Currently, this portion of the Talisman South Ranch is vacant fields. In Mach 1996, a Phase I and Phase II ESA for the property were conducted focusing on the Talisman sugar mill and surrounding areas. In November 1998, a Phase II ESA was conducted to determine the status of potential constituents of concern (COC) at each of the areas of concern identified in Phase I.

Based on the Phase I and Phase II ESAs, 11 areas of COC were detected in soil, groundwater, sediment, or surface water at concentrations exceeding regulatory cleanup target levels or guidance concentrations. Transference of ownership of each of the Exclusion Areas was deferred until a Site Rehabilitation Completion Order (SRCO) for each Exclusion Area was issued by the FDEP.

The list of Exclusion Areas included:

- Five pump stations
- Two pesticide mix load areas
- A former labor camp and crop-duster landing strip
- A former borrow pit/agricultural landfill
- The former sugar processing mill
- The surface water management areas adjacent to the sugar mill

These areas were primarily impacted with organochlorine pesticides (e.g., dichlorodiphenyltrichloroethane (DDT), petroleum products, and arsenic).

An assessment and remediation on all of the Exclusion Areas on behalf of Talisman Sugar Corp. and the St. Joe Company was performed. The cleanup objectives for each Exclusion Area within the proposed reservoir area were based on the proposed end land use for water storage areas. As such, cleanup target levels were chosen to be protective of potential ecological receptors which are likely to inhabit the area once a reservoir is constructed. For protection of wildlife, the clean up target levels for most of the chemicals found on the Talisman property are more stringent than the cleanup standards for human

health. Therefore, a cleanup to ecological standards is also inherently protective of agricultural workers during the interim period prior to reservoir construction as well as reservoir construction workers.

FDEP issued SRCOs for the majority of the Exclusion Areas. These parcels can be conveyed immediately with no restrictions. On the remaining parcels, the remediation work has been completed to the satisfaction of the FDEP; the FDEP has issued memoranda of technical concurrence. However, a deed restriction was necessary in order to convey the property to SFWMD.

The cleanup of the mill site involved assessment and remediation of a number of point source discharge areas. Areas of concern at the mill site included numerous leaking petroleum storage tanks, pesticide and/or arsenic impacted soils in the sediments of two drainage canals, an ash pit, and a water storage retention area, and metals-impacted soils adjacent to several building slabs.

In general, the petroleum impacted areas were handled through excavation and on-site treatment of soils in ex-situ bioremediation piles. Once the treatment was verified by confirmation sampling, the treated soils were returned to their respective excavations. Approximately 16,000 cubic yards of petroleum impacted soil was excavated, treated and backfilled.

The canals and surface depressions at the mill were covered with a two foot layer of clean soil. The cover is intended to prevent exposure of potential receptor species to these sediments. Pesticide and arsenic impacted soil was also excavated from other areas of concern at the mill site and consolidated in the ash pit. The ash pit was a low lying excavated area that accepted effluent from the boilers. The ash in the pit was lightly impacted with heavy metals and polynuclear aromatic hydrocarbons (PAHs). Additional soils from other areas of concern were also filled into the pit and the ash pit was covered with two feet of clean soil to prevent future exposure.

These three areas within the mill site where contaminated soils have been left and capped will also require restrictions on excavation activities. These parcels are identified as the South Rock Canal, the Ash Pit, and the Waste Lake Discharge Ditch. An additional area of capped, impacted soil is present approximately three miles west of the mill at the former borrow pit/agricultural landfill. These areas contain pesticide, PAH, and metal impacted soils which are buried beneath a clean soil cover. The excavation restrictions are necessary to prevent disturbance of these areas. These areas have been surveyed by a professional land surveyor and the coordinates have been provided to SFWMD to ensure that no disturbance of these areas occurs.

In summary, all of the physical assessment and remediation intended by SFWMD has been completed on all of the Exclusion Area parcels and all of the

technical documents relating to the cleanup have been reviewed and accepted by FDEP. A remaining outstanding activity is to record the appropriate deed restrictions on a few of the parcels. Once this activity is completed, it is expected that the FDEP will issue SRCO's on the remaining parcels and all of the parcels can be conveyed to SFWMD. No additional assessment, corrective actions, or closures are required on this property.

Cabassa Farm –tract #100-105

The Cabassa Farm property consists of approximately 9,700 acres and was historically used for the cultivation of sugarcane. Currently, the land is utilized for sugarcane cultivation with the far southeast portion used for rice cultivation.

A Phase I and Phase II ESA were conducted in February and March 1999, respectively. The Phase I and Phase II ESA identified four areas of concern that required additional assessment and/or corrective actions. A Contamination Ecological Risk Assessment and Corrective Action Plan were prepared in January 2002 for this property. Four hundred and fourteen tons of arsenic and copper impacted soil from the maintenance area and extensive soil sampling were conducted in the cultivated crop area using USFWS and SFWMD sampling protocol. Results of the updated ERA concluded that the residual concentrations of pesticides, copper, and zinc were not a threat to identified sensitive receptors. USFWS and FDEP concurred with SFWMD's recommendation for No further Action (NFA) for the equipment maintenance area, cane loading / equipment staging area and the cultivated crop area. In 2003, assessments, corrective actions, and closure activities associated with the pump stations were conducted and received NFAs from FDEP for each of the pump stations. No additional assessment, corrective actions, or closures are required on this property

3.14 AIR QUALITY

USEPA and FDEP have established ambient air quality standards for the State of Florida regarding six pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter 10 microns or less in diameter (PM_{10}), particulate matter 2.5 microns or less in diameter ($PM_{2.5}$), and sulfur dioxide (SO_2). National Ambient Air Quality Standards (NAAQs), Florida Standards, and Palm Beach County data are shown in Table 3-5. Palm Beach County which has 13 monitors, is the closest county to the EAA with monitoring stations. Two of these monitors measure ozone concentration levels. The monitor station in the county closest to Lake Okeechobee measures particulate matter. The air quality index (AQI) for ozone in Palm Beach County between 2001 and 2003 was 98.2% good and 1.7% moderate.

Table 3-5: NAAQS, Florida standards, & Palm Beach County data.

Pollutants	Averaging Time	Florida Standard	Primary NAAQS	Secondary NAAQS	2001 Palm Beach County
Carbon Monoxide	8 hour 1-hour	9 ppm 35 ppm	9 ppm 35 ppm	---- ----	2.5 ppm 3.3 ppm
Lead	Quarterly b	1.5 µg/m³	1.5 µg/m3	1.5 µg/m3	ND
Nitrogen Dioxide	Annual b	100 µg/m3 (.05 ppm)	0.053 ppm (100 µg/m3)	0.053 ppm (100 µg/m3)	0.0122 ppm
Ozone	1-hour c 8-hour d	0.12 ppm -----	0.12 ppm 0.08 ppm	0.12 ppm 0.08 ppm	0.107 ppm 0.094 ppm
Particulate Matter (PM10)	Annual b 24-hour c	50 µg/m3 150 µg/m3	50 µg/m3 150 µg/m3	50 µg/m3 150 µg/m3	26 µg/ m3 49 µg/ m3
Particulate Matter (PM2.5)	Annual b 24-hour c	------ ------	15 µg/m3 65 µg/m3	15 µg/m3 65 µg/m3	10 µg/ m3 26.1 µg/ m3
Sulfur Dioxide	Annual b 24-hour a 3-hour a	60 µg/m3 (0.02 ppm) 260 µg/m3 (0.10 ppm) 1,300 µg/m3 (0.5 ppm)	0.030 ppm 0.14 ppm ------	---- ---- 0.5 ppm	0.0011 ppm 0.003 ppm 0.008 ppm

a- Not to be exceeded more than once per year.
b- Arithmetic mean.
c- Not to be exceeded on more than an average of one day per year over a three year period.
d-Not to be exceeded by the three-year average of the 4th highest daily maximum.
e-Not to be exceeded by the three-year average of the 98th percentile of the 24-hour averages.

Source: U.S. Environmental Protection Agency.

According to the 2001 Air Monitor report prepared by FDEP, air quality parameters measured generally are all well within both National primary, secondary, and Florida Standards on average. Only the eight-hour ozone concentrations exceeded the Florida Standard, but met the National Standard.

3.15 NOISE

Noise in the EAA is not considered a problem because of its rural nature and distances between noise-generating activities. Rural areas have noise levels between 34-55 decibels and may approach 70 decibels along roads and near some agricultural operations. Urban areas are generally about 60 decibels, but may reach 90 decibels or greater in high-activity areas.

3.16 AESTHETICS

The Lake Okeechobee area is characterized by two types of scenery: open lake views, distinguished by a vast expanse of water with a vanishing horizon, and littoral zone viewsheds, characterized by various types of marshes, serving as a backdrop for wildlife. Hardwood swamps are found landward of the Herbert Hoover Dike (HHD), primarily on the west side of the lake. Significant exotic

and invasive vegetation species (melaleuca, Australian pine, torpedograss, cattail) are intruding into stands of native species that tends to diminish biological diversity and existing aesthetics in those areas. In the Indian Prairie region of the lake, expansion of torpedograss and cattail particularly, have affected aesthetic qualities of the lake.

Some remnants of the historical willow swamp vegetation still can be found (Lodge, 1994). The HHD sideslopes are generally well grassed but contain some exotic and/or dead vegetation that degrades the distant uniform appearance. However, the dike affords a panoramic view of the lake from its crest, which can be magnificent during a sunset or sunrise. Shoreline trees generally enhance the rim canal aesthetics when viewed from a distance.

Melaleuca control programs have left hundreds of acres of dead melaleuca forest standing, which affects the overall aesthetics north of the Old Moorehaven Canal. Substantially altered water levels could have a detrimental effect on many aspects of the region's viewable resources. Development is a nominal aesthetic impact to this region's aesthetics at the present.

The visual characteristics of the EAA can simply be described as agricultural lands. The land is quite flat with few natural topographic features. Much of the visible topographic features are associated with canals, levees, and agricultural fields. Agriculture is dominated by sugarcane production, with lesser amounts of sod, vegetables, and rice production. The area is open with a low population density and few buildings or other structures. This use produces a uniform and organized appearance to the landscape. There are few trees or other non-agricultural vegetation. The visual aesthetics are rather monotonous and of marginal value.

Along the St. Lucie Canal, much of the interior region is ditched for farming or range practices that have altered the natural vegetation and aesthetic resources of those areas. Many of the rural areas possess good scenic quality on a small scale. Orange groves, combined with scattered trees and forests, provide a tranquil backdrop to this rural agricultural setting.

The Caloosahatchee River Basin regional aesthetic overview is characterized by the Caloosahatchee River corridor, the Gulf of Mexico coastal plain, and surrounding uplands. The Caloosahatchee River is a linear body of water whose width allows observation of shoreline vegetation that includes texture, color, and wildlife varieties of interest and beauty. Minor urban impacts exist along the Caloosahatchee until the Fort Myers area where impacts increase noticeably. The coastal segments of the region possess a higher degree of aesthetic quality within the visual environment. State Parks, WMAs, and Wilderness Areas secure natural resources of prominent aesthetics. Much of the region's interior aesthetics are comprised of forested wetlands and irrigated pasturelands of

moderate aesthetic quality. Many of the regional rural areas possess scenic quality on a small scale. Rural areas are largely pine forested with some oak, hickory, and gum associations. Air traffic noise is an increasing adverse aesthetic impact. Development pressures are an increasing concern to natural and aesthetic resources.

The visual landscape of the WCAs is overwhelmingly flat. Landscape features include typical canals, levees and prairie wetland communities. Access points to the interior of the areas are limited. WCA-1 is operated as a wildlife refuge and offers opportunities for observation of migratory game birds during winter months. Although some of the marshlands have been degraded in visual quality by over-flooding and loss of tree islands, other areas, such as the south-central region of WCA-3A, still preserve good examples of original, undisturbed Everglades' communities, with a mosaic of tree islands, wet prairies, sawgrass expanses, and deeper sloughs. From the elevated viewpoint of the Eastern Perimeter Levee system, the view westward to the marshes is panoramic, though mostly homogenous.

3.17 CULTURAL, HISTORIC AND ARCHAEOLOGICAL RESOURCES

Compartments A and B contained no areas considered to be high probability and it was determined a CRM survey was not necessary. Continuous agricultural use and both road and canal construction have heavily disturbed the area. A review of the Florida master Site Files, a site visit and consultation with the State Historic Preservation Officer (SHPO) determined that it contains no areas considered high probability

Consultation with SHPO for Compartments A and B is complete, and it was determined there are no cultural concerns within either areas. Phase I and Phase II Cultural Resources Suvery were conducted in STA-5, Flowway-3 and STA-6, Section-2 of Compartment C. Phase II efforts were focused on testing four known sites in STA-6, 8HN44, 8HN47, 8HN48, and 8HN49 to evaluate their eligibility for nomination to the National Register of Historic Places. This work demonstrated that three additional sites in STA-6, Section-2, 8HN46, 8HN50, and 8HN51 had been destroyed as a result of agricultural clearing for sugarcane planting. The one known site in Flowway-3, 8HN4 (the Pepper Mound group) has also been destroyed. No remaining mounds or earthworks are present in its location. SHPO concurred in a letter dated January 26, 2006, that this site is no longer eligible for listing in the National Register of Historic Places. Phase I investigations, however, did reveal one small lithic scatter in Flowway-3—8HN119. This site is interpreted as a small, transient hunting station dating to an unknown period of the Archaic stage. The three artifacts that defined this site, a medial biface fragment of Tampa Bay chert and two biface thinning flakes of the same material, were recovered from plowzone

contexts. It is not considered to be eligible for listing in the National Register of Historic Places.

Sites 8HN44, 8HN47, 8HN48, and 8HN49 were determined to preserve intact archeological contexts dating to the Glades Tradition. Sites 8HN44, 8HN47, and 8HN48 have ceramics such as Gordon's Pass Incised, Sanibel Incised, and Cane Patch Incised that date to the Glades I late period, roughly 2000 to 1500 years BP. Site 8HN49 is slightly earlier and may date to the Glades I period at about 2500 to 2000 years BP. These sites are considered to be eligble for listing in the National Register of Historic Places.

In addition to the sites above, current investigations are being conducted on the remaining portion of Compartment C. Seven known sites (8HN45, 8HN46, 8HN52, 8HN53, 8HN54, 8HN55, 8HN56), and a recently discovered site have been identified to be potentially eligible for listing in the National Register of Historic Places.

3.18 RECREATIONAL RESOURCES

Several recreational opportunities exist on public lands within the EAA, such as the Holey Land WMA, Rotenberger WMA, and Lake Harbor Public Small Game Hunting Area. These offer significant recreational opportunities for visitors and tourists to the area. Each is different, but likely shares a patron base interested in sports recreation and outdoors activity. Many of the areas are adjacent to the proposed storage reservoir.

3.18.1 Holey Land Wildlife Management Area

Holey Land WMA contains approximately 35,000 acres and is operated by FWC. Holey Land WMA is bordered by Compartment A to the north and to the east. Primary recreational activities associated with the WMA are hunting, fishing, camping, hiking, and bicycling along L-5 and Miami Canal levees. Future activities or development may focus on improved access, wildlife viewing, and other non-consumptive activities.

The environment of Holey Land WMA has changed since 1991 due to rehydration under the Holey Land Restoration Project. Since hydrologic restoration began in 1991, Holey Land's recreational use has shifted from hunting toward fishing in perimeter canals and waterfowl hunting. Fishing is also allowed at the G-204, G-205, and G-206 culverts. Access for motorboats and airboats is provided at the G-200 and G-201 pump stations.

Game species occurring in Holey Land include white-tailed deer, common snipe, hog, and marsh rabbit; blue-winged teal, mottled ducks, and other game waterfowl which are found in sloughs in the NE corner of the WMA. Limited

alligator hunting is currently administered on Holey Land WMA as part of the FWC's Public Waters Alligator Hunt program.

The direct economic contribution to the economy by recreational use of the Holey Land WMA was estimated at $137,606 for 2001. The net contribution in total consumer revenue of Holey Land during that same year was estimated at between $65,659 and $131,138.

3.18.2 Rotenberger Wildlife Management Area

Rotenberger WMA encompasses approximately 25,000 acres and is also operated by FWC. Compartment A is located to the East. Holey Land WMA, STA-5, and STA-6 also border the site.

Recreational activities at Rotenberger WMA include hunting, fishing, and camping. FWC seeks to expand the range of public use in the future by improving access and informing the public of opportunities for wildlife viewing and other non-consumptive activities (FWC, 1997b).

Deer hunting is the primary public use at Rotenberger. Other game species include wild hogs, snipe, and waterfowl. Fishing is generally limited to borrow pits along Powerline levee and Miami Canal bank. While hydropattern restoration may result in increased production of forage fish for wading birds, there will only be a few miles of distribution canal within the area, making fishing from motorboats limited.

3.18.3 Stormwater Treatment Areas

Within the EAA, there are a total of five STAs. All five of these STAs are in flow through operations. One of these STAs, STA-3/4, is located adjacent to the proposed EAA storage reservoir. A sixth STA, STA-1E, although not physically located in the EAA, upon completion, will receive EAA runoff via the STA-1 Inflow and Distribution Works project located between STA-1W and STA-1E. These man-made wetlands offer a potentially valuable recreational resource. Recreational plans are being developed for the STAs to ensure that recreational uses are consistent with the primary use of the STAs- to achieve specific water quality improvements. To date, hunting has only been permitted in STA-5. The annual FWC report for the 2002 to 2003 waterfowl hunt season indicated that for this particular STA, 500 hunters were permitted and 1,715 ducks were harvested. Supervised bird watching events have also been held recently in some of the STAs.

The projects in the October 27, 2003 Everglades Protection Area Tributary Basins Long-Term Plan for Achieving Water Quality Goals (Long-Term Plan) were designed to achieve compliance with the water quality standards for the EPA by December 31, 2006. One of the key assumptions during the development

of the Long-Term Plan was that Compartments B and C would be under consideration for use as part of the EAA Storage Reservoirs Project through Fiscal Year (FY) 2010 and for this reason should not be considered for other Everglades restoration uses until FY 2011. Subsequent to completion of the Long-Term Plan, it was determined that all of the EAA Storage Reservoirs Project's water storage goals could be achieved on Compartment A, and that using Compartments B and C would not be a cost effective way to meet the storage objectives of the EAA Storage Reservoirs Project (Phase 1 and 2). In light of the availability of the land in Compartments B and C, the SFWMD proposed to initially expand STA-2 with a new 2,000-acre Cell 4 and to initially expand STA-5 with a new 2,055-acre third flow-way to assist in maximizing the treatment effectiveness of the STAs in improving water quality entering the EPA. The SFWMD submitted a revised Part 2 of the Long-Term Plan to the FDEP in November 2004, requesting approval to revise the Long-Term Plan to include the addition of STAs on Compartments B and C, including the initial expansions. FDEP approved this request in December 2004 and the USACE issued federal permits in August 2005 and December 2005 for expansions of STA-2 and STA-5, respectively. The initial expansions are are currently under construction and anticipated to be flow-capable by December 31, 2006.

As part of the Acceler8 program, the SFWMD is proceeding with the design of additional treatment areas on the remaining acreage of Compartments B and C to further assist in maximizing the effectiveness of the STAs in improving water quality entering the EPA. A Regional Feasibility Study which has been underway during 2005 is intended to determine the optimal configuration and operation of the additional treatment areas on Compartments B and C.

3.19 SOCIO-ECONOMIC ENVIRONMENT

3.19.1 EAA Socioeconomic Characteristics

The proposed storage reservoir is located in the southern portion of the EAA. Eleven census tracts are partially located within the EAA; Tracts 7903 in Palm Beach County and 0200 in Hendry County are only partially within the EAA Reservoir A-1 target area (Figure 3-6). Three incorporated population centers are within the EAA: the Cities of Pahokee, Belle Glade, and South Bay. These centers have a significant impact on the demographics of certain tracts and the EAA as a whole. The total estimated population in the EAA in 2000 was 42,265 persons.

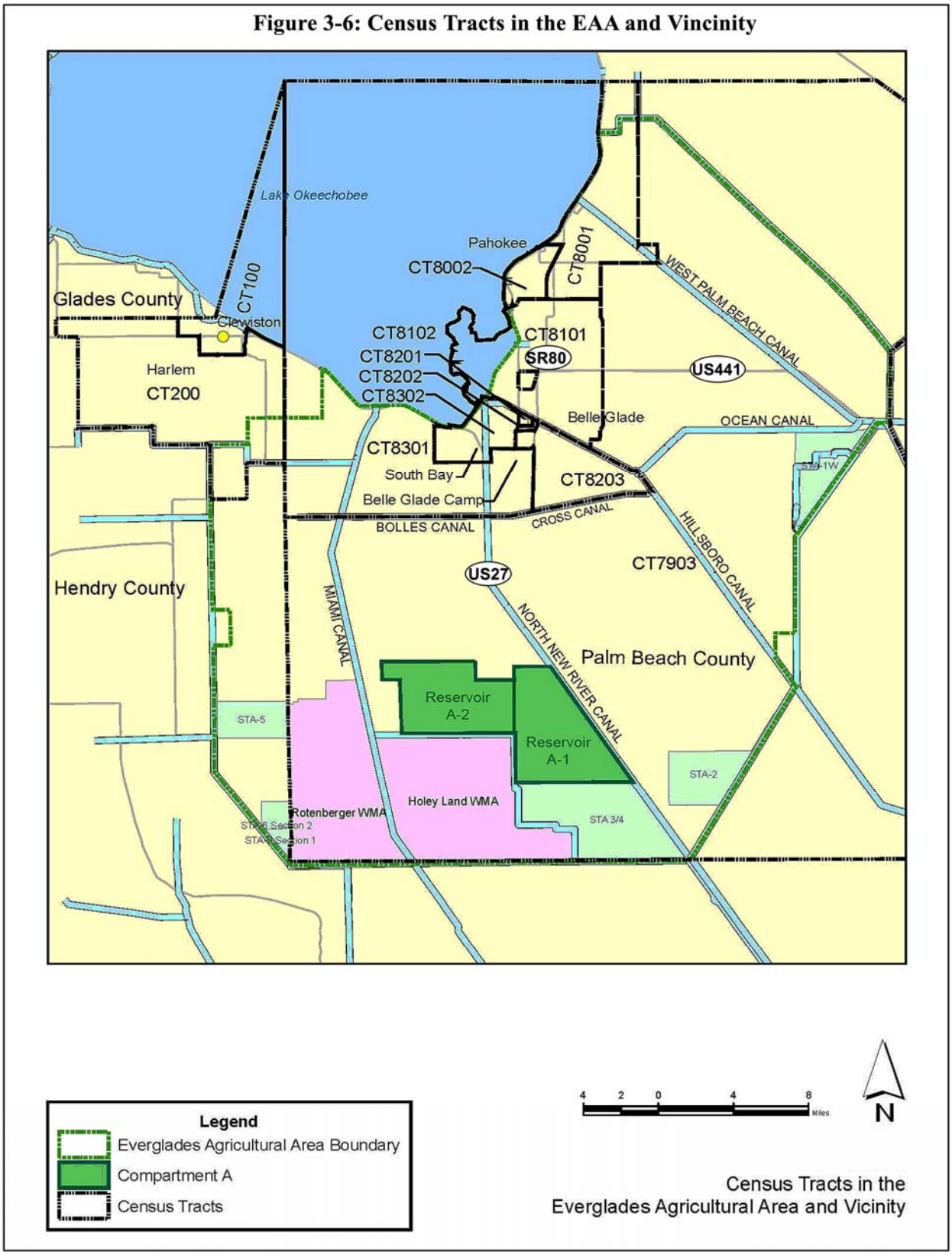

FIGURE 3-6: CENSUS TRACTS IN THE EAA AND VICINITY

From a socioeconomic perspective this area is generally "very depressed," but has significant community cohesion. It is an aging area that is likely to continue to see a loss of working age, educated population - typical of patterns seen in many rural areas throughout the United States. There is a high concentration of minority individuals, both African-Americans and Hispanics, with their numbers far exceeding non-minorities. Income levels are well below state averages with one-third to one-half of the families living in poverty.

Educational achievement in the EAA is low compared to Florida averages, with less than 10% of the area's adults having any formal education beyond high school and only about one-half having graduated from high school. About one-fourth of the adults did not complete ninth grade.

While Florida has experienced a population increase of almost 25% in the ten years between the 1990 and 2000 censuses, the EAA population decreased 5% from 44,700 to 42,265 persons. The population decline most likely reflects the mechanization of agricultural processes and out-migration of youth (USACE and SFWMD, 2003). Reflective of the population decline (that the EAA experienced between 1990 and 2000) the area has seen a decrease in families. Nine of the eleven census tracts saw a decrease of 10% to 20% in the number of families. The number of families in the three municipalities also declined.

The southern and central sections of the EAA have a very low population. Table 3-6 provides an overview of the socioeconomic characteristics within each of the census tracts in the EAA.

A high percentage of the population within the EAA is clustered near Lake Okeechobee, within and adjacent to the incorporated areas. Census tracts comprising over 80% of the surface area in the EAA contain just over 4% of the total population.

When viewing the 2000 income data for the EAA as a percentage of Florida incomes, the relative poverty of the EAA population is very visible. Median income levels of eight of the eleven tracts are less than three-quarters of Florida's median household and family income. Per capita income differences are more severe, with six of the tracts having less than one-half of the statewide average per capita income. Additionally, the per capita income of Florida is higher than that of all tracts in the EAA. The disparity between the Florida values and the individual tract values is much greater than in 1990.

Table 3-6: EAA Socioeconomic Characteristics.

Area	Population 1990	Population 2000	Percent Change (1990 - 2000)	Persons per Square Mile 2000	Median Household Income 2000	Per Capita Income 2000
Florida	12,937,926	15,982,378	23.5%	296	$38,819	$21,557
EAA	44,700	42,265	-5.4%	44		
Hendry County Tract 200	8,535	7,506	-12.1%	102	$31,760	$13,047
Palm Beach Co. Tracts						
7903	675	5,729	748.7%	5	$58,770	$21,177
8001	3,459	3,727	7.7%	104	$23,081	$9,303
8002	6,377	5,360	-15.9%	836	$23,625	$10,301
8101	5,554	6,229	12.2%	141	$33,906	$12,756
8102	1,137	1,091	-4.0%	1254	$ -	$8,022
8201	5,433	4,355	-19.8%	9467	$17,004	$8,776
8202	3,295	2,976	-9.7%	8043	$15,000	$8,056
8203	4,626	4,763	3.0%	258	$28,409	$12,592
8301	2,154	1,737	-19.4%	22	$24,125	$7,676
8302	4,130	4,521	9.5%	419	$25,227	$9,239
Cities						
Belle Glade	16,177	14,999	-7.3%	3226	$22,715	$11,159
Pahokee	6,822	5,822	-14.7%	1080	$26,731	$10,346
South Bay	3,358	3,895	16.0%	1437	$23,558	$9,126

* Derived from the U.S. Census 1990 and 2000. Data for census tracts 0200 and 7903 is not representative of the EAA area because large portions of these tracts lie outside the target area. Tract 8102 has no households or families.

Sources: US Census 1990; US Census 2000; USACE, SFWMD, 2003

Service-oriented occupations comprise the majority of employment in the EAA. Farming occupations represent a small percent of the workforce, reflective of the modernization of farming operations, while production, mostly related to agriculture, continues to be a major occupation in the EAA.

Analysis of 2000 block level census data reveals a total of 20 persons within the footprint of the Draft PIR/EIS Selected Plan or the Cell A-1 and Cell A-2 of Compartment A. While the land area of the Draft PIR/EIS Selected Plan totals 35,526 acres or 5.7% of the EAA, population residing within the storage reservoir area represents 0.05% of the EAA total population. The purchase agreement between the Department of Interior (DOI), SFWMD, and the landowners allowed farming to continue on most of the land until March 31, 2005. After March 2005, land may be leased for agricultural purposes until needed by USACE for restoration purposes.

The EAA began agricultural production in the early 20th century. However, it was not until the first dredging of Lake Okeechobee in 1919, the opening of the Palm Beach Canal, and the freeze of February 3, 1917, that farming emerged as an important economic activity in the area. The initial draining of the rich "muck" soils created opportunities for vegetable production.

Most of the land was owned by either the State of Florida or the Southern Land and Timber Company. Initially, farmers were allowed to farm the land without purchasing the property or paying rent. This resulted in the development of agricultural settlements along the southern shore of Lake Okeechobee. These settlements evolved into the three municipalities of Pahokee, Belle Glade, and South Bay, with incorporations beginning as early as 1922.

A hurricane that battered the area in September 1928 had far-reaching impacts on the area's land use. The hurricane's death toll of over 1,800 persons and extensive physical damage, caused by wind-driven waters of Lake Okeechobee overflowing into populated areas, led to the construction of the Herbert Hoover Dike around Lake Okeechobee to control future flooding.

After construction of the Herbert Hoover Dike, farming activities significantly increased. The EAA was formally created in the 1940s when one-half of the Everglades Economic Region, consisting of 1.6 million acres, was drained for agriculture and urban development.

Sugarcane production began with the construction of the Clewiston Sugar Mill in 1929. Prior to the Cuban revolution of 1959, 50,000 acres of the EAA were devoted to sugar cultivation. Imposition of the Cuban Embargo in the early 1960s, the arrival of Cuban refugees skilled in sugar production, and abolishment of the production limitation imposed by the "Sugar Act" in 1974, enabled the EAA to become the leading cane sugar production area in the United States. In 1995, over 500,000 acres were devoted to sugarcane production.

