Draft
Environmental Impact Statement

To Construct Stormwater Treatment Areas on Compartments B and C of the Everglades Agricultural Area, Florida

June 2008

U.S. Army Corps of Engineers
JACKSONVILLE DISTRICT

Prepared for:

The U.S. Army Corps of Engineers
Jacksonville District
1400 Centrepark Boulevard, Suite 750
West Palm Beach, FL 33401

TETRA TECH EC, INC.

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1901 South Congress Ave, Suite 270
Boynton Beach, FL 33426

DRAFT

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Under South Florida Water Management District, West Palm Beach, FL
Contract Work Order No. CN040902-WO03, Revision 4

June 6, 2008

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

May 27, 2008

Regulatory Division

Ms. Pearl Young
U.S. Environmental Protection Agency
Office of Federal Activities
EIS Filing Section
Ariel Rios Building (South Oval Lobby), Room 7220
1200 Pennsylvania Avenue NW
Washington, DC 20004

Dear Ms. Young:

Pursuant to § 1506.9 title 40 of the Code of Federal Regulations, enclosed are five copies of the Draft Environmental Impact Statement (EIS) for the construction of stormwater treatment areas on Compartments B and C of the Everglades Agricultural Area. We request that you publish the Notice of Availability for this Supplemental Draft EIS in the Federal Register on June 6, 2008.

The Draft EIS is available on the internet at www.saj.usace.army.mil. Concurrent with this letter, copies of this document and/or notices of availability have been mailed to agencies and other interested parties. If you have any questions, please contact Ms. Tori White at 561-472-3517.

Sincerely,

for Stephen R. Sullivan
Chief, Regulatory Division

Enclosures

CONSTRUCTION OF STORMWATER TREATMENT AREAS ON COMPARTMENTS B AND C OF THE EVERGLADES AGRICULTURAL AREA

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Responsible Agency: The lead agency is the U.S. Army Corps of Engineers (USACE), Jacksonville District. The Department of Interior (DOI) is a cooperating agency.

Abstract: The South Florida Water Management District (SFWMD) proposes to construct and operate stormwater treatment areas (STAs) on Compartments B and C of the Everglades Agricultural Area in Palm Beach and Hendry Counties, Florida. Compartment B STA will consist of approximately 6,700 acres of effective treatment area, and will be operated in close coordination with the existing STA 2 to assist in the phosphorus reduction capability of this STA, which discharges into Water Conservation Area (WCA) 2A. The SFWMD also proposes that the Compartment B STA be used to receive flows that otherwise would be directed to STA 1W and STA 1E, assuming there is capacity in the existing canals. The Compartment C STA will consist of approximately 6,200 acres of effective treatment area, and will be operated in close coordination with existing STA 5 and STA 6 to assist in the phosphorus reduction capability of these two STAs, which discharge into WCA 3A and Rotenberger Wildlife Management Area. As proposed, the project would impact approximately 7,591 acres and 5,918 acres of jurisdictional wetlands and other waters of the United States associated with the construction of Compartments B and C, respectively. The SFWMD would need to obtain a Department of the Army permit pursuant to Section 404 of the Clean Water Act from the USACE and an interim land use approval from DOI for construction of Compartments B and C, which were purchased with federal funds for Everglades restoration. This Draft Environmental Impact Statement evaluates the environmental effects of five alternatives including the SFWMD's preferred alternative described above, two additional alternatives that utilize Compartments B and C but with a different operational regime for Compartment B, an alternative that includes other lands for construction of an STA to assist existing STA 1W and STA 1E, and the No Action Alternative.

THE OFFICIAL CLOSING DATE FOR THE RECEIPT OF COMMENTS IS 45 DAYS FROM THE DATE ON WHICH THE NOTICE OF AVAILABILITY OF THIS DRAFT EIS APPEARS IN THE FEDERAL REGISTER.

If you require further information on this document, contact:

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ACRONYMS AND ABBREVIATIONS

AM&AC	Andytown Martin and Andytown Corbett
AP	Agricultural Production
APE	Area of Potential Effect
AR	Agricultural Residential
ASR	aquifer storage recovery
ATS	Algal Turf Scrubber
ATT	advanced treatment technologies
BA	biological assessment
BEA	Bureau of Economic Analysis
BMP	Best management practice
BOD	biological oxygen demand
C&SF	Central and Southern Florida
CAA	Clean Air Act
CC	Conservation Corbett
CEQ	Council on Environmental Quality
CERP	Comprehensive Everglades Restoration Plan
CFR	Code of Federal Regulations
cfs	cubic feet per second
CLA	Class Limit Adjustment
CO	carbon monoxide
CTSS	chemical treatment/solid separation
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Plan
DA	Department of Army
dB	decibel
dBA	decibels measured on the A-weighted scale
DEQ	Department of Environmental Quality
DMSTA	Dynamic Model for Stormwater Treatment Areas
DOI	U.S. Department of the Interior
EAA	Everglades Agricultural Area
EAA-A1	Everglades Agricultural Area Storage A1 Reservoir
ECP	Everglades Conservation Program
ECT	Environmental Control Technology
EFA	Everglades Forever Act of 1994
EFH	Essential Fish Habitat
EFH-HAPC	Essential Fish Habitat-Habitat Area of Particular Concern
EIS	Environmental Impact Statement

ACRONYMS AND ABBREVIATIONS (CONTINUED)

EMA-STA	emergent-macrophyte stormwater treatment area
ENP	Everglades National Park
EPA	Everglades Protection Area
ERA	Ecological Risk Assessment
ERM	Department of Environmental Resources Management
ERP	Environmental Resource Permit
ESA	Endangered Species Act
ESA	Environmental Site Assessment
FAC	Florida Administrative Code
FCD	Flood Control District
FCI	Functional Capacity Index
FCU	Functional Capacity Unit
FDEP	Florida Department of Environmental Protection
FDHR	Florida Division of Historical Resources
FDOT	Florida Department of Transportation
FFWCC	Florida Fish and Wildlife Conservation Commission
FNST	Florida National Scenic Trail
FPL	Florida Power & Light
FPPA	Farmland Protection Policy Act
FR	Federal Register
FWCA	Fish and Wildlife Coordination Act of 1958
GHG	greenhouse gas
GMFMC	Gulf of Mexico Fishery Management Council
ha	hectare
HLWMA	Holey Land Wildlife Management Area
km	kilometer
km^2	square kilometer
kV	kilovolt
LCAR	Limited Contamination Assessment Report
LOERP	Lake Okeechobee Environmental Restoration Projects
LO-PIR	Lake Okeechobee Project Implementation Report
LORSS	Lake Okeechobee Regulatory Release Schedule Study
LOW	Lake Okeechobee Watershed Project
MBTA	Migratory Bird Treaty Act
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
MOA	Memorandum of Agreement
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act of 1976
NAAQS	National Ambient Air Quality Standard

ACRONYMS AND ABBREVIATIONS (CONTINUED)

NAVD	North American Vertical Datum
NBO	North Build-out
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NNRC	North New River Canal
NO_2	nitrogen dioxide
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NTU	nephelometric turbidity unit
O&M	operation and maintenance
O_3	ozone
ORV	off-road vehicle
OSSF	Okaloaccoochee Slough State Forest
PAC	Pre-Approval Advance Cleanup
Pb	lead
PCR	phosphorous loading rate
PEIS	Programmatic Environmental Impact Statement
PIR	Project Implementation Report
PM_{10}	particulate matter less than 10 microns in aerodynamic diameter
ppb	parts per billion
PSI	Professional Services Industries, Inc.
PSTA	Periphyton Stormwater Treatment Area
PWA	Public Waterfowl Area
RCRA	Resource Conservation and Recovery Act
RIMS	Regional Input-Output Multiplier System
ROD	Record of Decision
RSTA	Reservoir and Stormwater Treatment Area
RWMA	Rotenberger Wildlife Management Area
SAFMC	South Atlantic Fisheries Mangament Council
SAV	submerged aquatic vegetation
SAV-STA	submerged aquatic vegetation-stormwater treatment area
SBO	South Build-out
SCFE	South Central Florida Express
SCOPES	Standard Local Operating Procedure for Endangered Species
SFWMD	South Florida Water Management District

ACRONYMS AND ABBREVIATIONS (CONTINUED)

SFWMM	South Florida Water Management Model
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SSC	species of special concern
STA	stormwater treatment area
TMDL	total maximum daily load
TNC	The Nature Conservancy
UMAM	Uniform Mitigation Assessment Method
US-27	U.S. Highway 27
USA	Undifferentiated Surficial Aquifer
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USSC	United States Sugar Corporation
WCA	Water Conservation Area
WHS	water hyacinth scrubber
WHS-STA	water hyacinth scrubber-algal turf scrubber
WMA	Wildlife Management Area
WMS	Water Management System
WQC	Water Quality Certificate
WRDA	Water Resources Development Act
WSE	Water Supply Environment
WSR	West Storage Reservoir

1.0 PROJECT PURPOSE AND NEED

This section focuses on the problems that need to be addressed, and for which the proposed project is being considered. It is designed to provide a concise description to the public and decision makers about what the essential needs and goals for the project are, and how the project being proposed will address them. The section begins with a description of the project background, including several events that have led to the development of the Proposed Action. Next, the project need and project purpose statements are provided in Sections 1.2 and 1.3. These are followed by a brief description of the Proposed Action, a discussion of the scope of analysis, and an overview of the related permit process. Finally, Section 1.6 discusses the permit decision to be made based on this Environmental Impact Statement (EIS).

1.1 BACKGROUND

The South Florida Water Management District (SFWMD) is requesting regulatory authorization from the United States Army Corps of Engineers (USACE), in the form of a Department of the Army (DA) permit pursuant to Section 404 of the Clean Water Act, to construct three additional Stormwater Treatment Areas (STAs) on Compartments B and C of the Everglades Agricultural Area (herein called the Compartments B and C Build-out Project). Construction of additional STAs on Compartments B and C is requested to further improve the quality of water entering the Everglades Protection Area (EPA) and to further restoration in the Everglades ecosystem. The SFWMD is also requesting interim land use change approval for construction from the United States Department of the Interior (DOI).

The three additional STAs are the Compartment B North Build-out (NBO), Compartment B South Build-out (SBO), and Compartment C Build-out. Compartment B is located in southern Palm Beach County just west of STA 2, east of U.S. Highway 27 (US-27), northwest of Water Conservation Area (WCA) 2A and south of Everglades Agricultural Area (EAA) lands. Compartment C is located in Hendry County just west of Rotenberger Wildlife Management Area (RWMA), east of C-139 basin agricultural lands, north of existing STA 6 and south of STA 5. See Figure 1-1 for a regional map of the EAA showing the STA Build-out locations.

1.1.1 Consent Decree

In 1988, the federal government filed a complaint against the Florida Department of Environmental Protection (FDEP) and SFWMD, for alleged violations of state water quality laws and intergovernmental agreements. The lawsuit was settled in 1991. In 1992, a Consent Decree was entered embodying the terms of the settlement agreement. The Consent

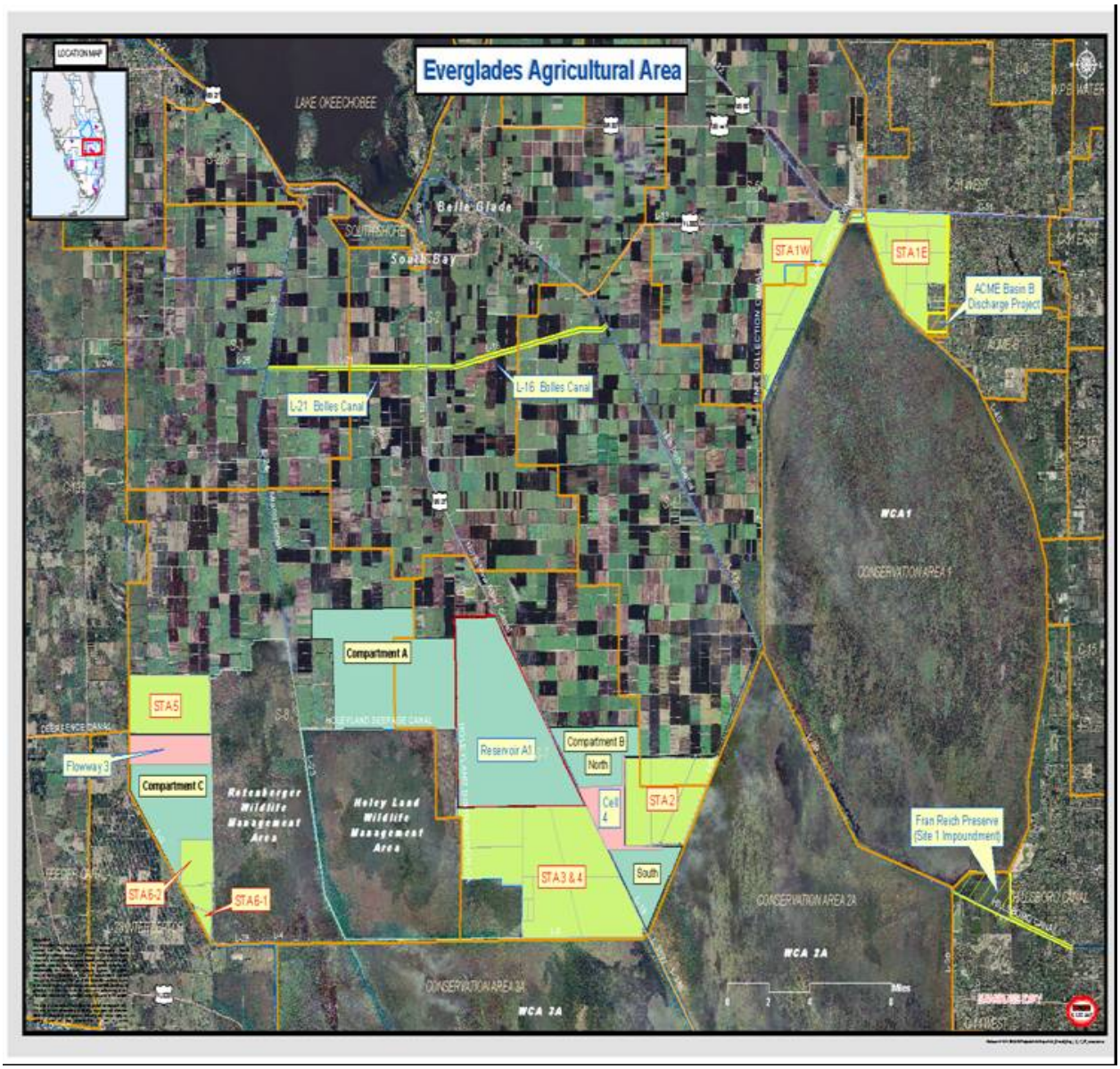


Figure 1-1. Regional Map of the EAA
Source: SFWMD 2007

Decree identifies a number of specific actions the SFWMD would undertake to address excess phosphorous in the EAA. These included the implementation of performance-based Best Management Practices (BMPs) to reduce phosphorous outflows from the EAA, and the creation of STAs to meet interim and long-term targets on the amount of phosphorous entering the EPA. In 1995, the settling parties moved to modify the Consent Decree, including the deadline for completion of STAs, to reflect changed circumstances caused by the passage of time and the enactment of the Everglades Forever Act by the Florida legislature in 1994. The motion to approve those modifications was granted in 2001. Implementation of the Consent Decree (Case No. 88-1886-CIV-MORENO) remains under

judicial oversight. The Record of Decision for this EIS will not constitute the decision of the federal government not to pursue Alternative E, or any other court-identified remedy.

1.1.2 Talisman Land Acquisition

Congress enacted the 1996 Federal Agriculture Improvement and Reform Act (Farm Bill) and provided funds on April 4, 1996 (Public Law 104-127, 110 Stat. 1022). Under Section 390 of the Farm Bill, the Secretary of Interior was authorized to use funds made available to conduct restoration activities in the Everglades ecosystem in South Florida, which includes the acquisition of real property and interests in real property located within the Everglades ecosystem and includes funding resource protection and resource protection activities in the Everglades ecosystem. The Farm Bill provided that the Secretary of the Interior could transfer funds to the USACE, the State of Florida, or the SFWMD to conduct the aforementioned restoration activities. The DOI, the USACE, the FDEP, and the SFWMD entered into a Framework Agreement (Appendix A) on October 3, 1996 to provide a framework for the Secretary of Interior to provide Section 390 funds in concert with other funds provided by the other parties for Everglades ecosystem restoration. The parties agreed to use Section 390 funds to acquire real property or to construct features that are intended to become part of existing or future USACE projects authorized by Congress and to acquire real property for conservation purposes. The parties agreed that any real property acquired or features constructed with these funds shall be used to conduct restoration activities in the Everglades ecosystem. The parties may also use Section 390 funds for resource protection and resource maintenance activities in the Everglades ecosystem. In addition, the Framework Agreement specifically requires the lands to be used consistent with restoration purposes prior to becoming part of an Army project.

The Framework Agreement provides a dispute resolution mechanism. The terms and conditions relevant to the provision of Section 390 funds under the Framework Agreement are set forth in individual funding agreements which may include dispute resolution provisions. Agreements between the DOI and the SFWMD use the standard forms and follow the standard procedures of the U.S. Fish and Wildlife Service (USFWS) pertaining to the transfer of funds and appropriate provisions appropriate or necessary to further the restoration of the Everglades ecosystem.

On March 26, 1999, the Nature Conservancy (TNC) closed on the acquisition of approximately 50,000 acres of land located within the southern portion of the EAA in Palm Beach and Hendry Counties. This acquisition was the culmination of many years of negotiations. The complex transaction was structured in two phases involving agreements between Talisman Sugar Co. and other sugar companies, the DOI, TNC, and the SFWMD. The DOI provided $99,434,312 in Federal Farm Bill funds for the acquisition of these lands

and the SFWMD provided $12,939,906. Compartments A, B and C lands were part of this acquisition as described in the Framework Agreement. Initially it was anticipated that Compartments A, B and C would be utilized as part of the EAA Storage Reservoir, a USACE project and one of the initially authorized projects in the Water Resources Development Act (WRDA) of 2000. The DOI transferred funds to the SFWMD pursuant to grant agreement FB-4 entitled *Cooperative Agreement Among The United States Department of the Interior and The Nature Conservancy and The South Florida Water Management District (Grant Agreement).* The Grant Agreement states that lands acquired for public ownership under this Agreement will be used and managed for purposes of Everglades ecosystem restoration and shall be subject to the provisions of the Framework Agreement, including but not limited to, those provisions applicable to interim uses of property prior to the commencement of the USACE project. Any proposed change in interim use for these lands may not be implemented until the DOI (1) reviews the proposal; (2) determines that it meets the requirements of the National Environmental Policy Act, Section 7 of the Endangered Species Act, Section 106 of the National Historic Preservation Act and any other applicable statutes; and (3) concurs with the proposal. The Grant Agreement includes a procedure for dispute resolution.

During the evaluation of alternatives and optimization of alternatives for the EAA Storage Reservoir Project Implementation Report, it appeared that it was less expensive to store water on a single smaller footprint than to construct multiple, shallower reservoirs. Therefore, the USACE screened the multiple and shallower designs and began detailed design of the 360,000 acre-foot EAA Storage Reservoir on a smaller footprint (Compartment A lands) such that the Compartments B and C lands were not needed for the footprint of the 360,000 acre-foot reservoir. In 2004, the State proposed, as part of its *Acceler8* Program to build one cell of the EAA Storage Reservoir (A-1) on an accelerated basis. The State received DA Section 404 Permit approval and DOI interim land use change approval for construction of the EAA A-1 Reservoir (EAA A-1). The analysis supporting these federal decisions included a modeling analysis that concluded that the existing stormwater treatment areas were sufficient to treat the additional Everglades deliveries that would be made possible with the EAA A-1; this analysis assumed that Compartments B and C would be STAs.

Subsequently, following several hurricanes affecting Lake Okeechobee, the modeling analysis was redone, and concluded that treatment of Lake Okeechobe discharges formerly provided to the Everglades would require the use of additional treatment area or a reduction in discharges from Lake Okeechobe to the Everglades. This proposed land use decision will require consideration of how Compartment B fits into the operational regime of the existing STAs to enhance and improve the quality of waters delivered to the Everglades (particularly WCA 3 and WCA 2) from farmland in the EAA, the EAA A-1 and/or Lake Okeechobee.

Although the DOI has conceptually approved the use of Compartments B and C as stormwater treatment areas, the SFWMD will also need to obtain land use approval from DOI for construction of STAs on the Compartment B and C lands prior to construction. The DOI needs to evaluate and determine if the requested change in land use can be authorized. Thus, concurrent with the analysis conducted in this EIS, the DOI must also determine that the Proposed Action results in restoration of the Everglades in order to approve the interim land use change for construction of Compartments B and C. This must include an analysis of the actual contribution of these proposed structures to restoring the Everglades as well as their contribution to improving the performance of other restoration features, specifically the EAA A-1. The Talisman lands were purchased for use in the EAA Storage Reservoir Project of which the A-1 Reservoir is a part. Compartments B and C were part of the Talisman purchase for the EAA Storage Reservoir. Therefore, the DOI is a cooperating agency on this EIS. As a cooperating agency, the DOI is assisting the USACE in the process to ensure the EIS fulfills the National Environmental Policy Act (NEPA) requirements associated with evaluating the land use change. The SFWMD will also need to obtain interim land use change approval from DOI for operation of Compartments B and C, both the initial operating plan and any successive operational changes.

To fulfill its statutory responsibilities under the Farm Bill that the lands be utilized to conduct restoration activities in the Everglades ecosystem, DOI requested that an alternative be added to this Draft EIS in which Compartment B operations enhance and improve the performance of the EAA A-1, either by freeing up more available treatment capacity in STA 3/4 for use by the EAA A-1 or by a more direct linkage, and to provide outflows that support restoration. One such alternative, Alternative D1, is an operational variant on Alternatives B and D. As such, it has been added to this Draft EIS to illustrate regional operational flexibilities made possible by the construction and operation of STAs on compartments B and C. The physical configuration is similar to Alternatives B and D, but differs by working in tandem with the EAA A-1 Reservoir to improve the quantity, timing and distribution of water that can be delivered to the WCAs and Everglades National Park for restoration purposes. Alternative D1 also relocates the receiving area of Compartment B outflow from WCA 2A to WCA 3A via use of the North New River Canal and S-11. It also differs from Alternative D insofar as 100 percent of the capacity (as demonstrated in Alternative B) of Compartment B is used to treat the additional restoration related deliveries.

1.1.3 Stormwater Treatment Areas

On October 4, 1996, the USACE published a Final Programmatic Environmental Impact Statement (PEIS) for the initial Everglades Construction Project (ECP), which consisted of six STAs comprising approximately 44,000 acres (Figure 1-2). A DA permit was issued to

SFWMD on March 13, 1997 (Permit No. 199404532). The SFWMD implemented the ECP, as required under the Consent Decree, in response to high phosphorus and other nutrient loads from stormwater and runoff from the EAA, Lake Okeechobee, and other contributory basins that discharge into the EPA. The EPA includes WCA 1, otherwise known as Arthur R. Marshall Loxahatchee National Wildlife Refuge (referred to as the Refuge for this EIS); WCAs 2A, 2B, 3A, 3B; and Everglades National Park (ENP). The initial ECP was intended to achieve an interim target discharge of a long-term annual flow-weighted mean for phosphorus concentration of approximately 50 parts per billion (ppb). Pursuant to the Consent Decree, the state committed to provide the water quantity and quality needed to preserve and restore the unique flora and fauna of ENP and the Refuge. The EFA was enacted to implement the same goals. The SFWMD's *Everglades Protection Area Tributary Basins Long-Term Plan for Achieving Water Quality Goals (Long-Term Plan), October 27, 2003* and the November 2004 revision of the Long-Term Plan recommend further studies to help provide the additional detailed information required for making a more informed decision for reducing phosphorus concentrations and meeting water quality standards. In 2005, the SFWMD completed the *EAA Regional Feasibility Study* to meet the objectives of the November 2004 revised Long-Term Plan. The Feasibility Study evaluated alternatives to provide additional treatment needed to reduce phosphorus loads to the EPA and comply with the EFA and Consent Decree.

1.1.4 Memorandum of Agreement

On October 14, 2004, a Memorandum of Agreement (MOA) regarding acceleration of several Comprehensive Everglades Restoration Program (CERP) and other projects was signed between the Governor's Executive Office and the SFWMD and collectively, the group of projects was named Acceler8. Acceler8, consisting of eight projects with multiple components (Figure 1-3), was designed to expedite attainment of water quality, quantity, and timing goals of Everglades restoration efforts ahead of the federal implementation schedule. Under the MOA, Compartment B and C STA expansions are intended to result in realization of environmental benefits by 2011. DA permits have been issued for some of the Acceler8 projects including: EAA A-1 Reservoir; C-43 West Storage Reservoir, C-44 Reservoir and STA, initial expansions of Compartment B (i.e., STA 2 Cell 4); and initial expansion of Compartment C (i.e., STA 5, Flowway 3).

Figure 1-2. Six Initial Stormwater Treatment Areas

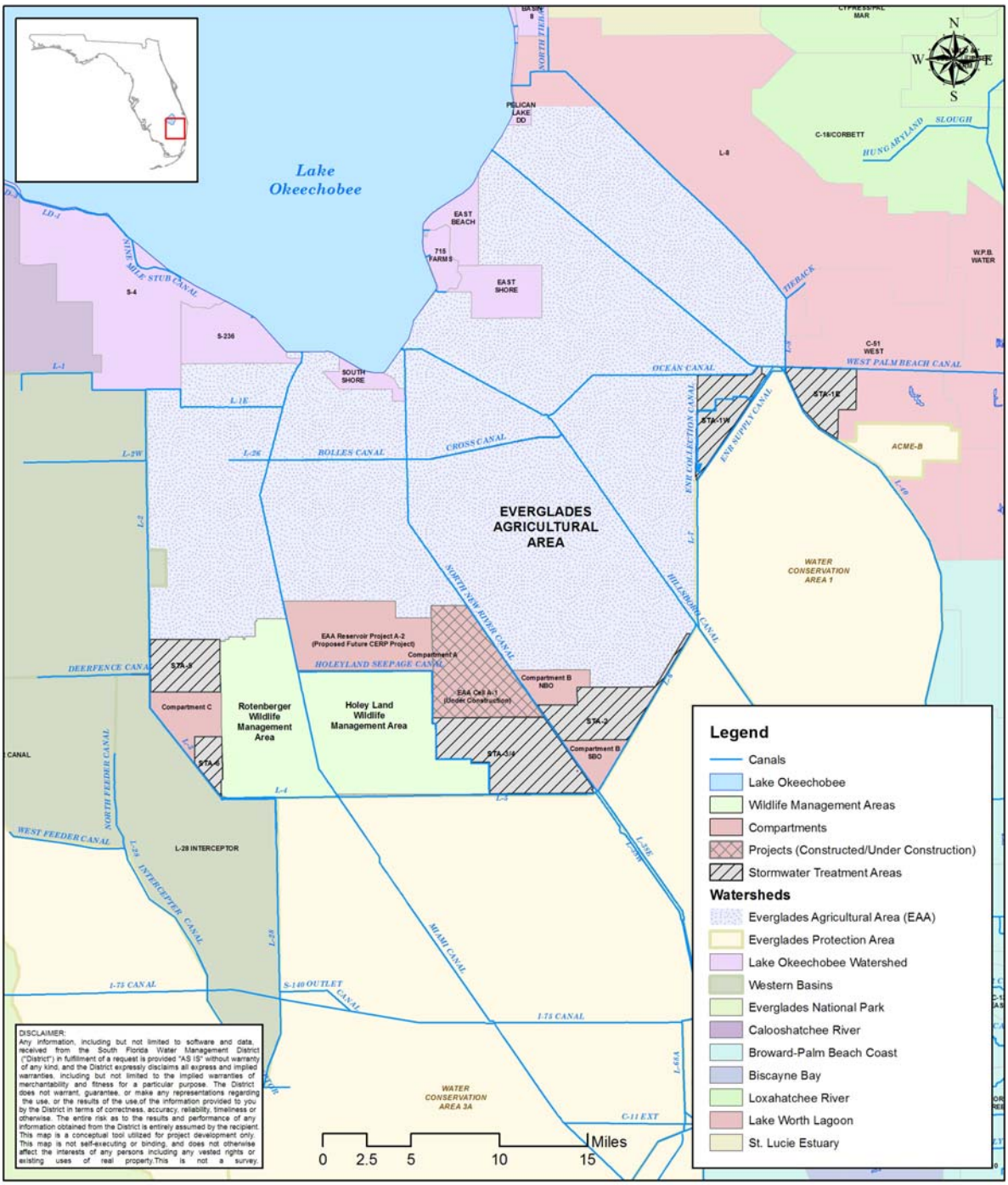
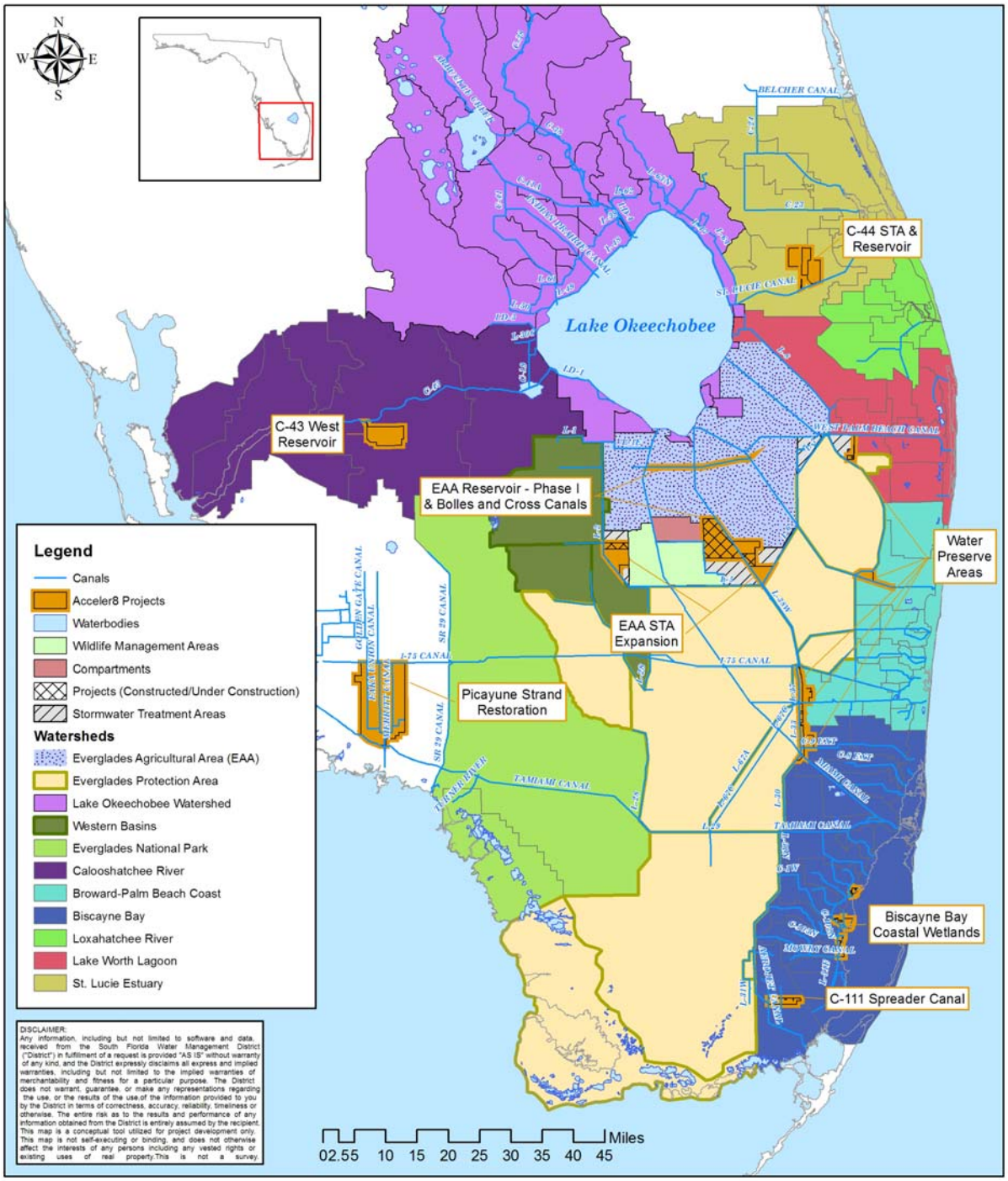


Figure 1-3. Acceler8 Projects Map



1.2 PROJECT NEED

Additional water quality treatment capacity is necessary in the EAA to further lower levels of phosphorus contained in releases from the EAA and Lake Okeechobee prior to entering the EPA. The project will provide an interim step in the overall process to reach water quality standards. Excessive amounts of phosphorus, exceeding state water quality standards, are flowing through/from the EAA into the EPA. Such deliveries are not consistent with the goals of the Consent Decree, the EFA and Rule 62.302.540 of the Florida Administrative Code (FAC). Increased phosphorus levels in the EPA have altered ecological habitat, reduced its functional quality, and exacerbated colonization of invasive exotic plant species. The Long-Term Plan (SFWMD 2003) was developed to further reduce phosphorous flowing to the EPA. The Long-Term Plan includes a combination of measures to achieve the phosphorus water quality standard in the EPA, such as optimizing performance of the STAs and source control Advanced Treatment Technologies (ATTs), and regulatory programs, and is intended to be integrated with CERP projects.