In 2002, the study area contained about 505,000 acres in agricultural products cultivation, about 90% of which is in Palm Beach County and 10% in Hendry County. In the 2000-2001 fiscal year, approximately $1.2 billion in agricultural sales were produced in the EAA, representing about one-seventh of Florida's total agricultural sales. The estimated $1.2 billion in sales is believed to result in a total of $2.8 billion in the two counties' economies, based on applied multipliers.

About nine out of every ten (86.8%) crop yielding acres in the EAA are associated with sugarcane. The remaining acreage is split between rice, sod, row crops, and other agricultural uses. Table 3-7shows acreage of agricultural uses in the EAA.

There are six sugar mills and one refinery (South Bay) currently operating in the EAA, with an additional mill and refinery in Clewiston also serving the area.

The combined capacity of these mills is over 17 million tons. Three major entities, U.S. Sugar Corporation, Florida Crystals Corporation, and Sugarcane Growers Cooperative (SCGC) provide the majority of the sugarcane production in the EAA.

Table 3-7: Acreage by Crop in the EAA.

Crop	Palm Beach County Acreage	Hendry County Acreage	Total Acreage	Percent of Total Acreage
Sugarcane*	423,358	45,442	468,800	92.7%
Row**	16,347	—	16,347	3.2%
Sod	9,846	—	9,846	1.9%
Nursery	618	—	618	0.1%
Pastures	1,075	1,884	2,959	0.6%
Miscellaneous	4,031	2,939	6,970	1.4%
Total	455,275	50,265	505,540	100.0%

* Includes rice and corn grown as rotation crops.
** Includes 1,814 non-productive acres associated with service area for row crops.
Source: USACE and SFWMD, 2003.

3.20 LAND USE

3.20.1 Land Use in the EAA

The EAA is situated to the south of Lake Okeechobee within portions of Palm Beach and Hendry Counties. Bordering the EAA to the south and east are WCA-1 (otherwise known as the Arthur R. Marshall Loxahatchee National Wildlife Refuge), WCA-2, and WCA-3. The EAA encompasses an area of 620,797 acres. Included in the EAA are the Rotenberger and Holey Land WMAs (approximately 25,000 acres and 35,500 acres, respectively) and six STAs (totaling approximately 36,400 acres).

The FWC land cover data is presented more fully in the previous Plant Communities section. Currently, land in the EAA is primarily in agricultural production, with sugarcane being the primary crop. Secondary agricultural uses include vegetables, rice, sod, and improved pasture. The dominant land use in the EAA, based on the FWC land cover data, is sugarcane, which utilizes 68% of the land area. Bare Soil/Clearcut covers almost 12% of the remaining land area

and sawgrass marsh another 6.5%. No other land cover classes contain more than 3% of the land area.

The EAA began agricultural production in the early 20th century. However, it was not until the first dredging of Lake Okeechobee in 1919, the opening of the Palm Beach Canal, and the freeze of February 3, 1917, that farming emerged as an important economic activity in the area. The initial draining of the rich "muck" soils created opportunities for vegetable production.

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After construction of the Herbert Hoover Dike, farming activities significantly increased. The EAA was formally created in the 1940s when one-half of the Everglades Economic Region, consisting of 1.6 million acres, was drained for agriculture and urban development.

Sugarcane production began with the construction of the Clewiston Sugar Mill in 1929. Prior to the Cuban revolution of 1959, 50,000 acres of the EAA were devoted to sugar cultivation. Imposition of the Cuban Embargo in the early 1960s, the arrival of Cuban refugees skilled in sugar production, and abolishment of the production limitation imposed by the "Sugar Act" in 1974, enabled the EAA to become the leading cane sugar production area in the United States. In 1995, over 500,000 acres were devoted to sugarcane production.

In 2002, the Study Area contained about 505,000 acres in agricultural products cultivation, about 90% of which is in Palm Beach County and 10% in Hendry County. In the 2000-2001 fiscal year, approximately $1.2 billion in agricultural sales were produced in the EAA, representing about one-seventh of Florida's total agricultural sales. The estimated $1.2 billion in sales is believed to result in a total of $2.8 billion in the two counties' economies, based on applied multipliers.

About nine out of every ten (86.8%) crop yielding acres in the EAA are associated with sugarcane. The remaining acreage is split between rice, sod, row crops, and

other agricultural uses. Table 3-7 shows acreage of agricultural uses in the EAA.

SFWMD anticipates a decline in sugarcane production within the EAA from 529,920 acres (1995 condition) to 491,520 acres (2050 condition) due to the purchase of agricultural land for restoration projects. Sugarcane production will also be directly related to future U.S. government import/export policies and relationship with Cuba.

There are six sugar mills and one refinery (South Bay) currently operating in the EAA, with an additional mill and refinery in Clewiston also serving the area. The combined capacity of these mills is over 17 million tons. Three major entities - U.S. Sugar Corporation, Florida Crystals Corporation, and Sugarcane Growers Cooperative (SCGC) - provide the majority of the sugarcane production in the EAA.

3.20.2 Land Use in Compartments A, B, and C

Land use within Compartment A of the EAA is comprised almost exclusively of Sugarcane (77%) and Bare Soil/Clearcut (20%). Other agricultural uses, wetlands, uplands, urban and extractive uses comprise the remaining three percent of the land area. Compartment B is out of production except for 46% of the total area which supports an active turf farm operation in the northern portion of the property. All of Compartment C has been out of production since the spring of 2005.

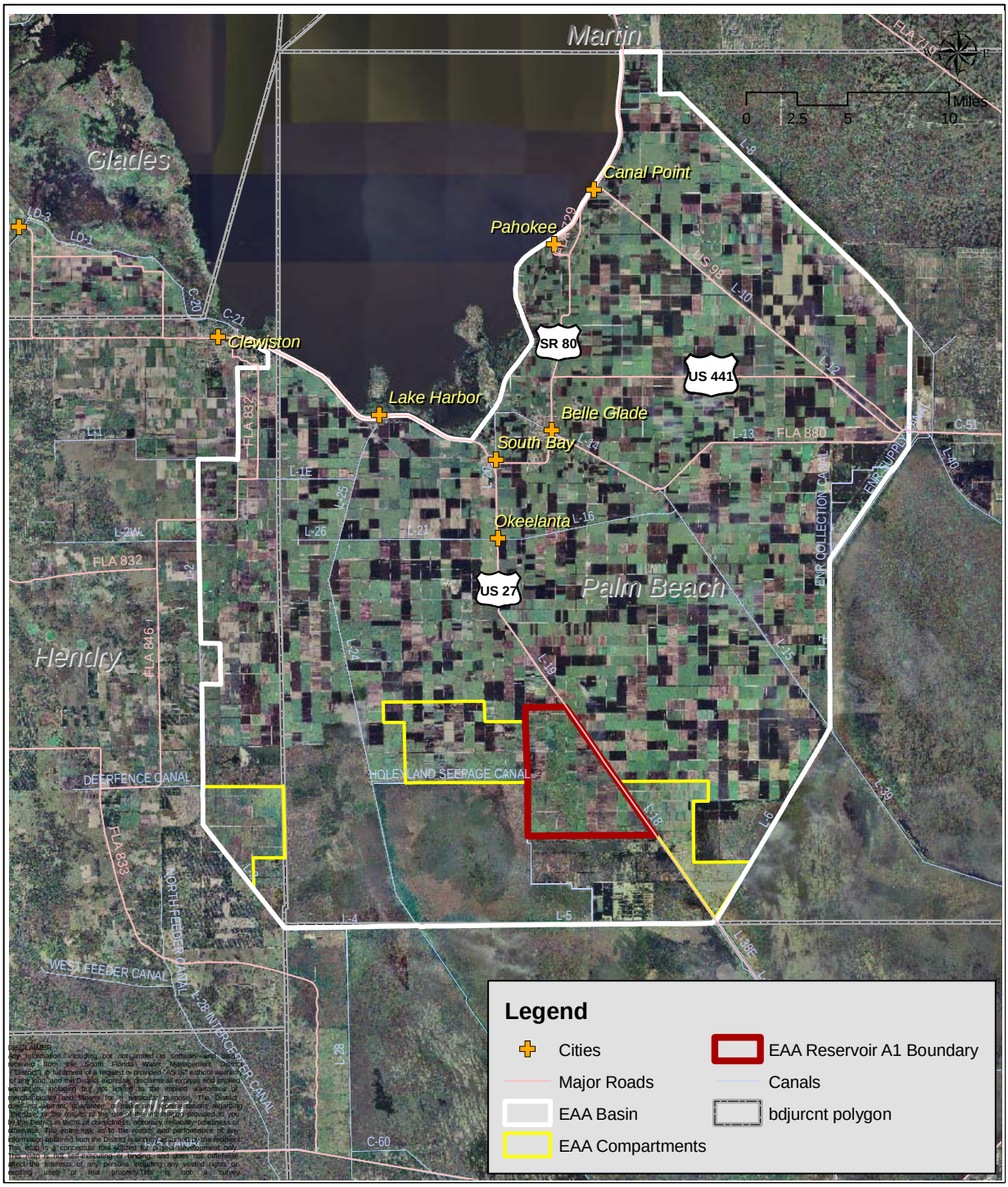
3.20.3 Agriculture

There is a large amount of agricultural lands surrounding Lake Okeechobee. About 505,000 acres are farmed in the EAA (UFBEBR, 2002), and sugarcane was harvested from about 86.8% of that acreage in 2002. Much of this acreage is likely categorized as unique farmland based upon its location, growing season, and high value crops, including sugarcane and vegetables. Continued agricultural production in the EAA has become increasingly controversial. Some of the factors that may affect EAA agriculture include, water quality concerns, soil subsidence, and urban encroachment. The water quality concerns, particularly phosphorus loading, are being addressed through best management practices, stormwater treatment areas, and growing use of organic farming practices and rice cultivation in rotation with sugarcane production. Although sugarcane cultivation in the EAA has come under some sharp criticism in recent years, sugarcane is recognized as the most appropriate crop for this region. Sugarcane requires less phosphorus fertilizer than other crops grown in the EAA (Sanchez, 1990), and sugarcane has been found to remove 1.79 times more phosphorus than was applied as fertilizer (Coale, et al., 1993). Florida sugarcane only requires small amounts of pesticides due to disease resistant and tolerant cultivars, and cultivation instead of herbicides for weed control.

Sugarcane also tolerates greater variability in water table levels, allowing for more flexible water management strategies (Glaz, 1995).

3.20.4 Roadway Facilities

Existing roadway facilities within the EAA basin includes State Road (S.R.) 80 and U.S. Highway 27. These two facilities are components of Florida's Strategic Intermodal System Plan (January 2005), which is a transportation system that will enhance the mobility of people and goods within the region. Both facilities are integral in the movement of agricultural goods and the economies of the cities of Pahokee, Belle Glade, and South Bay. U.S. Highway 27, a four-lane facility, is located along the eastern boundary of the proposed EAA A-1 Reservoir project footprint, whereas S.R. 80 is north (approximately 12 miles) of the proposed northern boundary of the A-1 Reservoir project footprint. Please see Figure 3-7 for roadway locations.



sfwmd.gov	Acceler8 South Florida Water Management District 2301 Center Park West Drive, Suite # 150 West Palm Beach, FL 33409 Tel # (561) 242-5520	**Figure 3-7** Everglades Agricultural Area Major Cities & Roadway Locations	UPDATED 28 APR 06 \\Dataserv\410\4130\CERP Projects\EAA\Final SEIS\Final_SEIS_Maps\Map_docs\Figure_3_7.mxd

FIGURE 3-7: EVERGLADES AGRICULTURAL AREA MAJOR CITIES & ROADWAY LOCATIONS

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CHAPTER 4
ENVIRONMENTAL EFFECTS

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4.0 ENVIRONMENTAL EFFECTS

This section provides a discussion of the environmental effects of the No Action and the Build Alternatives including the Preferred Alternative. It presents detailed analysis on the environmental effects including unavoidable adverse effects, irreversible and irretrievable resources, cumulative effects, and secondary effects. Documentation also is provided for a comprehensive review of environmental issues such as water supply, flood protection, threatened and endangered species, and other natural system and habitat needs. Mitigation and monitoring measures and environmental commitments that could be used to avoid and/or reduce potential impacts are discussed in Chapters 5 and 6 of this document. A 404(B)(1) Guidelines Evaluation is included in this document as Annex A.

Environmental effects to the northern estuaries, Lake Okeechobee, and the Greater Everglades are based, in part, on modeling runs using the South Florida Water Management Model v 5.5 (SFWMM), or 2 x 2, at the 2010 planning horizon (2010BS), which includes only authorized non-CERP features (e.g. Modified Water Deliveries project to be constructed by 2010) and a second simulation using the same 2010 planning horizon, Non-CERP projects with the EAA A-1 Storage Reservoir (2010A1). Model runs provide general information on how the environment is anticipated to respond when additional flows to the south are provided. Other scientific information from ongoing research and monitoring programs and best professional judgment is also considered in this analysis. It should be noted that environmental effects for threatened and endangered species were not evaluated using this 2010 modeling forecast but instead were assessed under an operational commitment that includes water deliveries to the south only when there is an environmental demand. (See Section 4.6.2 for more detail.) As discussed in Section 2.5.2, operation of the SFWMD's proposed Acceler8 EAA Reservoir A-1 project will be consistent with the interim operations plan of the CERP EAA Storage Reservoirs project.

The impacts are discussed in this chapter for the No Action alternative versus the Build Alternatives. Differences in level of effects are spelled out for the different Build Alternatives where there are differences in the level of effects that are not equivalent. This analysis is based on the best available information to date. As new information becomes available, such as the Lake Okeechobee Regulation Schedule Study currently undergoing NEPA evaluation, the USACE will consider the need to update any analyses herein.

4.1 EXISTING LAND USE

4.1.1 No Action

Palm Beach County's Managed Growth Tier System (MGTS), adopted in 1999, designates all land in the EAA as Glades Rural Tier, Urban Glades Tier, or Conservation. Glades Rural Tier was established to protect valuable agriculture areas and has only limited residential development potential. New growth in the EAA, which significantly contains Palm Beach County's remaining undeveloped land with urban residential development potential, will be channeled to the Urban Glades Tier.

Land use changes should influence future water quality conditions. It has been estimated that due to oxidation and subsidence of organic soils (Histosols) and based on standard farming practices, about 62,000 acres of the 570,000 acres of arable land would be unusable for any current agricultural use by 2050 (Snyder, 2004). An additional 241,000 acres would only be useable for highly water tolerant crops within that same period. Smaller acreages could be lost to farming if soils conserving farming practices are implemented in the near future. For the purposes of this forecast, it is assumed that areas of the EAA lost to farming would be converted to relatively natural wetland areas. Other land use changes should be relatively minor in the EAA.

Under the No Action Alternative, land use within the SFWMD's proposed EAA Storage Reservoir footprint would be either open space or agriculture and there would be no significant direct effects on land use.

4.1.2 Build Alternatives

The Build Alternatives were analyzed for potential land use effects relative to:

a. Development trends;

b. Consistency with existing plans and policies; and,

c. Compatibility with surrounding land use.

Construction and operation of an above ground reservoir will not have significant direct or indirect effects on development trends in the EAA. Conversion of the Build Alternatives land area to reservoir storage will have minimal effects on growth trends since the development potential of the property would be limited due environmental issues and the net change in employment will be small relative to EAA employment i.e., employment opportunities associated with construction of a project of this magnitude.

The Build Alternatives will be consistent with land use plans and policies in the Palm Beach County Comprehensive Plan. The alternatives are in the Glades Tier which has an Agricultural Production land use designation. The Department of Interior (DOI) and SFWMD have acquired agricultural lands for Everglades ecosystem restoration purposes. Conversion to either of these uses is consistent with the Future Land Use Plan for Palm Beach County and will not significantly affect surrounding land uses. A storage reservoir, construction of STAs, and natural areas on or within the project footprint would be compatible with surrounding land uses, and land uses in the area generally, which are almost exclusively in agricultural or conservation uses.

4.2 GEOLOGY, TOPOGRAPHY, AND SOILS

4.2.1 No Action

Future soil conditions are expected to continue to subside in the EAA region, impacting agricultural productivity, costs, and water control. As soil subsides, a minor lowering of topography would be expected.

4.2.2 Build Alternatives

With all of the Build Alternatives, an area approximately 50-foot wide between the property/project limits and seepage canal would remain as existing with no impacts to geology, topography, or soils. For the Preferred Alternative and additional area in the northern portion of the project approximately 650 acres of the Woerner Farm 3 Tract) would be left as undisturbed so as to avoid risk of pesticide contamination to wading birds. For the Preferred Alternative, a total of 844 acres of lands within the project boundary would not be impacted which includes the Woerner Farm 3 Tract and the approximate 50-foot wide perimeter buffer.

4.2.2.1 Geology

The geology will not be significantly impacted by the proposed action. The extent of the impact to the geology will be limited to breaking an area of caprock, the limestone layer below the highly organic surface soil, to obtain material for construction of the levees, as well as to construct cutoff walls, seepage canals, and borrow canals. The depth of the caprock varies from less than 1 to 4 ft; and averages at a depth of approximately 2 ft across the project area.

4.2.2.2 Topography

The project would result in conversion of relatively flat, uniform agricultural lands to a reservoir with deep water and embankments up to 25 feet above existing grade (generally 12.5 ft NGVD). The seepage buffer on the east,

west, and north of the project site would have a 150-foot wide strip returned to existing grade. Seepage and borrow canals would be constructed with all of the Build Alternatives. Random contouring of the seepage canals to provide littoral shelves would also lower existing topography. No adverse impacts to surface hydrology are anticipated as a result of this conversion.

4.2.2.3 Soils

The caprock and deeper sandy materials will provide the raw materials for construction of the reservoir embankment (or levee). Thus, a portion of the site's soils will be disturbed or covered by this levee or other structures. During construction of levees, the overlain muck soils will be removed and stockpiled on site to access the caprock. Following construction, muck soils will be redistributed to form the exterior side slope of the embankment. Remaining muck will be redistributed throughout the seepage buffer area in order to encourage wetland ecological features. The soils within the buffer area are anticipated to remain hydric and retain muck properties or revert to muck properties post- construction. Littoral shelves as a result of construction methodologies within the seepage canals would experience sediment deposition as sediment and plant material settle post-construction and produce peat/mucky soils over time.

Soils that remain undisturbed within the reservoir footprint would be impacted during operations of the reservoir, as a layer of fine sediments containing a high level of organic debris and nutrients will settle from the overlying water to coat the bottom. The low oxygen environment that is expected at the bottom of the reservoir will act to preserve organic material in the remaining soils and in the sediment.

The project may benefit soils regionally, as better water management practices may reduce the rate of soil subsidence in areas surrounding the reservoir. This proposed reservoir, in combination with future Acceler8 and/or CERP projects, is expected to ultimately improve hydroperiods in the Water Conservation Areas and reduce subsidence of soils there. Overall, significant impacts to soils are anticipated to be minor and localized. Some beneficial impacts are associated with implementation of the proposed project. However, the conversion of farmland is anticipated to be significant and irretrievable.

4.3 HYDROLOGY

4.3.1 No Action

Under the no-action alternative, water flows in the EAA would continue to be controlled by agricultural water management practices.

4.3.2 Build Alternatives

Construction and operation of the proposed reservoir would permanently affect surface hydrology. Post construction water will be pumped into the surface reservoir and contained within the reservoir. Some of the impounded water will seep under cut-off walls surrounding the impoundment and re-emerge within the seepage buffer or seepage canal collection system. The exception is within the southwest corner of the project site for the Preferred Alternative. The areas that are anticipated to be affected are the Holey Land WMA, and Rotenberger WMA, and STA 3/4.

The effects on changes to the groundwater flows south of the Cell A-1 were modeled with ModFlow. The seepage quantities represent approximately 10% of the flow required to be delivered to STA 3/4 and the Holey Land. Therefore, only the remaining portion of the required flow will be delivered from surface water sources to the areas south. This will result in no net change in volume downstream. The benefits to this concept include a reduced cost for cut off walls as well as improved water quality delivered to the STA and Holey Land.

For the Compartments B and C alternative cutoff walls would be constructed to minimize seepage along the northern boundary of Compartment B to avoid impacts to private ownership, however, seepage would be expected to occur into STA 2. Seepage cutoff walls would be constructed for Compartment C along the western boundary to avoid impacts to private ownership and along the eastern boundary to minimize seepage to the Rotenberger WMA.

For the Cell A-2 alternative cutoff walls would be constructed along the northern and western boundary to avoid impacts to private ownerships, while a cutoff wall along the southern boundary would be constructed to minimize seepage to the Holeyland WMA due to the length of the reservoir levee directly adjacent to the area.

The groundwater directly under the reservoir and to the south may be impacted by the proposed action. The reservoir water would be in direct contact with the groundwater through the surface soils.

4.4 CLIMATE

4.4.1 No Action

The No Action Alternative is anticipated to have no impacts to climate within the EAA.

4.4.2 Build Alternatives

The proposed action is not expected to significantly impact the general climate of the EAA. There may be some minor impacts to microclimates as a result of the presence of a large body of water or the levees containing the reservoir. This will take the form of altered wind directions, slightly moderated temperatures, and an increased likelihood of fog formation.

The proposed action may significantly lessen the impact of stormwater from hurricanes and other storms. The reservoir may be used to help control floodwaters and related environmental damage.

Replacement of crops with open water will act to increase evapotranspiration, which may have a minor, very local effect.

4.5 VEGETATION AND COVER TYPES

Vegetation and cover types are discussed for the EAA and other affected areas i.e., Lake Okeechobee, the Northern Estuaries, and Water Conservation Areas for the No Action Alternative and the Build Alternatives.

4.5.1 No Action

4.5.1.1 Everglades Agricultural Area

Without the Acceler8 EAA Storage Reservoir project, vegetation communities similar to those described in the Chapter 3 would continue to exist in the EAA. The majority of the EAA is considered atypical jurisdictional wetlands (historic Everglades wetlands disturbed through farming operations). Remnant wetlands are present and indicative of areas that were too wet to support agricultural operations. The No Action alternative would result in no direct impacts to the atypical or natural wetland areas.

Future environmental conditions in the EAA under the no action alternative would also be influenced by regional trends of soil subsidence and improving surface water quality. Of the two trends, soil subsidence should have a greater effect on the plant communities of the region. Continued long-term physical changes in the soil of the region would result in some shifts in land use and vegetation cover, primarily in the most abundant land cover category- disturbed agricultural lands. It would also affect remnant upland and wetland communities within the region. Changes expected within the EAA include continued loss of topsoil over time with current soil loss estimated at 0.6 inches per year (Snyder, 2004). This rate of soil loss should continue, although some evidence suggests that as soils become more mineralized, oxidation of the soil and consequently, subsidence, will decrease. In general, agriculture soils in the EAA evolve through a progression of

agricultural uses depending upon amount of topsoil available. It should be noted that this discussion is related to general trends on how subsidence affects land cover, without consideration of the important forces of politics and economics on agriculture.

Historically, vegetables were the primary crop in the upper Everglades from the 1930s through the 1940s which required deeper soils and good water control. As soil subsidence continued, sugarcane emerged as the primary crop due to its ability to tolerate wetter, shallower soils. Wetter soils result from the reduced ability to effectively drain shallow soils and the lowered land surface elevation due to subsidence. As the soil layer diminishes over the bedrock, agricultural products tolerant of wetter conditions such as rice or some pasture grasses are favored and replace sugarcane. However, continued changes in agricultural practices and/or cultivars may extend the time period for practical use of some crops, so the ability to predict the land use and cover in the EAA over the next 50 to 60 years is imprecise.

Geographic differences exist in the depth of soils within the EAA. Thicker soils are more prevalent in the north near Lake Okeechobee and thinner soils more common to the south. This suggests that changes within the EAA over the next 60 years would occur in the southern portions of the EAA and move northward.

Changes to the remnant "natural" communities on lands within the EAA are dependent upon the overall agricultural use of the region and resultant water management. Water management of the STAs and WMAs is anticipated to continue with little changes in vegetation cover anticipated in these areas. With continued use of the EAA region for agriculture, no significant net increase or decrease in aquatic areas within the EAA should occur. Larger scale changes in wetland cover could occur in some areas if agriculture is abandoned in some portions of the EAA. Cessation of active drainage of the agricultural fields by pumping would likely cause the fallow lands to revert to wetlands. Similarly, upland community margins could change to transitional wetlands, if the surrounding landscape becomes wetter, slightly, but not significantly reducing upland communities.

Predictions for disturbed land covers (which include all agricultural lands) are that no net increase or decrease in disturbed area would occur, but shifts between specific agricultural cover types could occur. About half the EAA could remain suitable for present day crops and the remainder could shift to more water tolerant crops (Snyder, 2004).

For urban and extractive cover types, there should be an increase in the urban area around the existing population centers of Pahokee, Belle Glade,

and South Bay but not an additional increase or decrease in extractive in the EAA.

Without development of a water storage reservoir, Compartment A would remain as disturbed land (agricultural), although some crop changes could result over time as soil thickness decreases. These changes would likely result in a conversion of vegetable crops to sugarcane and some conversion of wetter sugarcane land to other wet tolerant crops such as rice or wetter pasture grasses. Therefore, existing vegetation communities generally represent future conditions within Compartment A with some shift to crops tolerant of wetter conditions and minor shifts in remnant natural communities to those tolerant of increased water inundation. The SFWMD plans on converting all of or part of Compartments B and C to STAs, which would result in conversion of agricultural lands to submergent and emergent vegetation.

4.5.1.2 Lake Okeechobee

Extreme high and low water fluctuations of Lake Okeechobee would continue to adversely affect nearshore and littoral habitats. The Lake's natural resources are dependent on the littoral zone since it provides nursery areas, spawning areas, foraging areas, and nesting areas required for the completion of life cycles. High lake stages result in loss of beneficial littoral zone plant communities in favor of introduced exotics (e.g., torpedo grass) as well as impacts to wading birds and other water-dependent wildlife. In addition, frequent back pumping to the Lake from the EAA will continue, adding nutrient enriched water which increases phosphorus loading and reduces water clarity, thereby adversely affecting submerged aquatic vegetation (SAV) and emergent wetland species of the Lake's 96,000 acres of nearshore and littoral zones, as well as fish populations. Higher lake stages and back pumping events are also associated with increased in-lake nutrient loading, turbidity, and increased frequency of blue-green algal blooms (SFWMD, 2000).

4.5.1.3 Northern Estuaries

Continued regulatory releases from Lake Okeechobee to the Caloosahatchee and St. Lucie River watersheds would further exacerbate stormwater impacts to the estuaries by releases of freshwater impulses. During the wet season, large pulses of freshwater decrease salinity, increase nutrient inflow and increase turbidity to the estuary, thereby adversely affecting seagrasses and oyster populations.

The number of regulatory releases from Lake Okeechobee to the Caloosahatchee and St. Lucie Estuaries will continue under the No Action Alternative. Excess stormwater that is discharged from Lake Okeechobee to

the Gulf of Mexico through the Caloosahatchee River is very damaging to the estuary. The excess runoff from Lake Okeechobee will continue to be discharged and released to the west. Levels of non-point source pollutant loading to basin waters will continue during the wet season, in general, from Lake Okeechobee flood control discharges. Pollutant loading to the estuaries will continue under the No Action Alternative; hence, the submerged aquatic vegetation, oysters, fish, and other fauna in the estuaries will be adversely affected without the proposed action.

4.5.1.4 Water Conservation Areas

The continuation of high stage events will occur in WCA-2A under the No Action Alternative. Several studies conducted within WCA-2A has shown that cattail out-compete sawgrass in their ability to absorb nutrients and withstand deeper water conditions. Additionally, there is an increase in cattail production during years of high nutrient inflows (Toth, 1988; Davis, 1991). Cattail is considered a high nutrient status species that is opportunistic and highly competitive, relative to sawgrass, in nutrient-enriched situations (Toth, 1988; Davis, 1991). Current cattail distribution in WCA-2 reflects 4,400 acres in which cattails represent more than 50% of the vegetation coverage and 24,000 acres of mixed or scattered cattail (<50% coverage) present in the northeast portion of WCA- 2A. Similar high stage events and associated environmental effects will also continue to occur in WCA-2B. In addition, the altered hydroperiods in WCA-2B has allowed for the invasion of *Melaleuca* sp. The trend of increased production of cattails and its ability to out compete sawgrass will continue under the No Action Alternative.

The community structure and species diversity of Everglades vegetation located north of I-75 (WCA-3A North) is very different from the wetland plant communities found south of I-75 (WCA- 3A South). Improvements made to the Miami Canal and impoundment of WCA-3A by levees have over-drained the north end of WCA-3A and shortened its natural hydroperiod. These hydrological changes have increased the frequency of severe peat fires that have resulted in loss of tree islands, aquatic slough, and wet prairie habitat that were once characteristic of the area. Today, northern WCA-3A is largely dominated by sawgrass and lacks the natural structural diversity of plant communities seen in southern WCA-3A.

Over-drainage of the northwestern portion of WCA-3A has allowed the invasion of a number of terrestrial species such as willow, dog fennel, and broomsedge. *Melaleuca* sp. has become well-established in the southeastern corner of WCA-3A North, and is spreading to the north and west.