The six existing STAs included in the ECP were built and operated pursuant to the requirements of the EFA and contain more than 40,000 acres of effective treatment area. Subsequent to the design and construction of these STAs, the inflow volumes and phosphorus loads were updated to incorporate best available information, including several years of actual STA inflow and outflow performance data. One of the key assumptions during the design of the original STAs was that EAA agricultural BMPs would result in a 20 percent reduction in runoff volumes into the STAs; however, recent historical data have shown that although the required BMPs reduced phosphorus loads, the assumed inflow volume reductions have not occurred.

The Consent Decree assumed that volumes reduced by BMPs would be replaced with additional volumes from Lake Okeechobee; however, neither the original ECP design flow nor the 2001 Basin-Specific Feasibility Studies (ECP update with enhanced STAs) provided treatment capacity for the higher than originally assumed stormwater runoff volumes from the EAA. In addition, the STA inflow phosphorus concentrations have also shown notable increases in the past several years, possibly a result of long-term increasing trends in Lake Okeechobee phosphorus concentrations that were temporarily amplified by the 2004 and 2005 hurricanes and increases in runoff phosphorus concentrations. The higher-than-anticipated EAA runoff volumes, increases in runoff and Lake Okeechobee phosphorus concentrations, and associated increased nutrient concentrations of existing STAs has affected the performance of several existing STAs.

In addition, the federal and state agencies, as well as many others, have determined that the current alterations of flow volume, timing, and distribution continue to have an adverse

impact to the natural ecology of the Everglades. It is important to restoration that more water, at the right time, in the right place be delivered to the WCAs and ENP. These environmental restoration benefits are stated in the SFWMD's request for an interim land use change for construction of the EAA A-1 Reservoir; upon that request, the interim land use change approval was granted.

It should be noted that, while the interim land use change for construction of EAA A-1 Reservoir on Compartment A was approved by the DOI, and while the DA permit was issued by the USACE to the SFWMD for placement of fill in waters of the United States associated with construction of the EAA A-1 Reservoir, the operations plan for the EAA A-1 Reservoir has not been approved. It is assumed that existing STAs and additional/proposed treatment areas in the EAA would ultimately work in concert with the EAA A-1 Reservoir to achieve the goals and objectives stated in the EAA A-1 Final EIS (USACE 2006). Prior to approval of the operations plan of the EAA A-1 Reservoir, the USACE will conduct a NEPA evaluation of the planned operations for the reservoir, including its functional relationships with existing and additional/proposed STAs; other water management system infrastructure, features, and constraints; and full consideration of downstream effects of operations on restoration goals, the natural environment, and federally listed species.

This Draft EIS evaluates construction of additional STAs that will work in concert with the existing water management system, as well as future features such as the EAA A-1 Reservoir. The potential effects of the Action Alternatives will largely be a function of the manner in, and degree to which, the Action Alternative features are used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. Action Alternatives B, C, and D are presented to disclose how STAs constructed on Compartments B and C might be used as part of regional water management infrastructure to permit attainment of differing regional restoration intents and benefits (in addition to cleansing of water destine for delivery to the EPA). The construction and proposed use of the additional STA areas presented in this Draft EIS are in no way intended to propose, direct, or otherwise mandate specific changes in system-wide operations. The additional STAs presented in this Draft EIS are intended to provide additional treatment capacity that will permit changes in system operations that might otherwise not be feasible in the absence of the added treatment capacity. Such changes in system operations will be determined and evaluated in the future as part of ongoing restoration-related planning efforts.

1.3 PROJECT PURPOSE

The project purpose as described by the SFWMD is to utilize Compartments B and C to increase the treatment capacity of the existing ECP STAs in order to further reduce

phosphorus levels in stormwater runoff entering the EPA from the EAA and other water basins by building STAs on SFWMD-owned lands. Although, permit applicants are encouraged to provide a statement of the proposed activity's purpose and need from their perspective, ultimately, the USACE, will in all cases exercise independent judgment in defining the purpose and need for the project from both the applicant's and the public's perspective. An applicant's project purpose cannot be so narrow so as to eliminate all other alternatives from consideration. For actions subject to NEPA, where the USACE is the permitting agency, the analysis of alternatives required for NEPA environmental documents, will in most cases provide the information for the evaluation of alternatives under the Section 404(b)(1) Guidelines; on occasion, however, the NEPA document may address a broader range of alternatives.

The project purpose as defined by the USACE for the purposes of this Draft EIS and evaluation of the SFWMD's DA permit application to discharge fill for construction of Compartments B and C is to reduce nutrient concentrations in water delivered to the EPA such that discharges of water to the EPA comply with legal requirements. The project will provide an interim step in meeting water quality standards.

The project purpose as defined by DOI for the purposes of the land use change is to conduct restoration activities in the Everglades ecosystem. Thus, concurrent with the analysis conducted in this EIS, the DOI must also determine that the Proposed Action results in restoration of the Everglades in order to approve the interim land use change for construction of Compartments B and C. Consistent with the Farm Bill, this must include an analysis of the actual contribution of these proposed structures to restoring the Everglades as well as their contribution to improving the performance of other restoration features, especially the EAA A-1 Reservoir.

The objectives and goals to improve water quality to make progress towards meeting legal requirements can be met by:

- improving the phosphorus removing performance of the existing and planned STAs;
- adding greater operational flexibility to direct and balance STA loads and flows derived from the EAA, Lake Okeechobee, and from contributing basins for treatment prior to discharge to the EPA;
- adding redundancy to the existing STA facilities to enable maintenance and adaptive management activities, while maintaining ongoing treatment functions; and
- minimizing the potential for overloading the STAs.

Restoration of the Everglades ecosystem is advanced by Compartment B working in tandem with the EAA A-1 Reservoir to improve the quantity, timing, and distribution of water that is delivered to the WCAs and ENP, and by delivering Compartment B outflows to WCA 3A.

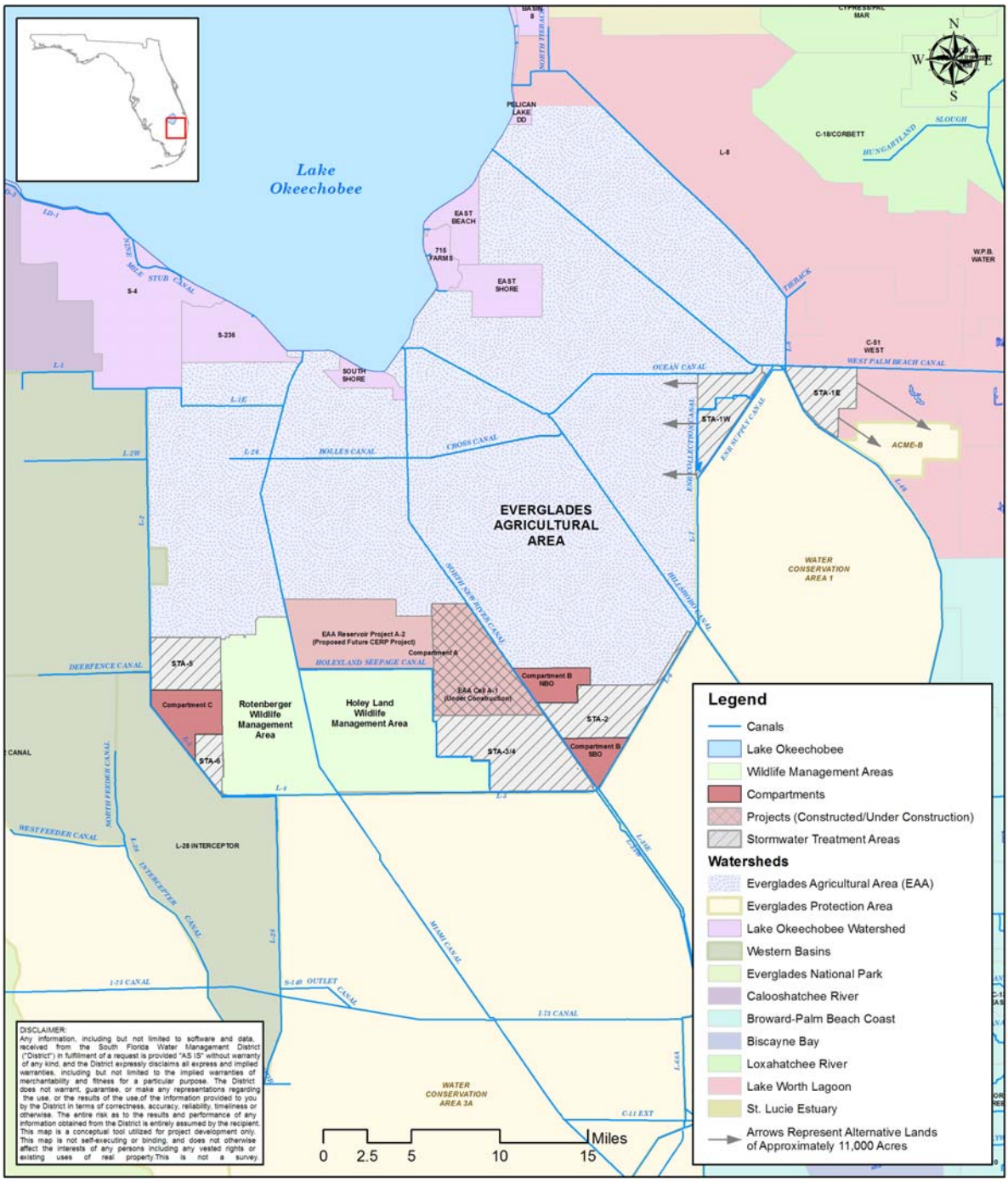
1.4 DESCRIPTION OF ACTION ALTERNATIVES

The SFWMD proposes to convert approximately 13,740 acres of publicly owned, primarily agricultural lands to additional STAs. This EIS addresses the Compartment B NBO and SBO areas, and the Compartment C Build-out (Figure 1-4), and also considers the conversion of alternative lands to assist existing overloaded STAs. In total, the build-out of additional stormwater treatment areas will provide approximately 12,900 acres of effective treatment area on the NBO, SBO, and Compartment C Build-out that will operate in association with STA 2, STA 3/4, STA 5, and/or STA 6, respectively, to assist the STAs in improving water quality entering the EPA. It should be noted that these acreages are based on the most current data available and may be changed based on updated designs for Compartments B and C. Any modifications in acreages will be reflected and available for review in the Draft Final EIS. Action Alternatives B, C, and D address construction of Compartment B NBO, Compartment B SBO, and Compartment C Build-out. These three alternatives differ with respect to operational protocols for Compartment B. Alternative lands for construction of STAs to meet the project purpose as defined by the USACE are also evaluated and include existing lands within the EAA that are in the vicinity of STA 1W and the STA 1E (Acme Basin B Section 24 lands). Alternative E represents construction of STAs on these additional lands. (Note: Acme Basin B – Section 24 are now under permit application review with the USACE as of May 9, 2008 for construction of a STA and recreational facility for the Village of Wellington. At the time this Draft EIS was compiled the permit application had not been submitted.)

1.4.1 Compartment B

Compartment B is a 9,585-acre, irregularly shaped parcel of land. The Compartment B Build-out will consist of approximately 6,700 acres of effective treatment area, and will be operated in close coordination with the existing STA 2 and/or STA 3/4 to assist in optimizing the phosphorus removal performance of these two STAs, which discharge into WCA 2A and WCA 3A, respectively. Depending on the hydrologic and hydraulic conditions, the NBO and SBO can assist in reducing inflows to STA 1W and STA 1E, which discharge into WCA 1. Compartment B has been separated into three specific areas: (1) STA 2 Cell 4 (2,000 acres); (2) the SBO; and (3) the NBO (Figure 1-4). STA 2 Cell 4 has already been constructed and has been flow capable since December 2006 (SFWMD 2008a).

Figure 1-4. Compartments B, C and Alternative Lands



1.4.2 Compartment C

Compartment C is an 8,800-acre parcel of land that is irregularly shaped. The SFWMD has already constructed the initial expansion of STA 5 on Compartment C lands, and currently proposes STA Build-out (Figure 1-4). The initial expansion included construction of one additional flow-way to STA 5, known as STA 5 Flow-way 3 (STA 5-3). The Proposed Action includes the construction of STAs into the remaining 6,200-acre areas of Compartment C (C-BODR). The Compartment C Build-out will consist of approximately 4,850 acres of effective treatment area, and will be operated in close coordination with existing STA 5 and STA 6, which received runoff from the C-139 and C-139 Annex to improve the phosphorus reduction capability of these two STAs, which discharge into WCA 3A and RWMA.

1.4.3 Alternative Lands and Acme Basin B – Section 24

Alternative lands are those lands in the vicinity of STA 1W and Acme Basin B – Section 24. Lands adjacent to STA 1W are within the EAA and would operate in conjunction with STAs 1W and 1E. Acme Basin B lands are just west of STA 1E in the Village of Wellington. During the preparation of this Draft EIS, these lands were considered due to their proximity to existing STA 1E and because they are owned by the SFWMD. However, as of May 9, 2008 a permit application was submitted by the Village of Wellington to construct the Section 24 Impoundment and is currently under review by the USACE. Acme Basin B – Section 24 lands are included as potential STA land for this Draft EIS, in lieu of the current permit application.

Lands adjacent to STA 1W are within the EAA. This area of alternative lands has been identified due to their proximity to STA 1W. Specific plots have land have not been identified, rather acreages of land necessary to achieve water quality goals as in Compartment B and C. The acreage of land to achieve those goals is approximately 10,137 acres.

1.5 SCOPE OF ANALYSIS

The analyses conducted in this EIS encompass a large geographic area. The following regions, further described in Section 3.1, make up the affected environment for the Compartments B and C Build-out project and alternative STA lands:

- EAA
- WCAs
- ENP

- Lake Okeechobee
- C-51 East Basin
- L-8 Basin
- C-139 and C-139 Annex Basins
- Acme B Basin-Section 24
- Northern Estuaries (Caloosahatchee River Estuary, St. Lucie River Estuary, and the Indian River Lagoon)
- Lake Worth Lagoon

The SFWMD's Proposed Action would impact one or more components of the environment in one or more of these regions. Environmental components considered include geology, topography, and soils; water resources; air resources; vegetation; fish and wildlife; threatened and endangered species; essential fish habitat (EFH); land use; recreational resources; aesthetic resources; cultural resources; socioeconomics; transportation and utilities; and hazardous, toxic, and radioactive waste.

1.5.1 Issues Evaluated in Detail

[Note: This section will be refined throughout the NEPA process.]

Agency and public scoping meetings were conducted in July 2007 to identify issues relevant to the Proposed Action and appropriate for detailed evaluation. Agency and public scoping and coordination are further described in Chapter 6 of this Draft EIS, and a Scoping Report is included as Appendix B of this Draft EIS. The following topics were identified for evaluation as part of NEPA regulations, and agency and public scoping:

- Federally Listed Species
- Archeological Resources
- Water Quality and Quantity
- Fish and Wildlife
- Vegetation
- Recreation
- Socioeconomics

1.5.2 Issues Eliminated from Detailed Analysis

[Note: This section will be refined throughout the NEPA process.]

The following issues were not considered as important to the Proposed Action based on public and internal scoping:

- Essential Fish Habitat
- Air Quality
- Noise Pollution

1.6 DECISIONS TO BE MADE

This Draft EIS is a comprehensive environmental analysis of for the Build-out of Compartments B and C and other Action Alternatives that would meet the project purpose as defined by the USACE and DOI for their respective federal actions as well as the No Action Alternative. This Draft EIS is the primary document to satisfy NEPA and the Council of Environmental Quality Regulations (CEQ, 40 CFR Parts 1500-1508). It also evaluates applicable federal laws, executive orders, and federal regulations as well as applicable state laws and regulations. Under Sec. 2 [42 USC § 4321] of the NEPA, the purposes of the Act are: "To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation" (NEPA 1969). NEPA also mandates an open process for the public to be informed about the proposed project, the environmental consequences, and the agency's decision.

The Proposed Action would result in filling in waters of the United States, including wetlands, and could have potential significant effects on the human environment. Under Section 404 of the CWA(33 USC 1344), 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). Based on review of this EIS, the USACE will make a decision to either issue, issue with conditions, or deny a permit for the Proposed Action. The USACE will render a permit decision under Section 404 of the Clean Water Act for discharge of fill material (including permanent inundation) within federal jurisdictional areas and Waters of the United States.

Also, because the SWMD is seeking an interim land use change approval, the project involves a federal action. Based on this analysis, the DOI will render its decision on a request for an interim land use change for construction of Compartments B and C.

The Proposed Action, through the USACE permit review and DOI land use approval processes, requires consultation under Section 7 of the Endangered Species Act (ESA) and Section 106 of the National Historic Preservation Act. Additionally, the Proposed Action would involve evaluation for compliance with the Section 404 (b)(1)Guidelines of the Clean Water Act; the Magnuson-Stevens Fishery Conservation and Management Act; Section 401 of the Clean Water Act; and the Coastal Zone Management Act consistency. Permits, licenses, and consultation requirements for the Compartment B and C Build-out are further described in Chapter 7.0 of this EIS.

2.0 ALTERNATIVES

The CEQ regulations for implementing the NEPA require that an EIS "rigorously explore and objectively evaluate all reasonable alternatives" including the No Action Alternative (40 CFR 1502.14[a] and [d]). In determining the scope of alternatives to be considered, the CEQ guidance states: "reasonable alternatives include those that are practical or feasible from the technical and economic standpoint using common sense" (CEQ 1983). The USACE regulations (33 CFR 320.4[a][2][ii]) require an evaluation that considers "the practicability of using reasonable alternative locations and methods to accomplish the objective of the proposed structure or work." The alternatives selected for this Draft EIS were developed through the agency and public scoping process under NEPA regulations.

This chapter provides the components for addressing the purpose and need of the project and the alternatives considered but eliminated from detailed study. There are dual purposes of the Proposed Action: to assist existing STAs in reducing nutrient concentrations contained in discharges from the EAA, other basins, and Lake Okeechobee prior to being discharged into the EPA; and to provide restoration benefits to the Everglades ecosystem.

For the purpose of this EIS, six alternatives (Alternatives A through F) were considered during the scoping process, and five are evaluated in detail (Alternatives A through E) in this Draft EIS. Alternative F is described in section 2.2 of this Chapter as considered but eliminated from detailed study.

The physical configurations and operational protocols for Alternatives A through D were evaluated using the Dynamic Model for STAs (DMSTA), and provided inflow and outflow data for water volume, phosphorus load and total phosphorus for the STAs. Alternative E was evaluated utilizing the Steady-State Design Model, which calculated the acreages necessary to achieve the overall phosphorus loading rate equal to the average inflows of Alternatives B through D. The six alternatives and modeling results are discussed below.

The DOI is a cooperating agency on this EIS and it is intended that the EIS be the NEPA document for which DOI will render a decisions to grant an interim land use change to the SFWMD or not for construction of STAs on Compartments B and C. As such, the DOI has identified a preferred alternative, Alternative D1, since this alternative would allow for restoration goals to be met. The land use change is a separate but related federal action to the USACE's federal permit.

2.1 DESCRIPTION OF ALTERNATIVES

One of the key aspects of the NEPA process is the assessment of how various alternatives that meet the purpose and need of the action could affect the environment. The purpose and

need of the action, as discussed in Chapter 1, is to "lower levels of phosphorus contained in releases from the EAA and Lake Okeechobee prior to entering the EPA" and to provide restoration benefits to the Everglades ecosystem including by working in tandem with the EAA A-1 Reservoir (EAA A-1) to improve the quantity, timing and distribution of water that can be delivered to the WCAs and ENP and by directing the outflow from Compartment B to WCA 3A. It is anticipated that the operations of Compartment B will be included in the Project Implementation Report and water control plan for the EAA Cell 1 Reservoir. The Legislature found that excessive amounts of phosphorus, exceeding state water quality standards, are flowing through/from the EAA into the EPA, which is not consistent with the Everglades Forever Act (EFA) and Rule 62.302.540 of the FAC. Increased phosphorus levels in the EPA have reduced ecological habitat and functional quality and allowed for the colonization of invasive exotic plant species. In addition, the federal and state agencies, as well as many others, have determined that the current alterations of flow volume, timing and distribution continue to have an adverse impact to the natural ecology of the Everglades.

NEPA requires, at a minimum, that a "Preferred Alternative" (Proposed Action) be compared to a No Action Alternative. The No Action Alternative represents the most likely baseline conditions that would occur if the proposed project did not move forward. For the USACE regulatory evaluation, the No Action Alternative equates to not issuing a permit for the Proposed Action. For regulatory purposes, the USACE is neither an opponent nor proponent of an Applicant's proposal; therefore, the Proposed Action is described as the Applicant's Preferred Alternative. The USACE will exercise independent judgment in defining the purpose and need for a project from both the Applicant's and the public's perspective and then will consider all reasonable alternatives that would meet the project purpose. Other Action Alternatives may also be developed that reduce the extent of impacts to resource areas while still meeting the purpose and need of the action as defined by the federal action agency. The Action Alternatives are compared to the No Action Alternative to determine the extent and severity of potential impacts.

During the scoping process, which included the publication of the Notice of Intent (NOI) in the Federal Register and two public scoping meetings, six alternatives were proposed for analyses for this EIS. The alternatives selected for analysis include Alternative A, the No Action Alternative; Alternative B, the SFWMD's Preferred Alternative; Alternatives C and D, which propose the build-out of Compartments B and C lands; Alternative E, use of other lands as STAs to assist existing STAs; and Alternative F, Chemical or Treatment Technologies. Alternatives A through E are described in the sections below. Alternative F, Chemical or Treatment Technologies, was not considered in detail due to the conclusions made in the December 2004 *Lake Okeechobee Watershed Final Project Implementation Report* prepared for the USACE and SFWMD by the HDR Engineering, Inc., described in

Section 2.3 below. In addition, the SFWMD provided results from the Basin-Specific Feasibility Studies to the Environmental Regulation Commission, which assessed implementation costs, measures to reduce phosphorus levels entering the EPA, environmental benefits and adverse effects, and scheduling. The results presented to the Environmental Regulation Commission and provided in FAC 62-302.540, *Water Quality Standard for Phosphorus within the EPA*, affirm chemical treatment technologies were not cost effective and could have an adverse effect on the environment. Therefore, Alternative F was not fully evaluated as a viable alternative for this Draft EIS.

Although this EIS is intended to disclose potential impacts and trade-offs associated with the use of Compartments B and C as STAs, it should be noted that the regional operations that might affect the manner in which, and degree to which, they are used can differ greatly. The presence of Compartments B and C, and the treatment capacity they offer would permit operational flexibilities that presently are limited due to lack of adequate treatment capacity.

As such, Alternatives B to D illustrate operational flexibilities that are anticipated to be made possible. In addition to the potential system operations illustrated in Alternatives B through D, it is possible that a variety of other system operations could be made available. One such alternative, Alternative D1, is an operational variant on Alternatives B and D. As such, it has been added to this Draft EIS to illustrate regional operational flexibilities made possible by the construction and operation of STAs on Compartments B and C. The physical configuration is similar to Alternatives B and D, but differs by working in tandem with the EAA A-1 Reservoir to improve the quantity, timing, and distribution of water delivered south to the WCAs and ENP for restoration purposes. Alternative D1 also relocates the receiving area of Compartment B outflow from WCA 2A to WCA 3A. It also differs from Alternative D insofar as 100 percent of the capacity (as demonstrated in Alternative B) of Compartment B is used to treat the additional restoration related deliveries. It is anticipated that the NEPA for the operational interaction of Compartment B with the EAA A-1 Reservoir will be contained in the NEPA evaluation of the planned operations for the EAA A-1 Reservoir.

The following sections describe the physical configurations and operational protocols of each of the five alternatives selected for evaluation. In general, Alternative A (the No Action Alternative) evaluates the existing physical configuration of treatment areas along with the EAA A-1 Reservoir, which is expected to be operational by 2010. Alternatives B through D evaluate approximately 12,000 acres of additional treatment areas in the full build-out of Compartments B and C, but differ in the protocol for capturing and treating the various inflow sources. Alternatives B, C, and D are identical with respect to the physical configuration and operational protocol for STA 5 and STA 6, including the full build-out of Compartment C. The primary differences (listed below and described in detail in the

following sections) in operating protocols among Alternatives B, C, and D concern Compartment B:

- Whether Compartment B treats only that runoff from the North New River Canal Basin that cannot be captured by the EAA A-1 (Alternative C).
- Whether Compartment B treats runoff from the North New River Canal Basin with the EAA A-1 capturing only that runoff that cannot be treated by Compartment B, thus freeing up capacity in the EAA A-1 and STA 3/4 for additional regulatory releases from Lake Okeechobee (Alternatives D). The additional/unused treatment capacity of Compartment B would then be used to treat additional inflows from the EAA A-1 and Lake Okeechobee, or
- Whether Compartment B treats runoff from the North New River Canal Basin with the EAA A-1 capturing only that runoff that cannot be treated by Compartment B, thus freeing up capacity in the EAA A-1 and STA 3/4 for additional regulatory releases from Lake Okeechobee. The additional/unused treatment capacity of Compartment B would then be used to treat additional inflows diverted from STA 2 (Alternative B), or from STA1W/E if the capacity to do so with existing canals exists.

Alternative E evaluates constructing STAs on parcels of land other than Compartments B and C. The main criterion for the consideration of other lands was that they must be able to benefit the performance of existing STAs by treating water from contributing watersheds without the need for canal/conveyance improvements. STAs recognized as stressed due to loading beyond their designed intent include STAs 2, 3/4, 5, 6, and 1W. Since constructing an STA on Compartment B seems to provide ample treatment for STA 2 and STA 3/4 basins, and an STA on Compartment C provides the desired treatment for STA 5, and STA 6 basins, the potential use of other lands around these STAs was not evaluated. Alternative E considers the build-out of 10,137 acres of land (based on assumed target phosphorous loading rate of 1.2 grams per meter squared per year for all STAs) adjacent to STA 1E and STA 1W to assist the existing STAs in capturing and treating runoff from the Hillsboro and West Palm Beach Basins prior to discharge into the Refuge. Furthermore, the additional treatment area near STA1 W could have the capacity to assist with treating regulatory releases from Lake Okeechobee currently sent to tide through the C-51 canal and the Caloosahatchee and St. Lucie Rivers.

It should be noted that for purposes of estimating the land requirements associated with STAs proposed under Alternative E that a design phosphorus loading rate (PLR) of 1.2 grams per square meter per year was assumed and applied to the additional STAs discussed per Alternative E and all existing STAs of the ECP (in lieu of only those proposed for evaluation

under Alternative E). Because the PLR of several existing STAs (e.g., STAs 1W, 1E, 2, and 5) in the No Action Alternative exhibit loading rates exceeding 1.2 grams per square meter per year, decreasing the loading of those STAs to a PLR of 1.2 required the ability to treat large volumes of water that would otherwise have been processed by the existing STAs per the other alternatives.

2.2 COMPARISON OF ALTERNATIVES

The following section summarizes the inflow and outflow values for each of the project alternatives, with the exception of Alternatives E and F. Diagrams for Alternatives E and F were not included since these two alternatives were formulated to treat water quality in the basins from which the water is derived, as such, the water budget compared to the No Action Alternative (Alternative A) would not be affected. Tables 2-1 and 2-2 show 36-year average annual inflow and outflow values, respectively, for Alternatives A through E. Table 2-3 shows a summary of receiving water flows for Alternatives A through E.

For ease of discussion, Figures 2-1 to 2-4 are discussed in the order in which the computer simulations for each alternative were developed. Flow amounts are highlighted to show the differences between the alternatives and amount of flow.

Alternative A is a representation of the No Action Alternative, illustrating what the study area water budget is anticipated to look like around 2010/2011 in the absence of federal actions associated with Compartments B and C.

Alternative B, the SFWMD's preferred alternative, presents a water budget for an alternative that focuses the use of Compartment B to assist STA 2 in treating water from the North New River Basin. Additionally, the referenced "available" treatment capacity of Compartment B is used to allow water that would otherwise have been treated by STA 2 (and subsequently discharged to WCA 2A9) to be treated by Compartment B (and subsequently discharged to WCA 2A). Note the redirection of water from STA 2 to Compartment B. Note that Alternative C decreases the volume of water from the North New River Basin that is treated by STA3/4 (and subsequently discharged to WCA 3A) by redirecting water to Compartment B for treatment (and subsequent discharge to WCA 2A)

Alternative C presents a water budget for an alternative that uses Compartment B to treat water from the North New River Basin that cannot be stored in the A1 reservoir, and Compartment C to expand the treatment capacity of STAs 5 and 6. (The function of Compartment C remains as it was in Alternative B.)