Vegetation located in the central and southern portion of WCA-3A probably represents some of the best examples of original, undisturbed Everglades habitat left in South Florida. This region of the Everglades appears to have changed little since the 1950s, and contains a mosaic of tree islands, wet prairies, sawgrass stands, and aquatic sloughs similar to those reported by Loveless (1959).

Elevated stage levels and an increase in the duration of high stage events will continue in WCA-3B. Tree island spatial extent will continue to decline due to extended hydroperiods, as well as further loss of the ridge and slough habitat and increased cattail expansion.

The majority of vegetation within WCA-3A South can be described as typical Everglades habitat with some exceptions due largely to the construction of canals and levees which compartmentalize the WCAs. Under the No Action Alternative, the above trends will continue and adversely affect the plant communities within the northern and southern portions of the WCA-3A. In addition, without reservoir storage capacity, water released to the WCAs could continue to be difficult to manage. The WCAs need water to sustain ecological needs during the dry season and protection from large freshwater releases related to flood control during the wet season. Continuation of the altered hydroperiods within the WCAs could have adverse effects on marsh communities and tree islands.

4.5.2 Build Alternatives

4.5.2.1 Everglades Agricultural Area

With all of the Build Alternatives, an area approximately 50-foot wide between the property/project limits and seepage canal would not be disturbed. For the Preferred Alternative, an additional area in the northern portion of the project (approximately 650 acres of the Woerner Farm 3 Tract) would be left as undisturbed so as to avoid risk of pesticide contamination to wading birds. For the Preferred Alternative, a total of 844 acres of lands within the project boundary would not be impacted. Undisturbed areas would likely experience a change in vegetative cover due to cessation of agricultural practices. This change would be affected by hydrology and seepage as a result of reservoir operation as well as regional soil subsidence.

Existing vegetation communities within the footprint of the Build Alternatives would be destroyed by construction. In general, construction will largely displace existing vegetation communities replacing them with aquatic habitat (water-covered reservoir areas) or disturbed uplands (embankments, roads, berms) with some wetland habitat within constructed seepage buffers and littoral shelves resulting from construction of seepage canals. The majority of the land will be water-covered to a depth up to

approximately 12.5 feet. The reservoirs for the Build Alternatives will most closely resemble an open-water lake community with significant differences and will lack much of a highly productive littoral zone because of the necessity to construct relatively steep sides to maximize water storage capacity.

The Build Alternative footprints are dominated by the disturbed (agricultural) land cover classes which have been determined to be jurisdictional atypical wetlands. The footprints of Cell A-1 and Cell A-2 contain approximately 24,589 acres of disturbed habitat (sugarcane, row crop and other agricultural uses) with sugarcane cover the predominant land cover class and 6,641 acres of Urban and Extractive habitat with bare soil/clear cut being the predominant land cover class. It is likely that in addition to the agricultural areas, some Urban and Extractive habitat may also be considered jurisdictional atypical wetlands due to the historic wetland conditions within the EAA and persistence of wetland hydrology and hydric soils. Natural land cover i.e., wetland habitats, within Cell A-1 and Cell A-2 is approximately 187.63 acres and 18.37 acres, respectively. Compartment B and Compartment C contain 7,485 and 6,240 acres of agricultural lands also determined to be atypical jurisdictional wetlands. Compartment C has been out of production since the spring of 2005, and all of Compartment B is out of production except for the northern portion which supports an active turf farm operation. Within the available lands portions of Compartments B and C (portions of each compartment are currently being converted to STAs) there are no natural wetlands remaining within Compartment B and approximately 288.35 acres of natural wetlands within Compartment C (USFWS, 2003). The majority of the existing wetlands, both natural and atypical, would be converted to other land covers, primarily open water, as a result of reservoir construction.

With all of the Build Alternatives a buffer area will be provided along the boundaries of the reservoir. This seepage buffer will extend 150 feet from the base of the embankment to the seepage canal. It will provide both seepage control and an opportunity for incidental ecological benefits. The first 50 feet of the buffer will be an upland maintenance corridor. The remaining 100-foot wide buffer would convert back to natural wetland habitat. Muck soils that are removed during construction would be redistributed over the caprock so that vegetation can naturally recruit. The seepage buffer would be hydrated by rainfall, seepage from the reservoir, and perhaps groundwater “backed up” from the cut-off walls. Potential wetlands within the seepage buffer of the Preferred Alternative cover approximately 205 acres. Similar acreages of seepage buffer would be provided with the other Build Alternatives.

In addition, littoral shelves resulting from construction of seepage canals would surround the seepage buffer and project site with all Build

Alternatives. The littoral zone will be located along the length of the seepage canal. The littoral zone would not be contoured to a specific design but instead randomly created by construction methodology to create a more natural zone. This will result in areas with narrow littoral shelves to extensive littoral shelves with varying elevations and depths. The littoral shelf would provide habitat for fish and wildlife, especially wading birds. Using a conservative estimate of 2 feet of littoral habitat on both sides of the canal, potential habitat as a result of the reservoir construction would be 13 acres. It is likely that this acreage would be higher.

4.5.2.2 Lake Okeechobee

The structure of the littoral and near shore zone vegetative community of Lake Okeechobee is influenced by extreme high and low stage events, stage envelope and increased phosphorus loading. A significant objective of the Acceler8 EAA reservoir project is to reduce undesirable low levels in Lake Okeechobee during the dry season and reduce undesirable high levels in the Lake during the rainy season. In addition, reductions in the discharges of storm water by back-pumping from the EAA into Lake Okeechobee will reduce additional phosphorus loading. A benefit of the Acceler8 EAA reservoir is a reduction in extreme lake levels. Extreme high and low lake levels have been identified to cause extreme harm to plant communities with little chance of recovery depending on duration. By reducing these extreme events, the Acceler8 EAA reservoir project provides conditions to allow for some recovery of the vegetative communities, in both structure and increased spatial extent, within the nearshore and littoral zones. For the littoral zone this includes emergent, submerged, and floating plants and for the nearshore zone this includes submerged aquatic vegetation, *Chara* sp., and bulrush. Additional benefits associated with reductions in back pumping to the Lake include, reduced phosphorus loading thereby reducing harmful algal blooms, encourages the expansion of cattail, as well as exotic plant species, and reduces the nutrient content in the water that is sent to the estuaries and STA 3/4 which ultimately flows downstream to the WCAs. The Compartment B and C alternative benefits to Lake Okeechobee would be less due to the location of Compartment C being further away from any of the major regional system canals capable of discharging a large volume of water south from Lake Okeechobee. Cell A-2 would provide less benefit because of the overall smaller capacity of the reservoir at this location.

4.5.2.3 Northern Estuaries

An objective of the Acceler8 EAA reservoir is to reduce undesirable freshwater discharges to the St. Lucie and Caloosahatchee Estuaries. Construction and operation of water storage features, such as the Acceler8 EAA reservoir, will provide salinity envelopes that avoid ecologically

damaging high and low salinity extremes. As a result, this will provide ecological conditions to allow reestablishment of SAV beds which provide important habitat for numerous organisms including benthic macroinvertebrates and the eastern oyster. The Compartment B and C alternative benefits to Lake Okeechobee would be less due to the location of Compartment C being further away from any of the major regional system canals capable of discharging a large volume of water south from Lake Okeechobee. Cell A-2 would provide less benefit because of the overall smaller capacity of the reservoir at this location.

4.5.2.4 Water Conservation Areas

The Preferred Alternative would provide benefits through improved hydroperiods, by providing inundation patterns progressing towards NSM defined targets and reductions in extreme high and low water events, to the plant communities of the ridge and slough system, including tree islands, within Water Conservation Area 1, Water Conservation Area 2A, Water Conservation Area 3A and Everglades National Park. By adding the Preferred Alternative to the regional system, regulatory discharges from Lake Okeechobee to Water Conservation Area 3A would be eliminated. Despite benefits to WCA 2A and WCA3A, no benefits are expected to occur in WCA 2B or WCA 3B. The impacts in WCA 2B to increases in high events during the extreme wet years is offset by the reduction in low events during the extreme dry years. However, hydroperiods in WCA 3B increase in relation to desirable NSM targets, although this is due in part to influences of non-CERP projects i.e. CSOP, that have not been authorized by Congress and downstream environmental constraints dictating water management operations.

Improvements to the water quality entering the Water Conservation Areas will also result from the ability to more effectively store water within the proposed EAA reservoir by metering peak flows in the STA3/4. STAs are intended to provide treatment rather than store water. However, during the wet season and flood events, they have been used to provide both functions. Creation of the reservoir will provide the needed storage function, allowing the STA 3/4 to be primarily used as water treatment facilities. Increased residence times of water within the STAs will ensure better treatment of waters released to the Everglades Protection Area and have beneficial water quality effects on all downstream ecosystems. Benefits resulting from the Compartment B and C and Cell A-2 alternatives would be somewhat less than the Cell A-1 alternative due to the smaller capacity of the reservoirs at these locations. In addition, in the Compartment B and C alternative, Compartment C's location on the far western side of the EAA would reduce the ability to retain significant flows from Lake Okeechobee which would reduce the volume of water that could be distributed to WCA-3A to the south.

4.6 FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES

Table 3-3 is a list of endangered, threatened, and species of special concern known in the EAA vicinity or other affected areas. This table does not provide an overall indication of use by protected species since many listed species can use Disturbed (agricultural) or Urban and Extractive habitats.

4.6.1 No Action

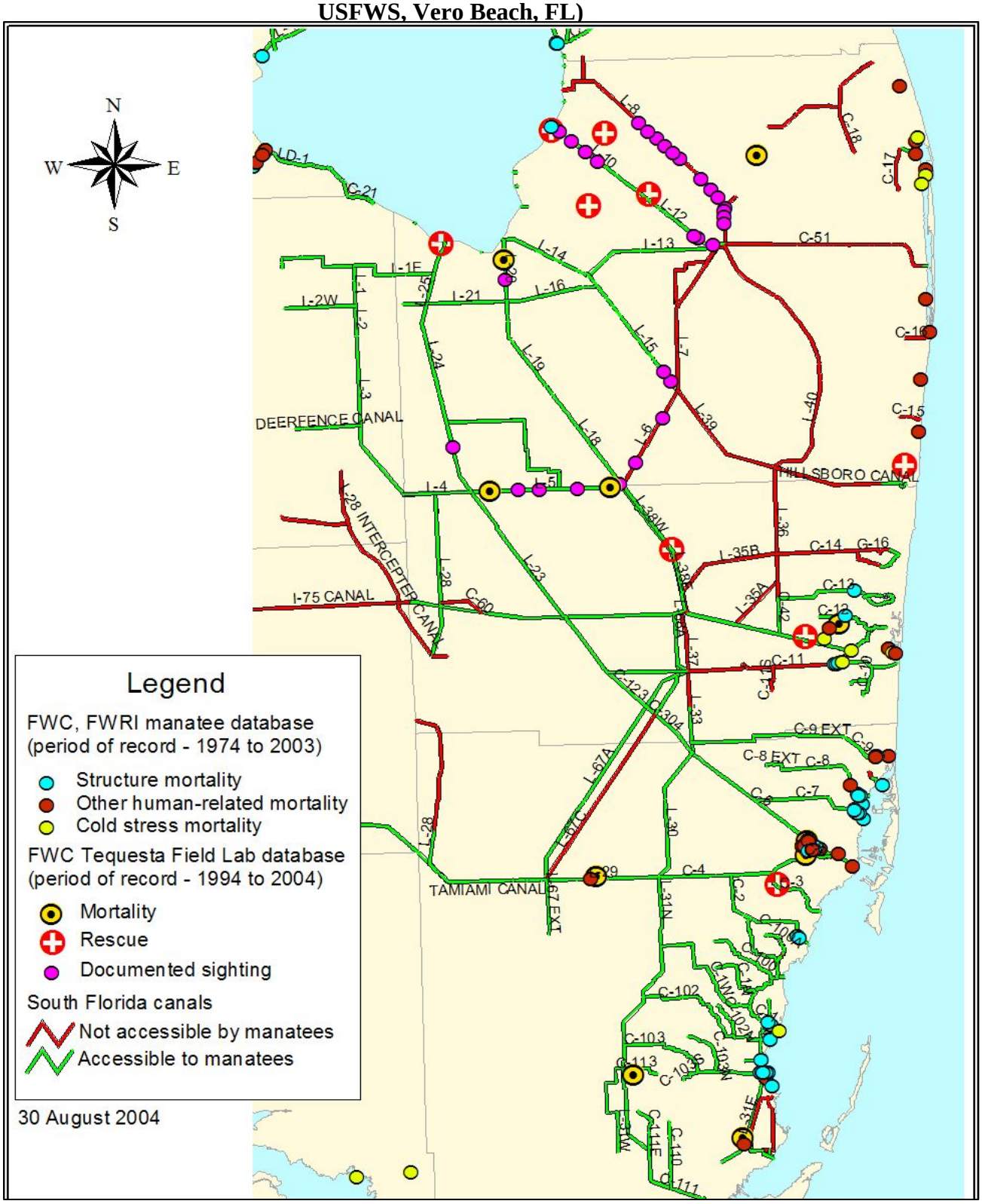
Under the No Action Alternative, use of the EAA including Compartments A, B, and C by most endangered, threatened, or state-listed wildlife should not change. Exceptions may include the federally endangered West Indian manatee.

Studies are currently underway to document use of the canals by manatees. A preliminary map, Figure 4-1, has been produced that shows over half the canals within the EAA are accessible to manatees. Maintenance dredging or other construction/repair activities may create obstruction for manatees. Manatees within the canals may continue to become entrapped within the system and suffer harm or mortality due to poor quality habitat and inability to navigate to more suitable habitat.

In the estuarine areas of the St. Lucie and Caloosahatchee watersheds, continued pulse releases of freshwater from Lake Okeechobee would further degrade the water quality of the estuaries and continue the high fluctuations in salinity. This would have a continued adverse affect on Johnson's sea grass, and it is possible that the spatial extent of this seagrass would continue to decline. Loss of additional SAV could affect federally listed species such as sea turtles and manatees by reducing available grazing areas. The loss of suitable habitat for smaller fishes and further decline of water quality would also likely have an adverse effect on the smalltooth sawfish. Smalltooth sawfish may be especially vulnerable to coastal habitat degradation due to their affinity to shallow, estuarine systems. Because of the slow individual growth, late maturation, and low fecundity, long-term commitments to habitat protection are necessary for the eventual recovery of the species (NMFS, 2000).

The no action alternative could contribute to the decline of the Okeechobee gourd which is typically found around Lake Okeechobee. Water management practices in the future could contribute to promoting nuisance / exotic vegetation around Lake Okeechobee, which could out-compete the gourd.

Figure 4-1: Manatee mortality, rescues, and incidents in the Central and Southern Florida Project (Draft Interim Report, Manatee Suitability Survey in the Everglades Region, CERP Interagency Manatee Task Force, November 29, 2004, USFWS, Vero Beach, FL)



Other federally-listed species occurring in the EAA that would be unaffected include the crested caracara, Florida panther, and eastern indigo snake. . Caracara use a variety of open habitat, both upland and wetland, for foraging. Maintenance of an open agricultural and wetland mix in the EAA under the no action alternative would continue to provide habitat for the caracara, panther, and indigo snake.

Water quality and water level improvements in the WCAs as a result of other projects such as expansion of the STAs would benefit the wood stork, snail kite, and bald eagle by increasing the available forage, improving access to prey species and reducing possible exposure to contaminants including pesticides. Somewhat improved water clarity and reduced nutrients improve habitat for the apple snail and increase successful foraging by the Everglades snail kite. However, the limited number of shallow open water or marsh communities in the EAA would minimize benefits of improved water quality to snail kite populations.

4.6.2 Build Alternatives

It is recognized that the timing and volumes of deliveries from a reservoir in the EAA to downstream natural areas could be affected by many existing operational and structural constraints of the regional water management system. Several of the existing constraints are planned to be reduced and/or eliminated by the time the Acceler8 EAA Reservoir A-1 project becomes operational. Until such time that additional water can be delivered in a manner consistent with restoring and/or sustaining hydrologic conditions, necessary to achieve the goals and objectives related to the natural system, conveyances to the EPA are likely to remain near existing levels. Effects to federally listed threatened and endangered species therefore were assessed by the USACE using these existing operational constraints listed above and discussed in Section 2.5.2. Interim operations, which would result in no water deliveries to the south unless there is a specific environmental need, are expected to have no effects on the American crocodile (*Crocodylus acutus*) and the Cape Sable seaside sparrow (*Ammodramus maritimus*) thus these two species have not been evaluated in this Final EIS. Prior to revising the interim operations plan to include long-term operations and/or other interrelated projects, the USACE will re-evaluate effects to all of the listed species, particularly the American crocodile and the Cape Sable seaside sparrow which have not been consulted on, to determine if re-initiation of Section 7 consultation is necessary.

According to terms of an agreement between the USACE, USFWS, and NOAA Fisheries, the Draft Integrated PIR/EIS for the CERP EAA Storage Reservoirs project also acts as the Biological Assessment for the purpose of Section 7 consultation under the Endangered Species Act. The USACE

originally proposed to use the Integrated PIR/EIS for the CERP EAA Storage Reservoirs project as the NEPA document for the regulatory action evaluating a component of the selected plan in the federal PIR/EIS. Therefore, the USACE determined that the Draft Integrated PIR/EIS and effect determination for the CERP EAA Storage Reservoirs project was also applicable for the regulatory action i.e., the SFWMD's proposed Acceler8 EAA Reservoir project. The USFWS concurred with the USACE's assessment for all but three species in a joint informal consultation on December 14, 2005, during the time that the Regulatory Division's evaluation of the Acceler8 EAA Reservoir A-1 project was integrated with the USACE's evaluation of the CERP EAA Storage Reservoirs project. After breaking off from the integrated process in January 2006, as discussed in Section 1.1 of this EIS, the consultation for the three remaining species i.e., Florida panther, wood stork, and bald eagle, was concluded separately for the two federal actions.

4.6.2.1 Florida Panther

Habitat of the Florida panther may be adversely affected by the proposed placement or construction of the reservoir. While the proposed project site is located outside the primary and secondary zone for the panther, it may utilize cover types that occur in the project footprint. In addition, the proposed site is within the panther dispersal zone and historic panther home range. The panther secondary zone is adjacent to the site, and telemetry data indicates that panthers have used adjacent areas, especially along the Miami canal. Once construction of the reservoir is complete, panthers may be forced to travel greater distances to cross or skirt portions of the EAA. There may be a loss of potential ranging, resting, and foraging habitat for the panther as a result of converting wetland, agricultural, and terrestrial areas in Compartments A, B, or C to an aquatic system. The seepage/habitat buffer, reservoir embankment, and undisturbed lands around the perimeter of the reservoir may provide potential compensation for the loss of ranging lands and potential habitat for the panther within the project footprint. It is also anticipated that the project would improve panther habitat within the WCAs with long term operation.

The USACE determined the proposed project "may adversely affect" the panther. Due to slight differences in acreages and design of the seepage buffer, the USFWS advised that separate Biological Opinions would be provided for the CERP EAA Storage Reservoirs project and the SFWMD's proposed Acceler8 EAA A-1 Reservoir project. A panther cumulative impacts analysis was prepared by the USACE for the SFWMD's proposed Acceler8 project and coordinated with the USFWS. Land covers anticipated to be provided as result of the project were evaluated for potential habitat value to the Florida panther (see Figure 2-11). On April 14, 2006, the USFWS terminated formal consultation by issuing a Biological Opinion (BO) stating

there will be no direct take in the form of mortality or injury of the Florida panther. It is the opinion of the USFWS that the loss of habitat from implementing the project, taking into consideration the status of the species, remaining habitat, and other factors considered by this biological opinion, such as the overall recovery objectives and other cumulative effects from the actions in the action area, will be offset by the conservation of other more functionally valuable habitat. Therefore, the proposed construction of the EAA project is not likely to jeopardize the continued existence of the Florida panther. Through implementation of the CERP Band 1/Acceler8 projects, the SFWMD proposes to preserve and enhance 59,294 acres and 41,772 acres of habitat used by the Florida panther in the Primary and Other Zones, respectively. Based on this the USFWS anticipated no direct take but incidental take in the form of harm and harassment associated with the loss of 15,924 acres of panther habitat within the "Other Zone" lands. The USFWS believes this level of take is not likely to result in jeopardy to the species.

The panther cumulative impact analysis considers the CERP Band 1/Acceler8 projects lands as compensation/preservation for the proposed take of habitat used by the panther. These lands are located in the core area of occupied habitat, the majority are adjacent to other large tracts of natural and preserved lands, and are consistent with the USFWS' goal to locate, preserve, and restore sets of lands containing sufficient area and appropriate land cover types to ensure the long-term survival of the Florida panther south of the Caloosahatchee River. The CERP Band 1/Acceler8 projects which include the EAA Reservoir A-1 project will result in preservation of 59,294 acres and 41,772 acres of habitat used by the panther within the Primary and Other Zones, respectively. These preservation efforts will benefit the Florida panther and its prey.

4.6.2.2 West Indian Manatee

As discussed in Section 3.4.5.2 manatees are currently able to access canals within the EAA, including those associated with the project site and the canals slated for expansion. Manatees have been documented in the area and have even gained access into the STA 3/4 water control structures adjacent to Compartment A. Manatee concerns relating to the footprint of the EAA Project are mainly due to the operation of structures including pump stations and spillway culverts.

As manatees currently have access to canals within the EAA, there exists the possibility for harm and/or mortality of manatees as a result of construction activities associated with canal expansion, including blasting, dredging, and watercraft activities.

Cumulative adverse impacts to the manatee could result from construction/improvements of the Miami, North New River, Bolles, and Cross Canals proposed under Acceler8 but not under the proposed action as well as numerous agricultural canals and from concurrent or future projects in the EAA. Construction of canals has allowed manatee to enter a region that it did not historically access; this, combined with the unsuitable habitat of the canals, increases the risk of manatee mortality (USFWS, 2005). By letter dated December 14, 2005, the USFWS concurred with the Corps' determination of not likely to adversely affect with inclusion of conservation measures in order to protect the manatee and reduce the risk of adverse impact.

4.6.2.3 Wood Stork

Wood storks typically forage in a variety of wetlands throughout the state, often far from known rookeries. However, during breeding season, productive wetlands providing good forage near rookeries are important to reproductive success. Seasonally flooded agricultural fields are also wood stork foraging habitat (Pearlstine et al. 2004). Loss of foraging habitat will occur in the project footprint as a result of reservoir construction, both from elimination of natural functional wetlands and the loss of atypical wetlands i.e., seasonally flooded agricultural fields. As embankments will be steep and covered with riprap/rock along the interior face of the reservoir, the embankments will likely provide limited resting/foraging areas for wood storks. Of greater importance to wood storks is the shallow habitat that may be created during the dry (breeding) season in the main portion of the reservoir, since wood storks require shrinking wetlands to concentrate food resources for their specialized feeding. Listed wading birds (including wood storks) and other wetland dependent fauna will also benefit from the deep-water refugia created within the reservoir. These refugia may become important foraging areas for listed wading birds during extreme drought. This will possibly create opportunities for wading bird foraging. Also, the short-hydroperiod wetlands created within the seepage/habitat buffer and the littoral shelves resulting from construction of seepage canals may provide suitable habitat for wood stork foraging and compensate for some of the loss of existing wetlands and temporarily flooded fields associated with the Build Alternative.

Although dry downs within the reservoir could concentrate and improve prey availability for wood storks, the potential remobilization of contaminants is of concern. When aquatic areas such as a reservoir dry and are subsequently re-hydrated, there is the potential for harmful contaminants such as mercury to be remobilized and ingested by prey species or by wood storks directly while feeding, thus negatively impacting the stork. The operation of the reservoir will minimize to the maximum extent practical, complete dry down

of the reservoir cells. The USFWS and FWC will be involved in developing the operations manual. *The Habitat Guidelines for the Woodstork in the Southeast Region* will be incorporated into the construction specifications as well as special conditions to reduce the risk of pesticide contamination including a redesign of the project footprint. The USACE determined the proposed project "may affect, but is not likely to adversely affect" the wood stork. By letter dated March 24, 2006, the USFWS concurred with this determination.

4.6.2.4 Bald Eagle

Bald eagles use the EAA and open water for occasional foraging; however, no eagle nests are documented in the vicinity of the project site. Eagles prefer using available open water areas near Lake Okeechobee for both nesting and foraging. Replacement of agricultural lands by open water reservoirs should not adversely affect bald eagle populations and may improve open water foraging areas. However, as discussed above regarding wood storks, when aquatic areas such as a reservoir dry and are subsequently rehydrated, there is the potential for harmful contaminants such as mercury to be remobilized and ingested by prey species of the bald eagle, thus negatively impacting the eagle. Reservoir drydowns will be minimized to the extent practicable. Also, the *Management Guidelines for the Bald Eagle in the Southeast Region* and *Bald Eagle Standard Local Operating Procedures for Endangered Species* will be used during construction of the EAA Project. If new electrical lines are constructed near open water to service new pumps, the publication "Suggested Practices for Raptor Protection on Power lines: The State of the Art in 1996" shall be consulted for recommended measures to protect bald eagles from electrocution. The USACE determined that the proposed project "may affect, but is not likely to adversely affect" the bald eagle. By letter dated March 24, 2006, the USFWS has concurred with this determination.

4.6.2.5 Audubon's Crested Caracara

Audubon's crested caracara is a widely foraging species using agricultural lands. Juveniles are nomadic, foraging sporadically over much of the agricultural lands in the EAA. Since the project footprint is outside their core breeding and nesting areas, it is unlikely that loss of foraging habitat will adversely affect this species. If caracaras or nests are encountered on the site, the USFWS will be consulted to ensure caracaras are not affected by the proposed activities. The USACE determined there will be "no effect" on the caracara. Although concurrence on a no effect determination is not needed, the USFWS provided written concurrence with this determination on December 14, 2005.

4.6.2.6 Everglade Snail Kite

Although conditions may be suitable for apple snail populations in some isolated wetlands, canals, and ditches in Compartments A, B, and C, no apple snails were observed during ground surveys and it is doubtful that these areas could support viable long-term apple snail populations. In addition, due to fluctuations in water levels and absence of vegetation, it is unlikely that apple snails would establish populations inside the reservoir and along the embankment system once construction is complete. Therefore, significant foraging habitat impacts for snail kites are not expected with the Build Alternatives. Due to the expected short-hydroperiod of the wetland portion of the seepage/habitat buffer and littoral shelves resulting from construction of seepage canals, conditions suitable to apple snail reproduction and snail kite foraging are possible, but unlikely.

This project may impact water stage conditions in WCA 2 and 3. The initial operating plan has been designed to minimize increases in high stage events and low stage withdrawals. In addition, littoral zones around Lake Okeechobee should significantly benefit from reduction in high stage events. This should benefit the conditions for apple snail populations and subsequently snail kites in the Lake Okeechobee littoral zone. The initial operations plan would be in place until the other Acceler8 features are functional and can receive the additional water that can be made available by the Acceler8 EAA Storage Reservoir. With all Acceler8 projects functioning, the long-term operational plan of EAA should improve habitat for apple snails. Therefore foraging habitat for snail kites should improve with this project. The USACE determined that this project "may affect, but is not likely to adversely affect" the snail kite or its critical habitat. The USFWS concurred with this determination on December 14, 2005.

4.6.2.7 Eastern Indigo Snake

Eastern indigo snakes have not been documented in Compartments A, B, or C, and although available habitat is present it is marginal. Indigo snakes are a wide-ranging species capable of utilizing a variety of habitats; therefore, they could occur within the affected area of all of the Build Alternatives. Construction of the reservoir on primarily agricultural land will result in the removal of potential habitat for the indigo snake. However, as the exterior embankments will be covered with soil and grass, they are expected to provide potential habitat for the snake. Also, the 50-foot wide maintenance portion of the seepage/habitat buffer may provide some improved habitat over that currently found within the buffer footprint and the undisturbed lands around the perimeter of the project would continue to provide habitat of existing quality. The use of the maintenance roads may make wildlife using these areas more vulnerable to road kill. There exists the possibility of

mortality of individual indigo snakes during construction and upon initial flooding of the reservoir. The initial flooding of the reservoir would be at a rate of one half inch per day until a depth of six inches is attained in order to minimize negative impacts to the eastern indigo snake. In addition, the *Standard Protection Measures for the Eastern Indigo Snake* (USFWS, 2002) will be followed during construction. The USFWS concurred with the USACE's determination that the project "may affect, but is not likely to adversely affect" the indigo snake on December 14, 2005.

4.6.2.8 American Alligator

The American alligator is a common species in the EAA occurring in open water habitat and wetlands. The alligator has been documented in wetlands and canals in Compartments A, B, and C. Although alligators will be affected by reservoir construction, they are a mobile species capable of retreating to unaffected areas. No alligator populations will be significantly or permanently affected. Once construction is completed, open water habitat will be greatly increased, expanding use by alligators. Embankments will likely create some suitable nest substrate for alligators. The USACE determined the proposed project would not affect the alligator. USFWS' concurrence with the no effect determination although not required was provided on December 14, 2005.

4.6.2.9 Sea Turtles

One of the objectives of this project is to reduce Lake Okeechobee regulatory releases to the St. Lucie and Caloosahatchee Estuaries, and thereby improve the water quality and salinity regime of the estuaries. This project, in concert with future Acceler8 projects, is expected to improve estuarine habitat conditions, including benefiting oyster bars and increasing the spatial extent of submerged aquatic vegetation. Improving the overall health of the estuary will benefit sub-adult sea turtles in the water that may forage in estuarine areas by increasing their food sources. For the aquatic environment, the USACE has determined this project "may affect, but is not likely to adversely affect" the sea turtles. As the proposed project will not affect the beaches, the USACE made a determination of "no effect" on the nesting habitat of sea turtles. The NOAA Fisheries and the USFWS concurred with the USACE's determinations for swimming and nesting sea turtles on April 11, 2006, and December 14, 2005, respectively.

4.6.2.10 Smalltooth Sawfish

As stated above, this project working in concert with future Acceler8 projects is expected to improve estuarine conditions. A more stable salinity regime should result in increased submerged aquatic vegetation coverage and increased populations of small fish and benthic organisms, which are a food

source for the sawfish. As such, the USACE has determined the proposed project "may affect, but is not likely to adversely affect" the sawfish. Concurrence from the NOAA Fisheries was provided on April 11, 2006.

4.6.2.11 Opossum Pipefish

Besides improving estuarine conditions, this project is expected to improve the littoral zone of Lake Okeechobee. Opossum pipefish have been documented in the St. Lucie Canal and the lake, and require dense emergent vegetation for breeding. This project working in concert with other Acceler8 projects is expected to improve water stages in Lake Okeechobee, which would result in benefits to the littoral zone, and reduce the amount of backpumping of agricultural runoff to the lake. These benefits to the water quality and vegetation of the lake would increase the food source and breeding area for the opossum pipefish. The USACE has determined the proposed project "may affect, but is not likely to adversely affect" the opossum pipefish. Concurrence from the NOAA Fisheries was provided on April 11, 2006.

4.6.2.12 Okeechobee Gourd

The current survival of the Okeechobee gourd is threatened by Lake Okeechobee water regulation practices and the expansion of exotic vegetation (primarily *Melaleuca* sp.) (USFWS, 1999). This project is expected to improve water stages in the lake, which may help to reduce the extent of exotic vegetation. The effects of this project on the Okeechobee gourd, if any, are expected to be beneficial. The USACE determined the project "may affect, but is not likely to adversely affect" the Okeechobee gourd. The USFWS has concurred with this determination on December 14, 2005.

4.6.2.13 Johnson's Seagrass

One of the objectives of this project is to reduce Lake Okeechobee regulatory releases to the St. Lucie Estuary, and thereby improve the water quality and salinity regime of the area. This project, in concert with other Acceler8 and CERP projects, is expected to improve estuarine habitat conditions, including benefiting oyster bars and increasing the spatial extent of seagrasses. Current modeling results from the South Florida Water Management Model (SFWMM) indicate a reduction in regulatory releases to the estuaries and the WCA by approximately 40%. The estuary is likely to have more stable salinity concentrations, and the reduction of releases from the lake is expected to also reduce the concentration of nutrients and pesticides going into the estuary. This project is expected to have a beneficial effect on Johnson's seagrass. The USACE has determined the proposed project "may affect, but is not likely to adversely affect" Johnson's seagrass. Concurrence from the NOAA Fisheries was provided on April 11, 2006.

4.7 STATE-LISTED SPECIES

4.7.1 No Action

The Florida burrowing owl has been documented in the EAA. If the owls are resident to the area and have burrows, burrowing owl use under the No Action Alternative could continue until soil subsidence and wetness make it unacceptable for burrow construction and maintenance. This species generally uses open upland habitat such as dry prairie or pastures.

Regional environmental trends in the EAA that would continue with or without the project include soil subsidence and gradually increasing soil wetness. As subsidence continues, slight expansion of wetland habitat may slightly benefit some wetland dependent species. Region-wide improvements of water quality would generally benefit state-listed wading birds (little blue heron, tri-colored heron, snowy egret, reddish egret, white ibis, limpkin, and roseate spoonbill).

Continued adverse affects on listed wading birds could result from the no action alternative in both Lake Okeechobee and the WCAs since regulation of surface water levels may compromise ecological needs for flood control needs.

4.7.2 Build Alternatives

Eleven state-listed bird species are documented from the EAA and it is likely that the species, particularly wading birds occasionally use Compartment A, B, or C. No nesting colonies of wading birds occur within close proximity to any of the Build Alternatives where there would be important foraging areas during crucial nesting season. Foraging habitat, however, exists within all of the Build Alternatives and such habitat would be affected by reservoir construction. Although there will be temporary effects to wetland foraging areas used by state-listed wading birds, these mobile species will take advantage of other similar areas within the EAA. Once construction is completed, a littoral zone and wetlands in the seepage buffer outside the reservoir will replace some foraging habitat.

The lands within the Build Alternatives likely contain burrows of the Florida burrowing owl, based on sightings of owls by an interagency field team. This owl is a state species of special concern. These birds use dry prairies, pastures, and agricultural areas to construct their underground burrows for nesting and cover. They exhibit some nest site fidelity; however, they will not use burrows if environmental conditions are not favorable. They require open land and dry soils. If construction occurs in the vicinity of owl burrows, a take permit will be required from the State of Florida to destroy the burrow. If required, burrow destruction should be undertaken prior to the nesting season, to ensure minimal disruption to the reproductive effort of the

owls. Typically, burrowing owls will construct new burrows away from areas under active disturbance. Thus, construction should be staged so that lands around the "taken" burrows are unattractive for burrow reconstruction.

The gopher tortoise, a state species of special concern, has not been documented within Build Alternatives. The heavy agricultural use of most of the area and lack of deep, well-drained sands reduces the likelihood of use by tortoises.

Region-wide improvements of water quality from reductions in phosphorus concentrations entering STA-3/4, improved timing of water deliveries to WCA 3, and reductions in pulse releases from Lake Okeechobee to the estuaries is expected as a result of the proposed project. Improvements to these natural areas should have a beneficial effect on state listed species, particularly the wading birds listed above.

4.8 FISH AND WILDLIFE

4.8.1 No action

4.8.1.1 Everglades Agricultural Area

Under the No Action Alternative, no significant change would likely result to fish and wildlife populations in Compartments A, B, or C. Regional trends that could shape future conditions in the EAA include: 1) minor changes in land cover/use caused by wetter conditions from soil subsidence; and, 2) improved surface water quality. Minor changes in regional land cover were discussed previously. In general, shifts to somewhat wetter conditions in the EAA would favor wetland fauna or wetland dependent fauna tolerant of the disturbed conditions in agricultural production areas. Some displacement of wildlife could result from expansion of urban or extractive land cover types within the EAA; however, these changes are not likely to affect Compartments A, B, and C.

Regional trends in water quality within the EAA should affect fish, aquatic or wetland wildlife populations directly or indirectly by affecting prey or forage used by wetland dependent species. Nutrient loadings to surface water would generally decrease through the project planning period. Slight declines in turbidity and suspended solids, sulfate concentrations, pesticides, and specific conductance in canals should continue. Thus, through the year 2050 under "without project" conditions, water quality should continue to generally improve. This will improve fish populations by increasing water clarity and allowing increased coverage of important fish habitat such as SAV. The general improvement of water quality within canals should somewhat benefit resident fish or wildlife directly; however, downstream receiving waters and fauna would significantly benefit. Although the canals

contribute to significant amounts of open water areas in the EAA and Compartment A, they have low habitat value due to their construction and management. These can lessen potential benefits to resident wildlife compared to more natural shallow, open water habitat. Canals generally lack littoral zones due to steeply sloped sides. These canals have reduced emergent or submergent vegetation due to vegetation management used to maintain conveyance capacities and levee integrity. Consequently, without the Project, wetlands, particularly marshes, should benefit by nutrient reductions since cattail-dominated freshwater marshes arise in nutrient-rich conditions, whereas sawgrass is favored in nutrient-poor conditions.

4.8.1.2 Lake Okeechobee

The desired restoration of historic water fluctuations within Lake Okeechobee could not be accomplished without the project including future Acceler8 projects. Although recent modifications to the lake's regulation schedule will assist in the restoration of Lake Okeechobee, the full benefit would not be fully realized without the available storage of the Acceler8 EAA reservoir to reduce extreme events and increased phosphorus loading due to back pumping. Continued artificially high water levels, extreme stage levels and back pumping events within the Lake Okeechobee basin reduces the availability of bedding habitat for fishes, disrupts the base of the food web and changes the extent and composition of the emergent and submergent vegetation communities. If opportunities for lower water levels and reductions in extreme events were allowed, this would provide good foraging for wading birds and other birds dependent upon aquatic prey species by concentrating prey and exposing additional shallow water habitat.

4.8.1.3 Northern Estuaries

Continued regulatory releases from Lake Okeechobee would adversely affect the estuarine water quality and the plants and animals within the estuary. Reduction of health or extent of the SAV has deleterious impacts to the estuarine fish and invertebrates that utilize this habitat as a nursery area. Loss of juvenile fish and shellfish as prey for predatory fish and birds has a cumulative adverse impact through the estuarine and marine food web, as well as directly reducing commercially important fish and shellfish.

4.8.1.4 Water Conservation Areas

Both water supply and water quality affect fish and wildlife in the WCAs. From a quantity, timing, and distribution standpoint, the No Action Alternative may further degrade these conditions. The current system does not allow water managers the flexibility of providing water to the WCAs during the dry season for ecological needs. This increases the susceptibility of these areas to large freshwater releases related to flood control.

Continuation of altered hydroperiods within the WCAs could have adverse effects on marsh communities and tree islands as well as the wildlife that depend on them.

Current trends in water quality within the WCAs impact fish, aquatic or wetland wildlife populations directly and indirectly by affecting prey or forage used by wetland dependent species. Stormwater Treatment Areas built as part of the Everglades Construction Project are expected to improve the quality of water going into the WCAs. Nutrient loadings to surface water will decrease such that water quality should continue to improve. This could improve fish populations by increasing water clarity and allowing increased coverage of important fish habitat.

4.8.2 Build Alternatives

4.8.2.1 Everglades Agricultural Area

4.8.2.1.1 Aquatic Fauna

Existing open water habitat in the form of agricultural ditches/canals would be lost under the construction footprint with all of the Build Alternatives. However, once the reservoir is constructed aquatic (open water) habitat will substantially increase. For example, existing ditches and canals will not be filled but instead allowed to remain with the footprint of the reservoir creating deepwater refugia in times of low water levels within the reservoir. Additionally, a borrow canal will be constructed within the reservoir for obtaining construction materials and will also provide deep water refugia. For the Preferred Alternative, there are 149.83 acres of existing aquatic habitat (ditches/canals) within the footprint of the open water reservoir. As a result of the project there would be 878.83 acres of deepwater refugia within the reservoir, 15,211 acres of total open water within the reservoir, and 142 acres of open water within the seepage canal excluding the littoral shelves. The acreage for open water within the reservoir would be less for Cell A-2 and Compartments B and C because of the smaller acreage for these alternatives.

The open water reservoir has the potential to harbor fish typical of nearby canals. Water would be conveyed to the reservoir by these canals which also act as conduits for the introduction of many aquatic organisms, including fish. Species that will likely inhabit the reservoirs include: largemouth bass, black crappie, red-ear sunfish, shad, bluegill, and mosquitofish, among others. Diversity of invertebrates living in reservoirs can be low, especially in deepwater systems that lack emergent vegetation. Invertebrates typically found in lake sediments that provide forage for fish include chironomids, crayfish, and shrimp. In general, shallow water fish bedding and rearing habitat will be limited to the margins of the reservoir. The reservoir's limited

littoral zone may tend to reduce populations of fish species dependent upon this habitat for reproduction and sheltering juveniles.

Amphibians and aquatic reptiles including frogs, turtles, snakes, and alligators will likely inhabit the deepwater reservoir. Limited emergent vegetation in the reservoir will also affect these organisms by reducing available forage, cover, and reproductive habitat. The reservoir will also create foraging habitat for osprey, bald eagle, terns, cormorant, and other aquatic birds that feed on fish. Ducks may also use the reservoir, but low cover of submergent and emergent vegetation may limit the habitat value. Mammals in the reservoir will likely be limited to river otter.

A littoral zone will be constructed within the seepage canal outside of the reservoir with all of the Build Alternatives. The littoral zone would provide habitat for invertebrates, fish, and amphibians.

4.8.2.1.2 Wetland Fauna

Natural, low quality wetlands would be displaced by reservoir construction with all of the Build Alternatives except construction of the reservoir within Compartment B. Acreages of natural wetlands present within the footprints of the Build Alternatives are as follows: Cell A-1 of Compartment A contains 187.63 acres, Cell A-2 of Compartment A contains 18.37 acres, and Compartment C contains 288.35 acres of wetlands. There are no natural, nonagricultural wetlands within the portion of Compartment B evaluated as an alternative for the Acceler8 EAA reservoir.

Actual habitat loss for wading birds likely will exceed the acreage of natural wetlands identified above as many of the existing agricultural lands are atypical wetlands. As such the sugarcane fields provide seasonal foraging habitat for a variety of wading and shorebirds. For the Build Alternatives direct losses of habitat loss potentially used by wetland fauna are as follows: Cell A-1 of Compartment A – 15,655.11 acres, Cell A-2 of Compartment A – approximately 15,000 acres, Compartment B – approximately 7,485 acres, and Compartment C – approximately 6,528.35 acres. Note that acreage estimates for Compartment A includes lands identified as Urban and Extractive.

Creation of wetlands within seepage buffers is an incidental benefit associated with all of the Build Alternatives. The seepage buffer would be located exterior to the reservoir embankment and extend to the seepage canal. Under the preferred alternative, approximately 205 acres of wetland habitat would be created as a result of the seepage buffer. The seepage buffer with its primary objective of reducing water quality effects of seepage

water is anticipated to provide habitat for macroinvertebrates, amphibians, reptiles, wading and aquatic birds, and small mammals.

Wildlife observed using herbaceous and shrub wetlands include marsh rabbit, red-winged blackbird, roseate spoonbill, anhinga, great egret, green-backed heron, belted kingfisher, little blue heron, tri-colored heron, and common moorhen, among others. These species are expected to occur in the seepage buffer, littoral zone, and the undisturbed lands that will surround the project footprint.

4.8.2.1.3 Upland Fauna

No existing natural upland communities are present within any of the Build Alternatives; therefore, no natural upland communities will be displaced by the proposed reservoir construction.

An earthen embankment will be created with all of the Build Alternatives. The embankment will allow for flexible water management and although not technically an upland community within the land cover classification, will partially function as an upland habitat. The embankment may provide some upland habitat as resting, basking, and burrowing places for birds and reptiles; provide corridors for non-aquatic species and nesting habitat for aquatic turtles, ground-nesting birds, snakes and possibly alligators. The presence of the embankment will help to improve wildlife and plant diversity in an area to be dominated by aquatic habitat. Use of the embankment by vehicles may make resident and transient wildlife somewhat more vulnerable to road kill since upland habitat will be scarce in the vicinity of the reservoir.

4.8.2.1.4 Fauna of Disturbed Areas

Approximately 15,467.48 acres of disturbed agricultural habitat would be replaced by the construction of the reservoir with selection of the Preferred Alternative. Under the other Build Alternatives, approximately 14,981.63 acres of disturbed agriculture habitat would be impacted with Cell A-2 of Compartment A, approximately 7,485 acres of disturbed habitat with Compartment B, and approximately 6,240 acres of disturbed habitat with Compartment C. These habitats represent the most extensive landscape feature throughout the region. Although they historically replaced native wetland communities, they still provide some wildlife benefits, providing feeding areas, cover, or breeding/nesting habitat for generalist wildlife species that can use a broad range of environmental conditions such as boat-tailed grackle, cattle egret, common nighthawk, killdeer, turkey vulture, and tree frogs. A few more specialized species such as burrowing owl or Woodstork may also use these lands where the habitats marginally meet certain environmental needs. Flooded sugarcane fields provide seasonal foraging habitat to a variety of wading and shorebirds.

Conversion of agricultural land to an open water reservoir would reduce the potential habitat for terrestrial wildlife. The USFWS has noted that although there would be an overall loss of habitat for terrestrial and shallow water species with the conversion of agricultural lands and associated canals, this may be beneficial overall, as prey on agricultural lands "may be potentially hazardous to wading birds" (USFWS 2005)

Temporary adverse effects on wildlife are anticipated during construction due to noise, land grading, and lighting. Commitments to the protection of wildlife during the construction phase are documented in the Chapter 8, Environmental Commitments. Wildlife is anticipated to return to the area after construction.

4.8.2.2 Lake Okeechobee

As a result of construction of the Acceler8 storage reservoir in the EAA and in concert with other Acceler8 projects, overall wildlife habitat benefits are expected to occur in the littoral and nearshore zones of Lake Okeechobee. Reducing Lake Okeechobee extreme high and low stage events in addition to reductions in back pumping from the EAA should increase appropriate nesting and foraging habitat for economically important sport fish populations, wading birds, migratory waterfowl, alligator, and the federally listed Everglade snail kite. The Compartment B and C alternative benefits to Lake Okeechobee would be less than benefits from construction of a reservoir in Compartment A. This is due to the location of Compartment C being further away from any of the major regional system canals capable of discharging a large volume of water south from Lake Okeechobee. Cell A-2 would provide less benefit because of the overall smaller capacity of the reservoir at this location compared to Cell A-1.

4.8.2.3 Northern Estuaries

As a result of construction of the Acceler8 storage reservoir in the EAA and in concert with other Acceler8 projects, overall wildlife habitat benefits are expected to occur in the St. Lucie and Caloosahatchee estuaries, and natural areas downstream. Reducing the fluctuation of salinities caused by large fresh water pulse flows, as well as reducing loading of phosphorus and nitrogen associated with the reduction of flows, would allow seagrass, and mangrove habitat conditions in the downstream estuaries to improve through a more sustained salinity regime. With these improvements in water quality and quantity, the appropriate conditions for sensitive estuarine biota including oysters and fish will benefit. The Compartment B and C alternative benefits to Lake Okeechobee will be less than benefits from construction of a reservoir in Compartment A. This is due to the location of Compartment C being away from any of the major regional system canals

capable of discharging a large volume of water south from Lake Okeechobee. Cell A-2 would provide less benefit because of the overall smaller capacity of the reservoir at this location compared to Cell A-1.

4.8.2.4 Water Conservation Areas

As a result of construction of the Acceler8 storage reservoir in the EAA and in concert with other Acceler8 projects, overall wildlife habitat benefits are expected to occur in Water Conservation Area 1, Water Conservation Area 2A, Water Conservation Area 3A and Everglades National Park. Specifically, improved hydroperiods will produce the maximum number of high quality foraging patches improving wading bird nesting patterns. Additionally, habitat improvements will benefit wildlife resources such as snail kites, waterfowl, alligators, turtles, frogs, fishes, apple snails, and other invertebrates. No benefits or impacts to wildlife are anticipated in WCA 2B and the potential exists for wildlife impacts in WCA 3B as a result of continued extreme events, elevated stage levels and previously stated influences of non-CERP projects and operational constraints. Benefits resulting from the Compartment B and C and Cell A-2 alternatives will be somewhat less than the Cell A-1 alternative due to the smaller capacity of the reservoirs at these locations. In addition, in the Compartment B and C alternative, Compartment C's location on the far western side of the EAA will reduce the ability to retain significant flows from Lake Okeechobee which will reduce the volume of water that could be distributed to WCA-3A to the south.

4.9 ESSENTIAL FISH HABITAT

4.9.1 No Action

Under the No Action Alternative EFH would continue to be adversely impacted through discharge of excess stormwater from Lake Okeechobee through the St. Lucie River to the Atlantic Ocean. Some freshwater, high volume, pulse releases are very damaging to the St. Lucie and Southern Indian River Lagoon estuaries. Likewise, excess stormwater discharged to the Gulf of Mexico through the Caloosahatchee River is damaging to the Caloosahatchee Estuary. Furthermore, continuing extreme lake stages, increases in phosphorus as a result of back pumping from the EAA affects water clarity, reduces spatial extent of near-shore and littoral zone vegetation, translating in impacts to EFH, as a loss of bedding and foraging habitat

4.9.2 Build Alternatives

Construction of a reservoir within the EAA will reduce the amount of undesirable freshwater releases to the estuaries thus reducing its adverse

impact on salinity levels. The proposed project is also expected to provide improvements in the water quality in Lake Okeechobee through reductions in back pumping translating to reduced pollutant loads to the estuaries. The proposed project is also expected to slightly improve the water quality in Lake Okeechobee thus reducing pollutant loads to the estuaries. Reducing the fluctuation of salinities caused by large fresh water pulse flows, as well as reducing loading of phosphorus and nitrogen associated with the reduction of flows, would allow seagrass, and mangrove habitat conditions in the downstream estuaries to improve through a more sustained salinity regime. With these improvements in water quality, the appropriate conditions for sensitive estuarine biota, such as species dependent on this habitat for egg, larval, and juvenile stages, are anticipated to benefit or rebound. Benefits in EFH are also expected within the Lake with reductions in extreme lake stages and phosphorus concentrations. The Compartment B and C alternative benefits to Lake Okeechobee and the estuaries will be less than benefits from construction of a reservoir in Compartment A. This is due to the location of Compartment C being away from any of the major regional system canals capable of discharging a large volume of water south from Lake Okeechobee. Cell A-2 would provide less benefit because of the overall smaller capacity of the reservoir at this location compared to Cell A-1

All construction features of the Build Alternatives are well inland of any EFH. Standard best management practices to reduce erosion and downstream turbidity will be included in the construction specifications.

The USACE has determined that construction activities would have no adverse impact on EFH in the downstream estuaries and that implementation of the project would have a positive affect on EFH. By letter dated November 17, 2005, the Habitat Conservation Division of the NOAA Fisheries concurred with the USACE's proposal to construct the EAA Storage Reservoirs project stating reducing high-volume freshwater pulsed releases from Lake Okeechobee should have a positive effect on EFH and other trust resources present in the St. Lucie and Caloosahatchee River estuaries, and the Indian River Lagoon. The EFH consultation for the CERP EAA Storage Reservoirs project applies to the SFWMD's proposed EAA Reservoir A-1 project since it is located within the footprint of the proposed CERP project and project goals and objectives are consistent.

4.10 CULTURAL, HISTORIC AND ARCHAEOLOGICAL RESOURCES

4.10.1 No Action

There will be no impacts to cultural, historic and archaeological resources with the No Action alternative.

4.10.2 Build Alternatives

Construction and operation of the reservoir within Cell A-1 of Compartment A, Cell A-2 of Compartment A, and Compartment B would have no effects on cultural resources. A review of the Florida Master Site Files, and a site visit in June 2002 determined Compartments A and B contained no recorded historical properties. The properties have heavily impacted by long-term agricultural practices and both road and canal construction, resulting in a highly disturbed landscape. SHPO concurred with the recommendation that no cultural resource survey was necessary, with the conditions that the project manager complete Archaeological Resource Manager's training or a professional archaeological consultant to be on call to perform periodic monitoring throughout the ground-disturbing phase of the project. Consultation with the SHPO for both Compartments A and B is complete.

Compartment C contains eight known prehistoric sites which are potentially eligible for the National Register of Historic Places (NRHP). Formation of the sites (mounds) is a result of long-term fluctuation in relatively high water tables as well as periodic (seasonal) inundation, processes which resulted in the leaching of calcium from the underlying coquina limestone formation as well as from the abundant shell remains in the overlying midden. The combination of the underlying coquina and the shell in the midden has served to create a highly nonacidic matrix that fosters excellent preservation of the mounds.

Additionally, the soil of the mounds, as well as the surrounding region, is a loose loamy sand. Texture of these soils is fundamentally granular (no clay to bind individual grains together into soil peds) and when dry, readily subject to erosion, mostly by wind, unless it is kept wet or under constant vegetative cover or a combination of both. And for the last 2000 years that the mounds have been in existence, the soil has been wet enough (via high water tables) to prevent significant erosion by means of wind action and other processes. Any efforts to change current conditions may have deleterious effects on the mound contents and thus their National Register eligibility, therefore construction of a reservoir would likely have an adverse impact on the historical resources. There is also one documented prehistoric site at the junction of the Bolles, Cross and New River Canals that was determined to be ineligible for listing with the NRHP. There are also documented historic sites on the south side of Lake Okeechobee around the junctions of Lake Okeechobee and both the Miami and North New River Canals.

The Project will comply with Section 106 of the National Historic Preservation Act of 1966 (PL89-665), as amended in 2000, it's implementing

regulations (36 CFR 800) and the Archaeological and Historic Preservation Act of 1974 (PL93-291), as amended.

4.11 SOCIO-ECONOMIC ENVIRONMENT

4.11.1 No Action Alternative

Despite population loss in the EAA between 1990 and 2000, the area should see significant population growth in the future. Palm Beach County's population is projected to increase 64%, from 1.13 million to 1.86 million, over the thirty year period from 2000 to 2030 (BEBR, 2002). Assuming a conservative 1% annual growth rate between 2030 and 2050, Palm Beach County's population would grow to 2.27 million. Hendry County has a much smaller population but should grow 71%, from 36,000 to 62,000 between 2000 and 2030. Assuming the same 1% annual growth rate from 2030 to 2050, Hendry County's population would grow to 75,000 persons.

The project footprint under the No Action alternative would not have significant direct or indirect effects on population within the EAA or the South Florida Region as measured by displaced population from the project footprint and induced population growth. The 2000 U.S. Census reported 20 persons living along the eastern border of Compartment A. The purchase agreement between the United States Department of Interior (DOI), SFWMD, and the landowners allowed farming to continue on most of the land until March 31, 2005. After March 2005, land could be leased for agricultural purposes until needed by USACE for restoration purposes. Compartments B and C are currently out of production, with the exception of a turf farm lease in the northern portion of Compartment B.

Under the No Action Alternative, likely land uses within the project footprint would not have a significant effect on future population growth in other areas resulting from agricultural uses of the area or conversion to open space uses. Palm Beach County's "Agriculture Production" land use designation on the project area restricts residential development to farm labor quarters and camps, caretaker's quarters (e.g., for pump houses), and dwelling quarters and farm residences for bona fide farm operations. Consequently, future residential development potential on the property is limited by the land use designation, whether the property remains in agricultural uses or is converted to open space. Even in the unlikely event that the land use designation was changed to allow higher density residential development, lack of central water and sewer infrastructure effectively preclude most residential development. Conventional well and septic systems are unlikely in the area because of soil and groundwater characteristics. In summary, potential uses under the No Action Alternative would not shift future population growth to another location.

Sugarcane production is expected to decline in the EAA from 529,920 acres (1995 condition) to 491,520 acres (2050 condition) due to the implementation of restoration on agricultural land. Sugarcane production will also be directly related to future U.S. government import/export policies and the relationship with Cuba.

4.11.2 Build Alternatives

Construction and operation of the Build Alternatives will not have significant direct or indirect effects on population within the EAA or South Florida Region as measured by displaced population from Compartment A and induced population growth. The 2000 U.S. Census reported 20 persons living along the eastern border of Compartment A.

The Build Alternatives will not have a significant effect on future population growth in other areas resulting from conversion of the site from agricultural use to a reservoir. As stated above, the county's land use designation restricts residential development, whether the property remains in agricultural use or is converted to storage reservoir.

Conversion from predominantly agricultural use to a storage reservoir will indirectly affect population by changing the type and number of employees employed in the area. Agriculture employment in the EAA was estimated to be 74 persons based on an employee to acreage ratio of one full-time farm worker per 289 acres of sugarcane (Roka & Cook, 1998).

The conversion to a reservoir will also eliminate the production value of sugarcane and other crops. Compartment A contains approximately 23,791 acres in sugarcane, 620 acres in row crops, and 142 acres in other agricultural lands (Water & Air Research, 2005). Sugarcane production on the Compartment A in 2002 was estimated to be 469,852 tons with a value of $13.3 million or about 3.7% of total sugarcane production value in Palm Beach County. Compartments B and C are currently out of production with the exception of a turf farm in the northern portion of Compartment B. Conversion to reservoir would not impact the majority of these lands, with the exception of the turf lease.

Construction, operation, and maintenance of a storage reservoir will generate demand for workers. This will have a positive impact through direct employment and spin-off service employment within the region. The need for construction materials, such as concrete, will also be filled locally. Once completed, operation and maintenance personnel will also be needed and filled primarily from the local (i.e., West Palm Beach-Boca Raton Metropolitan Statistical Area (MSA), Miami-Ft. Lauderdale Combined Metropolitan Statistical Area (CMSA), and the Ft. Pierce-Port St. Lucie MSA,

and Glades and Hendry Counties) area. The primary local benefits will be direct employment, direct purchase of construction materials as well as secondary/induced jobs (economic activity). Construction, operation, and maintenance employment has not been determined. Approximate construction costs are $379 million; annual operations and maintenance costs are estimated to be $28 million.

Water quality improvements in Lake Okeechobee, the Everglades, St. Lucie Estuary, Caloosahatchee Estuary and other areas resulting from the storage reservoir should have a significant, indirect effect on economic activity in the region through revenues from increased fisheries production and an increase in tourism-related expenditures. The Compartment B and C alternative benefits to Lake Okeechobee as well as the St. Lucie and Caloosahatchee Estuaries would be less than an alternative in Compartment A due to the location of Compartment C being further away from any of the major regional system canals capable of discharging a large volume of water south from Lake Okeechobee. The Cell A-2 alternative would provide less benefit because of the overall smaller capacity of the reservoir at this location compared to the Cell A-1 alternative.