Alternative D presents a water budget for an alternative that focuses the use of Compartment B to treat water from the North New River Basin as the water becomes available in an attempt to free capacity in the A1 reservoir to receive greater volumes of water discharged

from Lake Okeechobee (the function of Compartment C remains as it was in Alternative C). Note that Alternative D decreases the volume of water from the North New River Basin that is pumped to the A1 reservoir (and ultimately treated by STA 3/4) by directing water first to Compartment B for treatment (and subsequent discharge to WCA 2A). Note also that the volume of water discharged from Lake Okeechobee to the A1 reservoir increases while inflows to (and subsequently, discharged from) STA 3/4 remain generally unchanged. During assessment of Alternative D, it was noted that Compartment B seemed to have the capacity to effectively treat more water. A1 reservoir was conceptualized for Alternatives A through D as two pseudo-compartments for modeling purposes only to allow for routing/tracking of water volumes from different sources.

In addition to Alternative D, DOI proposes an operational alternative to Alternative D called D1. This alternative is part of the operational regime of Compartment B to provide additional water quality treatment to improve the performance of the EAA A-1 by either freeing up capacity in STA 3/4 or by a more direct linkage to WCA 3A and by distributing water from Compartment B into WCA 3A through S-11 or other appropriate structures. This is further described in Section 2.6 Alternative D. A water budget for Alternative D1 is not presented below due to timing of its identification for this Draft EIS, and will be depicted for the Final EIS.

Figure 2-1. Alternative A (Average Calendar Year Flow in 1,000 acre-feet)

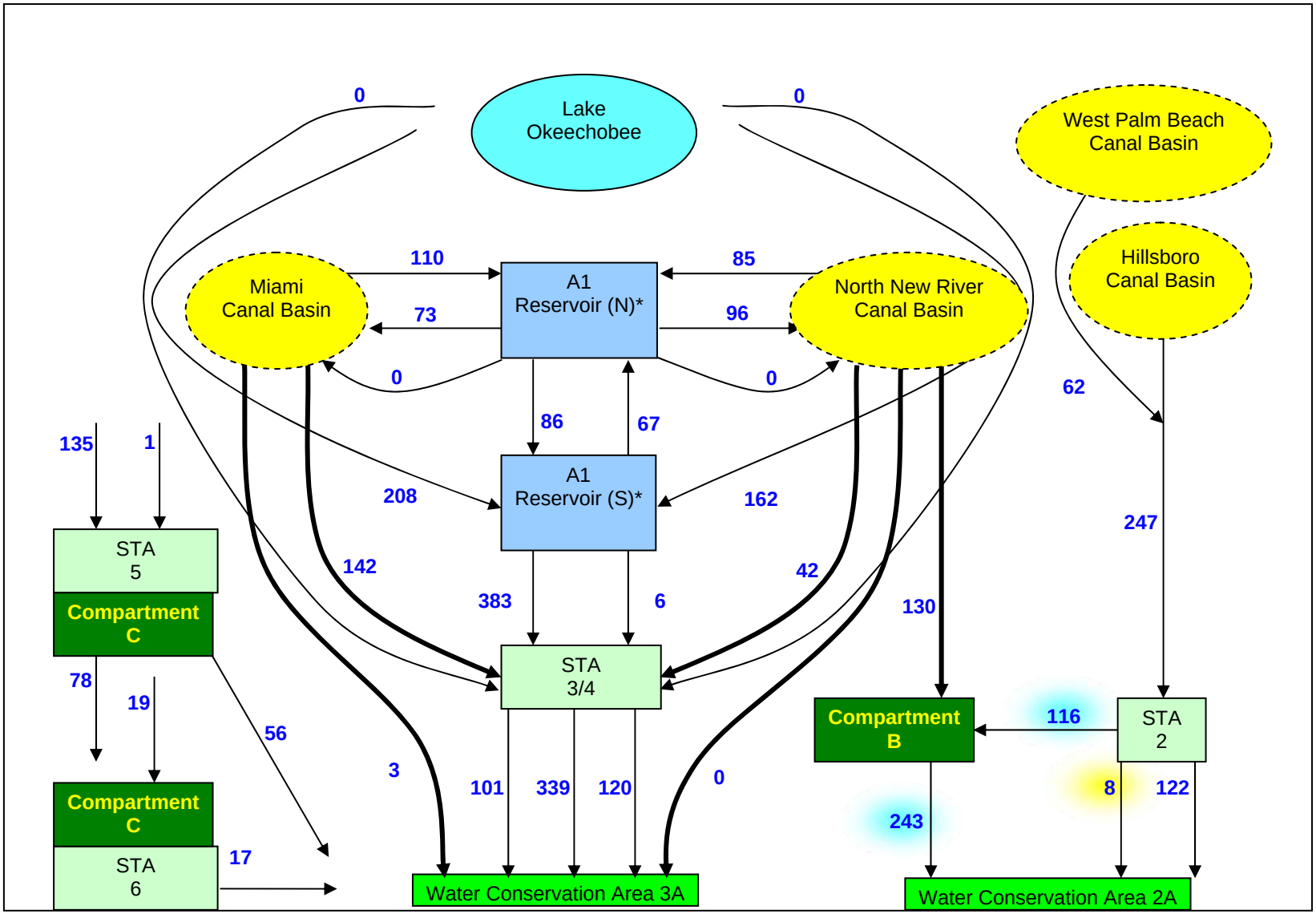


Figure 2-2. Alternative B (Average Annual Flow in 1,000 acre-feet)

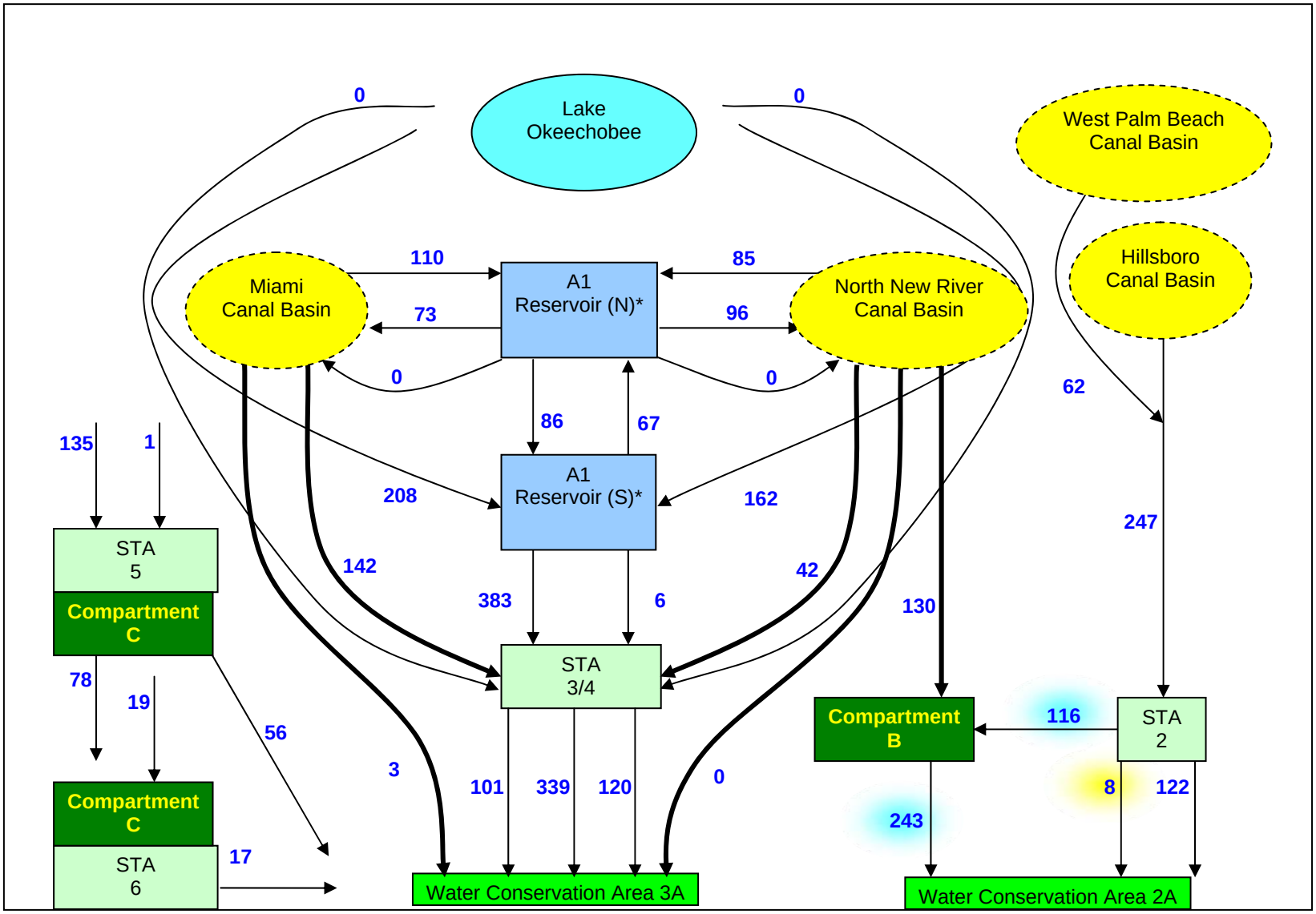


Figure 2-3. Alternative C (Average Annual Flow in 1,000 acre-feet)

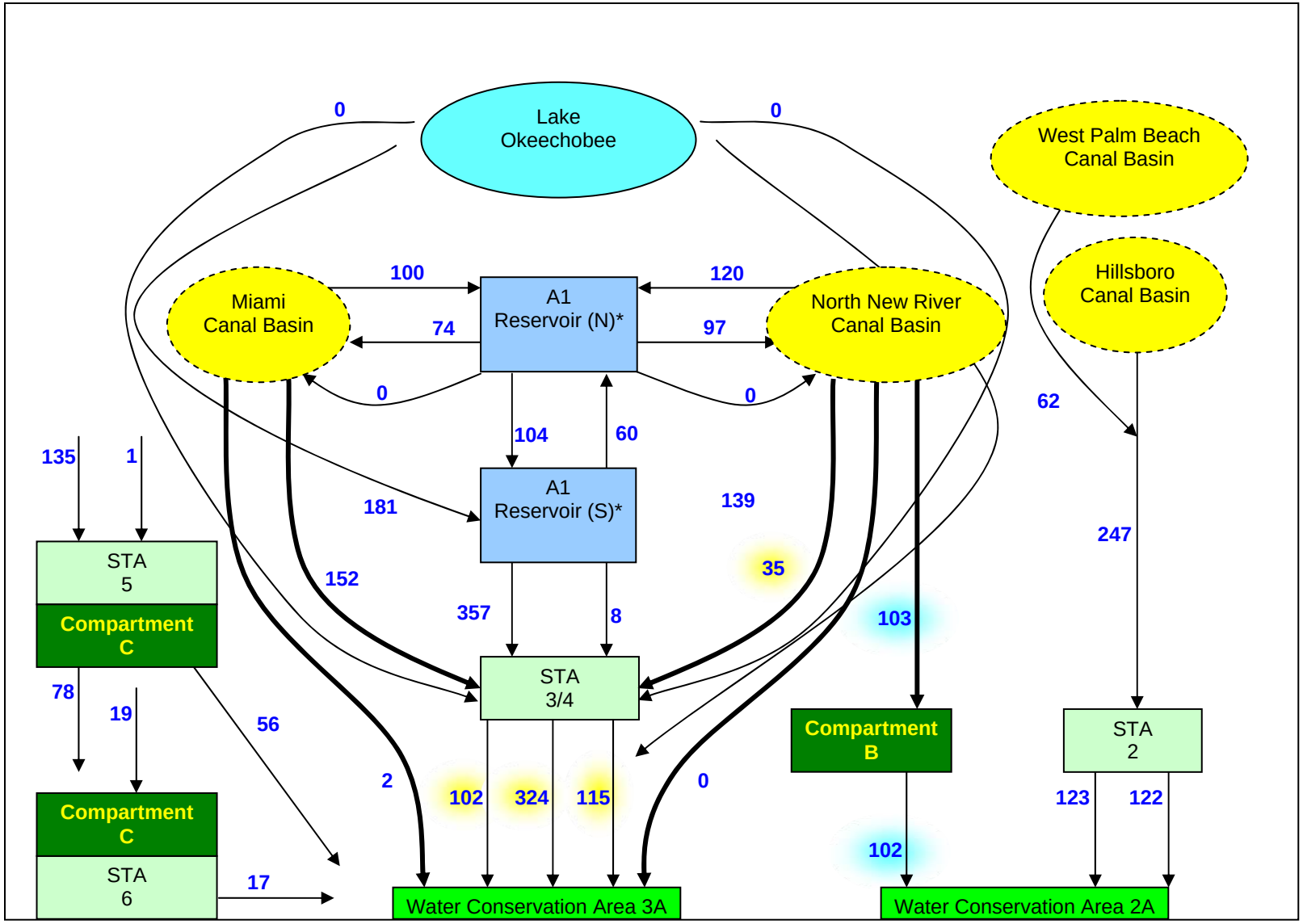


Figure 2-4. Alternative D (Average Annual Flow in 1,000 acre-feet)

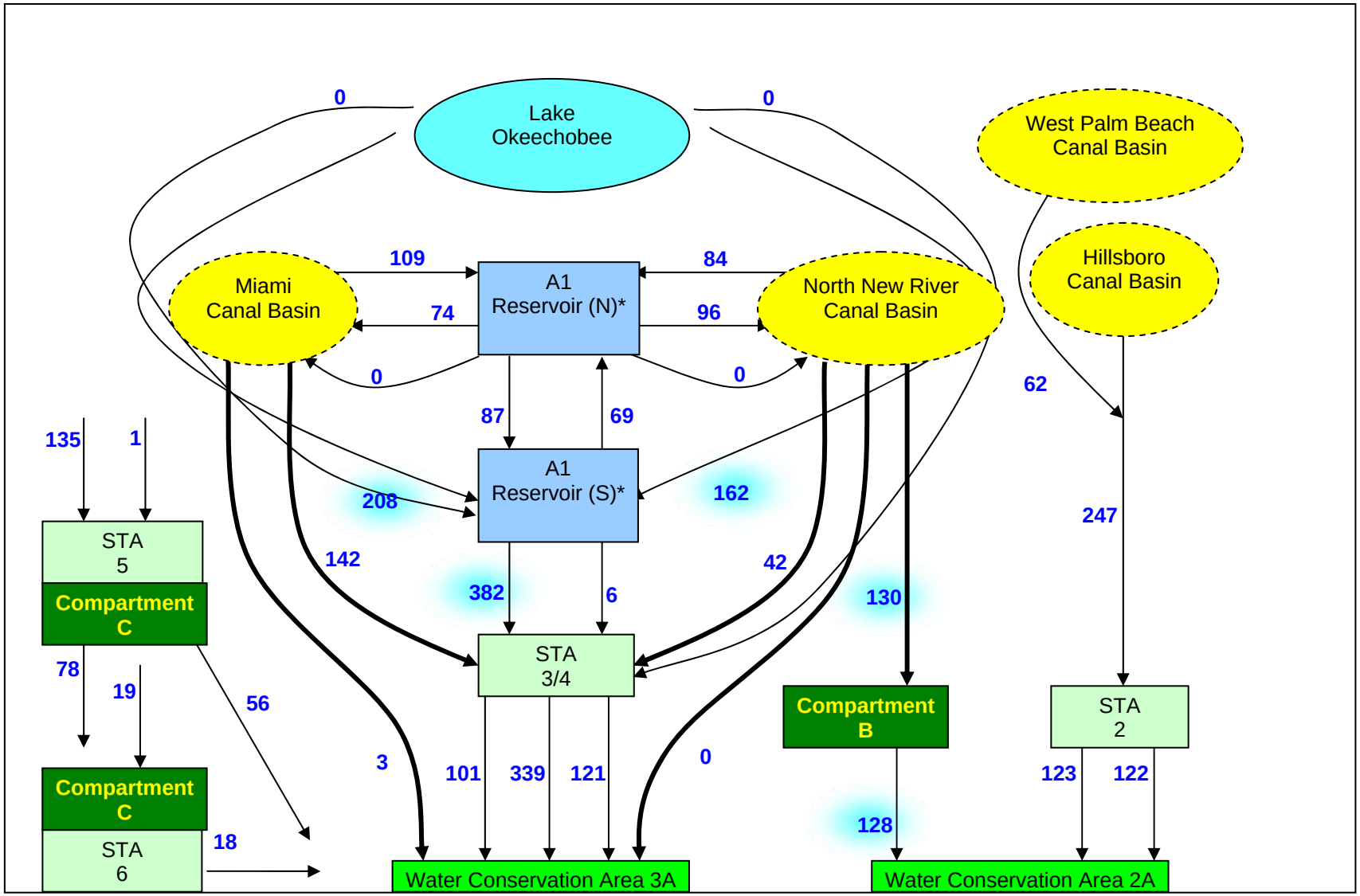


Table 2-1. Alternatives A through E 36-Year Average Annual Inflow Values

Alternative	Parameter	Unit	STA-1E	STA-1W	STA-2	Comp B	EAA A-1	STA-3/4	STA-5	STA-6	Comp C
AltA	Treat. Area	acres	5,132	6,670	8,240	N/A	15,200	16,543	6,095	2,284	N/A
	Volume	AF/yr	193,812	243,799	309,734	N/A	539,290	672,549	167,284	69,588	N/A
	TP Load	kg/yr	42,021	54,580	42,788	N/A	63,794	71,638	46,768	7,699	N/A
	TP Conc	ppb	176	181	112	N/A	96	86	227	90	N/A
	PLR	g/m2/yr	2.0	2.0	1.3	N/A	1.0	1.1	1.9	0.8	N/A
	HLR	cm/d	3.2	3.1	3.1	N/A	3.0	3.4	2.3	2.5	N/A
AltB	Treat. Area	acres	5,132	6,670	6,338	8,620	15,200	16,543	6,095	2,284	5,315
	Volume	AF/yr	193,332	243,570	186,096	248,269	571,919	610,797	83,570	51,039	76,934
	TP Load	kg/yr	41,959	54,533	24,881	32,372	67,496	64,343	23,567	10,644	18,733
	TP Conc	ppb	176	182	108	106	96	85	229	169	197
	PLR	g/m2/yr	2.0	2.0	1.0	0.9	1.1	1.0	1.0	1.2	0.9
	HLR	cm/d	3.1	3.0	2.5	2.4	3.1	3.1	1.1	1.9	1.2
AltC	Treat. Area	acres	5,132	6,670	6,338	8,620	15,200	16,543	6,095	2,284	5,315
	Volume	AF/yr	193,710	243,885	302,390	105,613	548,000	589,905	83,570	51,039	76,934
	TP Load	kg/yr	42,004	54,596	41,822	12,355	64,898	62,012	23,567	10,644	18,733
	TP Conc	ppb	176	181	112	95	96	476	229	169	197
	PLR	g/m2/yr	2.0	2.0	1.6	0.4	1.1	0.9	1.0	1.2	0.9
	HLR	cm/d	3.2	3.1	4.0	1.0	3.0	3.0	1.1	1.9	1.2
AltD	Treat. Area	acres	5,132	6,670	6,338	8,620	15,200	16,543	6,095	2,284	5,315
	Volume	AF/yr	193,336	243,563	302,980	131,657	571,393	610,905	83,570	51,039	76,934
	TP Load	kg/yr	41,959	54,532	41,887	15,438	67,510	64,352	23,567	10,644	18,733
	TP Conc	ppb	176	182	112	95	96	85	229	169	197
	PLR	g/m2/yr	2.0	2.0	1.6	0.4	1.1	1.0	1.0	1.2	0.9
	HLR	cm/d	3.1	3.0	4.0	1.3	3.1	3.1	1.1	1.9	1.2
AltE	Treat. Area	acres	5,132	6,670	8,240	N/A	15,200	16,543	6,095	2,284	N/A
	Volume	AF/yr	112,079	141,072	292,647	N/A	539,290	702,869	103,227	80,734	N/A
	TP Load	kg/yr	24,300	31,582	39,016	N/A	63,794	78,331	28,860	10,815	N/A
	TP Conc	ppb	176	181	108	N/A	96	90	227	109	N/A
	PLR	g/m2/yr	1.2	1.2	1.2	N/A	1.0	1.2	1.2	1.2	N/A
	HLR	cm/d	1.8	1.8	3.0	N/A	3.0	3.5	1.4	3.0	N/A

Note: 1. HLR = Hydraulic Loading Rate from surface inflows, i.e., does not include rainfall
2. PLR = Phosphorus Loading Rate from surface inflows
3. Total Phosphorous Concentrations (TPConc): Indivisible values are shown as '-'.

Table 2-2. Alternatives A through E 36-Year Average Annual Outflow Values

Alternative	Parameter	Unit	STA-1E	STA-1W	STA-2	Comp B	EAASR A-1	STA-3/4	STA-5	STA-6	Comp C	Add'l Treatment Area	Total Treated	Diversion
AltA	Volume	AF/yr	190,600	245,536	313,628	0	513,664	656,972	166,604	69,507	0	0	1,642,847	114,363
	TP Load	kg/yr	6,299	8,281	8,083	0	48,417	17,727	15,028	1,115	0	0	56,533	15,045
	TP Conc	ppb	26.8	27.3	20.9	-	76.4	21.9	73.1	13.0	-	-	27.9	106.7
AltB	Volume	AF/yr	190,293	245,336	189,582	257,844	546,691	595,822	82,855	50,999	76,357	0	1,689,088	106,731
	TP Load	kg/yr	6,269	8,270	4,084	4,944	52,201	15,120	3,271	818	2,768	0	45,543	13,192
	TP Conc	ppb	26.7	27.3	17.5	15.5	77.4	20.6	32.0	13.0	29.4	-	21.9	100.2
AltC	Volume	AF/yr	190,746	245,636	305,045	119,578	371,559	574,973	82,855	50,999	76,357	0	1,646,189	111,276
	TP Load	kg/yr	6,299	8,287	10,338	2,212	36,564	14,194	3,271	818	2,768	0	48,187	13,705
	TP Conc	ppb	26.8	27.4	27.5	15.0	79.8	20.0	32.0	13.0	29	-	23.7	99.8
AltD	Volume	AF/yr	190,151	245,330	305,643	143,554	546,113	595,892	82,855	50,999	76,357	0	1,690,781	106,974
	TP Load	kg/yr	6,269	8,269	10,387	2,656	52,202	15,144	3,271	818	2,768	0	49,581	13,239
	TP Conc	ppb	26.7	27.3	27.6	15.0	77.5	20.6	32.0	13.0	29	-	23.8	100.3
AltE	Volume	AF/yr	110,317	142,095	298,129	0	513,664	685,637	102,807	80,640	0	202,396	1,622,022	114,363
	TP Load	kg/yr	2,216	2,778	6,928	0	48,417	20,340	5,474	2,027	0	5,663	45,427	15,045
	TP Conc	ppb	16.3	15.8	18.8	-	76.4	24.0	43.2	20.4	-	22.7	22.7	106.7

Note: Total Phosphorous Concentrations (TPConc): Indivisible values are shown as '-'.

Table 2-3. Summary of Receiving Water Flows

Alternative	Parameter	Unit	WCA-1	WCA-2A	WCA-3A	Total WCAs	C-51 East	Rotenberger	Total
	Area	acres	143,238	109,174	496,964	749,376		27,500	
AltA	Volume	AF/yr	436,136	753,194	1,627,995	2,817,325	25,545	83,302	2,926,172
	TP Load	kg/yr	14,580	19,362	70,176	104,117	3,037	7,514	114,668
	TP Conc	ppb	27.1	20.8	34.9	30.0	96.4	73.1	31.8
	HLR	cm/day	0.25	0.58	0.27	0.31		0.25	
	PLR	$g/m^2/day$	0.03	0.04	0.03	0.03		0.07	
AltB	Volume	AF/yr	435,629	870,926	1,605,440	2,911,994	24,373	74,359	3,010,726
	TP Load	kg/yr	14,539	19,660	61,874	96,073	2,892	2,935	101,900
	TP Conc	ppb	27.1	18.3	31.2	26.7	96.2	32.0	27.4
	HLR	cm/day	0.25	0.67	0.27	0.32		0.23	
	PLR	$g/m^2/day$	0.03	0.04	0.03	0.03		0.03	
AltC	Volume	AF/yr	436,382	844,204	1,567,979	2,848,565	25,444	74,359	2,948,367
	TP Load	kg/yr	14,586	22,993	61,060	98,639	3,024	2,935	104,598
	TP Conc	ppb	27.1	22.1	31.6	28.1	96.4	32.0	28.8
	HLR	cm/day	0.25	0.65	0.26	0.32		0.23	
	PLR	$g/m^2/day$	0.03	0.05	0.03	0.03		0.03	
AltD	Volume	AF/yr	435,481	872,715	1,605,051	2,913,247	24,369	74,359	3,011,975
	TP Load	kg/yr	14,538	23,681	61,928	100,147	2,892	2,935	105,974
	TP Conc	ppb	27.1	22.0	31.3	27.9	96.2	32.0	28.5
	HLR	cm/day	0.25	0.67	0.27	0.32		0.23	
	PLR	$g/m^2/day$	0.03	0.05	0.03	0.03		0.03	
AltE	Volume	AF/yr	405,248	730,970	1,676,169	2,812,387	25,545	51,404	2,889,336
	TP Load	kg/yr	8,019	18,470	69,782	96,270	3,037	2,737	102,044
	TP Conc	ppb	16.0	20.5	33.8	27.8	96.4	43.2	28.6
	HLR	cm/day	0.24	0.56	0.28	0.31		0.16	
	PLR	$g/m^2/day$	0.01	0.04	0.03	0.03		0.02	

Notes: 1. HLR = Hydraulic Loading Rate from surface inflows, i.e., does not include rainfall

2. PLR = Phosphorus Loading Rate from surface inflows

2.3 ALTERNATIVE A: NO ACTION

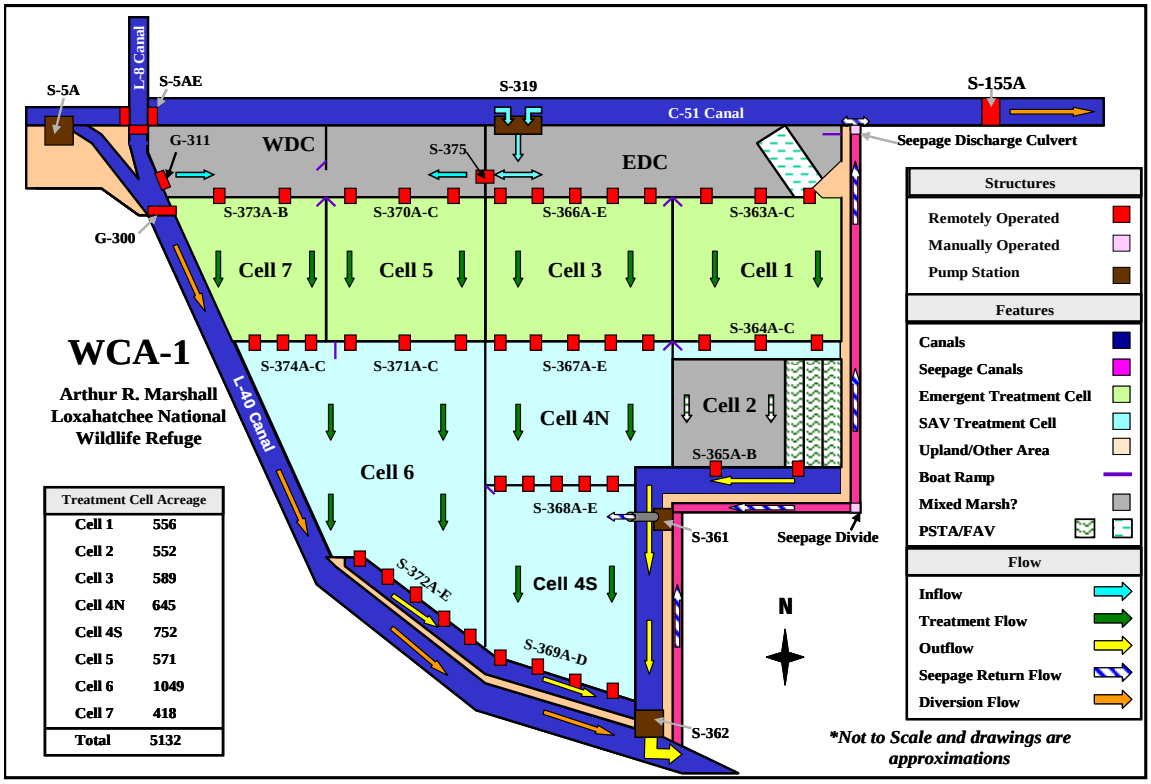
Alternative A includes a combination of existing features and additional features anticipated to be operational in the 2010 planning period. This alternative represents the baseline condition for the Draft EIS, and as such, does not include the treatment areas anticipated for the full build-out of Compartments B and C. Note that Alternative A does include the initial expansions of Compartments B and C, i.e., STA 2 Cell 4 and STA 5 Flowway 3. The structural and operational features of this alternative are described below.

2.3.1 Existing Features

Everglades Construction Project. This alternative includes the existing treatment areas of the ECP as described below.

- STA 1E (5,132 acres of effective treatment area). Working in concert with STA 1W, STA 1E captures and treats runoff from the C-51 Basin, Acme Basin B Section 24 (Section 24), L-8 Basin, S-5A Basin, and the East Beach Water Control District. Untreated runoff from Section 24 has been diverted north from its previous direct discharge point into the WCA 1 north for treatment in STA 1E. Treated discharges from STA 1E are pumped via S-362 into the L-40 rim canal that is located within the eastern portion of the Refuge. Depending on the difference in water level between the rim canal and the Refuge marsh and other factors such as vegetative resistance, a portion of the discharge exits the refuge via the S-39 and S-10 structures without entering the Refuge marsh. A schematic diagram of STA 1E is presented in Figure 2-5.

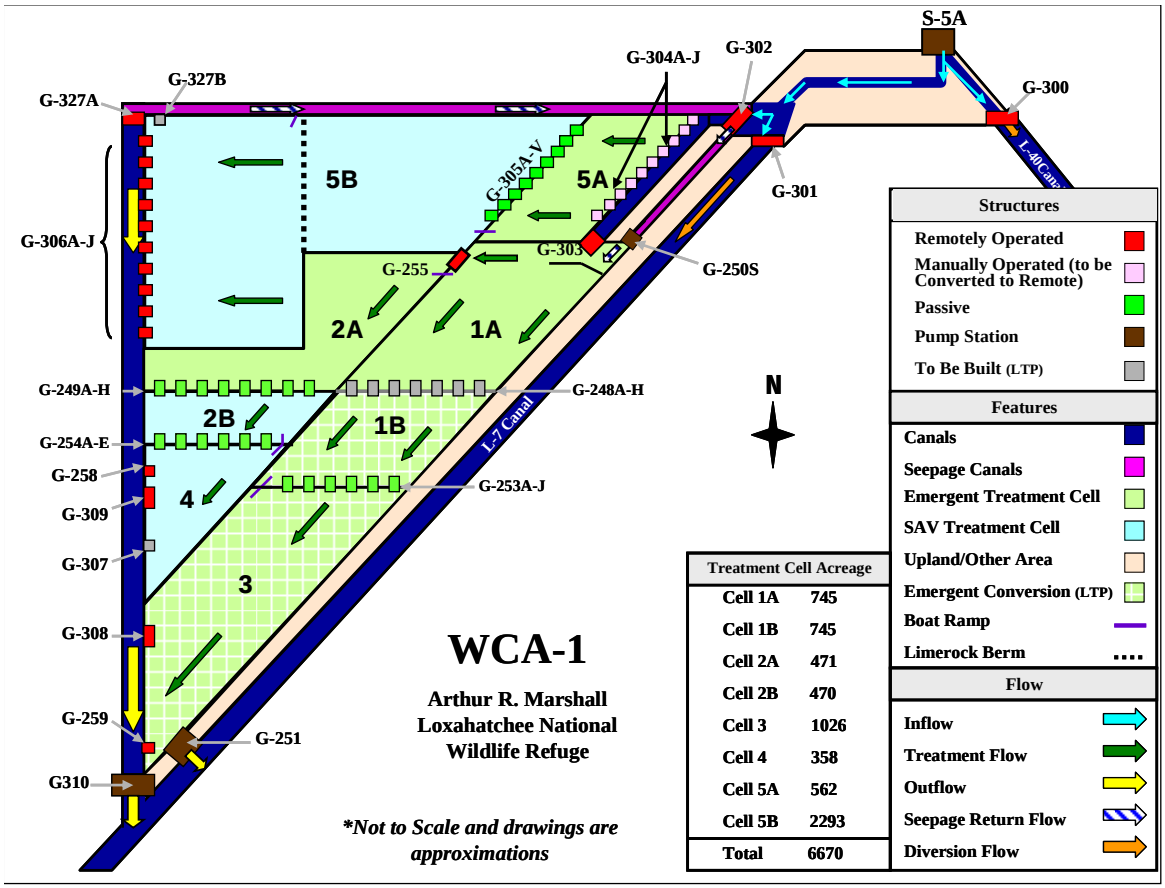
Figure 2-5. Schematic of STA 1E



Source: Pietro et al. 2007

- STA 1W (6,670 acres of effective treatment area). Working in concert with STA 1E, STA 1W captures and treats runoff from the S-5A Basin, East Beach Water Control District, L-8 Basin, and a portion of C-51 West Basin and Section 24, when re-directed from STA 1E. Treated discharges from STA 1W are pumped via G-251 and G-310 stations into the L-7 rim canal that is located within the western portion of the Refuge. Depending on the difference in water level between the rim canal and the Refuge marsh and other factors such as vegetative resistance, a portion of the discharge exits the refuge via the S-39 and S-10 structures without entering the refuge marsh. A schematic diagram of STA 1W is presented in Figure 2-6.

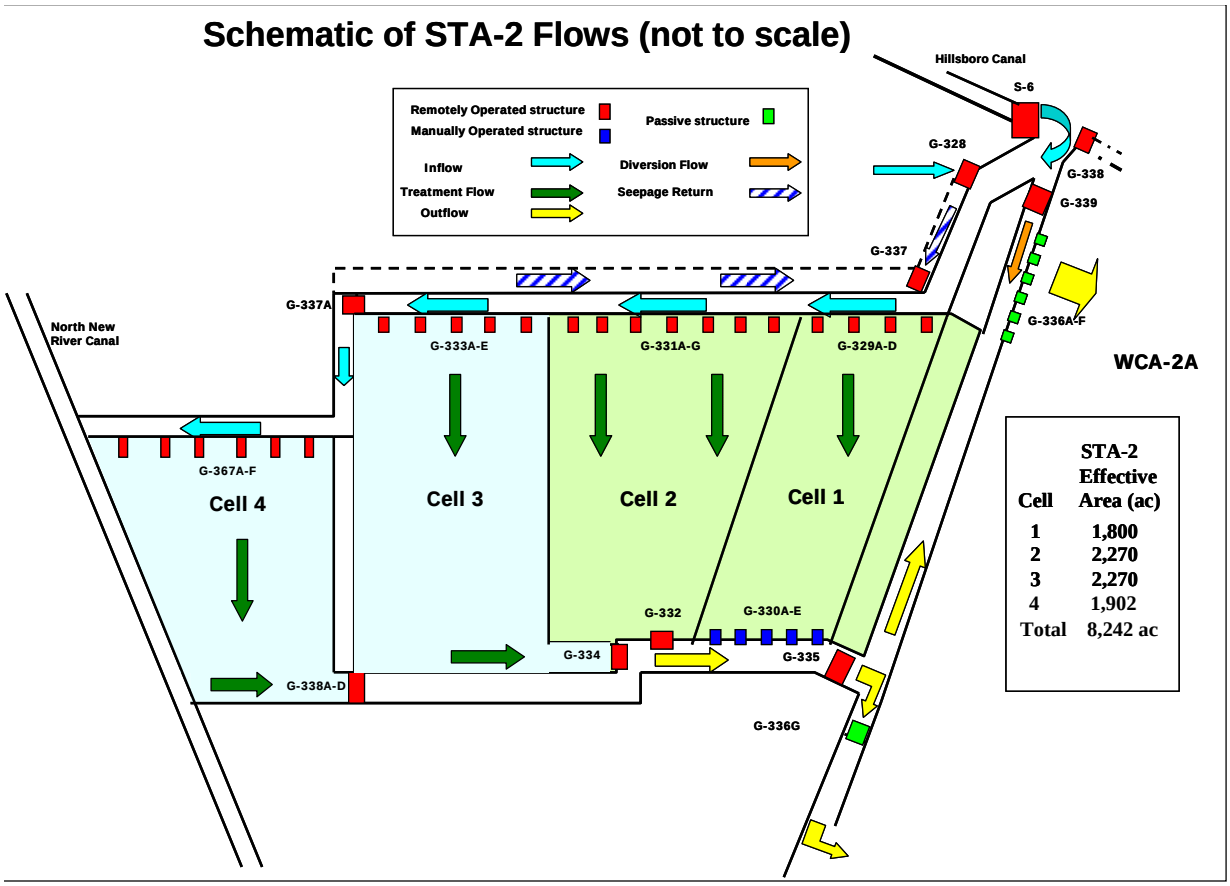
Figure 2-6. Schematic of STA 1W



Source: Pietro et al.. 2007

- STA 2 (8,240 acres of effective treatment area). This alternative includes the current configuration for the four treatment cells of STA 2. STA 2 captures and treats runoff from the S-6/S-2 Basin, the East Shore Water Control District, and Closter Farms (also known as 715 Farms). STA 2 also receives runoff diverted from the S-5A Basin via the existing G-341 structure, located on the Ocean Canal, that would otherwise go to STA 1E and STA 1W. Treated discharges from STA 2 are pumped via G-335 into the L-6 Borrow Canal, then delivered to WCA 2A through box culverts on the north of the L-6 levee and through a section of degraded levee on the south end of the L-6 levee. A schematic diagram of STA 2 is presented in Figure 2-7.

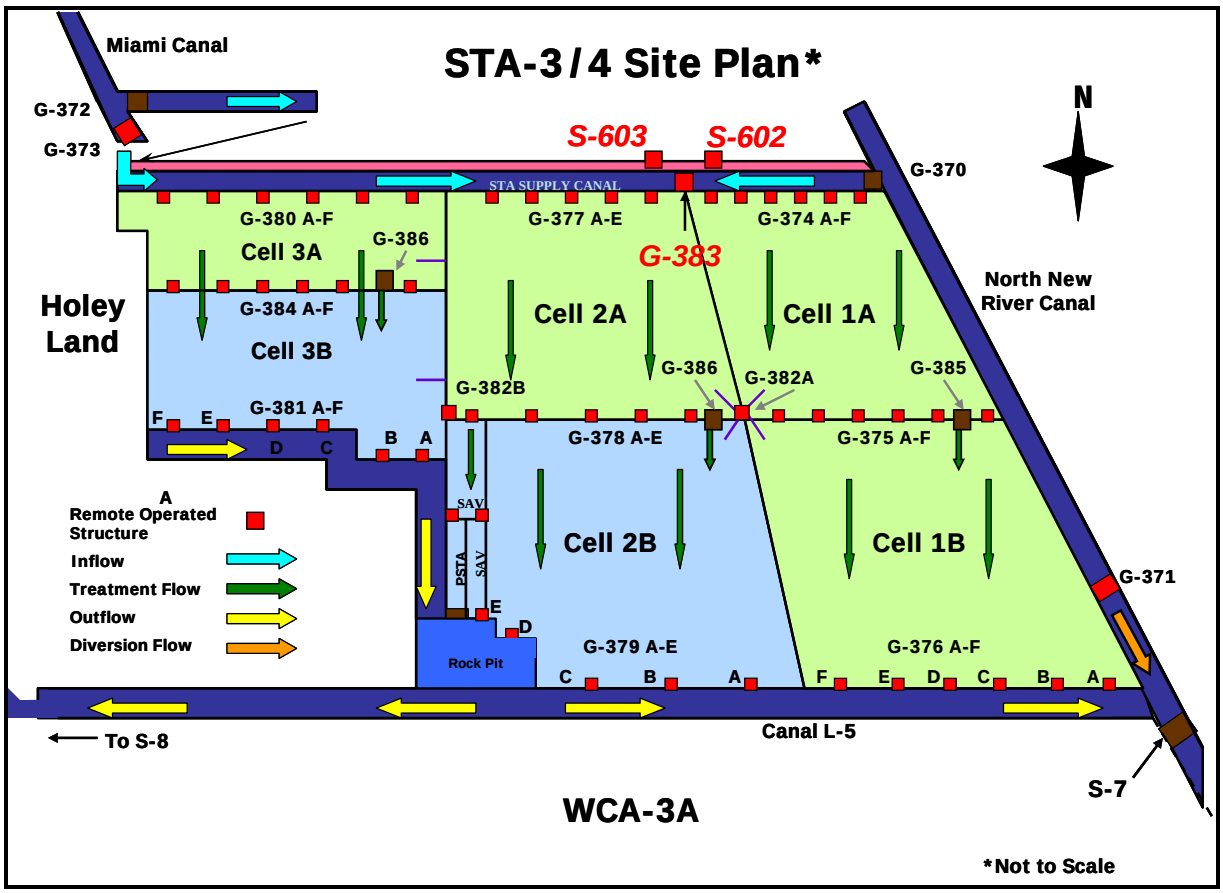
Figure 2-7. Schematic of STA 2



Source: Goforth 2007

- STA 3/4 (16,543 acres of effective treatment area). When the EAA A-1 is complete, STA 3/4 would capture and treat 1) a portion of the discharge from the EAA A-1 Project intended to be delivered to the Everglades for environmental benefits; 2) runoff from the S-7/S-2 Basin; 3) the S-8/S-3 Basin, the South Shore Drainage District; 4) the South Florida Conservancy District; and 5) a portion of the C-139 Basin. Treated discharges from STA 3/4 are delivered to the L-5 Borrow Canal, with approximately 50 percent entering WCA 2A via S-7 and the remainder entering WCA 3A via S-150, S-8 or G-404. A small portion is returned to the Miami Canal and can be delivered to the Holey Land Wildlife Management Area (WMA) to assist in hydropattern restoration of that remnant tract of Everglades habitat. A schematic diagram of STA 3/4 is presented in Figure 2-8.

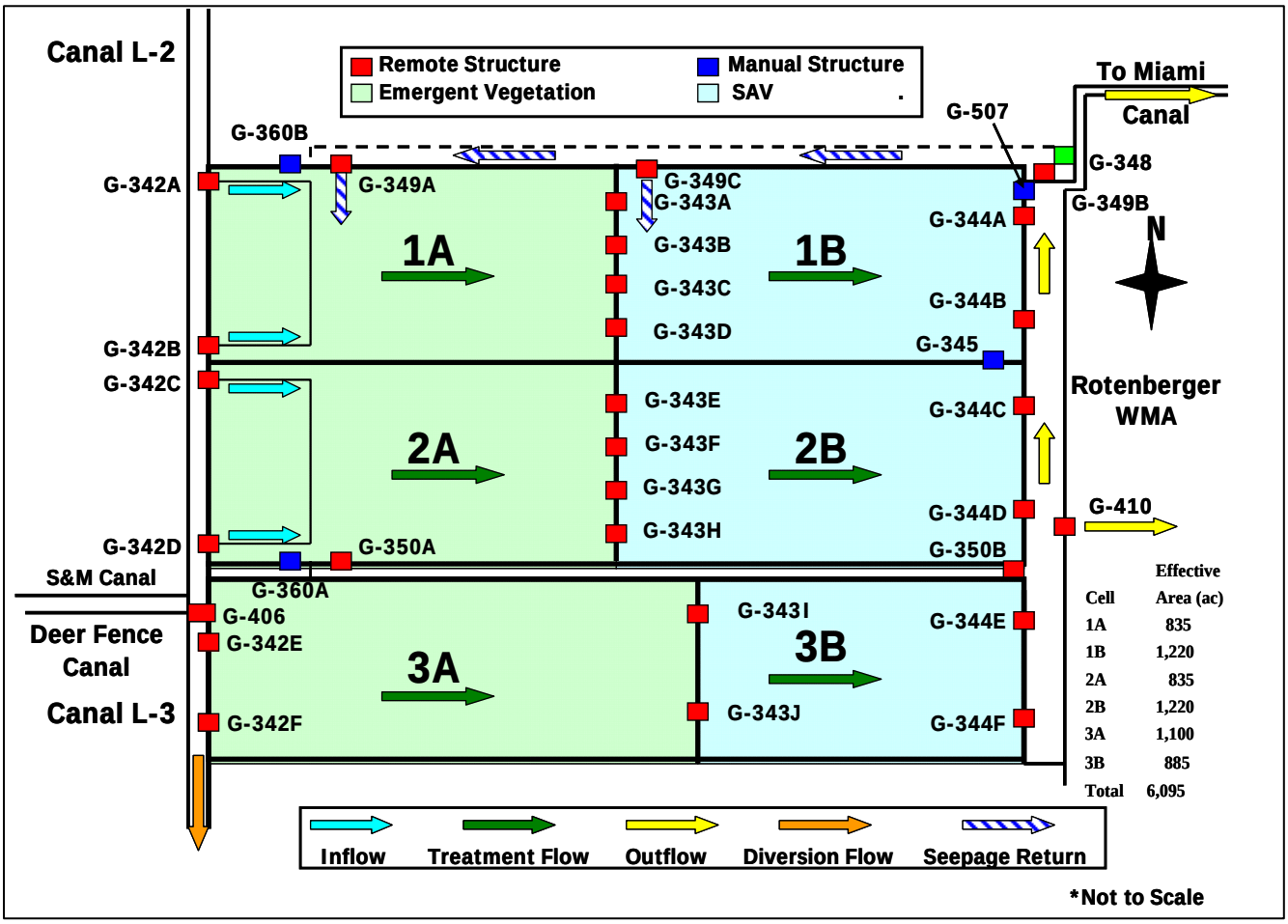
Figure 2-8. Schematic of STA 3/4



Source: Pietro et al. 2007

- STA 5 (6,095 acres of effective treatment area). STA 5 captures and treats runoff from the C-139 Basin. To evaluate environmental effects in Chapter 4, the inflow data sets for STA 5 used the historical flows and phosphorus loads for water years 1995 to 2007 period in lieu of simulated values. Treated discharges may be delivered to the Rotenberger WMA and the Holey Land WMA to assist in hydropattern restoration of those remnant tracts of Everglades habitat. All alternatives incorporated the assumption that 50 percent of the STA 5 discharges are delivered to the Rotenberger WMA and that 0 percent entered the Holey Land WMA to estimate the downstream impacts. A schematic diagram of STA 5, including the recently completed third flow-way, is presented in Figure 2-9.

Figure 2-9. Schematic of STA 5



- STA 6 (2,284 acres of effective treatment area). STA 6 captures and treats runoff from the fallow agricultural area of Compartment C and the C-139 Annex. The inflow data sets for STA 6 used the historical flows and phosphorus loads for the water years 1995 to 2007 period in lieu of simulated values, due to disparities between reality and the model. Treated discharges from STA 6 are delivered to the northwestern corner of WCA 3A. A schematic diagram of STA 6, including the recently completed Section 2, is presented in Figure 2-10.

Figure 2-10. Schematic of STA 6

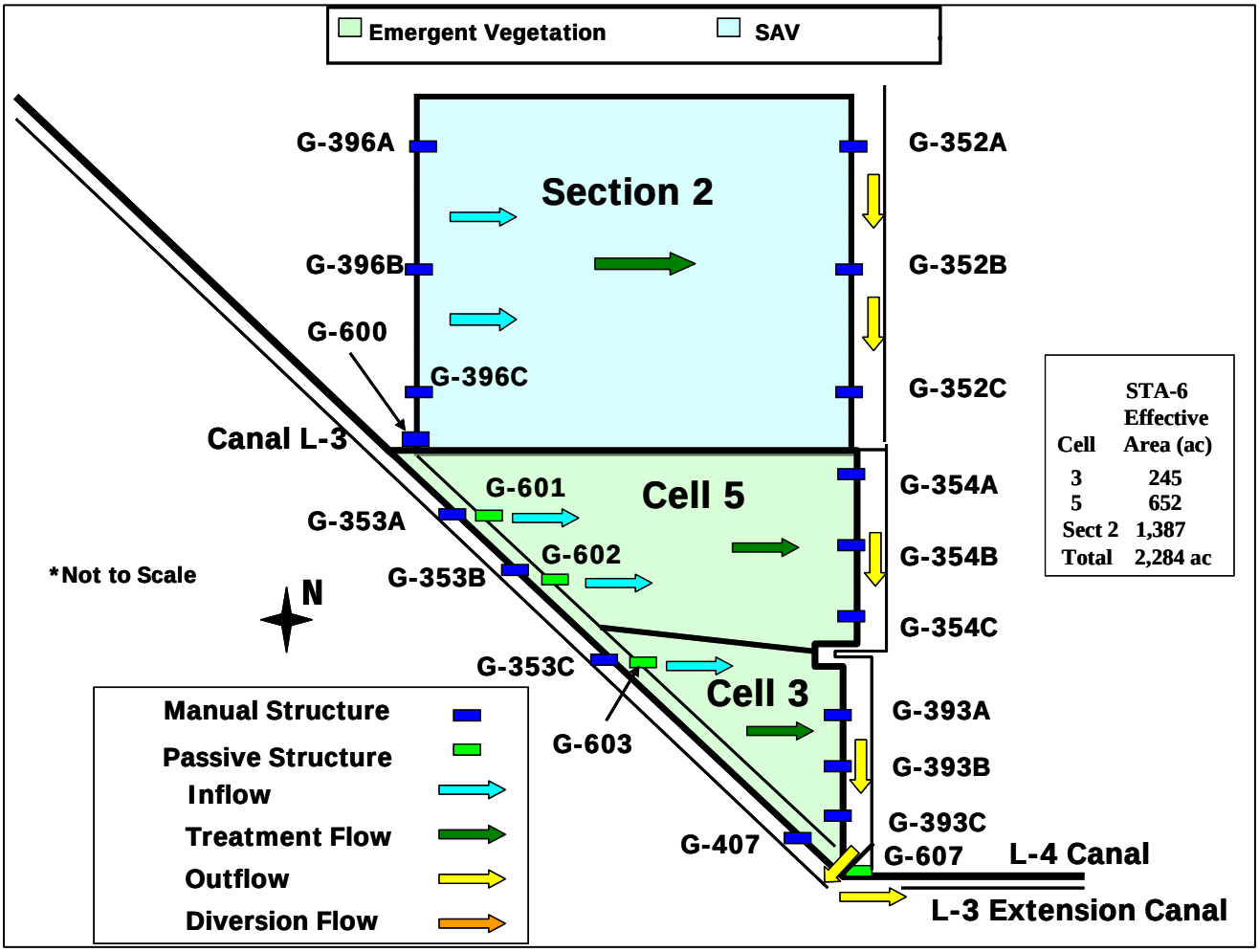


Figure 2-11. Location Map for STA 5, STA 6, and Compartment C Build-out

Source: Goforth 2007

Lake Okeechobee Operations. The following assumptions for the Lake Okeechobee operations were included in the model run simulations for Alternative A.

- Lake Okeechobee Regulation Schedule Water Supply Environment (WSE) levels were figured according to WSE decision trees: with pulse releases in Zone D modeled as Level III pulse in upper third of the zone; Level II pulse in middle third of the zone; and Level I pulse in the lower third of the zone, when the decision tree calls for regulatory releases to the estuaries in the zone.
- WSE thresholds were derived from the Class Limit Adjustment (CLA), which increased the frequency of pulse releases in Zone D of WSE.
- Modified WSE thresholds for Zone D1 were used to improve use of EAA reservoir.
- Lake Okeechobee Supply Side Management guidelines were used to implement Lake Okeechobee service area water restriction cutbacks as per Rules 40E-21 and 40E-22. The Lake Okeechobee service area water shortage triggering line is the line starting at 13.0 feet on October 1 and ending at 10.5 feet on May 31, with additional breakpoints defined in between.
- Assumed emergency flood control backpumping to Lake Okeechobee from the EAA would occur.
- Assumed completion of the Kissimmee River Restoration and Headwaters Revitalization Project.
- Factored in Lake Okeechobee environmental releases to supplement reservoir deliveries to Caloosahatchee and St. Lucie Estuaries.
- Considered environmental deliveries to WCA 3A according to Rainfall Driven Operations as a means of operating the EAA Reservoir.
- Did not include Lake Okeechobee makeup water deliveries to WCAs.

During preparation of this EIS, the regulation schedule for Lake Okeechobee was undergoing review and a plan to temporarily decrease the Lake's operational stages was being developed to permit maintenance and repair of the Herbert Hoover Dike. Hydrologic and water quality simulations prepared for presentation and use in this EIS were conducted prior to authorization of the regulation schedule revisions.

Anticipated Features. In addition to the existing features, Alternative A includes the anticipated features, excluding Compartments B and C, which are not part of the No Action Alternative. Refer to Figure 1-3. These features, which include the following projects: the EAA Reservoir; EAA Bolles Canal Improvement; North Palm Beach County (L-8

Reservoir); Water Preserve Area Conveyance; C-43 Basin Aquifer Storage and Recovery Part 2; and Indian River Lagoon – South (C-44), are expected to be implemented regardless of the decision made on this Proposed Action; therefore, they are included as part of the No Action Alternative.

EAA Reservoir.

A-1 Reservoir Project. This project is a component of the larger CERP EAA Storage Reservoir Project and is designed to provide significant additional water storage in the southern region of the EAA. This project has undergone a separate NEPA compliance review, USACE permit approval process, and DOI interim land use approval for construction. The project is an aboveground reservoir for water storage with a capacity of 190,000 acre-feet, or 62 billion gallons, at a depth of 12.5 feet. It is assumed that additional and existing STAs in the EAA would ultimately work in concert with the EAA A-1 Reservoir to achieve the goals and objectives as stated in the EAA A-1 Final EIS (USACE 2006). The reservoir would be constructed on a 16,700-acre parcel of land situated north of STA 3/4 and between the Miami and North New River Canals. Anticipated project benefits include the following:

- Capture, move, and store regulatory releases from Lake Okeechobee thereby reducing the number and volume of harmful discharges to coastal estuaries;
- Reduce water levels in Lake Okeechobee when needed, benefiting the Lake's environmental health and recovery;
- Capture, move, and store agricultural stormwater runoff, reducing the need for emergency back-pumping into Lake Okeechobee for flood control;
- Provide additional water to meet Everglades water demands, and providing water supply to meet supplemental irrigation demands dependent upon Lake Okeechobee;
- Improve the quantity, timing, and distribution of water deliveries to the WCAs and ENP by capturing water currently discharged to tide;
- Improve operational flexibility to move water within the EAA, including flow equalization and optimization of STA 3/4 performance to further reduce phosphorus inflows to the Everglades;
- Improve flood protection for lands adjacent to the Bolles Canal; and
- Provide opportunities for public access and recreation.

The operational intent of the EAA A-1 is to receive excess water from the system, runoff from the EAA, and releases from Lake Okeechobee. The simulated environmental deliveries

from the EAA A-1 to STA 3/4 for delivery to WCA 3A were in accordance with the Rainfall Driven Operations, which are intended to provide improved timing and location of water depths. Irrigation water was also released from the EAA A-1 back to the EAA to meet supplemental irrigation demands. It should be noted that while the USACE has issued a DA permit and while the DOI has approved an interim land use change for the EAA A-1 Reservoir, the operations plan for the EAA A-1 Reservoir has not been approved. It is assumed that existing STAs and additional/proposed treatment areas in the EAA would ultimately work in concert with the EAA A-1 Reservoir to achieve the goals and objectives stated in the EAA A-1 Final EIS (USACE 2006). Prior to approval of the operations plan for the EAA A-1 Reservoir, the USACE will conduct a NEPA evaluation of the planned operations for the reservoir, including its functional relationship with existing and additional/proposed STAs; other water management system infrastructure, features, and constraints; and full consideration of downstream effects of operations on restoration goals, the natural environment, and federally listed species. This Draft EIS evaluates construction of additional STAs that would work in concert with the existing water management system as well as future features such as the EAA A-1 Reservoir. The potential effects of the Action Alternatives would largely be a function of the manner in which, and degree to which, the Action Alternative features are used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity.

Action Alternatives B, C, and D are presented to disclose how STAs constructed on Compartments B and C might be used as part of regional water management infrastructure to permit attainment of differing regional restoration intents and benefits (in addition to cleansing of water destine for delivery to the EPA). The construction and proposed use of the additional STAs presented in this Draft EIS are in no way intended to propose, direct, or otherwise mandate specific changes in system-wide operations. The additional STAs presented in this Draft EIS are intended to provide additional treatment capacity that would permit changes in system operations that might otherwise not be feasible in the absence of the added treatment capacity. Such changes in system operations will be determined and evaluated in the future as part of ongoing restoration-related planning efforts.

EAA Bolles Canal Improvement Project. This project is a component of the CERP EAA Storage Reservoir Project and is designed to provide increased conveyance capacity to the EAA A-1, STAs, and to the local farmers in the Miami, North New River, and Hillsboro Canal Basins. The Bolles Canal has an east-west alignment in the northern portion of the EAA between Miami and North New River Canals (see Figure 1-1). The Bolles Canal Improvement Project, in conjunction with improvements to the Miami Canal and North New River Canal, will provide the necessary additional conveyance capacity needed to enhance

storage in the EAA Storage Reservoir and STAs, improve agricultural deliveries, and increase flood protection (not included in SFWMM simulation).

North Palm Beach County Project - L-8 Reservoir (870 acres, depth 44 feet**).** This initial phase of the larger North Palm Beach County Project includes a reservoir with a combined aboveground and in-ground storage capacity of approximately 38,000 acre-feet, and is located immediately west of the L-8 Borrow Canal and north of the C-51 Canal in Palm Beach County. The initial phase of the project includes an 870-acre reservoir with the water level fluctuating from 10 feet above grade to 30 feet below grade. Water will be pumped into the reservoir from the C-51 Canal and Southern L-8 Borrow Canal during the wet season or when excess water is available and returned to the C-51 and L-8 during dry periods. Additional projects of the larger North Palm Beach Project include canal improvements and water control structures that will also direct excess water into the City of West Palm Beach Grassy Waters Preserve and the Loxahatchee Slough and River. These projects are anticipated to be complete after 2011. Anticipated project benefits include the following:

- To increase water supply availability;
- To attenuate discharge to the Lake Worth Lagoon and provide compatible drainage benefits for northern Palm Beach County areas;
- To provide flows to enhance hydroperiods in the Loxahatchee Slough; and
- To increase baseflows to the Northwest Fork of the Loxahatchee River.

Water Preserve Area Conveyance. The Water Preserve Areas consist of a series of five project components located adjacent to the WCAs in Palm Beach, Broward, and Miami-Dade Counties. This project includes the construction of aboveground impoundments, a wetland buffer strip, pump stations, culverts, canals, water control structures, and seepage control systems. The five components that make up the Water Preserve Areas are:

- Site 1 Impoundment: 1,660 acres; depth 8 feet
- C-9 Impoundment: 1,739 acres; depth 4 feet
- C-11 Impoundment: 1,730 acres; depth 4 feet
- Acme Section 24 discharge to C-51W and then to STA 1E
- WCA 3A/3B Seepage Management Area

Anticipated project benefits include the following:

- Improve Everglades water quality by diverting urban runoff into impoundments;
- Improve hydropatterns in the WCAs along with improved flows to ENP;

- Enhance and increase the spatial extent of wetlands adjacent to the remaining Everglades;
- Reduce seepage of pristine water from the WCAs into urban areas;
- Provide a buffer between natural and developed areas;
- Reduce the amount of excess water discharged to tide and "lost" to the system in Palm Beach and Broward Counties;
- Provide supplemental water supply deliveries and aquifer recharge to urban areas, thus reducing demands on Lake Okeechobee and the WCAs;
- Maintain level of service for flood protection; and
- Provide opportunities for public access and recreation.

C-43 Basin Aquifer Storage and Recovery (11,000 acres, average depth 15 feet). This project will provide a significant portion of the total water storage requirements for the C-43 Basin. The project consists of an aboveground reservoir located south of the Caloosahatchee River and west of the Ortona Lock (S-78). Storage capacity is approximately 170,000 acre-feet. Water depth will vary from 12 to 26 feet. The reservoir will be constructed on an 11,000-acre parcel in Hendry County, west of the City of Labelle. Anticipated benefits include:

- Capture and store stormwater runoff from the C-43 Basin, reducing excess water flow to the Caloosahatchee Estuary;
- Capture and store regulatory releases from Lake Okeechobee, reducing discharges to the Caloosahatchee Estuary;
- Improve the salinity balance for the Caloosahatchee Estuary by controlling peak flows during the wet season and providing essential flows during the dry season;
- Provide an additional source of water to meet irrigation needs and urban demands after restoration needs are met; and
- Provide opportunities for public access and recreation.