Increased water storage capacity should reduce agricultural flood damage thereby indirectly affecting agricultural employment. The additional water storage should enhance economic values and social well-being in urban areas near Lake Okeechobee by reducing the number of structures affected by flooding. The storage reservoir will also increase the viability of agriculture through maintenance of high water tables, which is thought to be a key to reducing subsidence (Snyder, 2004).

Development of the storage reservoir will not have significant effects on community infrastructure and services. Infrastructure in the area is limited to roads, electric, and telephone service. Roads could be temporarily affected by traffic from construction activities; however, effects should be minor. Community services such as schools, public protection, and fire and emergency management services should be essentially unchanged.

4.12 ENVIRONMENTAL JUSTICE

In accordance with Executive Order 12898, the Federal government is required to review the effects of their programs and action on minorities and low income communities. This is accomplished by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. In public outreach efforts to date, the following potential environmental justice issues have been identified for a storage reservoir in the EAA:

- Displacement of minority or low income inhabitants of land within the footprints of land purchases required for each of the EAA Storage Reservoir project alternatives.
- Change in conveyance of water required by the alternatives causing flooding or related issues that would disproportionately impact minority groups or low income class groups.
- Loss of jobs for low income and minority workers as a result of acquiring agricultural land for the construction of reservoir(s).

The Acceler8 EAA Storage Reservoir will have no disproportionately high and adverse human health or environmental effects on minority or low income populations. The Acceler8 EAA Storage Reservoir project offers an opportunity to benefit these communities. By judicious selection of possible locations for the proposed reservoir(s) displacement of minority or low-income inhabitants has been avoided. In addition, land that has historically been used for agriculture, but now has limited agricultural value, will be used for the Acceler8 EAA Storage Reservoir project. This will minimize the potential direct loss of jobs. The Acceler8 EAA Storage Reservoir project can support the remaining agriculture in the EAA. In fact, it could improve agriculture by augmenting water supply and flood control for the EAA. It should also be noted that the Acceler8 EAA Storage Reservoir project is expected to contribute to hydrological and water quality improvements in Lake Okeechobee, coastal estuaries, and the historic Everglades. In addition, reduction of back pumping EAA run-off will improve water quality in the rim canal where South Bay and Belle Glade Municipalities currently withdraw water for potable supply. Recreational benefits are also being proposed as a goal and objective of the SFWMD's Acceler8 program. Socioeconomic development activities resulting from construction of the reservoir should include but are not limited to construction symposiums, contract opportunity assistance for small business involvement and job cross training for local residents. These all act to make the area more attractive to visitors and in turn, may provide jobs and subsistence for low income and minority populations of the area.

4.13 WATER QUALITY

Water quality would be equivalent for the Build Alternatives. Potential impacts to water quality as a result of implementation of the No Action and Build Alternatives are discussed below.

4.13.1 No Action

Many projects scheduled for completion have the specific purpose of lowering total phosphorus (TP) concentrations entering the Environmental Protection Area (EPA) and will also affect a variety of other water quality parameters.

Some of the projects will not show effects in the near future. For example, the overall goal of the Lake Okeechobee Protection Plan is to reduce TP loading from the watershed to the lake to an average of 140 metric tons per year from all sources. Achievement of this Total Maximum Daily Load (TMDL) rests partly on the proposed CERP Lake Okeechobee Watershed project (LOWP) realizing its water quality goals. The Lake Okeechobee Priority Basins contribute an approximate average annual phosphorus (P) loading to the lake of 322 metric tons, which is approximately 50% of the total P load (515 metric tons/yr) currently entering Lake Okeechobee. Assuming a 25% BMP reduction and a P-load TMDL of approximately 70 metric tons/year (approx. half of the total TMDL for the north rim of Lake Okeechobee, only), the LOWP has essentially been designed to reduce approximately 130 metric/yr of P. This leaves another approximate 190 metric tons/yr (or, so) of P load from the southern Lake Okeechobee basins that must be removed in order to achieve the overall Lake TMDL goal. If the LOWP does not occur, the state would look for other ways to implement other projects to achieve the target. This load is expected to eventually result in an average in-lake TP concentration of about 40 micrograms per liter (µg/L). However, this goal is not expected to be achievable for at least 30 years following the mandated 2015 project completion date. This predicted lingering TP concentration in the lake water column is expected due to the phosphorus trapped in sediments that will be released for years after TP levels in the water have dropped (FDEP, 2001).

Flows from other basins and watersheds are being incorporated into the EAA through the STAs. Total phosphorus is a parameter of particular concern in the EAA. Currently, implemented BMPs in the EAA have resulted in reductions of TP meeting or exceeding the 25 % reduction required for compliance (McGinnes, et al., 2004). In addition, the STAs have performed better than predicted and are planned to be further enhanced until completion in 2006 (B&M, 2003; Piccone, et al., 2004).

Additional projects that could improve water quality parameters are the improved operation of Holey Land and Rotenberger Water Management Areas (WMAs), which could increase nutrient removal efficiencies in these natural wetland areas through better hydroperiod management. Also, any conversion of EAA lands from sugarcane farming to fallow lands (possibly natural wetlands) would further reduce TP loads downstream.

All of these projects should result in a continuing decline of TP concentrations within the surface waters of the EAA. It is predicted that in the "without project" condition, average TP at the north end of the EAA canals could be as low as 40 µg/L, and somewhere in the vicinity of 10 to 15 µg/L at the south end of the EAA prior to discharge into the EPA.

Several other water quality parameters could be expected to change in response to anticipated activities and land use changes in the EAA over the planning period. For example, concentrations of organic nitrogen could decrease in response to the water quality programs being implemented in Lake Okeechobee, in the contributing basins to the EAA, and within the EAA. Total nitrogen concentrations have been declining in the EAA canals since at least the 1970s, apparently in response to changing farming practices and BMPs. These nitrogen concentrations should eventually level off at approximately 2 to 2.2 milligrams per liter (mg/L) based on normal background concentrations typical of South Florida wetlands.

Dissolved oxygen (DO) concentrations in the EAA canals have averaged between 3.9 and 4.8 mg/L over the past four decades with no clear temporal trends. These concentrations could increase slightly as a result of decreased nutrients in Lake Okeechobee. The water in the canals is largely from the lake. Lower nutrients in the lake will result in reduced levels of algae. This in turn would reduce the organic load to the canals allowing dissolved oxygen levels to rise slightly in the future. However, due to the physical nature of the canals and their position in an area of wetlands and organic soils, DO concentrations should continue to be depressed below the 5 mg/L Class III water quality criterion. DO concentrations within the STAs and within natural wetlands in the Holey Land and Rotenberger WMAs should remain similar to current conditions (typically < 4 mg/L).

Specific conductance increased in the EAA canals until the 1980s to an average of about 1,028 microSiemens per centimeter (µS/cm) and has been decreasing since that time. This decreasing specific conductance trend should continue in light of changing agricultural practices in the EAA to near historic levels, approximately 600 µS/cm, by the end of the planning period.

Levels of turbidity and suspended solids have declined slightly in the EAA canals in the past decade. A continuing trend of decreasing concentrations is expected in light of the variety of water quality improvement projects in and around the EAA. This trend could result in EAA canal concentrations of turbidity and suspended solids less than 10 Nephelometric Turbidity Units (NTU) and 10 mg/L, respectively.

Sulfate concentrations in the EAA canals increased from the earliest records in the 1930s through the 1980s when they reached a maximum decade average concentration of about 97 mg/L. Since 2000, average canal sulfate concentrations have declined to 1930s levels (about 42 mg/L). Total mercury concentrations have also decreased in the EAA canals over the past decade. This trend should continue under the “without project” condition.

Concentrations of some key pesticides that are frequently found in the EAA canals have declined precipitously over the past three decades. For example, average canal water concentrations for atrazine have declined from 1.2 to 0.6 µg/L since the 1980s. The average simazine concentration has declined from 2.2 to 0.08 µg/L over the same period.

4.13.2 Build Alternatives

Adverse impacts to water quality within downstream areas during construction of the proposed reservoir will be minimized through best management practices. During construction the site will be contained enclosing the construction areas with sedimentation barriers. Erosion will be controlled by compaction of soils, construction of ditches, and embankments, maintenance of relatively flat grades, and other appropriate erosion control techniques. Sedimentation will be controlled during construction by use of sediment controls basins and traps, filter berms, straw bales, etc. In addition, a National Pollution Discharge Elimination System (NPDES) Stormwater Pollution Prevention Plan (SWPPP) will be provided and implemented by the contractor during construction. The SWPPP will include quality monitoring, such as turbidity measurements, during construction and stormwater discharges. Monitoring of the discharges will be perform in accordance with the standard specifications and coordinated with the farming operations on site, prior to release if a release is necessary.

The proposed project when completed will be a large reservoir. If the reservoir feature is determined to be a "Water of the United States", the State would determine which water quality standards would apply. The reservoir may have poor water quality due to high nutrient concentrations, low dissolved oxygen, algal blooms, and pesticides. On the other hand if the reservoir is determined to be a waste treatment system, then a NPDES permit will be required. In order to assure water quality standards are met, monitoring would be required. Annex F includes the Water Quality Monitoring Plan for the CERP EAA Storage Reservoirs project; this plan would be implemented for the Acceler8 EAA Reservoir project if permitted by the USACE, absent a federally accepted Water Quality Monitoring Plan by the FDEP or a revised Water Quality Monitoring Plan for the CERP EAA Storage Reservoirs project.

Implementation of any of the Build Alternatives is expected to improve water quality conditions in the EAA, as well as in Lake Okeechobee, the Caloosahatchee Estuary, the St. Lucie Estuary, and the WCAs through 1) reducing releases from Lake Okeechobee 2) reducing backpumping of agricultural runoff into Lake Okeechobee 3) reducing phosphorus concentration of water released from the reservoir entering the STAs. The Compartment B and C alternative benefits to Lake Okeechobee would be less

than an alternative in Compartment A due to the location of Compartment C being further away from any of the major regional system canals capable of discharging a large volume of water south from Lake Okeechobee. The Cell A-2 alternative would provide less benefit than the Cell A-1 alternative because of the overall smaller capacity of the reservoir at this location.

Construction of a reservoir within Compartment B would require discharge through STA 2 or STA 3/4. Routing through STA 2 would not be feasible since this STA was not designed to capture and treat EAA basin runoff and Lake Okeechobee discharges. Construction of a reservoir within Compartment C would require discharge to be routed through STA 5 or STA 6. Depending on the volumes released, these STAs may or may not be constrained by discharge volumes. Construction of a reservoir within Compartment A requires routing of discharge from the reservoir through STA 3/4. STA 3/4 is the only STA that was designed to capture and treat EAA basin runoff and discharges from Lake Okeechobee. In addition, construction of a reservoir within Compartments B and/or C would preclude the planned buildout of the STAs. The SFWMD has planned has planned STA expansion to meet requirements of the US v. SFWMD consent decree and reduce phosphorus concentrations in the EPA. The STA buildouts will allow redundancy in the system for moving water around from one treatment train to another as necessary to meet legal requirements and environmental restoration objectives.

The proposed storage reservoir will reduce pollution loading into downstream receiving water bodies through the attenuation of surface flows and reduction of associated pollutant loads prior to discharge. The metering of water from the proposed storage reservoir into the STAs will allow them to consistently improve water quality before release to the WCAs and eventually to the EPA.

With construction of the remaining Acceler8 projects and system-wide operation water quality benefits would be significantly increased. System-wide modeling for all of the Acceler8 projects including the Preferred Alternative assuming a 2010 condition indicates the following water quality benefits:

- The volume of emergency flood control backpumping from the EAA is reduced by 33% annually and 31% during wetter years thus reducing nutrient loading to Lake Okeechobee.
- The frequency of emergency flood control backpumping from the EAA is reduced by 33% annually and 30% during wetter years thus reducing nutrient loading to Lake Okeechobee.
- Lake Okeechobee regulatory discharges directly to the Everglades are eliminated.

- Lake Okeechobee regulatory discharges to the estuaries are reduced by approximately 125,000 ac-ft. annually (a 23% reduction).

4.14 HAZARDOUS, TOXIC AND RADIOACTIVE WASTE (HTRW)

4.14.1 No Action Alternative

Under the No Action Alternative, lands within the EEA should remain in agriculture or open space uses. With agricultural land use, there is the potential of additional toxic releases between the present and the future. This potential exists because of the use of fuel and agricultural chemicals on the lands and roads of the within the project footprint.

4.14.2 Build Alternatives

Construction of a reservoir within a contaminated tract may pose a risk for foraging wading birds and other avian species. There are no contaminated sites located within Cell A-2 of Compartment A or Compartment C. Compartment B contains a significant contaminated tract, known as Woerner Farm 2. Construction of a reservoir in this location may induce risk of pesticide contamination to wading birds including wood storks and bald eagles. Woerner Farm 3 is a contaminated site in the northeastern portion of the Preferred Alternative, Cell A-1 of Compartment A. Due to a modification in the design of the proposed project, the reservoir footprint has been altered such that potential risk of negative impacts to foraging wading birds and other avian species feeding within inundated Woerner Farm 3 soils has been minimized. The Woerner Farm 3 lands will primarily be left undisturbed as a buffer between the project and the agricultural lands to the north.

Construction of the Acceler8 EAA reservoir will involve operation of heavy equipment. Use of such equipment represents potential for hazardous and toxic material and waste to be released to soils and waters of the area. Operation of heavy equipment requires fuel, lubrication, hydraulic fluid, and some field maintenance. Fueling stations may have spills associated with filling field tanks or transferring fuel to equipment. Tanks may also develop leaks under typical field conditions. Equipment may experience failures and/or accidents that release fluids.

Though pesticide levels in some canal sediments will require careful handling to keep the pesticides from dispersing into the ambient environment, it should be noted that contamination of the environment is not anticipated. Despite the nature of the dredging operations and the quantity of materials that will be handled, the implementation of procedures mentioned in Section 8 should prove adequate in the prevention of non-compliant pesticides exposure.

4.15 AIR QUALITY

4.15.1 No Action

The No Action Alternative is anticipated to have no impacts to air quality.

4.15.2 Build Alternatives

The operation of heavy equipment used for construction of the reservoir and supporting facilities will have some impact upon the local air quality, primarily in the form of elevated particulates, nitrogen oxides, and volatile organic compounds. Reservoir pumps and other equipment associated with the proposed action will be powered by diesel engines or additional electrical power with appropriate backup generators. Clean Air Act permits may be required for the pump stations prior to operation. No significant impacts to air quality are anticipated with any of the Build Alternatives.

4.16 NOISE

4.16.1 No Action

The No Action Alternative is anticipated to have no impacts to sound levels within the EAA.

4.16.2 Build Alternatives

Construction of the proposed reservoir will result in a temporary increase in sound levels in the vicinity of active construction. The operation of the pumps associated with the storage reservoir will increase sound levels in their vicinity. Use of emergency generators will further elevate the sound levels. The absence of a significant population minimizes the impacts of these increases in sound levels. No significant impacts to wildlife have been observed in the vicinity of other similar pump stations in the general area. Thus minor impacts to noise quality are anticipated.

4.17 NATURAL OR DEPLETABLE RESOURCES

4.17.1 No action

The No Action Alternative is anticipated to have no impacts to mineral resources.

4.17.2 Build Alternatives

There are limestone resources that will be unavailable for exploitation as a result of placement of the reservoir. Limestone is a commonly available mineral in the region. The impact of the proposed project upon limestone

resources is very minor. Not other significant mineral resource is known to exist.

4.18 WATER SUPPLY AND DRINKING WATER

4.18.1 No action

Lake Okeechobee is a main source of water for a variety of consumptive uses, including urban drinking water, irrigation for agricultural lands within the Lake Okeechobee Service Area, as well as a source of water for recharge for coastal wellfields during dry periods. The No Action Alternative would have no impacts on these resources. In the EAA, no high quality fresh water from the surficial aquifer is present in most areas making groundwater generally undesirable for domestic (drinking water) use except close to Lake Okeechobee.

4.18.2 Build Alternatives

As noted above, Lake Okeechobee is the main source for agricultural water supply and urban drinking water for municipalities adjacent to the Lake. The Build Alternatives would have a beneficial affect reducing undesirable low levels in Lake Okeechobee resulting in a reduction in water restrictions in Lake Okeechobee Service Area and in some cases for the Lower East Coast Service Areas. By reducing the number and duration of low Lake Okeechobee stages, the EAA A-1 Storage Reservoir will provide an additional source of water, improving the reliability of providing supplemental supplies. By comparing the without Preferred Alternative and with the Preferred Alternative model simulations, several key indicators of water supply to the users are anticipated, including:

Lake Okeechobee Service Area (including EAA agricultural areas)

- Local reservoirs reduce reliance on the regional system, decreasing supplemental demand on the lake by approximately 162,000 ac-ft. annually (a 31% reduction).

- The demand for supplemental irrigation supplies is most critical in the late dry season (March – May). The mean monthly water supplied by the Lake during these months decreases by 90,000 ac-ft, while the EAA A-1 reservoir provides the same volume during this timeframe resulting in no change to water available to meet Everglades Agricultural Area water supply demands.

- The number of months when water supply cutbacks occur is reduced by approximately 65% (19 fewer months with restrictions).

- Mean Annual volume of supplemental irrigation water supply not met due to water supply restrictions is decreased by approximately 35% (49,000 ac-ft reduced to 17,000 ac-ft).

- Volume of water supply demands not met for Seminole Tribe's Brighton Reservation declined slightly and Big Cypress Reservation restrictions are reduced by 80%.

Lower East Coast Service Area

- By reducing the frequency and duration of low Lake stages, the number of months when water supply cutbacks occur is reduced by approximately 46% depending on the service area (22 fewer months with restrictions). Lower East Coast Service Area 2 experiences a smaller decrease of 6 fewer months with water restrictions.

The Compartment B and C alternative benefits to Lake Okeechobee would be less than the Compartment A alternatives due to the location of Compartment C being further away from any of the major regional system canals capable of discharging a large volume of water south from Lake Okeechobee. The Cell A-2 alternative would provide less benefit because of the overall smaller capacity of the reservoir at this location compared to the Cell A-1 alternative.

The groundwater will be impacted by the build alternatives to a limited extent. The reservoir water will be in direct contact with the groundwater through the surface soils. The majority of the loss of seepage will be recovered through the seepage canal collection system. Based on the Water Balance Model prepared for the Basis of Design Report for the Preferred Alternative approximately 17,600 acre-feet/year of seepage would occur from the reservoir. However, the impact of this loss is expected to be beneficial for recharging STA 3/4 and to a lesser extent the Holey Land WMA.

4.19 FLOOD PROTECTION

4.19.1 No action

The No Action Alternative is anticipated to have no impacts to flood protection in the EAA.

4.19.2 Build Alternatives

In the case of all Build Alternatives considered, the removal of acreage in the EAA from agricultural production requiring flood protection and the construction of a reservoir will have a positive affect on the flood protection capability of the C&SF Project in the EAA. The Compartment B and C

alternative benefits to Lake Okeechobee would be less than a Compartment A alternative due to the location of Compartment C being further away from any of the major regional system canals. The Cell A-2 alternative would provide less benefit because of the overall smaller capacity of the reservoir at this location compared to the Cell A-1 alternative.

The construction of cutoff walls, as a part of the reservoir embankment, along with an external seepage canal will reduce and/or capture seepage from the reservoir. This will help to maintain the existing level of flood protection in areas adjacent to the reservoir.

4.20 CUMULATIVE IMPACTS

Cumulative impacts associated with the Build Alternatives would be similar. Cumulative impacts include the changes to the aquatic ecosystem that are attributed to the collective effect of a number of discharges of dredged or fill material that are likely to occur as a result of a project.

Construction of the EAA reservoir will provide benefits to the St. Lucie and Caloosahatchee Estuaries, Lake Okeechobee, the Greater Everglades, including the Water Conservations Areas and Everglades National Park, as well as improve the quality and timing of water delivery to the STAs for improved water treatment within the STAs. Based on system-wide modeling assuming the 2010 condition, the following benefits are expected with the construction of the EAA Reservoir A-1:

- The frequency of emergency flood control back pumping from the EAA to Lake Okeechobee is reduced by 33% annually and 30% during wetter years, thus reducing nutrient loading to the lake.
- Lake Okeechobee regulatory releases directly to the Everglades are eliminated.
- In the Caloosahatchee and St. Lucie Estuaries, the number of high flow months resulting from Lake Okeechobee regulatory discharges is decreased by approximately 15% and 21% respectively, increasing the frequency of maintaining the salinity envelope.
- Improvements to inundation patterns, timing and distribution of flows as well as reductions in low and high events, towards defined NSM depth targets in extreme dry and wet years were in: Water Conservation Area 1, Water Conservation Area 2A, Water Conservation Area 3A North, Water Conservation Area 3A Northeast, S-9 areas of Water Conservation Area 3A and Water Conservation Area 3A South in the driest years, and Shark Slough and the Marl Marsh Areas in Everglades National Park during the driest and wettest years.

- Increased ability to treat water entering the Everglades Protection Area from STA 3/4 based on a 16% Phosphorus reduction in water conveyed to STA3/4 from the EAA A-1 Reservoir, by metering peak flows to the STA thereby increasing residence time within the STA, ensuring better water quality treatment.

Anticipated future projects that may occur as a result of the EAA Reservoir A-1 project include construction of the remaining suite of Acceler8 projects, specifically improvements to Bolles and Cross canals (See Figure 1-2). These improvement will result in conveyance capacity increases for the both canals in order to provide improved flood protection and water flow capabilities for moving water to and from the EAA Reservoir and STAs. The Memorandum of Agreement between the Executive Office of the Governor and the SFWMD formalizes the State's commitment to implementing the Acceler8 projects which includes the proposed EAA Reservoir A-1 project (See Annex H). The Acceler8 projects are designed to contribute too many of the benefits from CERP as early as possible. The remainder of the CERP projects may follow as time and resources allow.

If permitted and constructed, the Acceler8 projects operated together as a system, will have significant positive cumulative impact on the south Florida ecosystem. Consistent with the goals and objectives of CERP, Acceler8 will improve water deliveries, through better timing and distributions of flows dictated by the natural system, and help maintain natural salinity balance in the estuaries. In addition, restoration through improvements in hydrology to wetland habitats will occur by reducing extreme high and low water level events, restoring sheet flow and controlling seepage. Furthermore, there will be improvements in water quality as a result of water diversions and storage in STA 3/4 prior to discharging into the natural system, as well as, reductions in back pumping to Lake Okeechobee and eliminating regulatory releases from the lake to the Everglades.

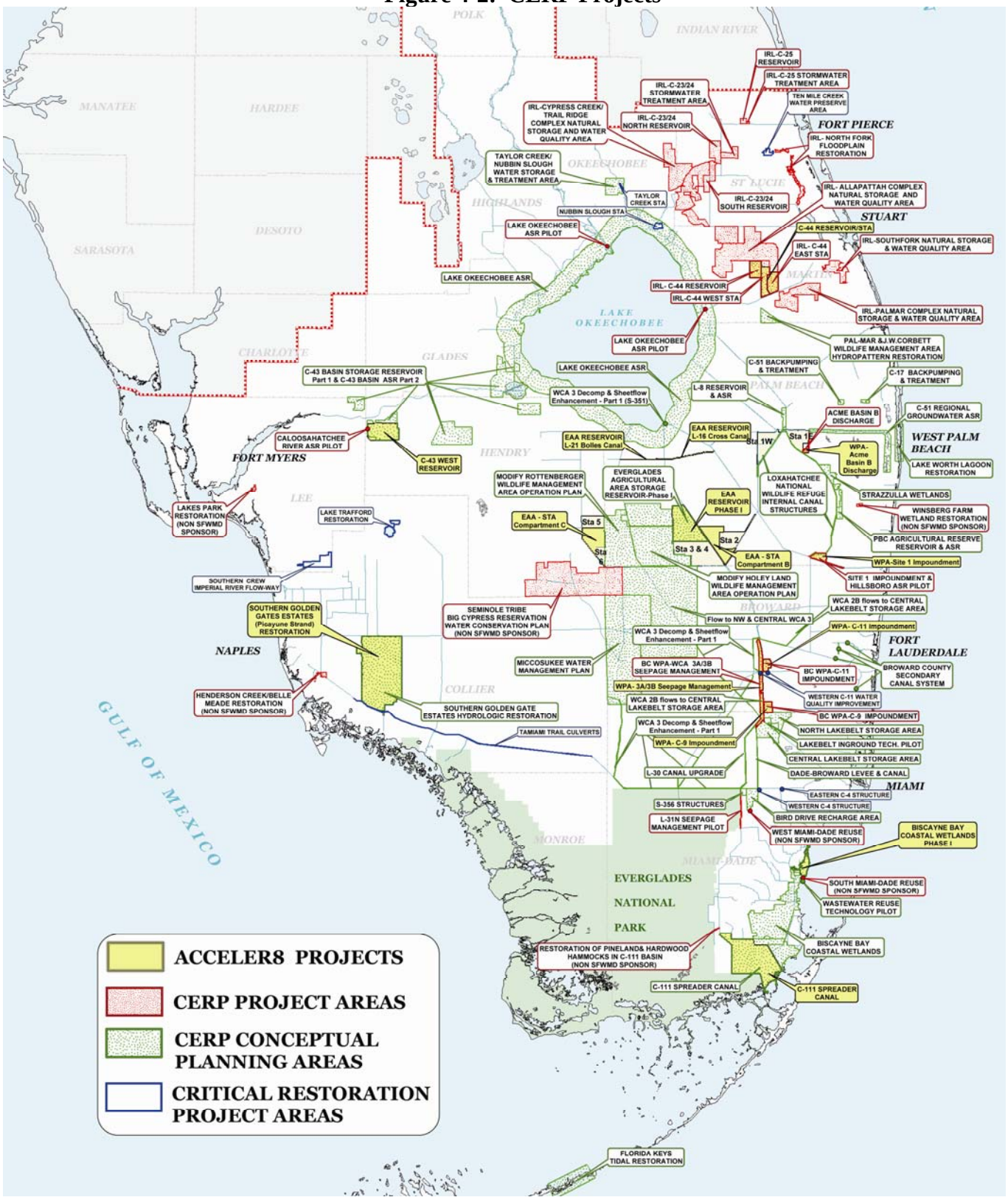
The Acceler8 projects may end up being a part CERP. The CERP contains 68 components that total approximately 217,000 acres of new reservoirs and wetlands-based water treatment area as shown in Figure 4-2. This plan increases the supply of fresh water for the Everglades and South Florida ecosystem and improves the quantity, quality, timing, and delivery of water to the natural system. A number of operational components have also been identified in the CERP and will, in most cases, occur in conjunction with related construction features. The operational features in the CERP include: a modified Lake Okeechobee regulation schedule; environmental water supply deliveries to the Caloosahatchee and St. Lucie Estuaries; modifications to the regulation schedules for WCAs 2A, 2B, 3A, 3B, and the current rainfall delivery formula for ENP; modified Holey Land Wildlife Management Area Operations Plan; Modified Rotenberger Wildlife

Management Area Operations Plan; a modification for coastal wellfield operations in the Lower East Coast (LEC); LEC utility water conservation; and operational modifications to the southern portion of L-31N and C-111.

The SFWMD's Acceler8 Program and the CERP are both anticipated to convert large areas within the EAA, around Lake Okeechobee, in the Caloosahatchee River basin, and on the upper east coast to reservoirs for increasing water storage for the overall gain and long-term benefit of the regional system. These project features will provide important storage functions which the C&SF Comprehensive Review Study, April 1999, deemed essential to the overall restoration of the freshwater marshes, the estuaries and the downstream Everglades. Some improvement to lake water quality will occur as a result of the project by redirecting nutrient rich EAA drainage to the reservoirs rather that directly to Lake Okeechobee. The overall benefit to the regional system is expected to be far greater than the localized adverse effects. As these features occur disparately across the landscape within different hydrologic basins, and as distinct units rather than multiple features within a single watershed, they will not likely result in a significantly detrimental cumulative effect.

Project features of both Acceler8 and CERP will cause some adverse consequences to agricultural land uses - permanently removing tens of thousands of acres from agricultural production. These impacts may be felt locally and/or regionally as the economic base derived from agriculture is incrementally reduced relative to other sectors of the economy. The overall benefit to the regional system is expected to be far greater than the localized adverse effects. As these features occur disparately across the landscape within different hydrologic basins, and as distinct units rather than multiple features within a single watershed, they will not likely result in a significantly detrimental cumulative effect.

Figure 4-2: CERP Projects



4.21 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Construction of the storage reservoir project will include many features considered permanent as well as require a modification to existing C&SF Project features, which may be deemed irreversible. This includes construction of an open water reservoir on a 16,768-acre site with attendant features and canals and some buffer lands. Such construction and structural modifications are proposed on such a scale that these features represent an irreversible and irretrievable commitment of resources.

Committed resources include state and federal funding to purchase lands and labor, as well as energy and project materials to build, operate, and maintain the project. Fish and wildlife habitat will be permanently altered (converted to open water, particularly in the case of a storage reservoir). These lands will likely be inundated for much of the year. Another resource that may be impossible to replace is the caprock. It is proposed to be broken at the top of the limestone formation underlying the soils in the area of the proposed Acceler8 EAA reservoir project.