Indian River Lagoon – South (C-44 Reservoir) (9,700 acres, depth 15 feet). As a component of the larger Indian River Lagoon-South Restoration Project, this project will capture and treat local stormwater runoff from the 116,516-acre C-44 Basin in Martin County, decreasing flows and improving water quality into the St. Lucie Estuary. The project consists of a 3,400-acre, 15-foot-deep aboveground reservoir that will hold 50,600 acre-feet of water, providing significant water storage for the C-44 Basin. The project also

includes a 6,300-acre STA to capture and treat stormwater runoff before it enters the St. Lucie Canal and, ultimately, the St. Lucie Estuary and Indian River Lagoon. New conveyance canals, embankments, and a pump station are part of the project to aid in moving water through the reservoir and STA. Anticipated benefits include:

- Capture and store local stormwater runoff from the basin; treat some or all of the runoff, and return it to the C-44 (St. Lucie) Canal when needed;
- Decrease and attenuate excess water flow to the St. Lucie Estuary;
- Improve water quality by reducing the amounts of phosphorus, pesticides, herbicides, and other pollutants in the runoff entering the estuary, improving the health of the ecosystem;
- Increase available water supplies for the environment and human needs; and
- Provide opportunities for public access and recreation.

Other assumptions incorporated into the South Florida Water Management Model (SFWMM) simulation for Alternatives A through D are summarized in Appendix H in the Alternative modeling reports. This simulation is used to estimate the potential effects of the alternative in Chapter 4.

It should be noted that unless explicitly stated to the contrary in the description of an alternative, the above-referenced structural and operational assumptions are common to all alternatives.

Summary of Simulated Inflows. As part of the evaluation of the potential environmental effects of the proposed alternatives, phosphorus reduction of the STAs was projected using the DMSTA model (Walker and Kadlec 2005). This model requires flow data to simulate phosphorus loads. Daily flow data for water years 1965 to 2000 (May 1, 1965 to April 30, 2000) were provided by the SFWMD for the SFWMM simulation of Alternative A (SFWMM "2010A8 Base"). A summary of the 36-year annual average inflows is presented in Table 2-4(a) below. As discussed above, the primary differences between the alternatives are operational, with variations in sources to STA 2, Compartment B, the EAA A-1, and STA 3/4. Table 2-4(b) summarizes the 36-year average annual inflow to these facilities by source to focus on these differences.

Table 2-4 (a). Alternative A 36-Year Average Annual Inflows

Alternative	Parameter	Unit	STA-1E	STA-1W	STA-2	EAASR A-1	STA-3/4	STA-5	STA-6	Additional Area	Total
AltA	Treat. Area	acres	5,132	6,670	8,240	15,200	16,543	6,095	2,284	0	44,964
	Volume	AF/yr	193,812	243,799	309,734	539,290	672,549	167,284	69,588	0	1,656,766
	TP Load	kg/yr	42,021	54,580	42,788	63,794	71,638	46,768	7,699	0	265,494
	TP Conc	ppb	176	181	112	96	86	227	90	-	130
	PLR	g/m2/yr	2.0	2.0	1.3	1.0	1.1	1.9	0.8	0	1.46
	HLR	cm/d	3.2	3.1	3.1	3.0	3.4	2.3	2.5	0	3.1

Note: 1. HLR = Hydraulic Loading Rate from surface inflows, i.e., does not include rainfall
2. PLR = Phosphorus Loading Rate from surface inflows
3. Total Phosphorous Concentrations (TPConc): Indivisible values are shown as '-'.

Table 2-4 (b). Alternative A Inflow Sources for the Central EAA

Alternative	Parameter	Unit	STA-1E	STA-1W	STA-2	EAASR A-1	STA-3/4
AltA	Treat. Area	acres	5,132	6,670	8,240	15,200	16,543
	Lake Inflow	AF/yr	0	0	0	318,145	0
	EAA inflow	AF/yr	19,209	243,799	282,204	221,145	295,463
	EAA SR A-1	AF/yr	0	0	0	N/A	360,658
	Other	AF/yr	174,604	0	27,530	0	13,176
	Total Inflow	AF/yr	193,812	243,799	309,734	539,290	672,549

Note: 1. Indivisible values are shown as '-'.

2.4 ALTERNATIVE B – APPLICANT'S PREFERRED ALTERNATIVE

Alternative B includes a combination of existing features and additional features anticipated to be operational in the 2010 planning period, including the treatment areas anticipated for the full build-out of Compartments B and C. The alternative represents the SFWMD's Preferred Alternative for the Draft EIS. The structural and operational features of this alternative are described below.

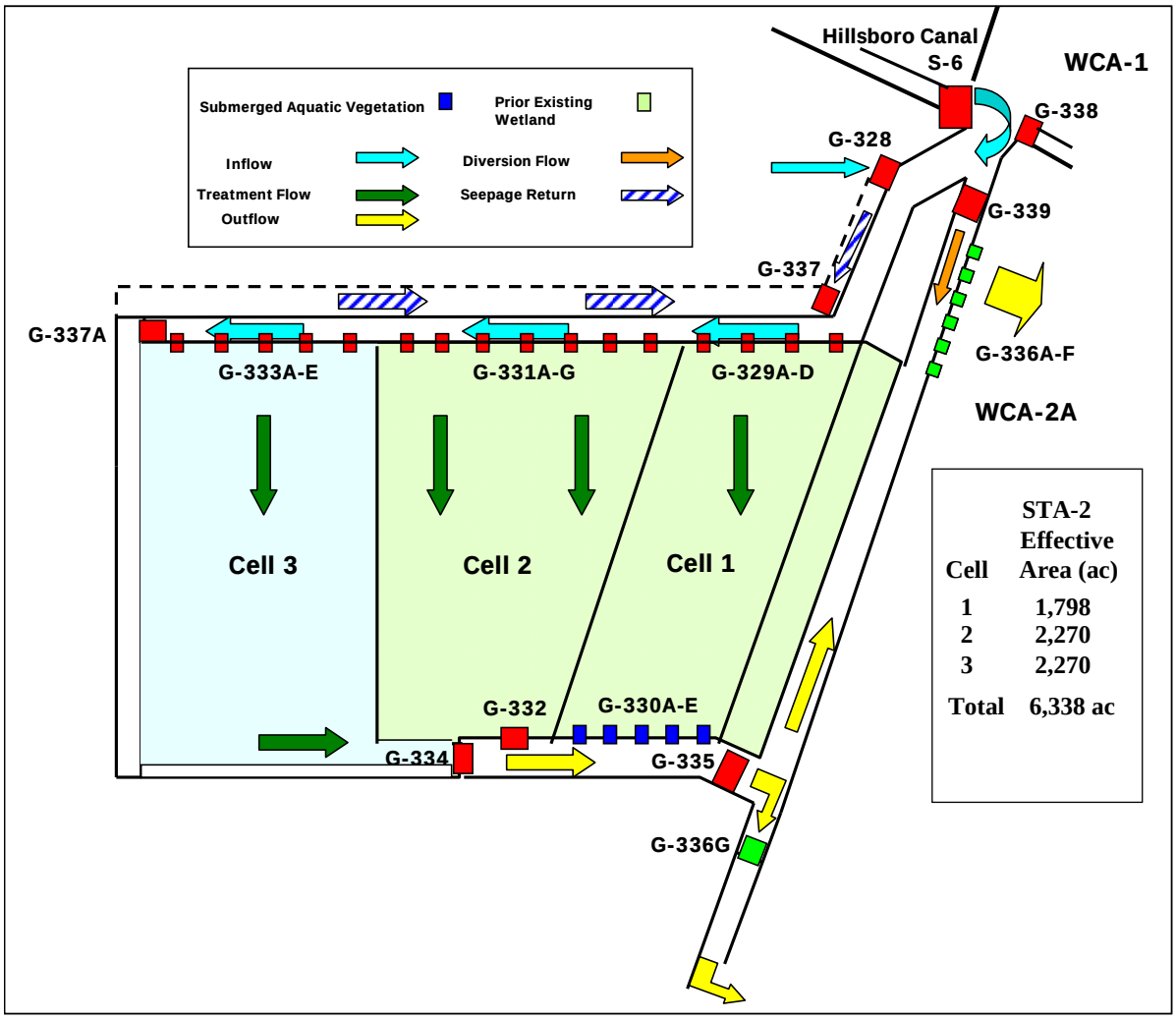
Everglades Construction Project. This alternative includes the existing and anticipated treatment areas of the ECP, as described below.

- STA 1E (5,132 acres of effective treatment area). This alternative simulates the configuration and operation of STA 1E in the same manner as the No Action Alternative (Alternative A).
- STA 1W (6,670 acres of effective treatment area). This alternative simulates the configuration and operation of STA 1W in the same manner as the No Action Alternative (Alternative A).

- STA 2 (6,338 acres of effective treatment area). This alternative includes:
  - The original treatment cells (1 through 3) of STA 2 and its expansion area of cell 4,
  - A hydraulic connection to the north build-out of Compartment B, and
  - The same inflow sources as Alternative A.

Treated discharges from STA 2 will be pumped via G-335 into the L-6 Borrow Canal, then delivered to WCA 2A through box culverts on the north of the L-6 Levee and through a section of degraded levee on the south end of the L-6 Levee. A schematic diagram of STA 2 is presented in Figure 2-12.

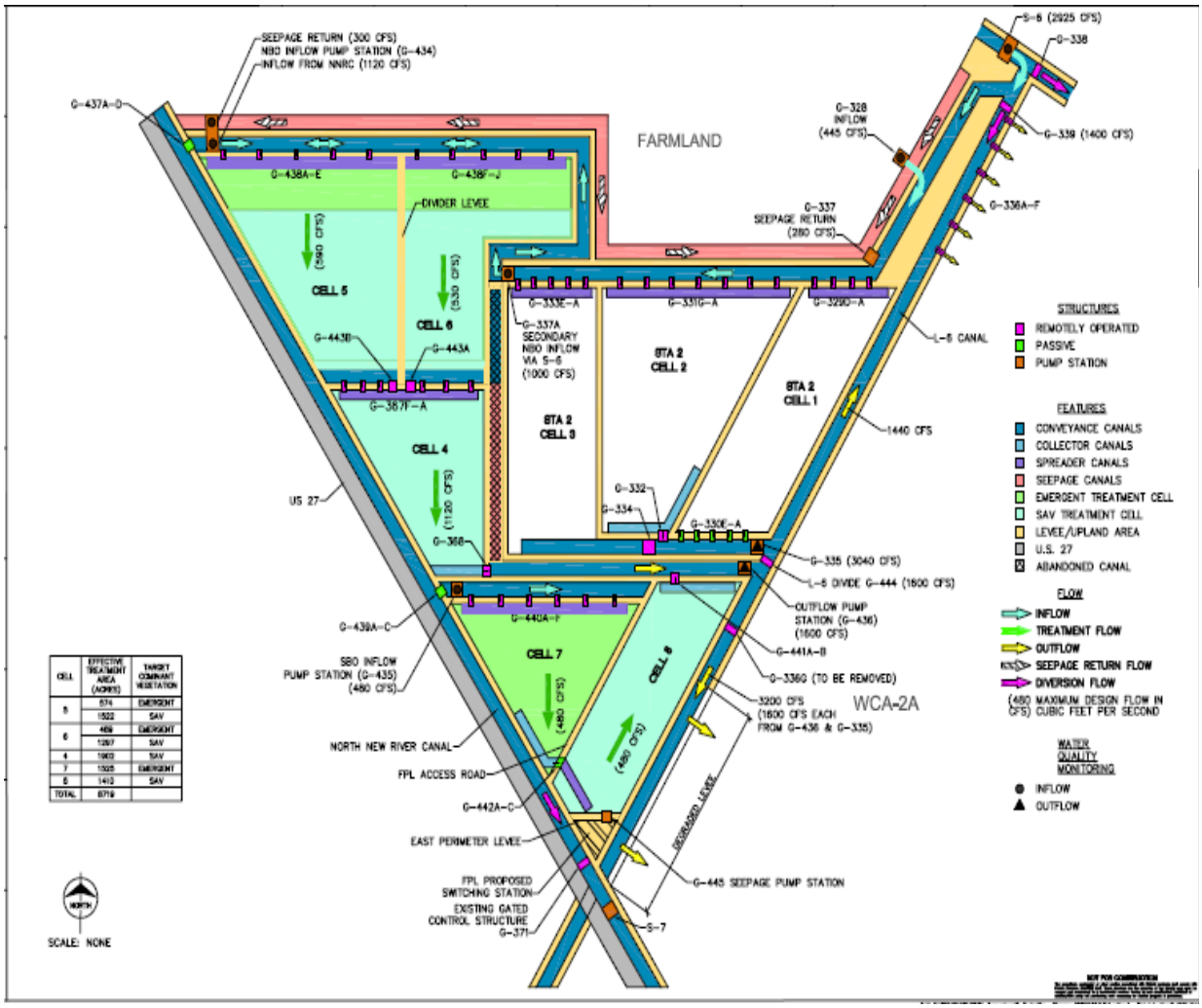
Figure 2-12. STA 2 Schematic



Note: Not to Scale
Source: Goforth 2007

- Compartment B (8,620 acres of effective treatment area). (Note: As stated in Chapter 1, acreage amounts are based on the most current data from preliminary design reports provided by SFWMD and will be updated for the Draft Final EIS with intermediate design information.). Compartment B consisted of two independent treatment areas (Brown and Caldwell 2007). The NBO consists of three cells: the initial two cells containing 3,922 acres of effective treatment area, followed by the existing Cell 4 of STA 2. Although the build-out is still under design by the SFWMD, the present configuration includes a north-south interior levee that divides the upper area into two parallel cells. Inflows will come from the North New River Canal via a new 1,120-cubic foot per second (cfs) pump station with inflows re-directed from STA 2, including runoff diverted from the S-5A Basin that would otherwise go to STA 1E and STA 1W, and will be limited to a total of 1,000 cfs. After they pass through the NBO, treated discharges would be conveyed to a new 1,600-cfs outflow pump station located directly south of the STA 2 outflow pump station G-335 (Brown and Caldwell 2007). The SBO consists of two cells in series, with the initial cell containing 1,477 acres of effective treatment area, followed by an additional 1,319 acres. Inflows to the SBO would come from the North New River Canal via a new 480 cfs pump station. In this alternative, Compartment B would aid STA 2 and STA 3/4 in receiving facility for runoff from the North New River Canal Basin. Treated discharges would be conveyed to the new 1,600-cfs outflow pump station located directly south of the STA 2 outflow pump station G-335 (Brown and Caldwell 2007). A schematic diagram of STA 2 is presented in Figure 2-13.

Figure 2-13. Schematic of Compartment B



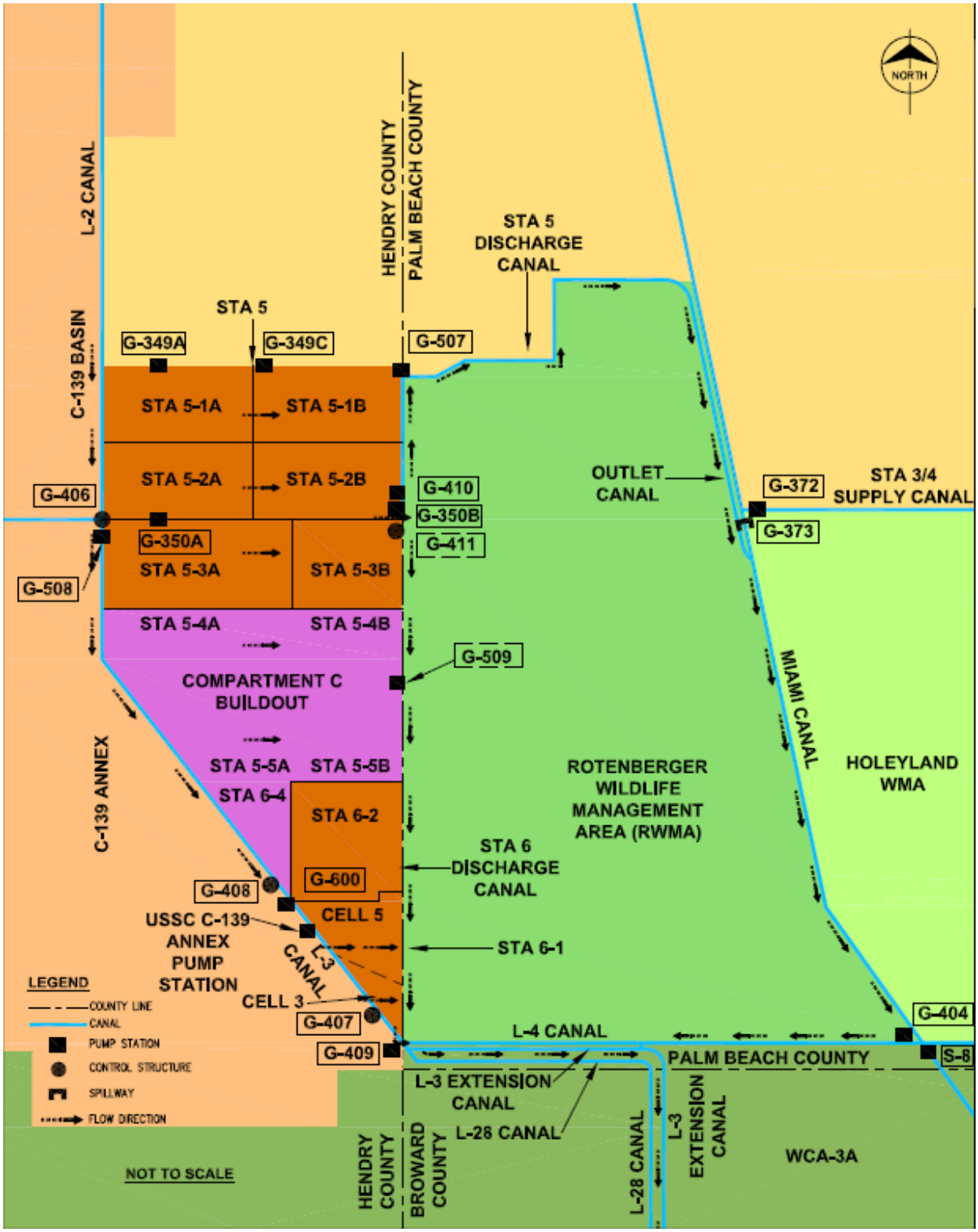
Note: Subject to revision

Source: Brown and Caldwell 2007.

- STA 3/4 (16,543 acres of effective treatment area). This alternative simulates the configuration of STA 3/4 in the same manner as the No Action Alternative (Alternative A). However, the magnitude and distribution of inflow sources varies from the No Action Alternative in the following ways:
  - The total long-term average annual inflows are approximately 9 percent less than the No Action Alternative, a result of Compartment B capturing a portion of the EAA runoff.
  - The long-term average annual inflow from EAA runoff is reduced approximately 50 percent, with a larger portion of the inflow attributable to discharges from the EAA A-1.

- STA 5 (10,940 acres of effective treatment area). The STA 5 effective treatment area is increased by almost 80 percent compared with the No Action Alternative, a result of incorporating the full build-out of Compartment C. In this alternative, STA 5 works in conjunction with STA 6 to capture and treat runoff from the C-139 and C-139 Annex Basins. Additional outflow structures from the Compartment C STA would discharge water into the extended STA 5 discharge canal. In this alternative, discharges from STA 5 flow-ways 1 and 2 would be directed north to the Miami Canal, as they currently are. However, a divide structure south of STA 5 Flow-way 2 in the discharge canal would route discharges from STA 5 Flow-way-3, all the new Compartment C flow-ways (4 and 5), and STA 6 (Sections 1 and 2) south to the northwest corner of WCA 3A. A schematic diagram of STA 5, including the full build-out of Compartment C, is presented in Figure 2-14.
- STA 6 (2,284 acres of effective treatment area). The STA 6 effective treatment area is increased by almost 80 percent compared with the No Action Alternative, a result of incorporating the full build-out of Compartment C. In this alternative, STA 6 works in conjunction with STA 5 to capture and treat runoff from the C-139 Basin; in addition, STA 6 also captures and treats runoff from the C-139 Annex. A schematic diagram of STA 6, including the full build-out of Compartment C, is presented in Figure 2-14.

Figure 2-14. Schematic of STA 5 and STA 6, including the Build-out of Compartment C



Note: Subject to revision
Source: URS 2007a,b.

Lake Okeechobee Operations. To evaluate the potential environmental effects under Alternative B in Chapter 4, Lake Okeechobee operations were simulated identical to the No Action Alternative, with the following exception:

- The EAA Storage Injection Line was lowered as compared with the Base Condition, by an average of 0.28 foot to deliver a greater fraction of Lake Okeechobee's discharges to the EAA A-1 Reservoir and decrease the duration of high stages in Lake Okeechobee.

Anticipated Features. With the exception of the build-out of Compartments B and C, the anticipated features of Alternative B are identical to the No Action Alternative. Table 2-5 identifies the status of the EAA regional water resource projects simulated for Alternative B.

Table 2-5. Anticipated Status of Regional Water Resource Projects in the 2010 Period under Alternative B

Project	Status During the 2010 Period
Original ECP	All 6 STAs are fully operational, including STA 6 Section 2. Approximately 20 percent of the S-5A Basin runoff diverted to the Hillsboro Canal through existing facilities. Ch. 298 District and 715 Farms diversions in place. No EAA runoff reduction adjustment necessary to account for best management practices.
Compartment B	The full area of Compartment B is operational as effective treatment area.
Compartment C	The full area of Compartment C is operational as effective treatment area.
EAA A-1	16,000-acre reservoir operable with a 12.5-foot depth
Acme Basin B	Runoff directed away from WCA 1 and discharged to C-51W, and then to STA 1E
L-8 Reservoir	Partially completed: 870 acres, depth 44 feet. Facilities not completed for diversion away from S-5A/C-51W.

EAA A-1 Reservoir Operation. For Alternative B, the EAA A-1 consists of the same configuration as in the No Action Alternative; however, its inflows would vary due to the availability of Compartment B. Compartment B would be the primary receiving facility for runoff from the North New River Canal Basin, and the EAA A-1 would capture the runoff flows that exceed the capacity of Compartment B. This operational protocol frees up capacity in the EAA Storage Reservoirs for capturing additional Lake Okeechobee regulatory releases, resulted in the following comparison to the No Action Alternative:

- Total inflows increased approximately 6 percent;
- Inflows from Lake Okeechobee increased by approximately 19 percent; and
- Inflows from EAA runoff decreased by approximately 12 percent, reflecting the operational intent of Compartment B to be the primary receiving area for runoff from the North New River Canal Basin.

As noted previously, the operational regime for the EAA A-1 Reservoir has not been finalized.

Summary of Simulated Inflows. Phosphorus performance of the STAs was projected using the DMSTA model (Walker and Kadlec 2005). Daily flow data for water years 1965 to 2000 (May 1, 1965, to April 30, 2000) were provided by the SFWMD for the SFWMM simulation "2010A8 STA2B" (Alternative B). A summary of the 36-year annual average inflows is presented in Table 2-6(a) below. As discussed above, the primary differences between the alternatives are operational, with variations in sources to STA 2, Compartment B, the EAA A-1, and STA 3/4. Table 2-6(b) summarizes the 36-year average annual inflow to these facilities by source to focus on these differences.

Table 2-6(a). Alternative B 36-Year Average Annual Inflows

Alternative	Parameter	Unit	STA-1E	STA-1W	STA-2	Comp B	EAASR A-	STA-3/4	STA-5	STA-6	Comp C	Additional Area	Total to STAs
AltB	Treat. Area	acres	5,132	6,670	6,338	8,620	15,200	16,543	6,095	2,284	5,315	0	56,997
	Volume	AF/yr	193,332	243,570	186,096	248,269	571,919	610,797	83,570	51,039	76,934	0	1,693,607
	TP Load	kg/yr	41,959	54,533	24,881	32,372	67,496	64,343	23,567	10,644	18,733	0	271,032
	TP Conc	ppb	176	182	108	106	96	85	229	169	197	-	130
	PLR	g/m2/yr	2.0	2.0	1.0	0.9	1.1	1.0	1.0	1.2	0.9	0	1.17
	HLR	cm/d	3.1	3.0	2.5	2.4	3.1	3.1	1.1	1.9	1.2	0	2.5

Note: 1. HLR = Hydraulic Loading Rate from surface inflows, i.e., does not include rainfall
2. PLR = Phosphorus Loading Rate from surface inflows
3. Total Phosphorous Concentrations (TPConc): Indivisible values are shown as '-'.

Table 2-6(b). Inflow Sources for the Central EAA Facilities for Alternative B

Alternative	Parameter	Unit	STA-1E	STA-1W	STA-2	Comp B	EAASR A-1	STA-3/4
AltB	Treat. Area	acres	5,132	6,670	6,338	8,620	15,200	16,543
	Lake Inflow	AF/yr	0	0	0	0	378,190	0
	EAA inflow	AF/yr	19,116	243,570	169,179	237,656	193,729	197,467
	EAA SR A-1	AF/yr	0	0	0	0	N/A	395,639
	Other	AF/yr	174,215	0	16,917	10,613	0	13,211
	Total Inflow	AF/yr	193,332	243,570	186,096	248,269	571,919	610,797

2.5 ALTERNATIVE C

Alternative C includes a combination of existing and additional features anticipated to be operational in the 2010 planning period, including the treatment areas anticipated for the full build-out of Compartments B and C. This alternative uses Compartments B to treat water from the North New River Basin that cannot be stored in the EAA-A1 and Compartment C to expand the treatment capacity of STAs 5 and 6. The structural and operational features of this alternative are described below.

Everglades Construction Project. This alternative includes the existing and anticipated treatment areas of the ECP, as described below.

- STA 1E (5,132 acres of effective treatment area). This alternative simulates the configuration and operation of STA 1E in the same manner as the No Action Alternative (Alternative A).
- STA 1W (6,670 acres of effective treatment area). This alternative simulates the configuration and operation of STA 1W in the same manner as the No Action Alternative (Alternative A).
- STA 2 (6,338 acres of effective treatment area). This alternative includes the original three treatment cells (1 through 3) of STA 2 and the same inflows as Alternative A and B; however, it does not include a hydraulic connection to the NBO of Compartment B. Hence, the STA received considerably higher hydraulic and loading rate (per unit area) than in Alternatives A and B. A schematic diagram of STA 2 showing this configuration was presented in Figure 2-12 above.
- Compartment B (8,620 acres of effective treatment area). Compartment B would consist of the same configuration as in Alternative B, but would not receive runoff re-directed from STA 2. As a result, long-term average annual inflows to Compartment B are decreased by 57 percent compared with Alternative B. All of the inflow originates as runoff from the North New River Canal.
- STA 3/4 (16,543 acres of effective treatment area). This alternative simulates the configuration of STA 3/4 in the same manner as the No Action Alternative (Alternative A). However, the magnitude and distribution of inflow sources varies from the No Action Alternative:
  - The total long-term average annual inflows are approximately 12 percent less than the No Action Alternative, a result of Compartment B capturing a portion of the EAA runoff from the North New River Canal.
  - The long-term average annual inflow from EAA runoff is reduced approximately 32 percent, with a larger portion of the inflow attributable to discharges from the EAA A-1.
- STA 5 (10,940 acres of effective treatment area). This alternative simulates the configuration and operation of STA 5 in the same manner as Alternative B.
- STA 6 (2,284 acres of effective treatment area). This alternative simulates the configuration and operation of STA 6 in the same manner as Alternative B.

Lake Okeechobee Operations. Lake Okeechobee operations are simulated for Alternative C identical to the No Action Alternative.

Anticipated Features. With the exception of the build-out of Compartments B and C, the anticipated features of Alternative C are identical to the No Action Alternative.

EAA A-1 Reservoir Operation. The EAA A-1 for this alternative would consist of the same configuration as in the No Action Alternative, with a similar operational protocol, and resulted in the following comparison to the No Action Alternative:

- Total inflows are expected to increase by approximately 2 percent,
- Inflows from Lake Okeechobee are expected to increase by approximately 3 percent, and
- Inflows from EAA runoff are expected to decrease by approximately 1 percent.

As noted previously, the operational regime for the EAA A-1 Reservoir has not been finalized.

Summary of Simulated Inflows. Phosphorus performance of the STAs was projected using the DMSTA model (Walker and Kadlec 2005). Daily flow data for water years 1965 to 2000 (May 1, 1965 to April 30, 2000) were provided by the SFWMD for the SFWMM simulation "2010A8 ALT1" (Alternative C). A summary of the 35-year annual average inflows is presented in Table 2-7(a) below. As discussed above, the primary differences between the alternatives are operational, with variations in sources to STA 2, Compartment B, the EAA A-1, and STA 3/4. Table 2-7(b) summarizes the 35-year average annual inflow to these facilities by source to focus on these differences.

Table 2-7(a). Alternative C 36-Year Average Annual Inflow Values

Alternative	Parameter	Unit	STA-1E	STA-1W	STA-2	Comp B	EAASR A-	STA-3/4	STA-5	STA-6	Comp C	Additional Area	Total to STAs
AltC	Treat. Area	acres	5,132	6,670	6,338	8,620	15,200	16,543	6,095	2,284	5,315	0	56,997
	Volume	AF/yr	193,710	243,885	302,390	105,613	548,000	589,905	83,570	51,039	76,934	0	1,647,045
	TP Load	kg/yr	42,004	54,596	41,822	12,355	64,898	62,012	23,567	10,644	18,733	0	265,733
	TP Conc	ppb	176	181	112	95	96	476	229	169	197	-	131
	PLR	g/m2/yr	2.0	2.0	1.6	0.4	1.1	0.9	1.0	1.2	0.9	0	1.15
	HLR	cm/d	3.2	3.1	4.0	1.0	3.0	3.0	1.1	1.9	1.2	0	2.4

Note: 1. HLR = Hydraulic Loading Rate from surface inflows, i.e., does not include rainfall
2. PLR = Phosphorus Loading Rate from surface inflows
3. Total Phosphorous Concentrations (TPConc): Indivisible values are shown as '-'.

Table 2-7(b). Alternative C Inflow Sources for the Central EAA Facilities

Alternative	Parameter	Unit	STA-1E	STA-1W	STA-2	Comp B	EAASR A-1	STA-3/4
AltC	Treat. Area	acres	5,132	6,670	6,338	8,620	15,200	16,543
	Lake Inflow	AF/yr	0	0	0	0	328,689	0
	EAA inflow	AF/yr	19,144	243,885	274,860	105,613	219,311	200,696
	EAA SR A-1	AF/yr	0	0	0	0	N/A	371,569
	Other	AF/yr	174,566	0	27,530	0	0	13,231
	Total Inflow	AF/yr	193,710	243,885	302,390	105,613	548,000	589,905

2.6 ALTERNATIVE D

Alternative D includes a combination of existing features and additional features anticipated to be operational in the 2010 planning period, including the treatment areas for the full build-out of Compartments B and C. However, unlike Alternative B, a portion of the inflows to STA 2 are not re-directed for treatment in Compartment B. The structural and operational features of this alternative are described below.

ECP. This alternative includes the existing and anticipated treatment areas of the ECP, as described below.

- STA 1E (5,132 acres of effective treatment area). This alternative simulates the configuration and operation of STA 1E in the same manner as the No Action Alternative (Alternative A).
- STA 1W (6,670 acres of effective treatment area). This alternative simulates the configuration and operation of STA 1W in the same manner as the No Action Alternative (Alternative A).
- STA 2 (6,338 acres of effective treatment area). This alternative includes the original three treatment cells (1 through 3) of STA 2, and the same inflows as Alternative A and B; however, it does not include a hydraulic connection to the NBO of Compartment B (similar to Alternative C). Hence, STA 2 receives higher hydraulic and phosphorous loading rate (per unit area) than in Alternatives A and B.
- Compartment B (8,620 acres of effective treatment area). Compartment B would consist of the same configuration as in Alternative B. The operational priority for Compartment B is to receive local EAA runoff from the North New River Canal Basin. No STA 2 inflows would be re-directed to Compartment B, thus ensuring the maximum capacity in Compartment B for North New River Canal Basin runoff. This approach also frees up capacity in the EAA A-1 to receive additional regulatory releases from Lake Okeechobee for subsequent treatment in STA 3/4. All of the Compartment B inflow originates as runoff from the North New River Canal. It is worth noting that Alternative D uses Compartment B at about 50 percent of the Compartment B capacity used by Alternative B. This is because Alternative D does

not use available capacity in Compartment B to treat water that would otherwise be treated by STA 2.

- STA 3/4 (16,543 acres of effective treatment area). This alternative simulates the configuration of STA 3/4 in the same manner as the No Action Alternative (Alternative A). However, the magnitude and distribution of inflow sources varied from the No Action Alternative:
  - The total long-term average annual inflows are approximately 9 percent less than the No Action Alternative because Compartment B would capture a portion of the EAA runoff from the North New River Canal, and
  - The long-term average annual inflow from EAA runoff is reduced approximately 33 percent, with a larger portion of the inflow attributable to discharges from the EAA A-1.
- STA 5 (10,940 acres of effective treatment area). This alternative simulates the configuration and operation of STA 5 in the same manner as Alternatives B and C.
- STA 6 (2,284 acres of effective treatment area). This alternative simulates the configuration and operation of STA 6 in the same manner as Alternatives B and C.

Lake Okeechobee Operations. Lake Okeechobee operations for Alternative D were simulated identical to the No Action Alternative, with the following exception:

- Lowered the EAA Storage Injection Line as compared with the Base Condition by an average of 0.28 feet to deliver a greater fraction of Lake Okeechobee's discharges to the A1 reservoir and decrease the duration of high stages in Lake Okeechobee.

Anticipated Features. With the exception of the build-out of Compartments B and C, the anticipated features of Alternative D are identical to the No Action Alternative.

EAA A-1 Reservoir Operation. The EAA A-1 for this alternative would consist of the same configuration as in the No Action Alternative, but the operational protocol would vary in a manner similar to Alternative B. As noted previously, the operational regime for the EAA A-1 has not been finalized. In this alternative, Compartment B would be the primary receiving facility for runoff from the North New River Canal Basin, and the EAA A-1 would capture runoff flows that exceed the ability of Compartment B to capture. This operational protocol frees up capacity in the EAA A-1 for capturing releases from Lake Okeechobee, resulting in the following comparison to the No Action Alternative:

- Total inflows increased approximately 6 percent,
- Inflows from Lake Okeechobee increased by approximately 19 percent, and

- Inflows from EAA runoff decreased by approximately 13 percent, reflecting the operational intent of Compartment B to be the primary receiving area for runoff from the North New River Canal Basin.

Summary of Simulated Inflows. Phosphorus removal performance of the STAs was projected using the DMSTA model (Walker and Kadlec 2005). Daily flow data for water years 1965 to 2000 (May 1, 1965, to April 30, 2000) were provided by the SFWMD for the SFWMM simulation "2010A8 EAALINE + ALT3" (Alternative D). A summary of the 35-year annual average inflows is presented in Table 2-8(a) below. As discussed above, the primary differences among the alternatives are operational, with variations in sources to STA 2, Compartment B, the EAA A-1 and STA 3/4. Table 2-8(b) summarizes the 36-year average annual inflow to these facilities by source to focus on these differences.

Table 2-8(a). Alternative D 36-Year Average Annual Inflow Values

Alternative	Parameter	Unit	STA-1E	STA-1W	STA-2	Comp B	EAASR A-	STA-3/4	STA-5	STA-6	Comp C	Additional Area	Total to STAs
AltD	Treat. Area	acres	5,132	6,670	6,338	8,620	15,200	16,543	6,095	2,284	5,315	0	56,997
	Volume	AF/yr	193,336	243,563	302,980	131,657	571,393	610,905	83,570	51,039	76,934	0	1,693,984
	TP Load	kg/yr	41,959	54,532	41,887	15,438	67,510	64,352	23,567	10,644	18,733	0	271,112
	TP Conc	ppb	176	182	112	95	96	85	229	169	197	-	130
	PLR	g/m2/yr	2.0	2.0	1.6	0.4	1.1	1.0	1.0	1.2	0.9	0	1.18
	HLR	cm/d	3.1	3.0	4.0	1.3	3.1	3.1	1.1	1.9	1.2	0	2.5

Note: 1. HLR = Hydraulic Loading Rate from surface inflows, i.e., does not include rainfall
2. PLR = Phosphorus Loading Rate from surface inflows
3. Total Phosphorous Concentrations (TPConc): Indivisible values are shown as '-'.

Table 2-8(b). Alternative D Inflow Sources for the Central EAA Facilities

Alternative	Parameter	Unit	STA-1E	STA-1W	STA-2	Comp B	EAA A-1	STA-3/4
AltD	Treat. Area	acres	5,132	6,670	6,338	8,620	15,200	16,543
	Lake Inflow	AF/yr	0	0	0	0	378,697	0
	EAA inflow	AF/yr	19,114	243,563	275,450	131,657	192,696	198,340
	EAA SR A-1	AF/yr	0	0	0	0	N/A	395,010
	Other	AF/yr	174,223	0	27,530	0	0	13,208
	Total Inflow	AF/yr	193,336	243,563	302,980	131,657	571,393	610,905
Notes:	1. EAA runoff includes runoff from the Ch. 298 Districts and 715 Farms							

2.6.1 Alternative D1 – DOI's Preferred Alternative

It is essential to Everglades restoration that more water flow south in a more natural regime to the WCAs and ENP. Improvement to the quantity, timing, and distribution of water entering the WCAs and ENP was one of the benefit commitments upon which the interim land use change approval for the construction of the EAA A-1 Reservoir was based. It is also important to restoration that Compartment B assist in the delivery of water to mimic a more natural recession into the dry season. DOI requested an alternative that incorporated Compartment B as part of the operational regime to provide additional water quality

treatment to improve the performance of the EAA A-1 Reservoir either by freeing up capacity in STA 3/4, or by a more direct linkage, and to make progress towards providing Compartment B outflows to WCA 3A by initially distributing water from Compartment B into WCA 3A through S-11, or other appropriate structures, until the CERP distribution spreader canal is constructed. Alternative D1 has the flexibility to provide these intended benefits. The EAA A-1 Reservoir is one part of the EAA Storage Reservoir, an element of the Everglades Restoration Project for which the Talisman lands were purchased, Compartments B and C are a part of the Talisman purchase and were intended for use in the EAA CERP Reservoir. The proposed interim land use decision for construction includes an analysis of the actual contribution of Compartment B to restoring the Everglades, as well as its contribution to improving the performance of other restoration features, especially the EAA A-1 Reservoir. As stated above, it is anticipated that the NEPA for the operational interaction of Compartment B with the EAA A-1 Reservoir would be contained in the NEPA evaluation of the planned operations for the EAA A-1.

2.7 ALTERNATIVE E

As discussed in Section 2.1, Alternative E considers the build-out of acres of land adjacent to STA 1E and STA 1W to assist the existing STAs in capturing and treating runoff from the Hillsboro and West Palm Beach Basins prior to discharge into the Refuge. The additional treatment area near STA1W could have the capacity to assist with treating regulatory releases from Lake Okeechobee currently sent to tide through the C-51 Canal and the Caloosahatchee and St. Lucie Rivers. Alternative E is the only alternative that gets STA 1E, STA 1W, or STA 5 to its operational envelope targets.

The steady-state model results for Alternative E do not specify a particular plot of land. Instead, the model estimates an area of land, acreages for the purposes of this Draft EIS, to achieve water quality goals. A summary of the 36-year annual average inflows for Alternative E is presented in Table 2-9 below.

In order to achieve a phosphorous loading rate of 1.2 grams per square meter per year, it was estimated that roughly 10,137 acres of treatment area would be needed to treat water from the STA 1W and STA 1E tributary basins entering the Refuge. For the purposes of this Draft EIS, lands in the vicinity of STA 1W and Acme Basin B Section 24 that is adjacent to STA 1E would be evaluated. The locations of these alternative lands have been selected because Compartments B and C Build-out do not assist STA 1W and STA 1E, but instead provide additional treatment for STAs 2, 3/4, 5, and 6. (The SFWMD intends to use existing canals to redirect water from STAs 1W and 1E to Compartment B; however, the model outputs for Alternative B, the SFWMD's Preferred Alternative, suggest that there is little capacity in the existing canals to support this.) Therefore, alternative lands in the vicinity of STAs 2, 3/4, 5

and 6 would achieve the same goals as Compartments B and C. Land adjacent to STA 1E are developed except for Acme Basin B Section, which are under permit application review by the USACE as an impoundment/STA for the Village of Wellington. Lands adjacent to STA 1W are in the EAA and a detailed analysis of property ownership, and wetland and wildlife surveys would need to be conducted if this alternative is selected. As stated above, there is currently not enough capacity in the existing canals to send water from the basins adjacent to STA 1W and STA 1E to Compartment B, so Alternative E provides additional treatment capacity to assist these STAs.

Table 2-9. Alternative E 36-Year Average Annual Inflow Values

Alternative	Parameter	Unit	STA-1E	STA-1W	STA-2	Comp B	Comp C	EAASR A-1	STA-3/4	STA-5	STA-6	Additional Area	Total
AltE	Treat. Area	acres	5,132	6,670	8,240	N/A	N/A	15,200	16,543	6,095	2,284	11,107	56,071
	Volume	AF/yr	112,079	141,072	292,647	N/A	N/A	539,290	702,869	103,227	80,734	224,138	1,656,766
	TP Load	kg/yr	24,300	31,582	39,016	N/A	N/A	63,794	78,331	28,860	10,815	52,590	265,494
	TP Conc	ppb	176	181	108	N/A	N/A	96	90	227	109	190	130
	PLR	g/m2/yr	1.2	1.2	1.2	N/A	N/A	1.0	1.2	1.2	1.2	1.2	1.17
	HLR	cm/d	1.8	1.8	3.0	N/A	N/A	3.0	3.5	1.4	3.0	1.7	2.5

2.8 DESCRIPTION OF ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

Six alternatives were identified during the scoping process, five of which included no action, the expansion of STAs on Compartments B and C, and alternative lands in lieu of the build-out of Compartments B and C for water treatment. The sixth alternative, identified as Alternative F, is Treatment Technologies, or Chemical Treatment for alternative water quality treatment. Treatment Technologies, for the purposes of this alternative, are considered stand-alone treatment measures. Stand-alone treatment measures functions would provide improved water quality without the use of another practice or measure. The evaluation of this alternative indicated that it would not provide a cost-effective option for meeting the purpose and need of improving water quality entering the EPA. Furthermore, this alternative would have the potential to adversely affect the environment.

In the December 2004 *Lake Okeechobee Watershed Final Project Implementation Report* (2004 PIR), six stand-alone water quality treatment measures were ranked and screened to evaluate their applicability to the Lake Okeechobee Watershed Project (LOW), as well as their history of evaluation, availability of benefit and cost data, and acceptability as a water quality solution, and are as follows: Storage Reservoir; Emergent-macrophyte STA (EMA-STA); Submerged Aquatic Vegetation STA (SAV-STA); Periphyton-dominated STA (PSTA); Water Hyacinth Scrubber – Algal Turf Scrubber (WHS-ATS); and Terminal Large-scale Water Treatment Facility. Table 2-10 below describes the summary of ranking methods and scores.

Table 2-10. Summary of Methods for Assigning Water Quality Management Measures Ranking Scores

	Primary Criteria		Secondary Criteria		
Rank	**TP Removal Cost ($/lb)**	**Proof-of-Concept (years)**	**Water Storage Potential ($/yr/AF)**	**Environmental Benefits (fish and birds)**	**Societal (Impacts/Benefits)**
5	<$10	>20	<200	>10,000	+++
4	$10-$20	10-20	200-400	5,000-10,000	++
3	$20-$40	5-10	400-800	2,500-5,000	+
2	$40-$60	1-5	800-1,600	1,225-2,500	-
1	>$60	>1	>1,600	<1,225	--

Notes:
1. Total phosphorus removal cost estimated using 50-year total present worth data and model estimates for total phosphorous removal.
2. Proof-of-concept is the estimated number of operational years of similar systems with data within central and south Florida.
3. Water storage potential based on estimated water balance and storage volume between control weir and cell floor.
4. Environmental benefits of fish and birds estimated by multiplying estimated biomass and numbers of species.
5. Societal impacts/benefits is a qualitative sum of positive and negative attributes of the Water Quality Management Model and based on best professional judgment.
6. Primary criteria are multiplied by 3 and added to secondary criteria ranks to yield the total estimated rank for each WMM.
7. Environmental benefits are multiplied by area and divided by 1,000.
Source: USACE and SFWMD 2004 Lake Okeechobee Watershed Final Project Implementation Report

For Alternative F, Treatment or Chemical Technologies, the most feasible treatment options were reviewed, including the Water Hyacinth Scrubber (WHS-STA) the Algal Turf Scrubber (ATS), and the Chemical Treatment/Solid Separation (CTSS) were reviewed for Alternative F.

WHS is a process registered by Hydro Mentia, Inc., that are designed as shallow ponds (3 to 5 feet) and require harvesting of floating plants called the water hyacinth *(Eiccchornia crassipes)*, which are accessible by shore (USACE and SFWMD 2004). Water hyacinth is a non-native floating aquatic plant that has been used in shallow treatment ponds and municipal wastewater treatment systems for the removal of total phosphorus. Extensive management practices have been required in Florida to control the proliferation of water hyacinth, including introduction of fungal and insect controls (USACE and SFWMD 2004). Total phosphorus is removed in the WHS through sedimentation of particulate phosphorus and sloughed biomass from the floating water hyacinth (USACE and SFWMD 2004).

ATS is also registered by Hydro Mentia, Inc., and has been evaluated for total phosphorus removal over the last few decades (USACE and SFWMD 2004). The ATS system allows attached algae to grow on a nylon mesh at an inclined plane and trap particulate and dissolved nutrients, including total phosphorus (Adey et al. 1993; Craggs 2000; USACE and

SFWMD 2004). Total phosphorus is removed by harvesting the algae and removing the wet biomass (USACE and SFWMD 2004).

CTSS is a chemical process that uses iron and aluminum to facilitate flocculation and coagulation, which causes contaminants and dissolved phosphorus from stormwater to emerge and settle as flocculent (USACE and SFWMD 2004). In the 2004 Lake Okeechobee Project Implementation Report (PIR), this method was shown to have operational flexibility and reliability, low land requirements, and the ability to reduce total phosphorus to levels lower than other technologies; however, this treatment involves high operation and maintenance costs, high capital costs, and solids management and disposal.

The 2004 PIR found that the environmental benefits would be minimal for either the WHS or the ATS. Chemical supplements to optimize plant growth and pest control agents to control hyacinth weevil are used and could be considered to have negative impacts to the environment (USACE and SFWMD 2004). The CTSS methodology was not included in the top five treatments for improvement of water quality in the 2004 PIR.

The ranking scores from the 2004 PIR for each of the stand-alone treatments are listed in Table 2-11 below. The results indicate that WHS and ATS should not be considered as a stand-alone measure to meet water quality goals until further research can be conducted (USACE and SFWMD 2004). The State of Florida Water Quality Standard Rules (FDEP 2005) state that, based on the Basin-Specific Feasibility Studies completed by the SFWMD, chemical treatment technology is not cost effective for improving water quality entering the EPA and there is a potential for adverse environmental effects. Based on this information, Alternative F was not fully evaluated as a viable alternative for the purposed of this EIS.

Table 2-11. Natural Management Measures Ranking Summary

		Primary Criteria		Secondary Criteria			
No.	**Management Measure**	**P Removal Cost ($/lb)**	**Proof-of-Concept (years)**	**Environmental Benefits (fish and birds)**	**Water Storage Potential ($/yr/AF)**	**Societal (Impacts/Benefits)**	**Total Ranking Score**
Stand-Alone (Man-Made Options)							
1.1	Storage reservoir	1	3	4	5	3	24
1.2	EMA-STA	3	5	4	3	4	35
1.3	SAV-STA	5	3	2	4	4	34
1.4	PSTA	3	2	4	2	4	25
1.5	WHS-ATS	3	1	1	1	3	17

Source: USACE and SFWMD 2004 Lake Okeechobee Watershed Final Project Implementation Report

3.0 AFFECTED ENVIRONMENT

This section describes the human, physical and biological characteristics of the natural and built/developed environments within the regions potentially affected by the Proposed Action and its alternatives. These regions include the EAA; Lake Okeechobee; the St. Lucie River Estuary; the Indian River Lagoon; the Lake Worth Lagoon; the Caloosahatchee River Estuary; WCAs 1, 2A, and 3A; and Acme Basin B-Section 24 lands. It should be noted that the potential effects discussed in the following sections will largely be determined by the manner in, and degree to which the STAs are operated in the context of regional water management infrastructure and associated system operations. Figure 3-1 shows the locations of the Compartments B and C Build-out and Alternative Lands in relation to the affected regions, which may vary depending on the specific physical and biological characteristics. Each section below begins with a description of the potentially affected region associated with the characteristic features discussed in that section. The information presented in this section has been gathered from existing EIS documents, literature, environmental and engineering studies completed for the proposed project, and information collected through the scoping process; it is the most up-to-date information available.

3.1 GEOGRAPHIC AND PHYSICAL SETTING

The Proposed Action will offer the potential to affect all or portions of the following geographic regions depending on the manner in, and degree to which they are used: the EAA, Holey Land and Rotenberger WMAs, Lake Okeechobee, WCAs, and the Northern Estuaries.

3.1.1 Everglades Agricultural Area

Compartments B and C and Alternative Lands adjacent to STA 1W considered under Alternative E are located in the EAA. The EAA is located south of Lake Okeechobee primarily in western Palm Beach County, extending south to WCA 3A. It is bounded on the east by WCA 1 (the Refuge), WCA 2A, the Western C-51 Basin, and on the west by the C-139 Basin.

Historically, the EAA was Everglades swampland, which has been drained and put into agricultural production. The former swampland produced the rich organic peat and muck soils that today make it a highly productive agricultural area, with approximately 620,797 acres of agricultural land (USACE 2006). The agricultural area designation was formally established in the 1950s (USACE and SFWMD 2004) and associated water management infrastructure had been substantially completed in 1962. Sugar cane is the area's dominant

crop with approximately 898 square miles of active sugar cane fields; this harvest provides 50 percent of the sugar produced nationally (USACE and SFWMD 2004).

Water in the EAA is managed to provide flood protection, irrigation, and fresh water for the EAA and surrounding environmentally sensitive areas through a series of canals, levees, culverts, gates, and pumps (USACE and SFWMD 2004). This Draft EIS divides the canals into the following three categories:

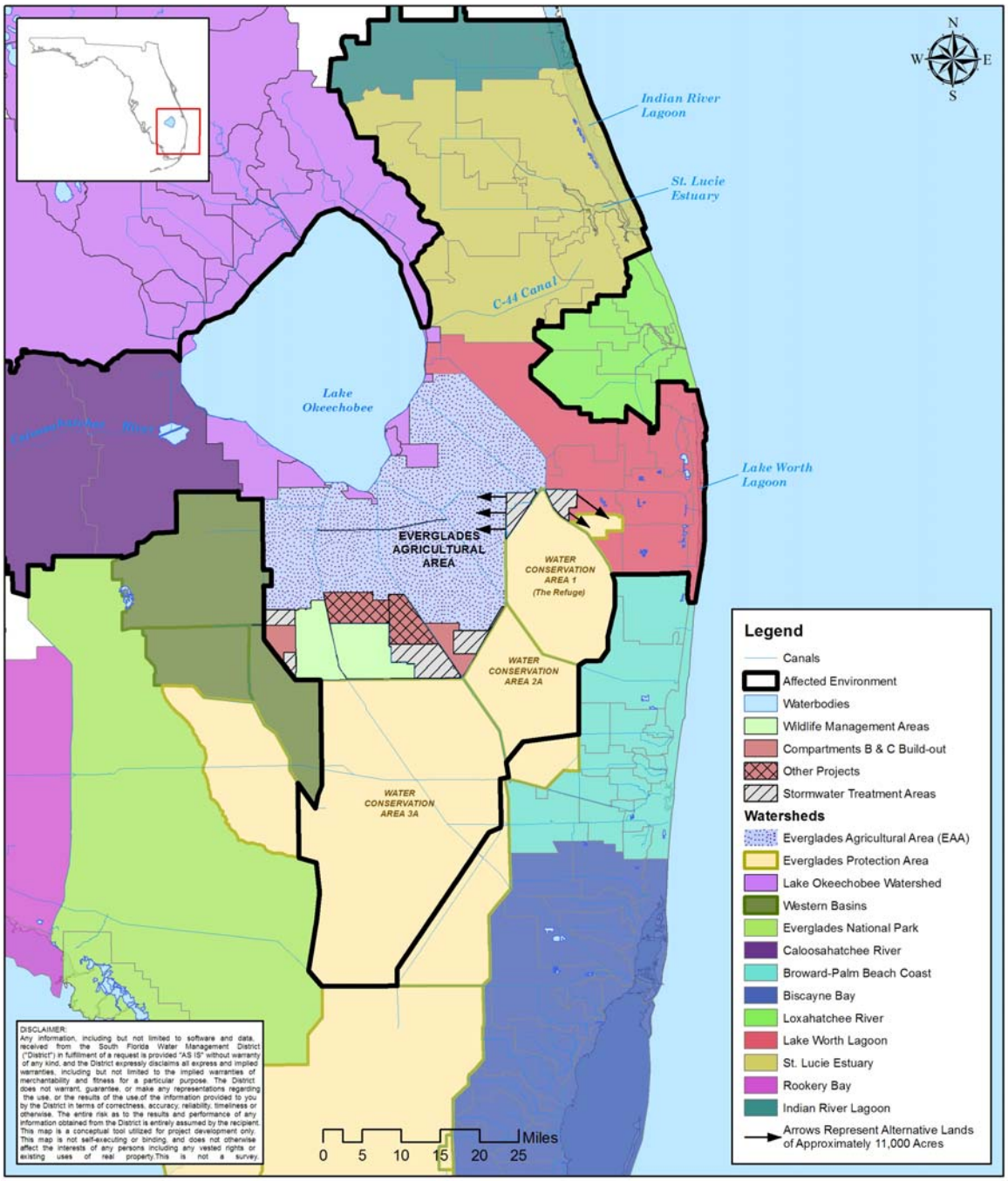
1. Primary Canals - These larger canals are managed by the SFWMD and convey water from Lake Okeechobee and the EAA to the WCAs and other downstream areas/users and/or to nearby coastal waters. Primary canals in the project area include the West Boundary, Hillsboro, North New River, West Palm Beach, Miami, and the L-8 Eastern Boundary Canals.
2. Secondary Canals - These smaller canals are also managed by the SFWMD and connect the primary canals. The connections may be open or may have water control structures with major canals. Secondary canals in the project area include the Bolles (L-21), Cross (L-16), Ocean (L-13), and L-1 Canals.
3. Agricultural Canals - These small, numerous, usually unnamed canals are the responsibility of the individual landowners and are used to provide water management of adjacent individual farming operations.

Discharge water from the EAA, which contains high levels of dissolved nutrients (mainly phosphorus and nitrogen from fertilizers and particulate matter), drain from the agricultural canals, to the secondary canals, into the six main primary canals, and are eventually discharged into the EPA or to tide. In addition to flood protection for and water supply to the EAA, the canals and water control structures convey regulatory releases from Lake Okeechobee to the WCAs; water supply releases to the EAA and eastern Palm Beach, Broward, and Dade Counties for municipal water supply and to prevent saltwater intrusion; and water supply releases to ENP (Cooper 1989). It should be noted that there are several local, secondary drainage districts that operate canal systems within the EAA. These canals are primarily used for agricultural purposes and are adjacent to the project area.

3.1.2 Wildlife Management Areas

Two large WMAs, the Rotenberger and Holey Land WMAs, are located in the southwest region of the EAA. The Rotenberger WMA (RWMA) is 28,760 acres and the Holey Land WMA (HLWMA) is 35,350 acres. Both are located in southwestern Palm Beach County, north of WCA 3, and are separated by the Miami Canal. The managing entity is the Florida Fish and Wildlife Conservation Commission (FFWCC). Recreation such as hunting and

Figure 3-1. Affected Environment



fishing is allowed with a permit. The RWMA is primarily sawgrass marsh with intermediate tree islands and willow heads (FDEP 2001b). The HLWMA is primarily sawgrass marsh, but it lacks the tree islands found in typical Everglades systems (FDEP 2001b).

3.1.3 Lake Okeechobee

Lake Okeechobee is an approximately 730-square-mile freshwater lake located north of the EAA with an average depth of roughly 9 feet (USACE 2007a). It is believed that the depressional area, now occupied by Lake Okeechobee, was formed approximately 6,000 years ago when the Okeechobean Sea receded (Lodge 2004). The depressional area then filled with water during the following period of wetter conditions. Historically, water flowed south from the lake to the Everglades through a series of small tributaries at the southern portion of the lake. Once the headwaters of the Everglades, the waters are now contained by the Herbert Hoover Dike and by an earthen levee around the southern perimeter of the lake. Discharges, water levels, and flows are highly managed through a series of water control structures and canals.

The Lake Okeechobee watershed spans more than 10 Florida counties, and is dominated by agricultural land uses that account for just over 50 percent of the total area (USACE 2008). Nutrient-enriched runoff from agricultural and urban activities within the watershed flows into the lake. As a result, the amount of phosphorus entering the lake has significantly exceeded the Total Maximum Daily Load (TMDL) established for Lake Okeechobee in 2001 by the FDEP. In addition, hurricane-driven extreme rainfall events in 2004 and 2005 also raised the annual total phosphorus load, resulting in additional phosphorus reduction measures needed to meet the TMDL target (USACE 2008).

3.1.4 Water Conservation Areas

Three WCAs (1, 2A, and 3A) receive water from the EAA and Lake Okeechobee after the water passes through the existing STAs. Under situations where STAs are overloaded, water can also be diverted to flow directly into the WCAs. The WCAs serve as surface water impoundments developed to provide water storage, flood control, and wildlife conservation (SFWMD 2007) and are subjects of Everglades restoration activities of the CERP. Although the highly managed hydrology in WCAs has dramatically altered vegetation communities and soils of the Everglades, the interior wetlands and wetland soils persist and continue to provide substantial wildlife habitat.

In 1951, WCA 1 was formally declared a national wildlife refuge under the authority of the Migratory Bird Conservation Act of 1929, and through a license agreement between the Central & Southern Florida Flood Control District (now called the South Florida Water Management District) and the U.S. Fish & Wildlife Service (USFWS). WCA 1, also known

as the Arthur R. Marshall Loxahatchee National Wildlife Refuge, will be referred to as the Refuge throughout this EIS. This 147,392-acre refuge is managed by the USFWS and includes more than 14,880 acres of Everglades habitat, recreational amenities, and a 400-acre cypress swamp that is the largest remaining remnant of a cypress strand that once separated the pine flatwoods in the east from the Everglades marshes (USFWS undated).

WCA 2A and WCA 3A are primarily state-owned and managed by the state for multiple purposes including flood protection, fish and wildlife, recreation, and water supply through aquifer recharge, among others. WCA 3A is a 578-acre impoundment with typical Everglades sawgrass and wet prairie vegetation. It is managed by the state and management decisions potentially affect tribal land because it overlaps with a portion of the Miccosukee Indian Reservation and is adjacent to the Big Cypress Seminole Indian Reservation. Directly to the south of WCA 3A is the ENP and Florida Bay. Hydrologic conditions in ENP, Florida Bay, and Biscayne Bay, including Biscayne National Park, are also dependent on freshwater flows coming from Lake Okeechobee and the EAA.

3.1.5 Northern Estuaries

The Northern Estuaries within the project affected area include the St. Lucie and Caloosahatchee River Estuaries, the Indian River Lagoon, and Lake Worth Lagoon. These areas receive freshwater inputs from the upstream Lake Okeechobee as necessary to manage water levels in the lake. The Caloosahatchee River is approximately 38 miles long and forms a tidal estuary as it reaches San Carlos Bay on Florida's Gulf Coast. During the late 1800s to early 1900s it was channelized and connected to Lake Okeechobee (SFWMD 2007). Water control structures and water management practices have significantly changed the historical river floodplain. Water management in Lake Okeechobee periodically involves releasing large quantities of water into the estuary (SFWMD 2007).

The St. Lucie River consists of a north fork and a south fork that merge into the middle estuary, which is located in the southern region of the Indian River Lagoon on Florida’s east coast. The south fork is now part of the C-44 Canal, or Okeechobee Waterway, which was constructed during the 1920s to provide a connection to Lake Okeechobee.

The Indian River Lagoon is believed to be the most biologically diverse estuary in North America (Gilmore 1977). It extends along 156 miles of Florida’s east coast, from Ponce Inlet in Volusia County south to Jupiter Inlet in Palm Beach County, and encompasses 1,120 square miles (SFWMD 2007). The Indian River Lagoon was originally a freshwater system, but was opened to the ocean when the St. Lucie Inlet was constructed.

Lake Worth Lagoon is one of the most important estuarine lagoon systems in Florida (PBCDERM 2007). It is located in central Palm Beach County and is approximately 20

miles long and 0.5 miles wide, with an average depth of 6 feet (PBCDERM 2007). Originally a freshwater lagoon, this system is now connected to the Atlantic Ocean via two inlets located at the north and south ends of the lagoon, known as the Lake Worth Inlet and the South Lake Worth Inlet, respectively. The region is highly developed, which is evident from the 28 marinas and hundreds of private docks on the lagoon (PBCDERM undated). Approximately 65 percent of the shoreline is bulkheaded, with only 19 percent of the original mangrove shoreline remaining (PBCDERM undated). In 1925, the West Palm Beach Canal (C-51), constructed to drain and allow development of the Everglades west of the lagoon, was completed. Today, the majority of fresh water discharged into the lagoon is from this canal (PBCDERM 2007).

The Northern Estuaries are highly disturbed and altered systems affected by development, dredge and fill, runoff, and freshwater releases from Lake Okeechobee. The results of these activities are changes in salinity and in dissolved oxygen content, increased turbidity, and nitrification in the estuaries (SFWMD 2005).