4.22 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

4.22.1 Land Use (Agriculture)

Agricultural lands will be permanently removed from production due to the construction of the proposed large above-ground storage reservoir. For the Preferred Alternative, this includes approximately 16,253.68 acres of agricultural lands. Even though some of the lands will be left undisturbed, they would be in the project footprint and out of production.

4.22.2 Wetlands

Natural and atypical wetlands will be permanently altered within the boundaries of the large above-ground storage reservoir. For the Preferred Alternative this includes 187.63 acres of natural wetlands and 15,467.48 acres of jurisdictional atypical wetlands, i.e., historic Everglades wetlands disturbed through agricultural practices as shown in Figure 2-8. The natural and atypical wetlands would be permanently removed by construction of the proposed large above-ground reservoir.

4.22.3 Uplands

A limited number of acres of uplands may be permanently altered within the boundaries of the large above-ground storage reservoir. No natural uplands are present within the area evaluated for the proposed project. For the Preferred Alternative, approximately 164.59 acres of uplands including

roads, levees, and an industrial site are located within the project footprint of which 119.06 acres would be permanently removed by construction activities. See Figure 2-8.

4.22.4 Water quality

Temporary increases in turbidity of local waters are expected from construction of the components of the large above-ground storage reservoir.

4.22.5 Air quality

Fugitive dust and vehicle exhaust from vehicular traffic and earth moving will be unavoidable.

4.22.6 Soils

Temporary disruption of soils is expected from most construction activities.

4.22.7 Cut-off Walls

Temporary disruption of the soils is expected during construction of the cut-off walls. No adverse environmental impacts are expected.

4.22.8 Wildlife

Localized disturbances to fish and wildlife are expected from construction of the components of the large above-ground storage reservoir.

4.22.9 Recreation

Limited impacts to recreation resources (canal fisheries for example) are expected.

4.22.10 Wildlife Including Listed Species

Localized disturbances to fish and wildlife are expected from deepening of canals and construction of levees and other structures.

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CHAPTER 5
COMPENSATORY MITIGATION

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5.0 COMPENSATORY MITIGATION

CERP is by definition a "comprehensive" and "programmatic" restoration plan that is dependent on the integrated function of its components (projects) for success. As stated in the Restudy (Summary p. *v*.):

> *"A major advantage of the Comprehensive Review Study is that it has used tools and methods to evaluate the entire C&SF Project area together as an integrated system. Thus, the effects of making modifications in one area on another area were able to be seen and then used to develop a plan that maximized positive system-wide benefits*."

The formulation and evaluation for CERP considered the system-wide interdependencies and benefits of the CERP projects, as well as the environmental benefits directly attributable to specific projects. To that end, CERP has been determined to be "self mitigating" in that project impacts are offset by project implementation. CERP defines the south Florida ecosystem as "the land and water within the boundary of the South Florida Water Management District in effect on July 1, 1999." The performance of CERP will be assessed by the REstoration COordination and VERification (RECOVER) program through the Monitoring and Assessment Plan (MAP). The RECOVER Assessment Team is primarily responsible for measuring the actual performance of implemented projects and interpreting that performance based on the analysis of information obtained from research, monitoring, modeling, or other relevant resources. The overarching goal for implementation of the MAP is to have a single, integrated, system-wide monitoring and assessment plan that will be used and supported by all participating agencies and tribal governments as the means of tracking and measuring the performance of the CERP.

The Acceler8 projects are designed to contribute to many of the benefits from CERP as early as possible. This program of projects will be designed to provide the quantity, quality, timing, and distribution of water necessary to achieve and sustain those essential hydrological and biological characteristics that define the restored South Florida ecosystem. The construction and operation of Acceler8 will be required to remain consistent with the Federal Central & South Florida Project as modified by law and its project goals and purposes as discussed in Section 6.4 of this EIS. Specifically, Acceler8 will improve water deliveries, through better timing and distributions of flows dictated by the natural system, and help maintain natural salinity balance in the estuaries. In addition, restoration through improvements in hydrology to wetland habitats will occur by reducing extreme high and low water level events, restoring sheet flow and controlling seepage. Furthermore, there will be improvements in water quality as a result of water diversions and storage in STA 3/4 prior to discharging into

the natural system, as well as, reductions in back pumping to Lake Okeechobee and eliminating regulatory releases from the lake to the Everglades.

The State is committed to implementing Acceler8 in order to expedite restoration of the Everglades and attain benefits ahead of the CERP schedule and in a cost effective manner. The Acceler8 program serves as the initial foundation for other comprehensive restoration efforts to follow. Therefore, it is unlikely that the State will abandon the Acceler8 initiative prior to completing design and construction of all of the projects which are specifically identified in the MOA signed on October 14, 2004, between the Executive Office of the Governor and the SFWMD (See Annex H).

Because the State proposes to proceed with construction of the Acceler8 projects ahead of the Federal Government and CERP, Department of the Army permits are required. Under the USACE's Regulatory Program, mitigation is required to offset unavoidable impacts to wetlands and other aquatic resources. Acceler8 is a State plan and the USACE permit decisions will be made prior to congressional appropriation and any CERP PCA execution; therefore, there is no guarantee that the federal CERP projects will be built and no guarantee that the Acceler8 projects will become federal projects. Thus dependency on future CERP projects for providing environmental benefits to offset impacts associated with individual Acceler8 projects would not be appropriate. Rather, the State is required to provide adequate compensatory mitigation to offset the Acceler8 project impacts.

Construction and operation of the SFWMD's preferred alternative, the EAA A-1 Reservoir will result in the loss of aquatic resources within the project footprint. This chapter describes the proposed impacts and compensatory mitigation plan for the proposed EAA A-1 Reservoir.

5.1 PROPOSED IMPACTS

The Uniform Mitigation Assessment Method (UMAM), Chapter 62-345 F.A.C., was used to assess the function and value of the proposed impact areas. As a result of the project 15,467.48 acres of jurisdictional atypical wetlands, 187.63 acres of jurisdictional natural wetlands, and 149.83 acres of other Waters of the United States i.e. agricultural canals/ditches, would be impacted by flooding, dredging, and/or filling. Although a majority of the site is considered jurisdictional Waters of the United States, it is highly disturbed. Wetland function and value have been severely reduced by agricultural practices i.e., sugar cane production.

Construction and operation of the project will result in a loss of 5,889.05 Functional Capacity Units (FCUs), as demonstrated in Table 5-1 below; therefore, compensatory mitigation necessary to offset the loss of 5,889.05 FCUs

is required. This mitigation requirement is based on a Future With-Project UMAM score or Functional Capacity Index (FCI) of zero. The reservoir will be operated to provide water storage. While there are ecological features within the reservoir, such as deep water fish refugia (approximately 878.83 acres) that are anticipated to provide opportunities for wildlife, these areas are not being claimed as mitigation credits since the success of the deep water refugia is contingent on the draw down of the reservoir and the appropriate water quality. Additionally the project will have a 150-ft wide seepage buffer adjacent to the reservoir embankment for purposes of maintenance and seepage collection. The area, estimated at approximately 205 acres, is expected to have hydrology suitable for short and long–hydroperiod wetlands. As part of the project description, the SFWMD will redistribute all remaining muck after construction of the embankment in order to facilitate recruitment of natural plant species within the seepage buffer. The SFWMD also will implement an exotic plant management program to maintain control over the level of exotic plant species within the embankment and seepage buffer. There will also be approximately 13 acres of littoral shelves located along the length of the seepage canal that will be incidentally created through construction activities. Both the seepage buffer and littoral shelves will incidentally provide some wetland function and value; however, since these areas are not being managed and monitored for ecological function, they are not being considered as compensatory mitigation and the Future With-Project FCI of zero is appropriate.

Table 5-1: UMAM Analysis of Impacts Associated with the EAA A-1 Reservoir.

Habitat	Existing Functional Capacity Index	With-project Functional Capacity Index	Delta	Acres	Functional Capacity Units "Debits"
Ag Fields	0.37	0	-0.37	15467.48	-5722.97
Canals	0.57	0	-0.57	149.83	-85.4
Wetlands	0.43	0	-0.43	187.63	-80.68
				15804.94	**-5889.05**

5.2 PROPOSED COMPENSATORY MITIGATION

The mitigation plan includes accounting for the system-wide interdependencies and watershed benefits of the Acceler8 projects in satisfying the regulatory requirements for individual Acceler8 projects. Current mitigation guidance, as set forth in Regulatory Guidance Letter (RGL) 02-2, focuses on taking a watershed approach, requiring wetland mitigation in the form of a watershed's ecological needs, use of a functional assessment to offset environmental losses, and ensuring protection of wetlands and other aquatic resources established as mitigation.

The Acceler8 projects are widespread throughout south Florida covering three different U.S. Geological Hydrologic Unit Codes (HUCs). As such, it difficult to recognize that benefits of an Acceler8 project located in one HUC may offset impacts to an Acceler8 project located in another HUC. The goal of the State's Acceler8 initiative is to design, construct, and operate projects consistent with the C&SF Project as modified i.e., the Acceler8 projects are anticipated to provide watershed functions to the south Florida ecosystem consistent with the goals and objectives of CERP. This watershed approach considers the south Florida ecosystem and recognizes the approach taken in the federal resource management program i.e., CERP. Consistent with CERP and for the purposes of this Final EIS, system-wide is defined as pertaining to the C&SF Project or the south Florida ecosystem as defined in WRDA 2000, as a whole. Environmental lift for the purposes of this Final EIS is defined as the net gain in function and/or values of aquatic resources within the south Florida ecosystem (as defined in WRDA 2000) affected by the Acceler8 projects.

With this watershed concept, the USACE will use a mitigation ledger to track adverse impacts and compensatory mitigation requirements for the SFWMD's proposed Acceler8 projects and the environmental lift anticipated as a result of the Acceler8 projects operating together as a system. As such, the Acceler8 projects are anticipated to provide watershed functions to the south Florida ecosystem consistent with the goals and objectives of CERP. Specifically, Acceler8 will improve water deliveries and help maintain natural salinity balance in the estuaries; improve natural habitats by reducing extreme high and low water level events; restore and enhance wetlands by improving timing and delivery of water, restoring sheet flow, and controlling seepage; and improve water quality through water diversion and storage prior to discharge into the natural system.

The Acceler8 projects, individually, may or may not contain enough positive environmental benefits to offset the individual project impacts. Individual project ecosystem features such as littoral shelves and seepage buffers would only be evaluated for functional gains and mitigation consideration would only be given for project features that would be specifically managed for ecosystem function and monitored to ensure performance and success. Water storage reservoirs and stormwater treatment areas which are managed for other purposes would not be counted as mitigation as discussed in Section 5.1 of this chapter. Individual Acceler8 projects without a net positive environmental benefit will be examined for their linkage to watershed benefits to the south Florida ecosystem associated with the system-wide operation of the Acceler8 projects.

An interagency team including the USACE, SFWMD, USFWS, and the USEPA is using UMAM to determine the environmental lift to aquatic resources within the south Florida ecosystem for which system-wide operation of the Acceler8

projects is anticipated to benefit. UMAM will also be used to track any negative environmental impacts as a result of system-wide operation of the Acceler8 projects. A draft preliminary mitigation ledger has been developed based on current project specific information, Acceler8 system-wide model runs, and the interagency team's analyses.

Losses of aquatic resource function and value as a result of construction and operation of the individual projects will be shown on the mitigation ledger as "debits". Functional losses will be added and fine tuned as individual Acceler8 projects are designed and evaluated. Functional gains associated with system-wide environmental lift for those habitats that have been assessed will be shown on the mitigation ledger as "credits". The ledger will be updated as assessments for both impact sites and mitigation areas are conducted and refined. Table 5-2 includes the system-wide benefits portion of the mitigation ledger based on evaluations conducted by the interagency team to date.

It should be noted that the existing FCI as shown on the draft preliminary ledger is based on existing conditions at the time of the interagency team's site visit. The existing FCI will be adjusted to reflect the period of record so that environmental lift better reflects operation of the Acceler8 projects and not environmental lift due to extreme natural storm/weather events. The mitigation ledger includes a temporal lag factor to offset aquatic resource functions that are impacted prior to being fully replaced through attainment of mitigation success criteria. Attainment of criteria is estimated to occur in 2020, since the State's schedule anticipates the Acceler8 projects online and in operation by 2011. Therefore, the USACE anticipates that by 2020, the environment will have responded to the system-wide operation of the Acceler8 projects and the UMAM goal scores and environmental lift will be attained. Mitigation monitoring as described in Annex B will include an annual evaluation of environmental responses to determine if the Acceler8 projects are trending toward the goal scores as projected on the mitigation ledger. It should also be noted that mitigation ledger also includes an UMAM risk calculation of 2.5.

Table 5-2: Draft Preliminary Mitigation Ledger for Acceler8 System-wide Benefits

Benefits									
Acceler8 System-wide Benefits	**HUC**	**Existing FCI**	**Adjusted FCI**	**With-Project FCI**	**Δ**	**Temporal Lag**	**Risk Factor**	**Estimated Acres**	**Ledger Credits**
Lake Okeechobee Nearshore Habitat	3090202	0.23	0.23	0.43	0.20	0.81	0.60	50,000.00	4,839.60
St. Lucie Estuary	3090202	0.33	0.33	0.53	0.23	0.81	0.60	5,120.00	495.58
Caloosahatchee Estuary	3090205	0.33	0.33	0.47	0.14	0.81	0.60	16,300.00	1,104.40
Water Conservation Area 1	3090202	0.57	0.57	0.70	0.13	0.81	0.60	16,000.00	1,006.64
Water Conservation Area 2A	3090202	0.40	0.40	0.50	0.10	0.81	0.60	105,308.45	5,096.51
Water Conservation Area 2B	3090202							28,292.00	-
Water Conservation Area 3A	3090202	0.63	0.63	0.73	0.10	0.81	0.60	481,964.68	23,325.16
Water Conservation Area 3B	3090202							98,271.54	-
Everglades National Park	3090202								-
								Total	**35,867.88**

5.3 ACCELER8 SYSTEM-WIDE MODEL RUNS

The Interagency Modeling Center (IMC) has performed model simulations using the South Florida Water Management Model (SFWMM), or 2 x 2, at the 2010 planning horizon with authorized non-CERP features (e.g. Modified Water Deliveries (Mod Waters) project to be constructed by 2010) without and with Acceler8 projects. Annex D contains the model output for both conditions and a description of the assumptions for the model simulations. Target areas of the model simulations showing hydrologic effects include Lake Okeechobee, the northern estuaries (i.e., the Caloosahatchee and St. Lucie estuaries), and the Greater Everglades including ENP, WCAs, and Picayune Strand. Figure 5-1 shows the Acceler8 projects and the target areas where hydrologic effects are anticipated.

5.3.1 Acceler8 System-Wide Environmental Benefits

In general, anticipated improvements in ecological performance can be expected by moving closer to the Natural System Model (NSM) depth targets for the wetlands in the WCAs and ENP. Additional improvements can be expected in Lake Okeechobee, the Caloosahatchee and St. Lucie Estuaries, and Picayune Strand by moving closer to hydrologic and ecological restoration targets identified by RECOVER. Using this information an interagency team has performed UMAM assessments for some of the areas that will be affected by Acceler8. As shown in the Table 5-2, the assessments conducted to date indicate that the Acceler8 projects will provide 35,867.88 FCUs or mitigation credits. It is anticipated that some performance i.e., environmental lift and subsequent mitigation credits, will be directly related to EAA A1 Reservoir project objectives.

Acceler8 system-wide hydrologic benefits, as predicted by comparing the two model simulations discussed above, are listed below by the region affected. Also, the key to successful environmental restoration of the south Florida ecosystem includes incidental benefits to water supply for agriculture and urban users.

5.3.1.1 Lake Okeechobee

Research has shown that sustained high lake levels, along with a reduction of spring recession and poor water quality, results in the loss and degradation of predrainage floral and faunal communities. Therefore, improvements to hydrologic conditions (extreme lake stages and water quality) will benefit the lake environment, through enhancement of ecological conditions in the littoral and near shore zone habitats. This will benefit submerged plant communities and macro-invertebrates, and improve taxonomic structure of zooplankton, thereby creating a more effective food web. When the model

simulations for the with-project and the without-project (Acceler8 projects) are compared, the with-project shows improvements to the extreme high and low stages as well as improvements in water quality. These improvements are:

- There is a 17% reduction in total time spent in extreme high water classification of over 17 ft.
- There is a 15% reduction in the number of days that lake stages remain below the extreme low stage classification of 11 ft.
- The number of minimum flows and level (MFL) events (lake stages fall below 11 ft NGVD for greater than 80 days) decrease by one (16% reduction).
- The volume of emergency flood control backpumping from the EAA is reduced by 33% annually and 31% during wetter years thus reducing nutrient loading to the lake and improving water quality.
- The frequency of emergency flood control backpumping from the EAA is reduced by 33% annually and 30% during wetter years thus reducing nutrient loading to the lake.
- Untreated Lake regulatory discharges directly to the Everglades are eliminated.
- Lake regulatory discharges to the estuaries are reduced by approximately 125,000 ac-ft. average annually (a 23% reduction).

5.3.1.2 Northern Estuaries

Restoration goals and strategies for the Northern Estuaries have related the effects of hydrology to freshwater flows and a corresponding influence on salinity regimes, water quality and estuarine epibenthic communities. Prior to water management, natural patterns of freshwater inflows sustained an ecologically appropriate range of salinity conditions in the estuaries with fewer high and low salinity extremes. The construction and operation of water storage and treatment facilities in the northern estuary region, will improve timing and distribution of flows resulting in nutrient load reductions, decreasing algal blooms and improvements to the spatial and structural characteristics of submerged plant communities, as well as recruitment and survivorship of the eastern oyster. Additionally, improved salinity patterns, through improvements in freshwater flows, will enhance mesohaline and oligohaline conditions in near-shore estuarine environments, providing conditions that are conducive to enhancing productivity, reducing stress on the estuarine communities and improving composition and health. The comparison of the model simulations of the with and without Accerler8 projects condition, shows that in the with-project, freshwater discharges to the Northern estuaries are expected to decline:

Figure 5-1: Acceler8 Projects and Target Areas for System-wide Hydrologic Effects

Caloosahatchee Estuary:

- The number of months below the low flow threshold (average discharge under 300 cfs) is decreased by approximately 76%.
- The number of high flow months from local basin runoff (average discharge over 2800 cfs) is decreased by approximately 28%.
- The number of high flow months resulting from Lake Okeechobee regulatory discharges (average discharge over 2800 cfs) is decreased by approximately 15%.

St. Lucie Estuary:

- The number of months below the low flow threshold (average discharge under 350 cfs) is decreased by approximately 64%.
- The number of high flow months from local basins (average discharge over 2000 cfs) is decreased by approximately 7%.
- The number of high flow months (average discharge over 2000 cfs) resulting from Lake Okeechobee regulatory discharges is decreased by approximately 21%.

5.3.1.3 Greater Everglades

Conceptual ecological models (CEMs) detail the role of inundation patterns influencing soil formation, vegetation patterns, faunal use and water quality characteristics. Based on CEMs, improvements to the timing and distribution of flows, during the driest (1972,80,81,87,89,93) and wettest (1970, 83,84,87,92,95) years for the percent period of record, will provide hydrologic conditions that attenuate deleterious hydropatterns and progress towards NSM defined depth targets. Comparisons of the model simulations for the with and without Accerler8 projects condition indicate that the following occur in the with-project condition (compared to the without):

- Inundation patterns, timing and distribution of flows targeting the number of events and duration of events, moving towards defined NSM depth targets for extreme dry and wet years in WCA 1 and WCA 2A during the driest years, WCA 3A North, WCA 3A Northeast, the S-9 area within WCA 3A and WCA 3A South, during the driest years, and Shark River Slough (SRS) within ENP as well as the Marl Marsh areas during the driest and wettest years.
- Improvements in the timing of flows versus base conditions during the wet season for the percent period of record were seen in WCA 2A, WCA 3A North, WCA 3A Northeast, S-9 area within WCA 3A, WCA 3A South (South of Alligator Alley to Tamiami Trail) and in SRS within ENP.

- Improvements in the timing of flows versus base conditions during the dry season for the percent period of record meeting NSM depth targets during extreme low and high events were in WCA 3A South, S-9 area within WCA 3A, SRS within ENP and in the Marl Marsh areas, an improvement in extreme low events.

Decline in ridge and slough habitat diversity and stability is a result of expansion of sawgrass into sloughs and wet prairies, tree island drowning, tree island burn-out, conversion to cattail under eutrophic conditions, and takeover by exotic species such as, *Melaleuca quinquenervia* and *Lygodium microphyllum*. Resumption of sheetflow and related patterns of hydroperiod, water depth, water quality, and fire will significantly restore and sustain the microtopography, directionality, and spatial extent of ridges and sloughs and improve the health of tree islands in the ridge and slough landscape. Benefits to landscape patterns and ridge and slough community sustainability are improved through a reduction in the frequency of extreme low and high water levels. Stage frequency largely determines vegetation patterns, seasonal movements and reproductive dynamics of all aquatic and many terrestrial animals in the Everglades. Comparisons of the model simulations for the with and without Accerler8 projects condition indicate that the following occur in the with-project condition (compared to the without):

- Reduction in the number and duration of extreme low events based on results of the percent period of record for the driest and wettest years in WCA 3A North (low events) and South (high events), SRS within ENP, and in the Marl Marsh areas.
- Reduction in the number and duration of extreme high events based on results of the percent period of record for the driest and wettest years in WCA 2A, WCA 3A Northeast, WCA 3A near the S-9 and WCA 3A South, and SRS in ENP.
- Resumption of natural patterns of volume, timing, and distribution of flow to the southern Everglades, in combination with interannual variation in rainfall, will restore natural multi-year wet and dry cycles as they would have occurred prior to drainage of the southern Everglades. Furthermore, restoration of historic spatio-temporal patterns of prey production and concentration is expected to reestablish wading bird nesting colonies in the coastal and tributary regions of the southern Everglades and Roseate Spoonbill nesting colonies in northeast Florida Bay. This restoration is also expected to increase numbers and success of nesting wading birds, Wood Storks, and Roseate Spoonbills and to cause Wood Storks to initiate nesting no later than January in most years. While there are no hydrologic models that can assess wading bird nesting and foraging performance,

there are several RECOVER performance measures (PMs) that will be used to monitor anticipated improvements to wading bird nesting and foraging which are dependant on improvements to hydropatterns.

- An increase is anticipated of approximately 28%, over base condition, in the stage duration curve of Manatee Bay and Barnes Sound Area with the Acceler8 projects based on the RECOVER performance measure model results and correlated to redistribution of flows resulting from the C-111 Spreader Canal Project.

The Cape Sable seaside sparrow (CSSS), a federally endangered species, will potentially be affected by flows originating from Lake Okeechobee, the EAA Reservoir and STA 3/4 as well as operations directly upstream from their existing habitat. It should be noted that as discussed in Section 4.0 and 4.6.2, environmental effects to threatened and endangered species were not evaluated in this Final EIS using the 2010 modeling forecast presented in Annex D which is used to support the Acceler8 mitigation evaluation. Instead effects to federally listed species were assessed under an operational commitment that includes water deliveries to the south only when there is an environmental demand. The USACE recognizes that prior to operating the project and/or other interrelated projects as modeled, downstream effects to listed species will be evaluated and potentially reinitiation of Section 7 consultation will be necessary. For the purposes of determining system-wide benefits and mitigation, the modeling output presented in Annex D is intended to verify changes in hydrology with all of the Acceler8 projects in place. Therefore, the assumptions used to perform the model runs include operational assumptions that water will be delivered to the WCAs and ENP to meet Natural System Model targets.

The mean annual flows delivered from STA 3/4 to WCA 3 remain unchanged with the addition of Acceler8 projects, however, the timing of those flows change. More water is anticipated to be delivered during the wet years to meet NSM depth targets and less during the dry years. Based on volume probability distributions, mean flows remain approximately 600,000 ac-ft, wet season flows at the 90th percentile increase from approximately 800,000 ac-ft to 1,100,000 ac-ft, and dry season deliveries at the 10th percentile decrease from approximately 375,000 ac-ft to 175,000 ac-ft with Acceler8 projects in place.

This change in flows through WCA 3 to ENP during wetter times may affect CSSS populations. Two hydrologic indicators of the potential effects are maintenance of short hydroperiod mixed-marl prairie vegetation and nesting condition availability. Both indicators apply to all six sub-populations that occur within ENP. Compared to the last comprehensive analysis by the USFWS, Planning Aid Report, May 6, 2004 of potential affects resulting from CERP implementation due to changes in inundation patterns in ENP, similar

performance is anticipated for the CSSS as a result of Acceler8, see Table 5-3 below.

Regardless of the comparative analysis, estimated results from the regional model indicate that one or more of the core subpopulations (e.g. indicator regions) may experience conditions that are unfavorable for the persistence of the core subpopulations and may reduce the likelihood of survival and recovery of CSSS. However, compared to the base condition, the expected changes in the Marl Prairie areas are minimal and will be addressed operationally.

Table 5-3: Comparison of performance for two Cape Sable Seaside Sparrow indicators

IR #	IR description	Performance Measure Name	2010BS	2010A8	CERP0
201	Sparrow A	#of nesting days in 8 out of 10 years*	45	35	0
		# of nesting days 7 out of 10 years**	70	60	10
		Duration of discontinuous Hydroperiod***	8	8	10.5
202	Sparrow B	#of nesting days in 8 out of 10 years	110	110	105
		# of nesting days 7 out of 10 years	120	120	120
		Duration of discontinuous Hydroperiod	3.5	3.5	3
203	Sparrow C	#of nesting days in 8 out of 10 years	105	105	105
		# of nesting days 7 out of 10 years	110	110	105
		Duration of discontinuous Hydroperiod	2.5	2.5	3.5
204	Sparrow D	#of nesting days in 8 out of 10 years	85	85	85
		# of nesting days 7 out of 10 years	100	100	100
		Duration of discontinuous Hydroperiod	3.5	2.5	3
205	Sparrow E	#of nesting days in 8 out of 10 years	85	85	60
		# of nesting days 7 out of 10 years	110	55	85
		Duration of discontinuous Hydroperiod	6	7	7
206	Sparrow F	#of nesting days in 8 out of 10 years	35	15	15
		# of nesting days 7 out of 10 years	50	45	40
		Duration of discontinuous Hydroperiod	7.5	8.5	9

*Results indicate the number of nesting days. 40 or more days is favorable for persistence of subpopulation, 80 or more days is very favorable, and other values unfavorable
**Results indicate the number of nesting days. 80 or more days is favorable for persistence of subpopulation, 40-80 or more days is borderline for persistence, and other values unfavorable.
***Target is 2-6 months discontinuous hydroperiod.

5.3.1.4 Biscayne Bay

Historic conditions indicate that patterns of freshwater inflow to Biscayne Bay resulted in more sustained mesohaline salinity conditions in coastal

areas with fewer high and low salinity extremes. Model results indicate that out of five modeling zones in the Bay, two experience a reduction in flow volume, two an increase in flow volume, and the fifth has no change. Therefore, comparisons of the model simulations for the with and without Acceler8 projects condition, indicate that mean annual water flows to Biscayne Bay are the same at approximately 915,000 ac-ft with the same seasonal distribution of 311,000 ac-ft mean dry season deliveries and, mean wet season of approximately 604,000ac-ft. While total volume was not increased, the water deliveries the Bay received were re-distributed throughout the nearshore zones reducing point discharges from canals.

5.3.1.5 Picayune Strand

In addition to hydrologic improvements to areas simulated by the regional model, Picayune Strand is expected to provide system-wide benefits. Ecological benefits are projected in wetland, upland, and estuarine habitats as well as protection to water supply, through improvements to aquifer recharge and the prevention of saltwater intrusion, and maintain drainage for developed areas north of the project. Expected improvements will result by reestablishing natural water volume, distribution and timing of flows in the wetland, enhancing the habitat, including rare tropical hammocks and plant species such as orchids and bromeliads. Based on habitat enhancement and upland preservation, benefits are expected for fish and wildlife including threatened or endangered species such as the Florida panther, Florida Black Bear, Red-cockaded woodpecker and wood stork. Finally, reducing freshwater releases (point source discharges) will improve the health and productivity of downstream estuaries.

5.3.2 Benefits to Other Water Related Needs

In addition to improvements to the natural system, improvements to agricultural, urban and tribal water supplies are anticipated. By reducing the number and duration of low Lake Okeechobee stages and Acceler8 reservoirs providing an additional source of water the reliability of providing supplemental supplies improve. By comparing the without and with model simulations, several key indicators of water supply to the users are anticipated, including:

Water Supply

Local reservoirs reduce reliance on the regional system, decreasing supplemental demand on the Lake by approximately 193,000 ac-ft. annually (a 37% reduction).

The demand for supplemental irrigation supplies is most critical in the late dry season (March – May). The mean monthly water supplied by the Lake

during these months decreases by approximately 90,000 ac-ft. However the EAA A-1 reservoir provides the same volume during this time frame resulting in a zero net change in water available to meet EAA water supply demands.

Lake Okeechobee Service Area - Water Supply

The number of months when water supply cutbacks occur is reduced by approximately 62% (18 fewer months with restrictions).

Mean annual volume of supplemental irrigation water supply not met due to water supply restrictions is decreased by approximately 63% (49,000 ac-ft reduced to 18,000 ac-ft).

Volume of water supply restrictions for Seminole Tribe's Brighton Reservation declines slightly and Big Cypress Reservation restrictions is reduced by 80%.

Lower East Coast Service Area – Water Supply

By reducing the frequency and duration of low Lake stages the number of months when water supply cutbacks occur is reduced by approximately 45% depending on the service area (22-24 fewer months with restrictions). Lower East Coast Service Area 2 experiences a slight increase of 6 more months with water restrictions.

5.3.3 Acceler8 Potential Adverse Impacts

Although improvements are expected in the natural system, some areas may not see the same level of improvements as water is stored and redistributed throughout the system. Specifically, the duration of high stages in Lake Okeechobee increase, although the frequency of high stages declines, and WCAs 2B and 3B did not meet defined NSM depth targets resulting in reduced performance described in the Greater Everglades section 5.3.3.2.

The USACE is in the process of updating the mitigation ledger to include any negative impacts as a result of implementation of Acceler8. Negative impacts associated with areas that have been assessed i.e., WCA 2A and WCA 3A were considered in the scoring. The environmental lift and mitigation credits provided by the Acceler8 projects are anticipated to offset any adverse impacts.

5.3.3.1 Lake Okeechobee

Generally, high stage events that do occur are longer in duration by approximately ½ month. This is due to limiting water releases to STA 3/4 to

avoid exceeding its treatment capability and remain within operational criteria. This adverse impact has been accounted for in the UMAM evaluation of the Lake Okeechobee nearshore habitat.

5.3.3.2 Greater Everglades

Negative impacts were determined based on modeling results that show the with-project condition trending away from, or not meeting, the defined NSM target. Specifically, in regard to the number of events and duration of those events, for the percent period of record, for inundation and extreme high and low events in both the driest and wettest years.

While no benefits are provided to WCA 2B, there is a minor trend in the northern compartment which did not meet the target for inundation patterns in the extreme dry years. Results for percent period of record were 6% short of target. While the number of inundation events was reduced by one, the duration increased by two weeks.

In WCA 3B, inundation patterns for the percent period of record were met in the driest and wettest years, although no benefits are provided. However, extreme high water events for the percent period of record in the north and west portions increased by 40% and 46%, respectively. Although, when interpreting these results additional mitigating circumstances should be accounted for such as, influences of non-CERP (e.g. Combined Structural Operations Plan - CSOP) and the inherent uncertainties in the model targets not included in the model scenarios.

The number and/or duration of extreme low events for the percent period of record for the driest years increased in WCA 2A, WCA 3A Northeast, and SRS. The number and/or duration of extreme high events for the percent period of record for the wettest years increased in WCA 3A North.

In the eastern panhandle of ENP across flow patterns transect 23-C shows a reduction in flow with the Acceler8 projects, which includes the C-111 Spreader canal project. The reduction in flow across this transect is anticipated to be offset by the project's anticipated redistribution of water across the Model Land and the Manatee Bay and Barnes Sound Area.

5.3.4 Acceler8 System-Wide Monitoring

Performance measures (PMs) are indicators of environmental conditions in the natural and human systems that have been determined to be characteristic of a healthy, restored ecosystem. Achieving the targets of a representative set of PMs is expected to result in system-wide sustainable restoration. RECOVER has identified PMs for CERP in order to predict system-wide performance of alternative plans and assess actual performance

following implementation. The PMs for CERP are organized into six categories: four physiographic regions (Lake Okeechobee, Northern Estuaries, Greater Everglades Wetlands and Southern Estuaries), total system, and water supply and flood protection of urban and agricultural areas. Some of the CERP PMs are attributable to Acceler8, and system-wide environmental benefits from Acceler8 are anticipated throughout the four physiographic regions identified by RECOVER.

Acceler8 system-wide environmental monitoring parameters, PMs, and restoration targets will be developed during permit evaluation of an individual Acceler8 project. As other Acceler8 projects are evaluated, additional applicable monitoring parameters will be identified and incorporated in order to establish one consolidated Acceler8 system-wide monitoring plan. The USACE will allow the SFWMD to use the results of other monitoring efforts to fulfill any permit/mitigation obligations in order to avoid duplication. However, the SFWMD will be required to perform any monitoring gaps necessary to fulfill mitigation requirements and will be responsible for evaluating and presenting the system-wide monitoring information to the USACE as part of the South Florida Environmental Report. Duration of the project-related monitoring would be dependent on project contributions and corresponding expected ecosystem response times. Furthermore, the SFWMD will be required to implement corrective actions necessary to achieve the required environmental lift and the USACE will require the SFMWD to provide sufficient financial assurances for the performance of all obligations, covenants, terms, conditions, and agreements required under any issued permit. Upon congressional authorization of a CERP project which includes an Acceler8 project or feature and subsequent execution of a Project Cooperation Agreement (PCA) with the SFWMD for the CERP project, the USACE will reevaluate the permit conditions including monitoring requirements to relieve the SFWMD of specific conditions that are no longer applicable. On the other hand, if monitoring identifies areas where Acceler8 system-wide environmental benefits are not being achieved, the USACE and the SFWMD will review the operating plan to determine if adjustments can be made to achieve environmental benefits. The SFWMD will be required to implement corrective actions necessary to achieve the required environmental lift including implementation of an alternative mitigation plan(s). Annex B contains a Draft Mitigation Monitoring Plan for the EAA Reservoir A-1 project.

5.3.5 EAA A-1 Reservoir Environmental Benefits

The benefits described in Section 5.3.1 are based on a 2010 forecast with all of the Acceler8 projects on line. If permitted, the Acceler8 EAA Reservoir A-1 is anticipated to be in operation by 2010. Independently, the EAA Reservoir will move toward the NSM depth targets and anticipated corresponding

ecological benefits, although the project is not expected to achieve all targets. Specifically, the EAA A-1 Reservoir will provide benefits that progress towards achieving expected Acceler8 system-wide environmental benefits to Lake Okeechobee, the Caloosahatchee and St. Lucie Estuaries and the Greater Everglades, particularly WCA 3A and ENP as described below. It should be noted that consistent with the modeling for the Acceler8 projects, modeling for the EAA Reservoir A-1, stand alone, is also based on a forecast which include the non CERP feature Mod Waters anticipated to be on line by 2010 and Rainfall Driven Operations as discussed in Annex D.

5.3.5.1 Lake Okeechobee

Providing a reduction in the frequency of extreme high water levels and low water levels within Lake Okeechobee will result in the following ecological benefits:

- There is a 25% reduction in the frequency of extreme high water classification of 17 ft (3 fewer events).
- There is a 34% reduction in the number of days when Lake stages remain below the extreme low stage classification of 11 ft.
- There is a 40% reduction in the number of events when Lake stages remain below the extreme low stage classification of 11 ft.
- The number of MFL events (Lake stages fall below 11 ft NGVD for greater than 80 days) decrease by one (16% reduction).
- The volume of emergency flood control backpumping from the EAA is reduced by 31% annually and 31% during wetter years thus reducing nutrient loading to the lake.
- The frequency of emergency flood control backpumping from the EAA is reduced by 28% annually and 22% during wetter years thus reducing nutrient loading to the lake.
- Untreated Lake regulatory discharges directly to the Everglades are completely eliminated.
- Lake regulatory discharges to the estuaries are reduced by approximately 93,000 ac-ft. average annually (a 17% reduction).

5.3.5.2 Northern Estuaries

Benefits to the Caloosahatchee and St. Lucie Estuaries will result from reducing the extreme, undesirable freshwater discharges to the estuaries. Ecological benefits from this project, in addition to other Acceler8 projects, include:

Caloosahatchee Estuary:

- The number of months below the low flow threshold (average discharge under 300 cfs) is decreased by approximately 76%, representing fewer times below the Minimum Flow and Level criterion found in 40E-8, F.A.C.
- The number of high flow months from local basin runoff and lake discharges (average discharge over 2800 cfs) remains unchanged.
- The number of high flow months resulting from Lake Okeechobee regulatory discharges is decreased by approximately 15%.

St. Lucie Estuary:

- The number of high flow months (average discharge over 2000 cfs) resulting from Lake Okeechobee regulatory discharges is decreased by approximately 4%.

5.3.5.3 Greater Everglades

Benefits to the Greater Everglades, as described in Section 5.3.1.3, will result from improvements to hydrologic events, as a result of the EAA A1 reservoir project. In summary these benefits are ecological improvements to landscape patterns, ridge and slough community sustainability, wading bird nesting patterns and foraging habitats, and water quality.

Improvements to inundation patterns, timing and distribution of flows targeting the number of events and duration of events, trended towards defined NSM stage targets for extreme dry and wet years in WCA 3A North, WCA 3A Northeast, S-9 area within WCA 3A and WCA 3A South during the wettest years, SRS within ENP, and the Marl Marsh areas during the driest and wettest years.

Reductions in the number and duration of extreme low events are expected based on results of the percent period of record for the driest and wettest years in WCA 3A North and South, SRS within ENP and the Marl Marsh areas.

Reductions in the number and duration of extreme high events are expected based on results of the percent period of record for the driest and wettest years in WCA 1, WCA 2A (wet season only), WCA 3A Northeast, WCA 3A near the S-9 and South, SRS within ENP and the Marl Marsh areas.

Improvements in the timing of flows versus base conditions during the wet season for the percent period of record were in WCA 2A, WCA 3A North,

WCA 3A Northeast, S-9 area within WCA 3A, WCA 3A South and in SRS within ENP.

Improvements in the timing of flows versus base conditions during the dry season for the percent period of record were in WCA 3A South, S-9 area within WCA 3A, SRS within ENP and the Marl Marsh areas.

Anticipated improvements in hydrologic events translate to benefits through improved ecological conditions to specific acres of vegetation communities (Table 5-4) such as tree islands (trees/shrubs), and the ridge and slough landscape (sawgrass/wet prairie/broadleaf) in WCA 3A include:

Table 5-4: Hectares of current vegetation community composition in WCA 3A based on the South Florida Water Management District vegetation map by Rutchey et al. 2005.

Hectares	WCA3S	S9	WCA3NE	WCA3NW
Trees/shrubs	3,671	132	1,284	2,310
Sawgrass	50,898	8,708	34,532	14,189
Wet Prairie	46,519	5,795	1,431	5,820
Broadleaf	1,831	734	2,084	8

Benefits to wading bird nesting patterns and foraging habitats will improve by providing a reduction in extreme low and high water events and progressing towards hydrologic patterns that produce the maximum number of high quality foraging patches (available prey fish) which correlates to good nesting efforts.

Improvements to the water quality entering the WCAs will result from the ability to more effectively store water within the proposed EAA reservoir by metering peak flows in the STAs. STAs are intended to provide treatment rather than store water. However, during the wet season and flood events, they have been used to provide both functions. Creation of the reservoir will provide the needed storage function, allowing the STAs to be primarily used as water treatment facilities. Increased residence times of water within the STAs will ensure better treatment of waters released to the EPA and have beneficial water quality effects on all downstream ecosystems. Improvements are expected in water quality of inflows into the Greater Everglades through reduction in total phosphorus concentrations entering STA 3/4 from the proposed EAA A1 Reservoir.

The reservoir itself reduces phosphorus concentrations by 16% before conveying water to STA 3/4.

Outflow volumes (approximately 599,000 ac-ft average annually) and concentrations from the combined EAA A-1 Reservoir and STA 3/4 are projected to be within the ranges of the performance projections in the Long-Term Plan for Achieving Water Quality Goals (Burns and McDonnell, 2003) and the EAA Regional Feasibility Study (Burns and McDonnell, 2005).

5.3.5.4 Biscayne Bay

Comparison of model simulations without and with the Accerler8 projects indicate that the mean annual water flows to Biscayne Bay remain unchanged (approximately 922,000 -932,000 ac-ft) with the same seasonal distribution of 311,000 ac-ft mean dry season deliveries and, mean wet season of approximately 611,000 ac-ft.

5.3.6 Incidental Benefits

In addition to improvements to the natural system, improvements to agricultural, urban and tribal water supplies are anticipated. By reducing the number and duration of low Lake Okeechobee stages, the Acceler8 reservoirs will provide an additional source of water, improving the reliability of providing supplemental supplies. By comparing the with and without Acceler8 projects model simulations, several key indicators of water supply to the users are anticipated, including:

Lake Okeechobee Service Area (including EAA agricultural areas):

- Local reservoirs reduce reliance on the regional system, decreasing supplemental demand on the lake by approximately 162,000 ac-ft. annually (a 31% reduction).
- The demand for supplemental irrigation supplies is most critical in the late dry season (March – May). The mean monthly water supplied by the Lake during these months decreases by 90,000 ac-ft. However, the EAA A-1 reservoir provides the same volume during this timeframe resulting in a net zero change in water available to meet Everglades Agricultural Area water supply demands.
- The number of months when water supply cutbacks occur is reduced by approximately 65% (19 fewer months with restrictions).
- Mean Annual volume of supplemental irrigation water supply not met due to water supply restrictions is decreased by approximately 35% (49,000 ac-ft reduced to 17,000 ac-ft).

- Volume of water supply demands not met for Seminole Tribe's Brighton Reservation declined slightly and Big Cypress Reservation restrictions are reduced by 80%.

Lower East Coast Service Area

- By reducing the frequency and duration of low Lake stages, the number of months when water supply cutbacks occur is reduced by approximately 46% depending on the service area (22 fewer months with restrictions). Lower East Coast Service Area 2 experiences a smaller decrease of 6 fewer months with water restrictions.

5.3.7 EAA Reservoir A-1 Project Adverse Impacts

In addition to improvements expected in the natural system, some areas may not see the same level of improvements as water is stored and redistributed throughout the system. Differences in impacts outlined for Acceler8 described previously contain all Acceler8 projects, while these impacts are specifically attributable to the EAA A-1 reservoir based on model results comparing the A-1 reservoir to base conditions and defined NSM depth targets where applicable. Specifically, the frequency of high stages above 15 ft for 30 or more days in Lake Okeechobee increased. As discussed in Section 5.3.3 environmental lift and mitigation credits provided by the Acceler8 projects are anticipated to offset any adverse impacts as a result of the EAA Reservoir A-1 project.

St Lucie Estuary:

The number of months below the low flow threshold (average discharge under 350 cfs) increases by approximately 5%.

Greater Everglades:

Negative impacts associated with the EAA Reservoir A-1 Project have the same trends and results as those outlined for the Acceler8 system wide negative impacts or resulted in no improvements over base conditions.

5.3.8 Compensatory Mitigation Plan for the Proposed EAA A-1 Reservoir

As indicated in Section 5.2 above, functional assessments are currently underway in order to project the environmental lift anticipated in the year 2020 as a result of operation of the full suite of Acceler8 projects. An interagency team has conducted site visits to assess the function and value of the nearshore habitat of Lake Okeechobee, wetland habitat within WCA 1, WCA 2A, and WCA 3A, as well as the estuarine habitat in the St. Lucie and Caloosahatchee Estuaries, since some environmental lift in these areas will be achieved as a result of operation of the EAA A-1 Reservoir, stand alone.

These areas were selected since they will be directly influenced by the EAA Reservoir A-1 Project and can be evaluated for wetland and aquatic resource function and value with UMAM. As shown in Table 5-2 the assessments conducted to date indicate the Acceler8 projects will provide 35,867.88 FCUs or mitigation credits. It is anticipated that some of this projected environmental lift will be directly related to EAA A1 Reservoir project objectives.

The projected 35,867.88 mitigation credits are based on the 2010 forecast with modeling assumptions as described in Section 5.3 and Annex D. Achievement of the project UMAM goal scores and full mitigation credits is not anticipated until 2020; however, environmental lift and trends toward achievement of the goal scores is expected after 2010, when the projects are anticipated to come on line. The total credits generated to date exceed what is required to offset impact to 5,889.05 FCUs associated with construction and operation of the EAA Reservoir A-1 project. Therefore, the remaining 29,978.33 FCUs would be available to offset project impacts associated with other Acceler8 projects.

The number of mitigation credits assessed for the nearshore habitat of Lake Okeechobee and the St. Lucie and Caloosahatchee Estuaries is approximately 6,439.58 Functional Capacity Units (FCUs). This is important to note because unlike the Greater Everglades, benefits to the lake and northern estuaries are not contingent on operation of the reservoir and Acceler8 projects as modeled. On the other hand, attainment of the goal scores for the Greater Everglades as depicted on the draft preliminary mitigation ledger is contingent on a long-term operations plan or an operations plan which includes interrelated projects. The USACE recognizes that an operations plan as modeled has not been approved and/or fully evaluated for effects to listed specie, namely the American crocodile and CSSS. Thus rather than rely on benefits that are contingent on the future operations plan with deliveries to the south and potential reinitiation of Section 7 consultation, the USACE proposes to use a portion of the mitigation credit provided through benefits to Lake Okeechobee, the St. Lucie Estuary, and the Caloosahatchee Estuary to offset impacts associated with the EAA Reservoir A-1 project. With this concept, there would be 550.53 FCUs remaining after compensating for the EAA Reservoir A-1 project impacts.

PMs and restoration targets associated with Acceler8 system-wide benefits have been identified. For the EAA Reservoir A-1 Project, monitoring of PMs and restoration targets will be required for those system-wide benefits that are ascribable to the EAA A-1 Reservoir which will include the regions of Lake Okeechobee, Caloosahatchee and St. Lucie Estuaries, the Greater Everglades and ENP as discussed in Section 5.4.2. The USACE will require the SFWMD to evaluate the PMs on an annual basis and determine if the

project is trending toward success, achievement of the restoration targets, and the functional lift projected in the mitigation ledger. Although the full benefits are not expected until 2020, annual evaluation of the monitoring information will allow the USACE to determine early on if adaptive management measures are needed so that success is achieved on time. A draft mitigation monitoring plan which includes those regions where the EAA Reservoir A-1 is anticipated to provide environmental benefit is included in Annex B.

5.4 ASSURANCES FOR ACHIEVING ENVIRONMENTAL LIFT

On October 14, 2004, a Memorandum of Agreement (MOA) regarding acceleration of the Comprehensive Everglades Restoration Plan (Acceler8) between the Executive Office of the Governor and the SFWMD was signed (See Annex H). The State's Acceler8 program includes a series of projects with a total budget of $1.8 billion. The State is committed to implementing Acceler8 in order to expedite restoration of the Everglades and attain benefits ahead of the CERP schedule and in a cost effective manner. The Acceler8 program serves as the initial foundation for other comprehensive restoration efforts to follow. Therefore, it is unlikely that the State will abandon the Acceler8 initiative prior to completing design and construction of all of the projects which are specifically identified in the MOA.

If permitted and constructed in accordance with the projected schedule, the Acceler8 projects are anticipated to be in operation by 2011 with attainment of environmental benefits by 2020. Adequate and binding legal assurances are required to rely on system-wide environmental benefits for compensatory mitigation associated with Acceler8 projects that are not constructed and/or permitted. These assurances will include permit conditions that specify impacts associated with each project, requirements for achieving system-wide environmental benefits such as monitoring of ecological attributes to ensure attainment of projected "credits" depicted on the mitigation ledger, measures for adaptive management, reevaluation of permit conditions if benefits are not met and success is not achieved, and financial assurances to ensure that compensatory mitigation is provided and completed. Annex G contains a draft permit template that is intended to be applicable to any of the Acceler8 projects.

During permit evaluation for each Acceler8 project, the USACE will review the operational commitments to ensure desirable water quality and quantity is provided to the natural system at appropriate times and locations, to achieve environmental benefits required to offset impacts associated with the individual projects described on the mitigation ledger. Additional assurances for protecting water to the natural system will be provided through the State's Water Resource Protection Authorities as discussed in special

condition number 11 of the Draft Permit Template, Annex G. If and when the Acceler8 project becomes a part of CERP, the SFWMD will be required meet mandates in WRDA 2000 and the Programmatic Regulations prior to execution of a PCA (See Section 6.4, Project Assurances).

5.4.1 Alternate Compensatory Mitigation

Alternate mitigation would be required if the system-wide benefits (credits) are not sufficient to offset project impacts (debits), if the system-wide benefits are not achieved following adaptive management, and/or if all of the Acceler8 projects are not brought on line. As stated above, the USACE does not anticipate achievement of the full Acceler8 mitigation credits until 2020 and appropriate risk and time factors have been included in the UMAM evaluation. If prior to 2020, the ledger does not contain enough credits to offset the debits or if after 2020 the goal scores have not been achieved then alternate mitigation will be necessary to replace all individual project debits that are not offset. The SFWMD has identified alternate mitigation opportunities within the EAA Reservoir A-1 Project footprint through creation of 844 acres of managed native plant upland buffer within the Woerner Farm 3 Tract and perimeter buffer areas and/or planting of appropriate native plant species within the 205-acre seepage buffer area. Additionally the SFWMD has indicated enhancement within the 3,335-acre Strazulla wetlands or acquisition of environmental lands as other alternate mitigation options. Alternate mitigation would be assessed in the same manner as the project impacts with UMAM and considerations for risk and temporal lag.

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CHAPTER 6
COMMITMENTS

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6.0 COMMITMENTS

The South Florida Water Management District and its contractors commit to avoiding, minimizing, or mitigating for adverse effects during construction activities by taking the following commitments:

6.1 ENVIRONMENTAL COMMITMENTS

1. Employ best management practices with regard to erosion and turbidity control. Prior to construction, the construction team should examine all areas of proposed erosion/turbidity control in the field, and make adjustments to the plan specified in the plan control device as warranted by actual field conditions at the time of construction.

2. The contract specifications will prohibit the contractor from dumping oil, fuel, or hazardous wastes in the work area and will require that the contractor adopt safe and sanitary measures for the disposal of solid wastes. A spill prevention plan will be prepared by the contractor.

3. Demolition debris would be transported to a landfill or otherwise disposed of in accordance with federal, state, and local requirements. Concrete or paving materials would be disposed of in accordance with federal, state, and local requirements.

4. Soil within the lower 1/3 of the Woerner Farm 3 Tract, approximately 300 acres, will be removed and used to form soil on the northern exterior face of the reservoir. In addition, the soil would be vegetated.

5. Minimize complete drydown of reservoir cells to the extent practicable in order to minimize potential remobilization of contaminants.

6. All muck soil removed for construction and remaining after placement of muck along the exterior reservoir embankment will be redistributed throughout the seepage buffer area.

7. Implementation of an exotic plant management program for the reservoir project site including the embankment, seepage buffer, and undisturbed lands within the Woerner Farm 3 Tract and outer buffer area.

8. Inform contractor personnel of the potential presence of threatened and endangered species in the project area, the need for

precautionary measures and the ESA prohibition on taking listed species. Construction contractors will be trained and briefed on how to identify the wood storks and bald eagles in the area. The USFWS will be notified upon observation of any stork or eagle nesting activity.

9. The following special measures will be incorporated during project construction to minimize effects to any listed species that may be present: a) *Standard Protection Measures for the Eastern Indigo Snake*; b) *Management Guidelines for the Bald Eagle in the Southeast Region and Bald Eagle Standard Local Operating Procedures for Endangered Species*; and c) *Habitat Guidelines for the Wood Stork in the Southeast Region*.

10. If new electrical lines are constructed near open water to service new pumps, the publication Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996 shall be consulted for recommended measures to protect bald eagles from electrocution.

    Both the FWC and the USFWS have been consulted for recommendations on avoidance of impacts to federally listed and state listed species. Both the FWC and USFWS will be consulted in the event that colonial or solitary wading bird nests are observed within the construction footprint. In addition, Florida burrowing owls are known to inhabit ruderal areas, such as canal banks and road berms, in the vicinity of the project. Eagle, wood stork, and burrowing owl surveys will be performed prior to the start of construction. If owls are observed within the Acceler8 EAA Storage Reservoir construction footprint, the FWC will be consulted for management measures and the contractor may be required to obtain a permit. More information on FWC permit requirements and applications can be found on the web at http://wld.fwc.state.fl.us/permits/permits.html. If bald eagle nests are encountered on the project footprint, the USFWS' *Habitat Management Guidelines for the Bald Eagle in the Southeast Region* will be implemented during construction of the EAA Project.

    The USFWS will be notified upon locating a dead, injured, or sick wood stork or bald eagle before, during, and after construction of the reservoir.

11. For the manatee, the following Standard Protocols will be used during construction: a) Protocols to Minimize/Avoid Entrapment at structures; b) Protocols for Existing and New Culverts based on the

size of culverts; c) the Manatee Blasting Protocol when explosives are required; d) Ground Observer Protocols, as well as the *Standard Manatee Construction Conditions*. In addition, intake canals and/or structures will include an aluminum grate from the bottom of the structure to approximately 1 ft above high water, with 8 inches of bar spacing, or a similar exclusion feature. The features will be designed for temporary removal in the event of a water emergency.

If barriers are in place at the Lake Okeechobee structures S-351, S-352, and S-354 to prevent manatees from entering the EAA, prior to initial construction of the EAA Project, adverse effects to manatees in the EAA will be minimized and observer protocols and barriers at individual structures of the EAA Project will be unnecessary.

12. The SFWMD agrees to maintain an open and cooperative consultation process with the USACE, USFWS, USEPA, FDEP, and FWC throughout the design, construction, and operation of the reservoir.

13. A monitoring program will be established to assess mercury levels and other contaminants within the water column, including before drying and upon rehydration of the reservoir. Additional monitoring will be performed at inflow and outflow points. The monitoring program will also include assessing mercury levels and other persistent contaminants in prey fish (mosquitofish, sunfish, and largemouth bass) within the reservoir and downstream area. In the event that ecological risks from contaminants to listed species become evident through sampling regimes and monitoring, the USACE will consult with the USFWS to determine if re-initiation of consultation in accordance with Section 7 of the ESA is necessary.

14. The initial manually flooding of the reservoir will be at a rate of one-half inch per day until a depth of six inches is attained in order to minimize negative impacts to the eastern indigo snake. The reservoir will also be initially manually filled at a rate of one inch per day from the six-inch to 12-inch water depth to allow additional time for other terrestrial wildlife to vacate the area.

15. To protect any unknown cultural resources, conditions stipulated by the SHPO will be followed. Language will be included in specific conditions of any issued permit outlining the steps to be taken in the event that undiscovered historical properties are encountered. An informational training session, developed by a professional

archaeologist, will be conducted for the contractor's personnel to explain what kinds of archaeological/cultural materials might be encountered during construction of the impoundment, and the steps to be taken in the event these materials are encountered. A professional archaeologist will conduct periodic monitoring of the project area during construction to determine if activities are impacting unanticipated cultural resources.

16. In order to offset project impacts, the State will not allocate any water made available by the project for consumptive use until the State demonstrates that the project can be operated consistent with the approved operating plan to achieve the environmental benefits identified for the project.

17. Compliance with the State of Florida's legislative and statutory requirements for state projects being constructed pursuant to state CERP authorities.

6.2 OPERATION COMMITMENTS

The operational goals of the EAA Reservoir A-1 are to capture and store Lake Okeechobee Regulatory releases (model results indicate approximately 281,000 acre-feet annual average) and EAA basin runoff (estimated at 227,000 acre-feet annual average); to deliver water from the reservoir (estimated at 332,000 acre-feet annual average) to downstream natural areas via STA-3/4 at times of natural system need; and to deliver water from the reservoir to meet local agricultural water supply demands (estimated at 171,000 acre-feet annual average) that would otherwise be met via deliveries from Lake Okeechobee. The hydrologic conditions for Lake Okeechobee and the EAA will be assessed to determine which area has the greatest need for runoff or discharge removal. This will depend on the regional drainage system's capability to convey water to the reservoir while maintaining existing levels of flood protection and water supply within the basin.

Water will be released from the reservoir to meet environmental demands identified based on natural system targets in the Everglades. Releases from the reservoir into STA-3/4 would not result in failure to meet legal requirements including NPDES discharge criteria. The simulated range of STA 3/4 inflow volumes (approximately 599,000 ac-ft average annually), associated outflow volumes, and resulting nutrient concentrations from the combined EAA A-1 Reservoir and STA 3/4 are projected to be within the design tolerances and ranges of the performance projections per the Long-Term Plan for Achieving Water Quality Goals (Burns & McDonnell, 2003) and the EAA Regional Feasibility Study (Burns & McDonnell, 2005). The SFWMD has demonstrated in the Dynamic Model for Stormwater Treatment

Areas located in Annex D that inflows and associated nutrient loading rates (based on existing water column concentrations in Lake Okeechobee and EAA basin runoff) can be tolerated by STA3/4 without compromising its ability to meet/exceed the State's existing and planned future performance expectations. Environmental releases from the reservoir through STA-3/4 will be made with the intent to meet environmental needs identified in the Everglades; however, these releases will be limited to avoid creating undesirable impacts due to constraints of the existing C&SF project that maybe present when the project becomes operational.

Releases may be made into the NNRC to provide water supply for other water related needs when there is water remaining in the reservoir after demands of the Everglades have been met. Otherwise deliveries for other water related needs, including consumptive use, will continue to be provided via deliveries from Lake Okeechobee. Water remaining in the reservoir may also be provided for other water related needs when it is necessary to create storage capacity for additional Lake Okeechobee regulatory releases.

It is recognized that this project is one component of a much larger and complex environmental restoration program that will involve revisions to the operating manual to allow for the interrelationship of the other components. Prior to revising the interim operations plan to include operations and/or other interrelated projects which send water deliveries to the south, the USACE will re-evaluate downstream effects to determine if additional analyses are needed. Specifically, the USACE will evaluate effects of the American crocodile and the Cape Sable seaside sparrow to determine if re-initiation of Section 7 consultation is necessary.