3.1.6 Alternative Lands

Lands other than those in Compartments B and C Build-out footprint are considered as action sites in Alternative E. Alternative E was formulated to disclose the potential benefits and trade-offs that might be realized via exploration of potentially-viable alternative means of improving the quality of discharges to the EPA. Most of the lands assumed to be used for stormwater treatment under Alternative E lands are located to the west of STA 1W and within the EAA; therefore, the general characteristics of these lands are addressed in the EAA discussions. Alternative E includes assumed stormwater treatment use of some lands located east of STA 1E known as Acme Basin B-Section 24. Conditions for these lands are discussed separately from other affected areas. Information on Acme Basin B-Section 24 is from the SFWMD Draft Environmental Assessment for DA permit application SAJ-2004-3561 (SFWMD 2006).

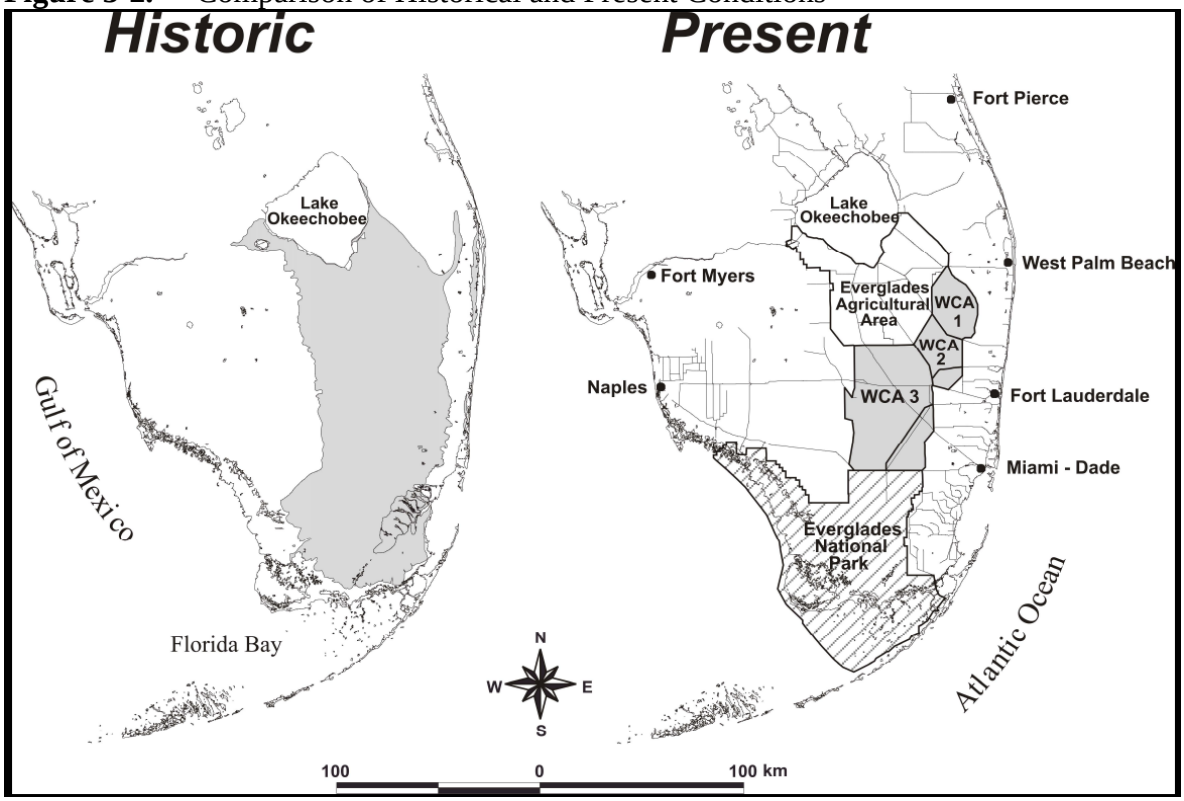
Section 24 is in the Acme Basin B of the Western C-51 Drainage Basin, directly adjacent to the southeastern corner of STA 1E. STA 1E and Acme Basin B-Section 24 are located within the incorporated boundaries of the Village of Wellington. Acme Basin B-Section 24 comprises 362 acres of fallow agricultural lands that were historically wetlands. Water from Acme Basin B-Section 24 is currently directed into the Western C-51 Canal for delivery into STA 1E or STA 1W via the S-319 inflow pump station. A permit application for construction of a STA/recreation area within Acme Basin B-Section 24 was received by the USACE on May 9, 2008 and is currently under review by the USACE.

3.2 OVERVIEW OF WATER MANAGEMENT SYSTEM

The Everglades is a vast wetland composed of a variety of habitat types, including sawgrass marshes, wet prairies, sloughs, ponds, tree islands, and mangrove estuaries that dominate the landscape of south Florida (Davis 1943a, 1943b; Loveless 1959). The Everglades is situated in a shallow limestone depression that has gradually filled with organic material and sediments over the last 4,500 to 5,000 years. Historically (before 1900), the hydrology of the region was driven by regional rainfall and inflow from Lake Okeechobee (Parker and Hoy 1943; Parker 1984). Before 1900, the Everglades extended from the south shore of Lake Okeechobee to Florida Bay in a sweeping arc (Figure 3-2) that was approximately 100 miles long and 40 to 50 miles wide and encompassed more than 3,861 square miles (Gunderson and Loftus 1993; Light and Dineen 1994).

Efforts to manage surface water in south Florida began in the mid-1800s. The primary goal was to drain the land and exploit its rich organic soils and subtropical climate for agriculture (Light and Dineen 1994; Anderson and Rosendahl 1998; Snyder and Davidson 1994). By the 1920s, more than 400 miles of canals had been excavated by local and regional authorities for drainage to allow for farming and urban development.

Figure 3-2. Comparison of Historical and Present Conditions

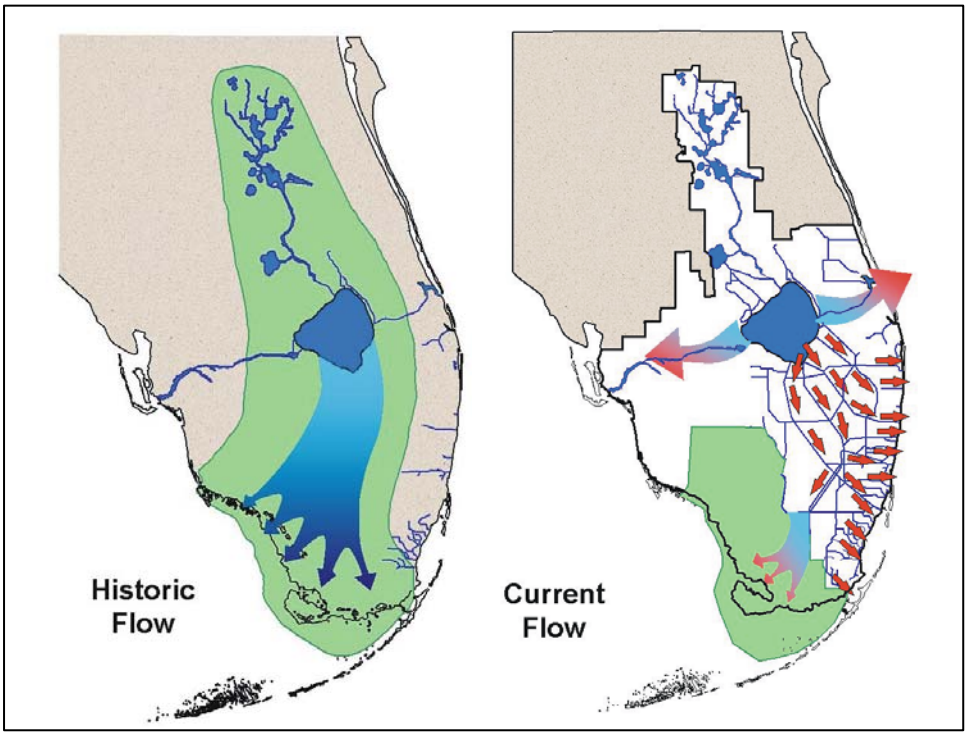


Source: Chimney M. and G. Goforth 2006

The inadequacies of the drainage system were highlighted with the hurricanes and resulting flooding of 1926, 1928, and 1947. In 1948, the U.S. Congress authorized the Central and Southern Florida (C&SF) Project, which extends from south of Orlando to the Florida Keys and is composed of a regional network of canals, levees, WCAs, and water control structures. Today, the hydrology of the region is managed by the SFWMD and USACE, which operate one of the world's largest and most complex flood control and water supply systems. Management objectives for the C&SF Project have changed over the years. Throughout much of its history, the project was operated by the SFWMD (and its predecessor agency, the Central and Southern Florida Flood Control District [FCD]) primarily to provide flood control and regional water supply for agricultural and urban areas; prevent saltwater intrusion; supply water to ENP; and preserve fish and wildlife, recreation, and navigation. The C&SF Project dramatically altered the timing, quality, quantity, and distribution of water in south Florida (Figure 3-3). Within the last 20 years, preservation and restoration of the remaining Everglades ecosystem has become a priority.

It is generally accepted that the C&SF Project had unintended adverse effects on the Everglades ecology, to the extent that the biotic integrity of the remaining ecosystem is threatened (Harwell 1998; Chimney and Goforth 2001). These adverse effects included decreasing the spatial extent and connectivity of wetlands and habitat, damaging marsh vegetation and estuarine areas, and decreasing natural storage capacity (USACE and DOI 2005). In addition, enclosing the WCAs within levees and adopting regulation schedules based on flood control and water supply needs disrupted the region's natural hydropattern (direction and spatial extent of flow) and hydroperiod (water depth, timing, and duration). This disruption, in turn, led to excessive flooding in some areas, overdrainage of other areas, and periodic reversals in the seasonal delivery of water throughout the system (Kushlan 1989 and 1991). These disturbances resulted in widespread changes to the ecology of the Everglades, such as dramatic declines in the size of wading bird populations (Ogden 1994) and the invasion of cattail (*Typha* sp.) into more than 24,710 acres of native sawgrass and slough habitat (Rutchey and Vilchek 1994; Wu et al. 1997), that are reviewed in Rader and Richardson (1992), Davis and Ogden (1994), McCormick et al. (2002), and Sklar et al. (2002).

Figure 3-3. Comparison of Major Historical and Current Flow Paths in the Everglades



Source: USACE and SFWMD 1999.

The remnant Everglades (the WCAs, WMAs, and ENP) still supports unique biotic communities that contain more than 40 threatened or endangered plant and animal species (USACE and SFWMD 1999) and is widely regarded as an ecosystem of immense regional, national, and international importance (Lodge 1994; Maltby and Dugan 1994). The ENP has been designated as an International Biosphere Reserve, a United Nations World Heritage site, and a Wetland of International Importance under the 1987 Ramsar Convention, one of only three wetlands in the world to receive all of these recognitions (Maltby and Dugan 1994). ENP has been granted status as an Outstanding Florida Water and an Outstanding National Resources Waters by the State of Florida and is a Federal Wilderness Area. The Refuge has been designated an Outstanding Florida Water. Both ENP and the Refuge are federally protected wetlands.

Comprehensive Everglades Restoration Plan (CERP). The CERP (or the Plan) was approved by Congress as a framework for structural modifications and operational changes to the C&SF Project that are needed to restore, preserve, and protect the south Florida ecosystem while providing for other water-related needs of the region, including water supply and flood protection (WRDA 2000). Congress directed that the Plan be implemented to ensure the protection of water quality in, the reduction of the loss of fresh water from, and

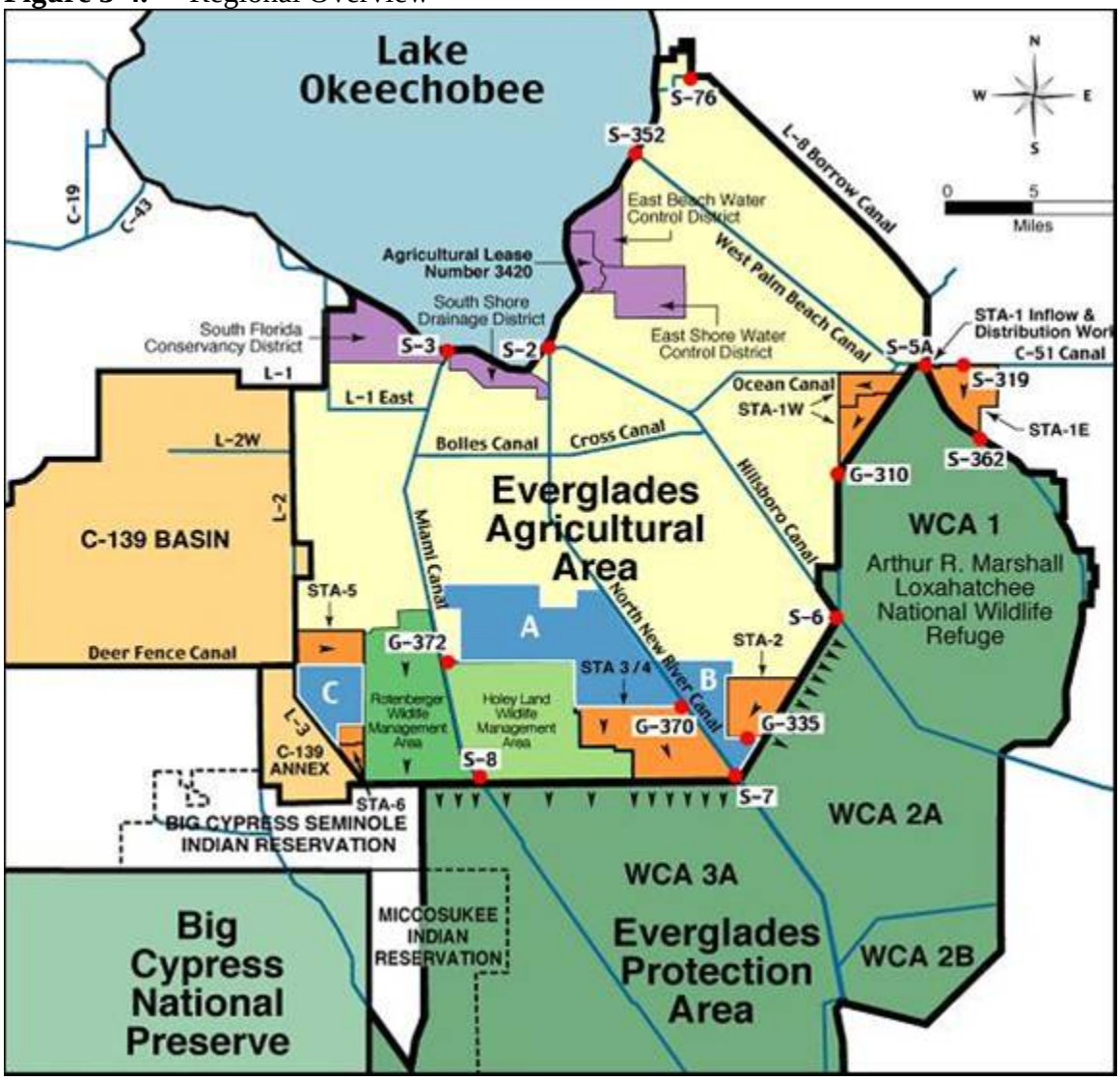
the improvement of the environment of the south Florida ecosystem, and to achieve and maintain the benefits to the natural system and human environment described in the Plan. The SFWMD, USACE, and the DOI, in partnership with other state and federal agencies and stakeholders, are undertaking CERP, one of the largest ecosystem restoration programs in the world. The CERP is a regional system of water resource projects aligned to allow for restoration of the Everglades while providing for other water-related needs of the region. The many water storage and conveyance modifications envisioned per the CERP are intended to enhance the ability to improve the quantity, quality, timing, and distribution of deliveries by capturing water that is presently discharged to tide in excessive quantities and delivering that water to/through the remaining Everglades. More information can be found at the CERP Web site (http://www.evergladesplan.org/).

Acceler8. The Acceler8 Program was initiated by the state to accelerate the construction and operation of critical CERP and the Everglades Forever Act Projects such that restoration benefits to Everglades might be realized at a faster pace than might otherwise be possible given potential limitations on federal resources.

Everglades Construction Project. Prior to construction of STAs, most of the EAA runoff flowed directly into the WCAs carrying elevated levels of nutrients and other constituents (such as total suspended solids, pesticides, and bacteria) and decreasing the levels of dissolved oxygen (Hand et al. 1986; Nearhoof 1992). Pollutant loads associated with stormwater runoff can be exceptionally high. Heavy phosphorus loading has caused varying levels of eutrophication (growth and decomposition of oxygen-depleting plant life) in parts of the WCAs and also resulted in the invasion of cattail (*Typha* sp.) into more than 24,710 acres of native sawgrass and slough habitat (Rutchey and Vilchek 1994; Wu et al. 1997). These effects are reviewed in Rader and Richardson (1992), Davis and Ogden (1994), McCormick et al. (2002), and Sklar et al. (2002).

The EFA of 1994 set into action a plan for restoring a significant portion of the remaining 1.5 million-acre Everglades ecosystem through a program of construction, research, and regulation. The Act addressed water quality, water quantity (including hydroperiod), and the invasion of exotic plant species in the Everglades ecosystem. The foundation of the interim phosphorus control program is the ECP, which encompasses six strategically located constructed wetlands, referred to as STAs (Figure 3-4). The existing STAs comprise more than 52,000 acres. The long-term phosphorus removal mechanism within the STAs is the creation of plant biomass and subsequent accretion of this organic material onto the sediment. The STAs are located along the northern boundary of the Everglades WCAs and in most cases are adjacent to existing major flood control pump stations that have been in operation since the late 1950s.

Figure 3-4. Regional Overview



Source: Goforth 2007

In addition to taking advantage of the existing pump stations, these locations allow for improvement in the spatial distribution of water entering the Everglades, changing the hydraulic regime from discrete point sources to a linear distribution that approaches sheetflow. Almost 50,000 acres of agricultural lands (primarily sugar cane, citrus, sod, vegetables, and pasture) and remnant wetlands were acquired for the project.

Best Management Practices (BMPs). In addition to the STAs, significant reductions in phosphorus loads have been achieved through use of agricultural BMPs within the adjacent EAA. The State of Florida's long-term goal is to combine point-source, basin-level, and regional solutions in a system-wide approach to ensure that all waters discharged to the EPA

achieve final water quality goals by December 31, 2010 (Rule 62-302.540 FAC). Additional background information can be found in Chimney and Goforth (2001).

As stated in Chapter 1, the Consent Decree identifies specific actions SFWMD would undertake to address excess phosphorous in the EAA, including the creation of STAs to meet interim and long-term targets on the amount of phosphorous entering the EPA.

3.3 GEOLOGY, TOPOGRAPHY, UNIQUE LAND FORMS, AND SOILS

The following sections summarize the geology, topography, unique land forms, and soils in the vicinity of Compartments B and C, and Alternative Lands adjacent to STA 1W located within the EAA, and Acme Basin B-Section 24 adjacent to STA 1E. The information on lands within the EAA contained in this section was summarized from the basis of design reports for Compartments B (URS 2007a,b) and C (Brown & Caldwell 2007), unless otherwise noted. Information on Acme Basin B-Section 24 is from the SFWMD Draft Environmental Assessment for DA permit application SAJ-2004-3561 (SFWMD 2006).

3.3.1 Geology

Compartments B and C of the EAA are located in the western part of Palm Beach County and the eastern part of Hendry County. This area, also referred to as the Everglades, lies within a large geological depression on the Florida Plateau that extends from Lake Okeechobee south to Florida Bay. This area lies between two areas of slightly higher elevation: the exposed Pliocene limestone of the Big Cypress Ridge to the west, and the late Pleistocene quartz and oolitic limestone of the Atlantic Coastal Ridge to the east. The depressed area has been covered by shallow marine and freshwater sediments that accumulated during an interglacial period several hundred thousand years ago (NPS 1997). The sediment accumulations have formed a layer of relatively flat sedimentary rock that is overlain by a fairly uniform layer of freshwater peat and organic soil (muck), deposited during the Holocene epoch. These surficial organic soils fill the geologic depression between the two ridges and range in thickness from over 10 feet in the northern Everglades to less than 3 feet in the southern Everglades.

The principal geologic formations that underlie the Compartments B and C of the EAA were deposited in the Quaternary period during several glacial and interglacial periods over the last 2 million years and include the Fort Thompson formation, the Tamiami formation, and the Hawthorn group. The Caloosahatchee formation is also present in the EAA region; however, this formation was not encountered during the studies for the basis of design reports for Compartments B and C.

The Fort Thompson formation consists of marine sands, shell beds, sandstones, limestone, and marl. This layer ranges from 30 to 50 feet thick underneath Compartment B and from 2 to 15 feet thick underneath Compartment C and then thins to non-existent in the western side of Compartment C. This layer is underlain by the Tamiami formation, which is composed of predominantly silty, shelly sands, and silty shell marls of low permeability with interbedded lenses of limestone or sandstone. This layer ranges up to 150 feet thick under the project area.

The base of the Tamiami formation is underlain by the relatively impervious beds of the Hawthorn formation. The Hawthorn group underlies all of Compartments B and C and is made up of relatively impermeable clayey and sandy marls with some limestone. The Hawthorn begins at a depth of approximately 100 feet below land surface and ranges from 300 to 600 feet in thickness. The Hawthorn group is underlain by carbonate rock layers several thousand feet thick, which begins at depths of approximately 400 feet below land surface.

The geology of lands adjacent to STA 1W and Acme Basin B-Section 24 is expected to be of the same type and of the same nature as within the EAA and Compartments B and C, as discussed above.

3.3.2 Topography

The Everglades area, including the EAA, is topographically relatively flat with elevations generally less than 18.6 feet North American Vertical Datum (NAVD), which is approximately equal to 20 feet National Geodetic Vertical Datum (NGVD). The ground surface generally slopes from north to south with an average gradient of 0.15 foot per mile. The highest ground elevations occur in the northern Everglades at 15.6 feet NAVD (17 feet NGVD) and the lowest elevations occur in the southern Everglades at -1.1 feet to -0.4 feet NAVD (0.3 to 1.0 feet NGVD).

The topography of Compartment B is relatively flat except for the drainage ditches, farm roads, and levees present in the area. The average elevation of the unfilled and unexcavated areas of Compartment B is approximately 7.5 feet NAVD. The existing North New River Canal (NNRC) and its levee border Compartment B on the west, and US-27 parallels the NNRC to the west. The L-6 Canal and WCA 2 border Compartment B on the east. Immediately west of the L-6 Canal is a double circuit of Florida Power & Light (FPL) 500-kilovolt (kV) transmission line towers, and 1 mile to the west is a third circuit FPL 500-kV transmission line tower running parallel to the double circuits in a southwesterly to northeasterly direction. Elevations along the top of the existing NNRC east levee generally

range from about 14 to 18 feet NAVD. Elevations along the top of the existing L-6 Levee generally range from about 17 to 19 feet NAVD.

The topography of Compartment C is also relatively flat, at elevations between 10 feet and 16 feet NAVD, and naturally drains toward the east. The project area slopes less than 2 percent, with several concave depressed areas that are consistent with wetlands and freshwater marshes. Compartment C is located just west of the Palm Beach-Hendry County line and is bordered by the L-3 Borrow Canal (L-3 Canal) on the west, the RWMA on the east, Stormwater Treatment Area Flow-way 3 (STA 5-3) on the north, and Stormwater Treatment Area 6, Section 2 (STA 6-2) on the south. Elevations range from approximately 10 to 15 feet NAVD (11.4 to 16.4 feet NGVD), with the higher elevations occurring near the western side of Compartment C. Additionally, the topography flattens from about the middle to the east side of the build-out site in the transitional area into the Everglades.

The topography of Alternative Lands adjacent to STA 1W are anticipated to be similar to other lands within the EAA.

3.3.3 Unique Land Forms

Lake Okeechobee and the Everglades are unique geographical features in south Florida. Lake Okeechobee is the second-largest freshwater body in the country and provides habitat to many aquatic species. The Everglades region is referred to as a shallow “river of grass,” flowing 100 miles from Lake Okeechobee to the Gulf of Mexico. The wetlands are the principal land form of interest in the Everglades region. These wetlands contain “tree islands,” which are areas raised slightly above the water that support wetland trees such as cypress and red maple as well as other vegetation.

3.3.4 Soils

The underlying soils of the EAA are typically organic soils, consisting mostly of peat and muck. Historically, the EAA was part of the largest region of organic soils, commonly 14 feet thick or more. Through years of draining and agricultural production, these soils have been significantly reduced or in some areas even lost completely (Lodge 2004). Recent studies have been conducted on the subsidence of soils in the EAA, and it is projected that by 2050 nearly half of the EAA will have less than 8 inches of soil, which means the soil elevation on average is decreasing 0.6 inch a year (Snyder 2004).

According to the United States Department of Agriculture (USDA) Soil Survey, 88 percent of the EAA is composed of the following series of soils: Torry muck, Terra Ceia muck, Pahokee muck, Lauderhill muck, Dania muck, and Okeelanta muck. The remaining 12 percent of the EAA is composed of sands. The percentages of peat, muck, and sand vary

depending on the location in the EAA. The organic soils of the EAA are classified based on their organic and mineral content, the depth of the mineral layer, the composition of the mineral layer, and the decomposition of the organic layer. The Torry muck can be described as black, poorly drained organic soil with layers of fine-textured inorganic material and clay. Locally, this soil is referred to as apple muck and is typically more than 51 inches thick. Terra Ceia muck is dark, very poorly drained organic soil more than 51 inches thick over limestone, and Pahokee muck is similar to Terra Ceia but is 36 to 51 inches thick. The other soils in the series similar to Terra Ceia and Pahokee muck are the Lauderhill and Dania muck, with thicknesses of 20 to 36 inches and 8 to 20 inches over limestone, respectively. The Okeelanta muck varies from the other soils in the series because it is overlays sand rather than limestone, and its thickness ranges from 16 to 40 inches.

3.3.4.1 Compartment B Soils

According to the basis of design report for Compartment B (URS 2007a,b), the USDA Soil Conservation Service mapped the EAA in the 1970s as part of a soil survey for Palm Beach County. Seven primary soil types were identified in the EAA, Compartment B, as a result of the survey: Torry muck, Terra Ceia muck, Pahokee muck, Lauderhill muck, Dania muck, Okeelanta muck, and Okeechobee muck. The Terra Ceia and Pahokee series represent about 80 percent of the soils in EAA Compartment B. Classification of these soils is largely based on soil properties and the depth to limestone. Terra Ceia and Okeechobee muck represent the deepest soils (more than 96 inches), followed by Pahokee muck (between 36 and 96 inches), the Lauderhill muck (between 20 and 36 inches), and the Dania muck (less than 20 inches).

3.3.4.2 Compartment C Soils

According to the draft basis of design report for Compartment C, the USDA Soil Conservation Service has completed extensive mapping of surface soils in Hendry County. According to the Soil Survey of Hendry County, there are several surface soil types for the project area, including nine primary surficial soil types: Plantation muck, Terra Ceia muck, Lauderhill muck, Dania muck, Okeelanta muck, Immokalee sand, Myakka sand, Basinger sand, and Oldsmar sand. Classification of these soils is largely based on soil properties and their depth to the underlying limestone, with Terra Ceia muck representing the deepest muck soils (typically more than 48 inches) followed by Lauderhill muck (between 20 and 36 inches) and Dania muck as the shallowest (less than 20 inches). In addition, the project area is primarily covered by a surface layer of muck soils at the surface (estimated at 50 percent). Compartment C has been subjected to sugar cane production, and the organic surficial soil layers have been altered by prior cultivation and harvesting. It generally appears that the areas of muck are the most significant in the eastern side of the project area, particularly near the discharge canal and levees, and thin out toward the central portion of the project area.

Poorly drained sandy soils are found toward the western side of the project. Localized depressional areas or small relic streambeds filled with peat, typical of the Everglades topography, are also located on Compartment C and, when encountered, may be filled with more than 5 feet of muck soils.

3.3.4.3 Alternative Lands

Lands adjacent to STA 1W are agricultural lands and information is currently being collected on historical and current farming practices. Soils and geology within these adjacent lands are expected to be of the same type and nature as occurring within other EAA lands as discussed above.

Based on the SFWMD Draft Environmental Assessment for the Acme Basin B-Section 24 DA permit application (SFWMD 2006), soils within Acme Basin B-Section 24 comprise Okeelanta muck and Tequesta muck that are nearly level, poorly drained organic soils typical of a historical wetland. Okeelanta muck is an organic soil with sandy material within a depth of 4 inches. Tequesta muck comprises a thin organic layer on the surface overlying a mineral soil that has a sandy surface layer and a loamy subsoil.

3.4 WATER RESOURCES

The Water Management System (WMS) of the EAA is operated to provide fresh water, irrigation, and flood protection for the EAA and the surrounding environmentally sensitive areas. Hydrography, water management practices, and major groundwater features in Compartments B and C have been described in several studies completed by SFWMD, USACE, and U.S. Geological Survey (USGS). Water resource information for Alternative E lands adjacent to STA 1W and Acme Basin B-Section 24 lands have been evaluated using data for Compartments B and C. In addition, Alternative E lands were evaluated using the Steady-State Design Model.

3.4.1 Surface Water Hydrology

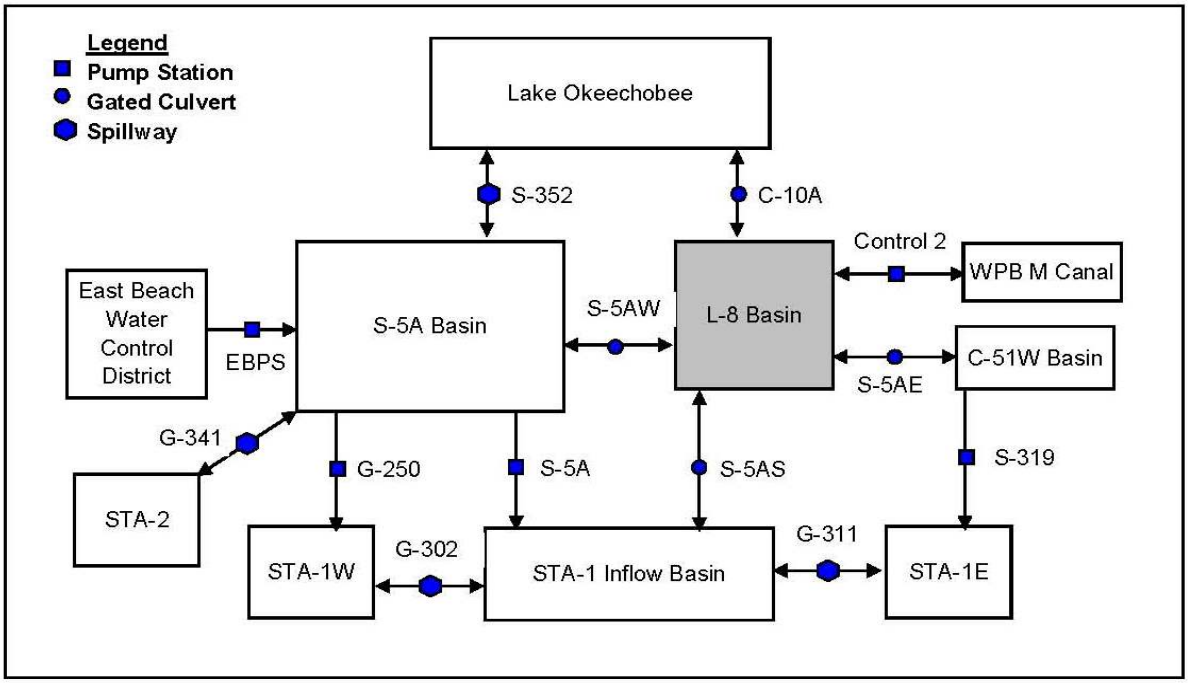
The existing surface water hydrology can be described in terms of what is entering and leaving the STAs. In a recent report, *Updated Flow and Phosphorus Data Sets for the ECP Basins* (Goforth 2007) prepared for SFWMD and USACE, the surface water hydrology for the EAA, including the STAs, was depicted as illustrated in Figures 3-5 through 3-8.