The operating manual will include a water budget that estimates the appropriate volume and distribution of water necessary to achieve the system-wide environmental benefits identified in Chapter 5. Operations for the project may be modified through the USACE approval process as necessary to incorporate changing operations in other areas of the project or when modifications in operations are identified through the adaptive management process. Until such time that the Acceler8 EAA A-1 Reservoir project, as anticipated, becomes a Congressionally authorized federal CERP project, a Project Cooperation Agreement is signed, and a CERP operating manual is in existence, the State's operating manual(s), including modifications to the manual, will be reviewed by the USACE for approval prior to implementation. (See Annex G which includes a Draft Permit Template with specific conditions addressing operation of the proposed facility.)

6.3 ENGINEERING AND DESIGN COMMITMENTS

1. The proposed EAA Reservoir A-1 project will provide capacity to store storm runoff and will increase the pumping capacity from the NNRC. In addition, areas within the EAA Reservoir A-1 previously used for agriculture will no longer deliver runoff to the NNRC, thereby making available 500 cfs of NNRC water that was previously unavailable. Therefore, the project will not diminish flood protection and should reduce flooding in the NNRC under most conditions. Flood damage reduction, while not a primary project objective, will be attained by increasing canal conveyance capacity in the canals and by providing storage capacity in the surface impoundments.

2. A monitoring program of groundwater levels in the farmland will be initiated during the construction of the proposed EAA Reservoir A-1 and continue after construction is completed. This will provide information to the SFWMD for evaluating the effectiveness of the seepage control. The monitoring program is a means to document whether flood protection has been maintained required by Chapter 373.1501 F.S.

3. A zoned embankment concept has been developed to utilize materials from the required seepage collection canal excavations and available on-site borrow resources, and to minimize sorting and processing of the excavated materials for embankment construction.

4. For a zoned embankment, a configuration along the STA-3/4 Supply Canal will be utilized that provides cost-savings and additional storage. Rather than setting back the embankment from the proposed EAA Reservoir A-1 boundary, the embankment would tie in with the northern embankment of the Supply Canal.

5. Curved corners will be utilized in the northwest and southeast corners of proposed EAA Reservoir A-1, as they provide additional storage benefits. Both the northwest and southeast corners will be curved at a radius that aids construction of the embankment.

6. Northeast pump station recommendation:

   - Construction of a 3,600 cfs northeast pump station concurrent to the construction of EAA Reservoir A-1.
   - Use of the G-370 pump station unmodified during phase one operation to pump into the EAA Reservoir A-1 when its water levels are less than eight feet and directly to the STA Supply Canal when EAA Reservoir A-1 water levels are greater than eight feet.
   - Modification of the G-370 pump station to pump 2,220 cfs capacity to full EAA Reservoir A-1 depth was evaluated but not

recommended as a cost effective means of supplying water to the reservoir.

7. In addition to the gated structure the proposed EAA Reservoir A-1 will be equipped with an orifice-type spillway which will guard against overfilling. The spillway will be designed to limit overflow discharges to less than 500 cfs during rainfall events with more than a 100 year recurrence interval.

8. A Project Operating Manual (POM), for day-to-day use in managing essentially all foreseeable conditions affecting the EAA Reservoir A-1 will be developed upon completion of the Project. Knowledge gained from the Operational Testing and Monitoring Phase will be incorporated into this POM, which will be coordinated with SFWMD and the USACE Jacksonville District.

9. The proposed EAA Reservoir A-1 will be operated to assure that implementation of the project will not diminish flood protection in the EAA.

6.4 PROJECT ASSURANCES

The goal of the Acceler8 program is to assist in the restoration, preservation, and protection of the South Florida ecosystem while providing for other water related needs of the region. This program of projects will be designed to provide the quantity, quality, timing, and distribution of water necessary to achieve and sustain those essential hydrological and biological characteristics that define the restored South Florida ecosystem. The construction and operation of Acceler8 will be required to remain consistent with the Federal Central & South Florida Project as modified by law and its project goals and purposes.

Given that the Acceler8 projects are intended to be constructed by the State and are a subset of planned federal projects within the CERP, the SFWMD has agreed with the Federal government to design, construct, and operate the Acceler8 projects consistent with the requirements of the WRDA 2000, applicable federal and state law, and the Central and Southern Florida Project purposes as a whole. The State acknowledges that it will be in full compliance with the Programmatic Regulations, President/Governor Agreement, and Section 601 of WRDA 2000 prior to execution of a Project Cooperation Agreement in order for the Acceler8 project to become a federal project. Until such time, the Acceler8 projects are a state program and programmatic regulations are not directly applicable.

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CHAPTER 7
AGENCY COORDINATION AND PUBLIC INVOLVEMENT

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7.0 PUBLIC INVOLVEMENT

7.1 PUBLIC INVOLVEMENT PROGRAM FOR ACCELER8

A number of opportunities occur through the Acceler8 design process for the public and government agencies to provide input regarding each project. Project information, schedules, documents, and presentations to the Public are kept updated and available on the Acceler8 website, http://www.evergladesnow.org.

A series of public workshops and stakeholder meetings are held for the Basis of Design Report (BODR) and the Preliminary Design Plan (30% plans) for each Acceler8 project including Water Resources Advisory Commission (WRAC) Issue Workshops. At these workshops, information regarding the project is presented; technical questions are answered; and the public are provided the opportunity to comment. Monthly updates for the Acceler8 projects are also provided during full WRAC meetings and SFWMD's Governing Board meetings, where the public also has the opportunity to comment. Acceler8 status presentations have also been provided at the Quarterly meetings of the South Florida Ecosystem Restoration Task Force and the South Florida Ecosystem Restoration Working Group where the public also has an opportunity to provide comments.

7.2 AGENCY/PUBLIC COORDINATION FOR THE PROPOSED ACCELER8 EAA STORAGE RESERVOIR A-1 PROJECT

A multi-agency Project Delivery Team, led by the U.S. Army Corps of Engineers (USACE), is in the process of preparing the Final Project Implementation Report / Environmental Impact Statement (PIR/EIS), for the federal CERP EAA Storage Reservoirs project as specifically authorized in section 601(b)(2)(C)(ii) of WRDA 2000. The SFWMD proposes to construct the EAA Reservoir project prior to implementation of any federal CERP EAA Storage Reservoirs project. The USACE is proceeding with two separate and independent but related actions, the regulatory evaluation of the SFWMD's proposed Acceler8 EAA Reservoir project and the planning evaluation of the federal CERP EAA Storage Reservoirs project both of which are described in the September 2005 EAA Storage Reservoirs Draft Integrated PIR/EIS. On October 12, 2005, concurrent with the comment period for the September 2005 Draft Integrated PIR/EIS, the Regulatory Division circulated a Public for the SFWMD's proposed Acceler8 project. The USACE and SFWMD had anticipated that the SFWMD would accelerate construction and achievement of benefits of certain CERP projects by obtaining required permits and initiating construction upon completion of the Final Integrated PIR/EIS for the federal CERP project with the Final PIR/EIS serving as the NEPA evaluation for both federal actions. Because of delays in completion of the

Final Integrated PIR/EIS for the federal CERP EAA Storage Reservoirs project, the SFWMD is pursuing a Department of the Army permit prior to completion of the CERP EAA Storage Reservoirs Final EIS.

The SFWMD's decision to pursue a USACE regulatory permit prior to a final PIR/EIS, resulted in the regulatory action diverging from the CERP PIR action. A Draft Supplemental EIS for the regulatory action, i.e., the Acceler8 EAA Reservoir A-1 project, was released on 10 February 2006. The Draft Supplemental EIS supplemented the September 2005 Draft Integrated PIR/EIS and recognized that there would be an independent regulatory action which broke away from the Integrated PIR/EIS process.

The Draft Supplemental EIS was circulated for 45 days after noticing in the Federal Register. Copies of the Draft Supplemental EIS were mailed to appropriate Federal and State agencies, Native American Tribes, environmental groups, and interested public. In addition, public libraries in the project area were provided copies to maintain in the reference section of the libraries. The Draft Supplemental EIS was also posted electronically for web viewing.

Concurrent with the Draft Supplemental EIS, a supplemental regulatory Public Notice was circulated on February 13, 2006, for a 30-day comment period.

Annex E includes copies of the Draft Supplemental EIS response letters and a detailed response to each comment. Below is a list of the comments received on the Regulatory Public Notice and/or Draft Supplemental EIS and a brief response to the comments. The reader is referred to Annex E for a copy of the EIS comment letters and a more detailed response to the comments.

7.2.1 NMFS

By electronic mail on March 1, 2006, the NMFS Habitat Conservation Division (HCD) responded to the regulatory Public Notice stating present staffing levels preclude further analysis of the proposed activity and no further action is planned. NMFS HCD stated the position is neither supportive of nor in opposition to the authorization of the proposed work. By letter dated April 11, 2006, the NMFS Protected Resources Division responded to the Draft Supplemental EIS stating the document adequately addresses the issues associated with threatened and endangered species under the NMFS' purview.

7.2.2 USFWS

The USFWS responded by electronic mail to the Draft Supplemental EIS (See Annex E). Their comments were incorporated into a letter submitted by the DOI. The USFWS comments were primarily technical including seepage, incorporation of ecological features into the project design, quantification of benefits, contaminants, and wildlife resources. The proposed project includes features that are anticipated to provide incidental ecological benefits. The SFWMD will include measures to avoid risk of contamination and avoid adverse impacts to wildlife resources. Model simulation assumptions and results can be found in Appendix D and Chapter 5 includes an analysis of environmental benefits anticipated as a result of EAA Reservoir A-1 and all of the Acceler8 projects. See Annex E for the USFWS' comments and a detailed response. A meeting was held on April 27, 2006, with the USACE, SFWMD, DOI, and USFWS to discuss the comments received.

7.2.3 Natural Resource Defense Council (NRDC)

By letters dated March 15 and March 24, 2006, the NRDC responded to the Supplemental Public Notice dated February 13, 2006, and the Draft Supplemental EIS dated January 2006, respectively. The comments from both letters are identical; therefore, only the March 24, 2006 letter is contained in Annex E. The NRDC stated the Draft Supplemental EIS does not evaluate reasonable alternatives, does not contain a PIR, and violates the Clean Water Act. In response, the USACE has updated Chapter 2, Alternatives, and Chapter 4, Environmental Effects, and has added a 404(b)(1) Guidelines Evaluation, Annex A. Regarding the need for a PIR, this requirement applies federal CERP projects and not USACE Regulatory actions. See Annex E for more details on the response to the comments. It should also be noted that the applicant, SFWMD, met with the NRDC to discuss their comments on April 25, 2006.

7.2.4 Sierra Club

By electronic mail on March 15, 2006, the Sierra Club responded to the Supplemental Public Notice agreeing with the comments in the NRDC letter. The Sierra Club also indicated concerns with the loss of wetlands directly impacted by the project and stated the Draft Supplemental EIS failed to adequately address environmental effects of the project and Acceler8, specifically with modeling information. In response to the comments, modeling information and a 404(b)(1) Guidelines Evaluation have been added and Chapter 4, Environmental Effects, has been updated. See Annex E for a copy of the electronic mail and a detailed response to the comments.

7.2.5 Natural Resource Conservation (NRCS)

By letter received on March 27, 2006, the NRCS responded to the Draft Supplemental EIS with comments pertaining to the project's ability to meet EAA irrigation demands. Evaluation of the project indicates that improvements to agricultural, urban and tribal water supplies are anticipated as a result of the project. See Annex E for a copy of the letter and a response to the comments.

7.2.6 Department of the Interior (DOI)

By letter dated March 27, 2006, the DOI responded to the Draft Supplemental EIS. A meeting was held on April 27, 2006, with the USACE, SFWMD, DOI, and USFWS to discuss the comment letter. See Annex E for a copy of the letter and a response to the comments. The DOI stated the Draft Supplemental EIS does not identify how benefits of the EAA Reservoir A-1 will be provided and suggested that the Acceler8 project be linked to the CERP EAA Storage Reservoirs project and CERP requirements. In response to the comments, the USACE has included modeling outputs for the EAA Reservoir A-1 and the Acceler8 projects, Annex D, as well as Chapter 5, Mitigation, which identify benefits associated with the EAA Reservoir A-1. Regarding linkage to CERP requirements, these requirements are not part of the USACE regulatory evaluation. However, the regulatory evaluation does include a public interest evaluation, mitigation evaluation, and consistency with other federal requirements such as the C&SF Project. Annex E contains a detailed response to these comments.

7.2.7 Sugar Cane Growers Cooperative of Florida (SCGCF)

By letter dated March 27, 2006, SCGCF responded to the Draft Supplemental EIS requesting that the Regulatory Division provide model runs for the EAA Reservoir A-1 and recirculate a 30-day Public Notice. This request was based on a letter from the Regulatory Division on November 21, 2005, following the October 2005 Regulatory Public Notice at which time the Acceler8 project was being evaluated under the Draft Integrated PIR/EIS. In response to the comment, modeling information has been included in Annex D but in the context for evaluating environmental benefits and public interest, not for the purposes of CERP requirements. See Annex for a copy of the letter and a detailed response to the comment. It should be noted that the applicant, SFWMD, requested a meeting with the SCGCF to discuss the comments but the SCGCF declined.

7.2.8 Florida State Clearinghouse

By letter dated March 27, 2006, the Florida State Clearinghouse indicated the proposed project is consistent with the Florida Coastal Management

Program. The consistency determination was contingent on the USACE and SFWMD continuing to work with the State agencies to resolve any remaining State issues. Specifically, the Florida State Clearinghouse attached copies of letters from FDOT, FDEP, FWC, and SHPO which were written in response to the September 2005 Integrated PIR/EIS for the CERP EAA Storage Reservoirs project. The Florida State Clearinghouse requested the USACE work with the FDEP on alternatives analysis of costs and benefits to reduce water quality concerns, with the FDOT to provide detailed information on all features proposed within the FDOT right-of-way, and with FWC regarding seepage to the Holey Land. Many of the FDOT's comments were written in response to the CERP EAA Storage Reservoirs project and do not pertain to the Acceler8 EAA Reservoir A-1. Many of the comments which do pertain to the Acceler8 project have been coordinated with the FDOT through the BODR process. In addition, a meeting was held on April 18, 2006, with the USACE, SFWMD, and FDOT to discuss transportation concerns. In response to the FDEP comments, Chapter 2, Alternatives, has been updated and Chapter 5, Mitigation, has been added. Regarding the FWC comment, no net increase in volumes of water supply will be made to the Holey Land under the current operation schedule. See Annex E for a copy of these State comment letters and a response to comments.

7.2.9 USEPA

By letter dated March 27, 2006, the USEPA responded to the Draft Supplemental EIS with comments regarding reservoir footprint changes and concerns with water quality and operational constraints of STA 3/4. The USACE affirms that the reservoir footprint has changed in order for the project to avoid risk of pesticide contamination. In response to the concerns with water quality and STA 3/4, the USACE has added a Water Quality Monitoring Plan, Annex F, and has updated information on the operational constraints of STA 3/4, Section 2.5.2 and Annex D. See Annex E for a copy of the letter and a more detailed response to the comments. It should also be noted that a meeting was held with the USACE, USEPA, and SFWMD to discuss the comments on April 25, 2006.

7.3 OTHER AGENCY/PUBLIC COORDINATION FOR THE PROPOSED ACCELER8 EAA STORAGE RESERVOIR A-1 PROJECT

Meetings and presentations to specifically present/discuss the BODR and the Preliminary Design Plan for the Acceler8 EAA Reservoir A-1 Project are as follows:

7.3.1 Basis of Design Report

- Stakeholder briefing with Agriculture Group on November 14, 2005

- Stakeholder briefing with Environmental Groups on November 14, 2005
- Stakeholder briefing with Special Taxing Districts / Local Governments on November 16, 2005
- Stakeholder briefing with Municipalities Tri City Area on November 17-18, 2005
- Stakeholder briefing with Seminole Tribe – November 18, 2005
- WRAC Issues Workshop briefing held on November 21, 2005
- WRAC – December 7, 2005
- Governing Board Status Update- December 14, 2005

7.3.2 Preliminary Design for the Embankments

- Stakeholder briefing with the Seminole Tribe – March 20, 2006
- Stakeholder briefing with Environmental Groups – March 21, 2006
- Stakeholder briefing with the Agricultural Group – March 22, 2006
- Stakeholder briefing with Special taxing districts/local government – March 23, 2006
- Stakeholder briefing with City Manager, Belle Glade – March 23, 2006
- Stakeholder briefing with the Miccosukee Tribe – March 24, 2006
- Stakeholder briefing with the Mayor of Pahokee – March 24, 2006
- Stakeholder briefing with the Mayor of South Bay – March 27, 2006
- WRAC Issues Workshop Public Meeting- March 30, 2006
- WRAC- April 6, 2006
- Governing Board Status Update- April 12, 2006

7.3.3 Other Meetings

Additionally, an assurance pre-application meeting was held with Florida Department of Agriculture and Consumer Services. A Criteria Committee Meeting (CCM) was held on June 20, 2005. Other meetings have been held with representatives from the following agencies present:

- Florida Department of Environmental Protection
- Florida Fish and Wildlife Conservation Commission
- Florida Department of Agriculture and Consumer Services
- U.S. Army Corps of Engineers

- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service

Governing Board Review and action on contracts related to the EAA Storage Reservoir Project include the following:

- Test Cell Construction and Operation – December 4, 2005
- Farming Transition Lease Agreement - January 6, 2006

7.3.4 Public Outreach Efforts

In an effort to encourage local labor and increase local employment, the SFWMD has undertaken various steps; including, education by the means of regional partnerships with Palm Beach Community College, Palm Beach School Board, Workforce Development and Community Based Organizations, holding workshops for vendors, and construction symposiums.

7.3.5 Additional Coordination

In addition to the efforts described above, additional information regarding coordination efforts on utilities and public infrastructure, including roads such as US 27 and SR 80, can be found in Annex G of the September 2005 Draft Integrated PIR/EIS for the CERP EAA Storage Reservoirs project under the State Compliance Report. As of now, meetings have been held with:

- Florida Department of Transportation (FDOT)
- Florida Power and Light
- Palm Beach County
- Lake Worth Drainage District (LWDD)

7.4 PUBLIC INVOLVEMENT FOR THE FEDERAL CERP EAA STORAGE RESERVOIRS PROJECT

A Revised Draft Integrated Project Implementation Report / Environmental Impact Statement (PIR/EIS) for the CERP EAA Storage Reservoirs project was released on 24 February 2006, and circulated for 45 days. A public meeting to hear comments on the Revised Draft Integrated PIR/EIS was held in Belle Glade, Florida on March 15, 2006.

7.5 FUTURE PUBLIC INVOLVEMENT FOR THE EAA RESERVOIR A-1 PROJECT

The EAA Reservoir A-1 Project will have impacts on the surrounding area and local communities. The list of stakeholders will continue to be developed

by the SFWMD as design for the EAA Reservoir A-1 Project progresses with subsequent coordination. Stakeholders currently identified include the following:

- Audubon Society of Florida
- Bergeron
- Carroll, Jack E. and Larry G.
- EAA Environmental Protection District
- Florida Crystals Corporation
- Florida Department of Agriculture and Consumer Services
- Florida Department of Environmental Protection
- Florida Department of Transportation
- Florida Fish and Wildlife Conservation Commission
- Florida Ranch Enterprises, Inc.
- Florida Power & Light
- Lake Worth Drainage District
- Okeelanta Corporation
- New Hope South, Inc.
- NLDS Acquisition Corporation
- Palm Beach County
- Star Ranch Enterprises, Inc.
- Sugar Farms Co-op
- Talisman Sugar Corporation
- Tri-Cities (South Bay, Pahokee, Belle Glade)
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Natural Resources Conservation Service
- U.S. Sugar Corporation
- Woerner South Inc
- Miccosukee Tribe of Indians of Florida
- Seminole Tribe of Florida

This Final Environmental Impact Statement, for the SFWMD's proposed EAA Reservoir A-1 Project will be distributed to interested members of the public and made available at public venues such as libraries and governmental buildings. This will be accompanied by print and electronic publication of the event. Project information and points of contact will also be provided at the Jacksonville District web page: www.saj.usace.army.mil.

There will be a 30-day comment period after the Final EIS is published. Responses received from the public and agencies within the comment period will be compiled and considered in the EAA Reservoir A-1 design and Record of Decision.

7.6 FEDERAL, STATE, AND LOCAL PERMITS, LICENSES OR OTHER CONSULTATION REQUIREMENTS

SFWMD will be responsible for obtaining other Federal, State, and Local permits, Licenses or other consultation requirements for the proposed EAA Reservoir A-1 Project, as described in this section.

7.6.1 Spill Prevention, Control and Countermeasures (SPCC) Plans – CWA

Under the provisions of USEPA 40 CFR Part 112 - Oil Pollution Prevention, facilities which have above ground petroleum products storage of greater than 1,320 gallons aggregate or greater than 42,000 gallons below ground storage, are required to have a SPCC Plan which meets all of the requirements of this regulation. Part 112 of 40 CFR establishes procedures, methods and equipment, and other requirements to prevent the discharge of oil from facilities into or upon the navigable waters of the United States or adjoining shorelines. The SPCC Plan must be formulated under the supervision of and certified by a registered professional engineer and must be available at the facility for inspection by the FDEP and USEPA personnel. If above ground petroleum products storage exceeds the above thresholds, a SPCC Plan will be required.

7.6.2 National Pollution Discharge Elimination System Permits (NPDES)

If the proposed project is determined to be a "treatment area", a Section 402 permit (NPDES) will be required under the Clean Water Act. This program has been delegated to the FDEP by the USEPA. If determined to be necessary, the NPDES permit will be required prior to operation of the facility.

7.6.3 Coastal Zone Management Act (CZMA)

The CZMA authorizes the National Oceanic and Atmospheric Administration to administer the federal Coastal Zone Management Program (CZMP). The

purpose of CZMP is to preserve, protect, develop, and where possible, to restore or enhance, the resources of the nation's coastal zone. The federal CZMP has delegated the day-to-day management of the program in Florida to the Florida Department of Community Affairs, including determinations of consistency (FDEP 2005b).

CZMP coordinates state governmental activities related to the protection, preservation, and development of Florida's natural, cultural, and economic coastal resources. A network of 10 agencies implements the program (FDEP 2005b). CZMP consistency for the proposed project has been granted.

7.6.4 Magnuson-Stevens Fishery Conservation and Management Act

Public Law 104-208 reflects the Secretary of Commerce and Fishery Management Council authority and responsibilities for the protection of EFH. Federal agencies that fund, permit, or carry out activities that may adversely impact EFH are required to consult with the NMFS regarding the potential effects of their actions on EFH. The USACE is satisfied that the consultation procedures to implement the EFH provisions of the Magnuson-Stevens Act have been met.

7.6.5 Section 7 Endangered Species Act Consultation

The proposed project has been determined to be compliant with Section 7 of the Endangered Species Act. The USACE recognizes that reinitiation of Section 7 consultation may be necessary prior to approval of the operations plan and/or an operations plan that includes interrelated projects.

7.6.6 Section 106 - Cultural Resources

The proposed project has been determined to be compliant with Section 106 of the National Historic Preservation Act.

7.6.7 Clean Air Act (CAA)

The northeast pump station proposed for the EAA Reservoir A-1 may affect air quality; thus compliance with this act will be required. However, under the current delegation agreement between the USEPA and FDEP, permit review is administered at the state level and reviewed for concurrence with CAA Requirements by the USEPA. The SFWMD shall apply for these permits during the construction and operation phases.

7.6.8 State Permits

7.6.8.1 Comprehensive Everglades Restoration Plan Act (CERPRA)

The FDEP is responsible for reviewing the majority of environmental permits. Florida Statute (F.S.) 373.1502(3)(b) authorizes the FDEP to issue permits for the construction, operation and maintenance of CERP project components under the CERPRA. The SFWMD's proposed EAA Reservoir A-1 Project is considered part of the CERPRA. The FDEP is currently evaluating a CERPRA permit for construction of the seepage canal.

7.6.8.2 Consumptive Use Permit

The SFWMD's proposed EAA Reservoir A-1 Project will be permitted under CERPRA, therefore, a Consumptive Use Permit will not be required in accordance with Florida Statute Section 373.323 F.S. During the CERPRA process, however, a consumptive use evaluation will be conducted. All pertinent information has been submitted with the CERPRA application (Dated June 2005).

7.6.8.3 Florida Department of Transportation Access Permit

An Access Permit is required from the FDOT for driveways, streets, turnouts, or other means of providing access to the state highway system. Rule 14-96 and 14-97 F.A.C. govern access permits. Any access roads constructed for the EAA Reservoir A-1 Project, which will connect to the state highway system, will require an access permit from the FDOT. A General Permit will be required for the construction of the planned bridge on U.S. 27, thus coordination with FDOT is ongoing. In addition, the proposed EAA Reservoir A-1 Project would be required to undergo Maintenance of Traffic review to determine any necessary traffic improvements resulting from the EAA Reservoir A-1 Project.

7.6.8.4 Clean Air (Title V) Permit

The FDEP is responsible for all Title V permits, which regulate both major and minor emitters. The SFWMD shall apply for these permits during the construction and operation phases.

7.6.8.5 Petroleum Storage Tanks

Petroleum storage tanks are regulated under the provisions of Rule 62-761 F.A.C. (Underground Storage Tanks – USTs) and Rule 62-762 F.A.C. (Aboveground Storage Tanks – ASTs). If the EAA Reservoir A-1 Project requires either UST storage capacity in excess of 110 gallons or AST storage capacity in excess of 550 gallons, then the project must comply with the

applicable standards for engineering, construction and operation of the storage system. Additionally, all regulated storage tanks must be registered with the FDEP and will be subject to annual inspections by the Palm Beach County Department of Environmental Resource Management.

7.6.8.6 Hydrostatic Testing Permits

Hydrostatic test plans will be reviewed by FDEP and a permit determination will be made by the FDEP, if any testing is required in the proposed EAA Reservoir A-1 Project.

7.6.8.7 National Pollution Discharge Elimination System (NPDES) Permits

Construction activities associated with the EAA Reservoir A-1 Project will likely be permitted under FDEP's Generic Permit for Stormwater Discharge from Large and Small Construction Activities (GCP) pursuant to Section 62-21.300(4)(a) F.A.C. This NPDES permit requires development of a Storm Water Pollution Prevention Plan (SWPPP). In addition to the GCP, if any offsite discharges will occur due to construction dewatering activities, coverage under the NPDES General Permit for the Discharge of Produced Groundwater from any non-contaminated site activity may be required pursuant to Section 62-621.300(2) F.A.C.

7.6.8.8 Dam Safety Permit

The FDEP is responsible for the State of Florida Dam Safety Program; the water management districts within the State are also authorized to regulate dams. The permitting process for construction of dams within the State of Florida is found within Chapter 373 F.S. Additionally, the Federal Emergency Management Agency (FEMA) has published a report titled Federal Guidelines for Dam Safety (April 2004). The height and size of the proposed berm around the EAA Reservoir A-1 will determine which provisions apply.

7.6.9 Local Permits

Local permitting authority for the EAA Reservoir A-1 Project resides with several county Departments and Divisions. Primary coordination of local permit review will be administered by Palm Beach County's Planning, Zoning and Building (PZB) Division. Following is a list of County Departments and Divisions which will be involved in review of the proposed EAA Reservoir A-1 Project.

7.6.9.1 Palm Beach County Planning, Zoning & Building (PZB) Division – Development Review

Under the County's Development Review Procedures, the EAA Reservoir A-1 Project may be required to obtain Zoning Approval and a Building Permit prior to construction. However, in discussions with County PZB Division staff, it was indicated that the County will first review the proposed EAA Reservoir A-1 Project to determine if it may be exempted from this process under the provisions of the EFA, Section 373.4592 F.S. If not, the following reviews will be conducted.

7.6.9.2 Palm Beach County Fire Rescue

As a component of building code compliance review, the proposed EAA Reservoir A-1 Project will be required to demonstrate compliance with County and National Fire Protection Association (NFPA) Fire Codes regarding fire protection facilities and emergency response capabilities.

7.6.9.3 Palm Beach County Health Department (CPHU)

The CPHU will be responsible for permitting any potable water or domestic waste facilities both during the construction and post-construction phases of the EAA Reservoir A-1 Project. If temporary sanitary facilities or holding tanks are required to temporarily support construction personnel, these facilities will need to be permitted by the CPHU. If permanent potable water and domestic waste facilities are planned, these facilities will require both construction and operation permits.

In addition, a permit is required for the construction, repair, or abandonment of any well unless specifically exempted by rule or law. The construction and/or repair of water wells, including monitoring wells, must be performed by a Florida-licensed water well contractor. Section 62-532 of the FDEP Rules regulates all such activities (DOH, 2005). The County Public Health Unit (CPHU) is delegated the authority for issuance of permits for wells less than four inches in diameter.

7.6.9.4 Palm Beach County Department of Environmental Resources Management

Vegetation removal activities in Palm Beach County are regulated under Article 14C of the Unified Land Development Code (ULD). In general, this ordinance requires a standard permit for vegetation removal on non-residential projects of any size. However, a "de minimis approval" may be available for projects involving removal of invasive and nuisance species only. Compliance review will be conducted by the Palm Beach County Department of Environmental Resource Management.

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CHAPTER 8
LIST OF PREPARERS AND REVIEWERS

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CHAPTER 9
LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT

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CHAPTER 10
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