3.4.1.1 STA 1E and STA 1W

Water is diverted to STA 1W and STA 1E from the STA 1 Inflow Basin, S-5A Basin, and C-51W Basin (Figure 3-5). The STA 1 Inflow Basin receives a portion of the water discharged through S-352 from Lake Okeechobee through the S-5A Basin. Water flows from the S-5A Basin through the S-5A pump station to the STA 1 Inflow Basin. Water from the STA 1

Inflow Basin can either be directed through gated spillways G-302 to STA 1W or through G-311 to STA 1E. STA 1E receives water pumped through S-319 from the C-51W Basin (USACE 2007a).

Figure 3-5. L-8 Basin Schematic (Representing STA 1E, STA 1W, and STA 2)

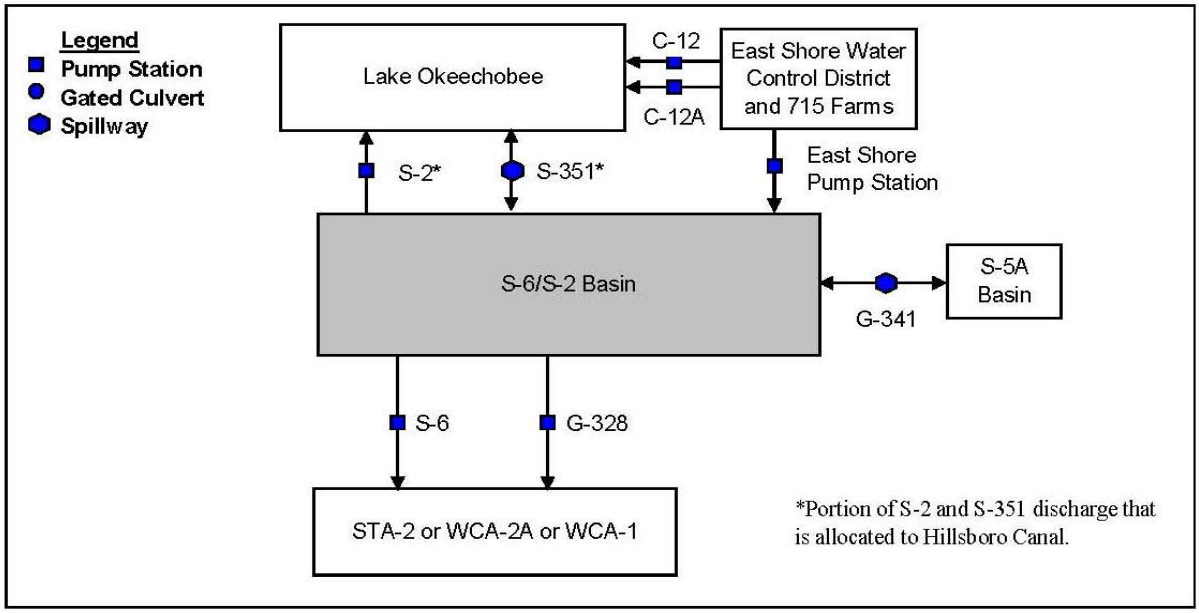


Source: USACE 2007a

3.4.1.2 STA 2

STA 2 receives runoff from the S-5A Basin and S-2/S-6 Basin (Figures 3-5 and 3-6). Inflows to STA 2 are routed through pump stations S-6 and G-328. G-328 is an agricultural pumping station connected to the STA 2 Supply Canal. Basin runoff is routed to STA 2 for treatment via the S-6 and G-328 pump stations. STA 2 discharges are then routed to WCA 2A. Outflow from STA 2 is regulated from pump station G-335. S-6 outflow operates only during the day unless headwater elevations remain close to 10 feet (SFWMD 2006). The Hillsboro Canal provides water to S-6 from S-351, which also supplies the NNRC. Structure S-351 allows the releases to be made from Lake Okeechobee to the Hillsboro and North New River service areas.

Figure 3-6. S-2/S-6 Basin Schematic (Representing STA 2)



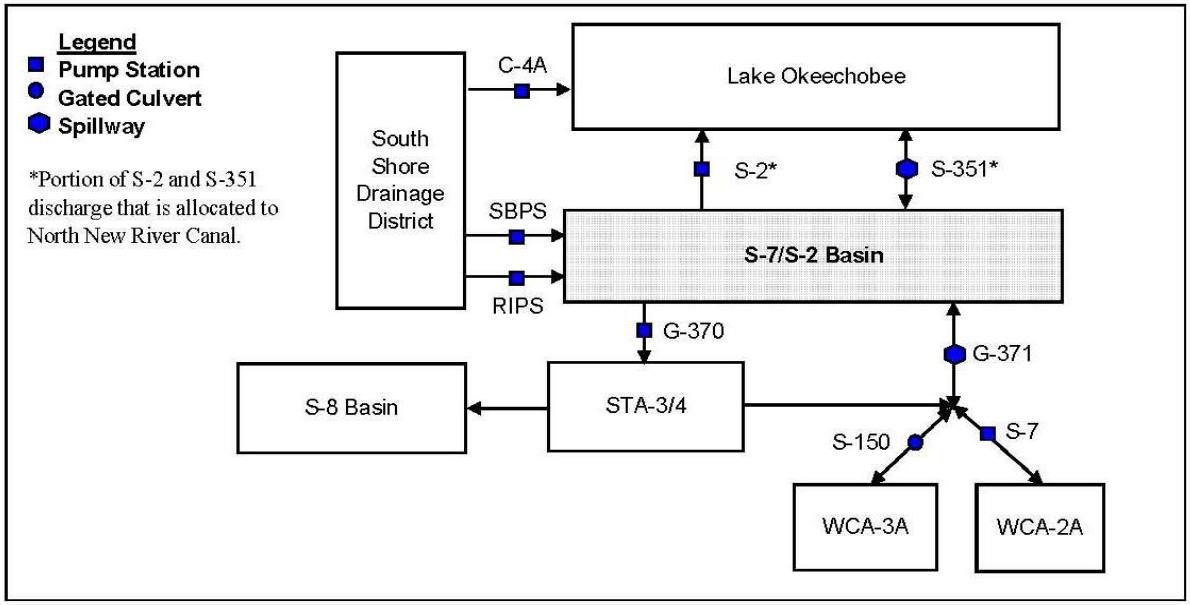
Source: USACE 2007a

3.4.1.3 STA 3/4

Water flows from the NNRC into STA 3/4 through inflow pump station G-370 from the S-7/S-2 Basin. Discharges from STA 3/4 are conveyed to the S-7/S-2 Basin, WCA 2A, and WCA 3A (Figure 3-7). G-371, divide structure, segregates untreated water in the NNRC from the STA 3/4 treated discharge. The S-7 pump station provides a hydraulic gradient for discharges from STA 3/4. Outflow treated in STA 3/4 is routed to the S-7 pump station to discharge into WCA 2A. Flow from STA 3/4 can also be diverted through the S-150 culvert into WCA 3A (USACE 2007a).

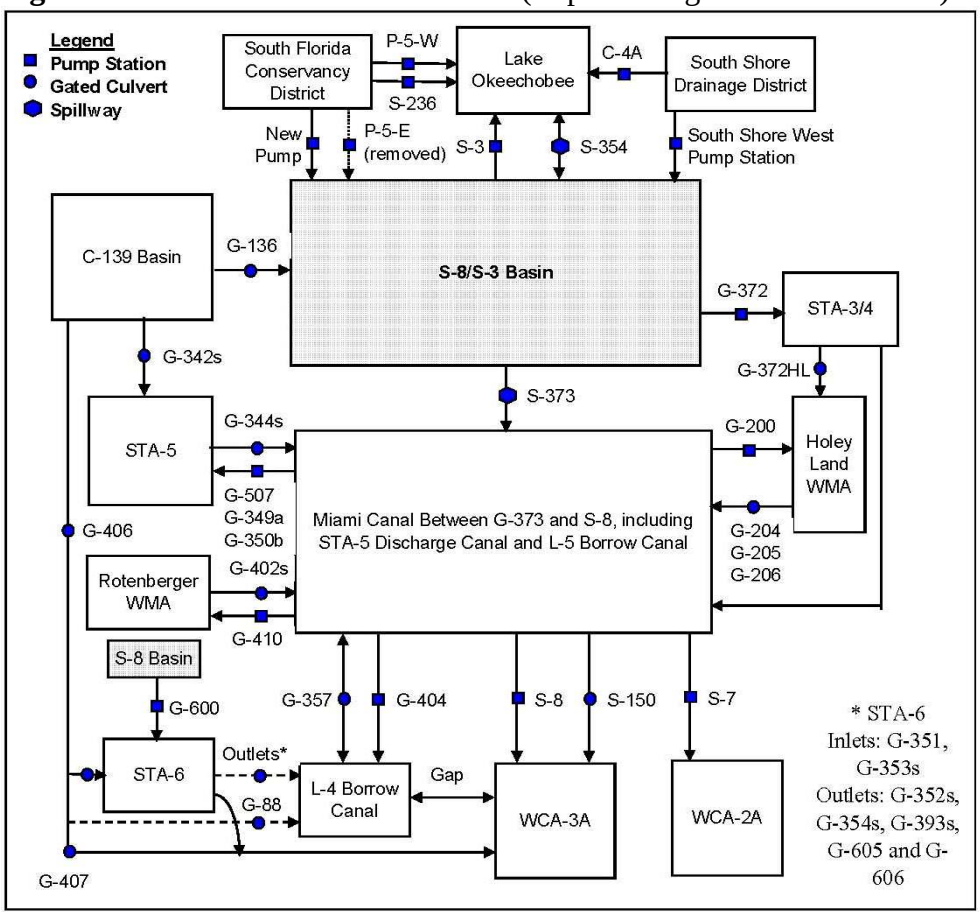
Basin runoff from the C-139 Basin can be diverted into the Miami Canal and then to STA 3/4 through G-136, depending on local conditions (Figure 3-8). Pump station G-372 is a primary inflow pump station supplying water from the Miami Canal to STA 3/4. G-373, the divide structure, segregates untreated water in the Miami Canal and treated water from STA 3/4 (USACE 2007a).

Figure 3-7. S-2/S-7 Basin Schematic (Representing STA 3/4)



Source: USACE 2007a

Figure 3-8. S-3/S-8 Basin Schematic (Representing STA 5 and STA 6)



Source: USACE 2007a

3.4.1.4 STA 5 and STA 6

The primary source of inflow to STA 5 is from the C-139 Basin through the G-342 A-F gated structures. A small hydration pump station (G-507) may also supply water to the STA from the Miami Canal. The STA 5 treated water is discharged through the G-344 A-F outflow structures and is routed through the discharge canal to the Miami Canal south of the G-373 divide structure. The discharge canal was re-routed in 2005, and STA 5 is no longer considered a tributary to the EAA and the S-3/S-8 Basin (USACE 2007a).

STA 6 received runoff from a small portion of S-8/S-3 Basin located north of STA 6 through the G-600 pump station until a new flow-way was constructed in 2006. Discharges from STA 6 before the new construction were conveyed to S-8. After June 2000, discharges from STA 6 no longer contributed to the S-8 flows. Gates G-406, G-351, and G-353s bring water into STA 6. Outflow from STA 6 is transported through gates G-352s, G-354s, G-393s, G-605, and G-606 to the L-4 Borrow Canal (Figure 3-5) (USACE 2007a).

Updated Flow and Phosphorus Data Sets for the ECP Basins (Goforth 2007) further describes hydrologic routing, inflow, and discharges from a number of basins throughout the EAA. The total volume of inflow and outflow from the STAs since construction is presented in Table 3-1.

Table 3-1. Inflow and Outflow STA Volumes

Water Year	STA-1E	STA-1W	STA-2	STA-3/4	STA-5	STA-6
		Total Inflow Volume (acre-feet)				
2005		341,094	316,273	671,442	119,910	34,035
2004		292,690	256,938	23,303	153,080	52,674
2003		591,845	282,731	NA	170,203	56,252
2002		236,731	212,807	NA	164,737	53,437
2001		81,346	NA	NA	55,145	39,400
Average	**193,812***	**308,741**	**267,187**	**347,373**	**132,615**	**47,160**
Water Year		**Total Outflow Volume (acre-feet)**				
2005		383,663	371,023	648,872	121,427	22,187
2004		297,603	284,780	27,708	136,466	35,549
2003		595,999	308,297	NA	160,518	32,753
2002		267,624	240,685	NA	166,692	27,945
2001		90,929	NA	NA	57,389	27,221
Average	**190,600***	**327,164**	**301,196**	**338,290**	**128,498**	**29,131**

Source: SFWMD Web site 2007

*Based on modeled results (Goforth 2007)

Currently, Compartments B and C Build-out, Acme Basin B-Section 24 lands, and Alternative Lands adjacent to STA 1W are either active agricultural lands or inactive agricultural (fallow) lands, and are not managed as part of the existing EAA water management system. Hydrology within these areas is driven by precipitation, flood events

and drought. Hydrology in active agricultural lands adjacent to STA 1W are also driven by irrigation. Adjacent canals receive storm water runoff from these areas.

3.4.1.5 Lake Okeechobee

Lake Okeechobee contributes flow through a complex network of canals to all of these basins and the Caloosahatchee River and St. Lucie Canal. The lake is 730 square miles with a mean depth of 9.0 foot. Inflows to Lake Okeechobee average 2.1 million acre-feet per year. Nearly half the inflow to Lake Okeechobee is through the Kissimmee River. The Upper and Lower Kissimmee River watersheds cover more than 2,300 square miles of Central Florida. The remaining inflow to Lake Okeechobee is from Lake Istokpoga, Fisheating Creek, the Taylor Creek-Nubbin Slough Basin, and reverse flows from the Caloosahatchee River, the St. Lucie Canal, and the EAA (SFWMD 2007).

3.4.1.6 Water Conservation Areas

Three WCAs follow the southeastern and southern boundary of the EAA. These are the Refuge, WCA 2A, and WCA 3A. The Refuge covers 230 square miles and receives an average annual inflow volume of 436,136 acre-feet of water. WCA 2A is 210 square miles and receives an average annual inflow volume of 462,761 acre-feet of water. WCA 3A covers the largest area, 915 square miles, and receives an annual average inflow volume of 749,466 acre-feet of water.

3.4.2 Groundwater Hydrology

There are three principal aquifers in the EAA: the Biscayne Aquifer, the Undifferentiated Surficial Aquifer (USA), and the Upper Floridan Aquifer. The USA and Biscayne Aquifers are both non-artesian freshwater aquifers. The Floridan Aquifer is much deeper, underlying both the USA and Biscayne Aquifers.

The USA consists of unconsolidated sand, shell sand, and shell with areas made up of limestone beds. The USA is up to 250 feet thick with transmissivity values as high as 50,000 square feet per day. Present in most of Palm Beach County, the USA is a major source of groundwater in both Palm Beach and Hendry Counties.

The Biscayne Aquifer is a highly permeable, non-artesian freshwater surficial aquifer located from the lower quarter of Palm Beach County southward through to Miami-Dade County. This aquifer consists of limestone and sandy limestone and is from 100 to 400 feet thick. Transmissivity values greater than 1,000,000 square feet per day have been calculated. A thick confining clay layer underlies the Biscayne Aquifer, separating it from the underlying Floridan Aquifer.

In south Florida, the Floridan Aquifer contains brackish water and is subdivided by a series of confining clay layers, the Upper Floridan and Lower Floridan Aquifers. The Floridan Aquifer is roughly 100 to 500 feet thick and the depth to the upper boundary varies from about 400 to 1,000 feet deep. The transmissivities in the Upper Floridan vary between 10,000 and 50,000 square feet per day in Palm Beach and Miami-Dade Counties and between 100,000 and 250,000 square feet per day in regions just east of Lake Okeechobee. The Lower Floridan begins at depths ranging from 1,000 to 1,800 feet and ends at depths ranging from 3,000 to 3,500 feet (SFWMD 2004).

3.4.3 Water Quality

SFWMD originally designed and constructed STAs to work in combination with the EAA BMP program to reduce the total phosphorous levels from the EAA runoff down to an annual average flow-weighted mean concentration of 50 parts per billion (ppb).

The Everglades is an oligotrophic system accustomed to low nutrient concentrations such that high concentrations act as a pollutant and result in changes to the ecosystem. High nutrient concentrations have resulted in widespread changes to the ecology of the Everglades, including invasion of cattail (*Typha* sp.) into more than 24,710 acres of native sawgrass and slough habitat (Rutchey and Vilchek 1994; Wu et al. 1997); these effects are reviewed in Rader and Richardson (1992), Davis and Ogden (1994), McCormick et al. (2002), and Sklar et al. (2002). The Florida Legislature, in Subsection 373.4592(3)(b), F.S., has determined that the combination of BMPs and STAs contained within the Long-Term Plan constitutes the best available phosphorous reduction technology for achieving the phosphorous criterion in the EPA.

The most recent summary of water quality for the EAA was presented in *Updated Flow and Phosphorus Data Sets for the ECP Basins* (Goforth 2007).

Water quality standards depend on the designated use of a water body. According to the FDEP *Watershed Management Basin Rotation* (FDEP 2007), waterbodies within the EAA have been defined as Class III Waters with a designated use of “recreation, propagation, and maintenance of healthy, well-balanced population of fish and wildlife.” Lake Okeechobee is a Class I Water for “potable water supply.” Applicable water quality criteria for Class I and III Waters are defined in Surface Water Quality Standards Section 62-302.530, FAC.

Several agencies collect water quality data in the EAA, including SFWMD, FDEP, USGS, U.S. Environmental Protection Agency (USEPA), and various public and private research organizations. Much of the data collected can be found on line. Data collected by SFWMD have been made available on the Internet at http://www.sfwmd.gov/org/ema/dbhydro/. The

USGS has also created an Internet data exchange at http://sofia.usgs.gov/exchange/. FDEP and USEPA also maintain similar Internet sites where monitoring data can be obtained.

As previously discussed, the parameter of greatest concern is phosphorus. In 2001, a TMDL was developed for total phosphorus on Lake Okeechobee. Implementation of the TMDL was presented in a phased approach to meet an in-lake phosphorus concentration of 40 µg/L (FDEP 2001a). Reductions in phosphorus from Lake Okeechobee will be reflected in discharges to the EAA. Since 2005, concentrations of total phosphorus in S-3/S-8 have remained the same at 82 µg/L, while concentrations in S-2/S-6 have increased by nearly 10 percent, from 99 µg/L to 109 µg/L (USACE 2007a). These concentrations are much greater than the water quality criterion of 10 µg/L. On average, total phosphorus concentrations increased 10 percent since 2005 for basins throughout the EAA assessed in the *Updated Flow and Phosphorus Data Sets for the ECP Basins* (Goforth 2007). The average annual total phosphorus concentrations for conveyances throughout the EAA are also presented in the report.

Average annual total phosphorus concentrations flowing in and out of STAs are presented in Table 3-2. The most recent data collected on other water quality parameters can be found on the Internet in the 2008 South Florida Environmental Report (SFWMD 2007). Parameters discussed in the water quality chapter include dissolved oxygen, specific conductance, sulfate, and pesticides; the report also contains dedicated chapters on STA performance, phosphorus and nitrogen, and mercury and sulfur.

Table 3-2. Inflow and Outflow STA Total Phosphorus

Water Year	STA-1E	STA-1W	STA-2	STA-3/4	STA-5	STA-6
	Flow-weighted Mean Total Phosphorus Inflow (µg/L)					
2005		247	126	105	165	78
2004		141	77	49	255	53
2003		154	67	NA	277	77
2002		148	77	NA	244	69
2001		148	NA	NA	231	138
Average	**176***	**168**	**87**	**77**	**234**	**83**
Water Year	**Flow-weighted Mean Total Phosphorus Outflow (µg/L)**					
2005		98	20	13	81	19
2004		47	14	16	97	12
2003		53	17	NA	136	26
2002		38	16	NA	78	16
2001		39	NA	NA	105	31
Average	**27***	**55**	**17**	**15**	**99**	**21**

Source: SFWMD Web site 2007
*Based on modeled results (Goforth 2007)

3.4.4 Water Supply

According to the *EAA Regional Feasibility Study* (A.D.A. Engineering, Inc 2005) the STAs will not be used to treat water supply deliveries to the lower East Coast. The water supply deliveries instead will be delivered to the WCAs when water levels in the WCAs are below the floor of the regulation schedules.

3.4.5 Flood Protection

Runoff from the EAA is collected and routed to the WCAs for flood control (SFWMD 2004). The flood storage capacity of the WCAs is essential to flood control in the EAA. Lake Okeechobee becomes a source of flood storage in extreme events, such as hurricanes. 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, make up the flood control works on Lake Okeechobee (SFWMD 2006).

3.5 AIR RESOURCES

The following sections discuss air quality, climate, and noise conditions within the EAA, including Alternative Lands adjacent to STA 1W. Corresponding conditions for Acme Basin B-Section 24 lands are anticipated to be similar to those in the EAA.

3.5.1 Air Quality

USEPA and FDEP have defined ambient air quality standards for six pollutants, which include carbon monoxide (CO); lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (a mixture of liquid and solid particles that may be made up of acids organic chemicals, metals, allergens, dust or soil 10 microns or less in diameter, PM_{10}), and sulfur dioxide (SO_2). USEPA has established two types of National Ambient Air Quality Standard (NAAQS) — primary and secondary — for these pollutants (FDEP 2005). Primary standards protect public health, while secondary protect public welfare related values (property, materials, and plants and animals) (FDEP 2005).

As indicated in the EAA Reservoir A-1 Final EIS (USACE 2006), the closest air quality monitoring stations to the EAA are stations operated by Palm Beach County. Two of the monitors measure ozone concentrations, and the monitor station closest to Lake Okeechobee measures particulate matter. The 2005 air monitoring report for Florida states that measured concentrations for all of the six pollutants monitored at these stations in 2005 were measured below (in compliance with) the national standards.

The basis of design report for Compartments C (URS 2007a,b) addresses existing air quality conditions for Compartment C, Hendry County, and Florida in general. The report notes that air quality in Florida is generally good because the prevailing winds tend to disperse airborne

pollutants, although some air pollutants are common to all parts of the state. Air quality in urbanized areas typically is most affected by automobiles, land clearing, and permitted emitters, such as power plants and major industries.

Hendry County is not listed as a non-compliant county for air quality standards in the USEPA's "Green Book." Sugar cane cultivation and processing practices can have some localized effects on air quality near the Compartment C site and in Hendry County in general, however. Prior to harvesting the cane, a high-temperature controlled burn is applied to the area to be harvested. The burn removes dead leaves from the cane stalk, facilitating an easier harvest. Although each controlled burn is short in duration and localized in area, because large portions of Hendry County and the EAA are in sugar cane production the cumulative contribution of multiple controlled burns can temporarily diminish overall air quality in the local area.

Other activities in Hendry County that could affect air quality are the operation of the large boilers used in sugar processing. Two main sugar mills in Hendry County operate during the harvesting season, which extends from approximately mid-October through mid-March. The transportation of sugar cane, by truck or train, also produces some air emissions. Sugar cane harvesting and processing activities produce air emissions during approximately half of the year.

3.5.2 Climate

The following discussion of climate is taken from the basis of design report for Compartments B (Brown and Caldwell 2007). Climatic conditions for all areas potentially affected by the Proposed Action are essentially the same.

The climate of south Florida is generally characterized as subtropical. Temperatures typically range from about 35 to 100 °F, although lower and higher extremes have been recorded. Recorded annual rainfall in south Florida has varied from 37 to 106 inches. Of the 53 inches of rain that south Florida receives annually on average, 75 percent falls during the wet season of May through October. Highly localized storms occur almost daily during this period. Tropical storms and hurricanes also provide major contributions to wet-season rainfall in some years, as evidenced by the four major storms that affected south Florida during the summer of 2004. Rainfall during the dry season is governed by large-scale weather fronts that pass through the region. Evapotranspiration rates are high in south Florida. Total evapotranspiration approximates annual rainfall on a long-term average annual basis.

3.5.3 Noise

Noise is the unwanted or excessive sound, typically elevated above background sound levels. Sound levels in rural areas typically range from 35 to 55 decibels (dB) and occasionally escalate to 70 dB near roadways and agriculture (USACE and SFWMD 2006). When compared with the common sources and sound levels shown in Table 3-3, the background sound levels typical of rural areas are consistent with settings that are considered to be relatively quiet.

Table 3-3. Common Noise Sources and Sound Levels

Noise Source	Sound Level
The rustle of leaves in a breeze	25 dB
A whisper from 6 feet	35 dB
Normal female speech	60 dB

Source: J.J Van Houten 1974 as cited in USACE and SFWMD 2006

The following discussion of existing noise conditions is from the basis of design report for Compartment B (Brown and Caldwell 2007), with some modifications. Compartment C and the lands considered for Alternative E have a similar land use and environmental setting, and are expected to have essentially the same existing noise conditions as Compartment B.

The area evaluated for noise impacts is the EAA, which is located in a rural inland area of south Florida that is relatively isolated from major roadways and development except for US-27 a major north-south roadway that abuts Compartment B to the west. The area is characterized predominantly by agricultural production, primarily of sugar cane. Because most of the area is used for crops, agricultural production accounts for most noise sources. Common noise sources include harvesters and related machinery used to harvest the sugar cane, tractor-trailer trucks and large trailers for hauling the harvested crop to sugar mills, and support vehicles. The cane is planted by hand, but large vehicles are used to bring cuttings to the fields, and buses and vans are used to transport workers for planting. Agricultural noise sources not associated with harvesting include operation of machinery used to maintain the fields and water pumps used for water supply and drainage. Sound levels from large vehicles and agricultural machinery are noticeably higher than the rural background levels discussed above. For example, the typical sound level for a heavy truck at a distance of 50 feet is 90 dB, which is considered to be loud (USEPA 1974).

A specific noise impact associated with sugar cane production is the burning of the cane field before the harvest. The burn is an intense, high-temperature event that produces a roaring sound in the immediate vicinity, and has a very brief duration.

Existing noise conditions in the affected project area have a distinct timing pattern. Burning and harvesting the cane fields are transitional events that occur once a year for a specific

location, although within the EAA they can be distributed over a 6-month period. Equipment usage outside of harvesting activity can occur at any time, although these noise occurrences are highly intermittent and are infrequent in a specific location. The general pattern is one of background sound levels on a predominant basis, punctuated by intermittent, short-term, localized increases in noise levels when specific activities occur in a given location.

3.6 VEGETATION

The affected areas evaluated in this section include: (1) Lake Okeechobee; (2) the Northern Estuaries; (3) the Lake Worth Lagoon, (4) the EAA; (5) WCAs 1, 2A and 3A; (6) Compartment B; (7) Compartment C; and (8) Alternative lands. For this discussion, the vegetative communities are categorized into aquatic, wetland, upland, and disturbed habitats within each affected area. Aquatic communities include submerged or floating plant species that thrive within permanent inundation or open water. Wetlands are characterized by seasonal fluctuations in hydrology that may range from dry or moist during the dry season to saturated or inundated conditions during the wet season. This hydrologic regime provides optimal growing conditions for plant species adapted to anaerobic soil conditions caused by inundation or saturation by surface or groundwater. Upland habitats are communities dominated by plant species adapted to aerobic soil conditions and are seldom or never inundated. Disturbed communities typically occur as a result of anthropogenic activities or encroachment by exotic or invasive species that degrade a natural plant community. The plant species described in this discussion do not include all vegetation found within the study area; but rather represent the dominant plants found within each community type.

3.6.1 Lake Okeechobee

Historically, the natural vegetative communities within and surrounding Lake Okeechobee were freshwater marshes, hardwood swamps, cypress swamps, pond apple forests, and pine flatwoods. Freshwater marshes are dominated by sawgrass *(Cladium jamaicense)*, Carolina willow *(Salix caroliniana)*, sweetbay *(Magnolia virginiana)*, and cypress *(Taxodium* spp.*)*. Surrounding upland areas were pine flatwoods vegetated with slash pine *(Pinus elliottii)*, cabbage palm *(Sabal palmetto)*, and saw palmetto *(Serenoa repens)*. These vegetative communities have been greatly altered by the water management practices within the lake and by nutrient inputs. Periods of prolonged high water levels, lake drawdowns that cause rapidly receding water levels and contribute to increased risks for brush and peat fires in the Lake's littoral marsh, and nutrient inputs have degraded naturally occurring vegetative communities and allowed for invasive exotic species to colonize.

3.6.1.1 Aquatic

Approximately 75 percent of Lake Okeechobee consists of open water habitat (USACE and SFWMD 2006). Submerged aquatic vegetation is present between deeper open water and the littoral zone, representing approximately 200 km² of the lake habitat (SFWMD undated). Some of the most dominant submerged aquatic vegetation (SAV) within this region includes hydrilla *(Hydrilla verticillata)*, pondweed *(Potamogeton* spp.*)*, coontail (*Ceratophyllum demersum*), southern naiad (*Najas guadalupensis*), muskgrass (*Chara* spp.), bladderwort *(Utricularia* spp.*)*, and tape-grass/eel grass *(Vallisneria americana)*. Hydrilla is a non-native invasive plant that is considered one of the more problematic aquatic plants in the United States. It forms dense mats of vegetation that interfere with recreation and destroy fish and wildlife habitat. Lotus lily *(Nelumbo lutea)*, white waterlily *(Nymphaea odorata)*, water hyacinth *(Eichornia crassipes)*, water lettuce *(Pistia stratiotes)*, spatterdock (*Nuphar* spp.), and duckweed *(Lemna* spp.*)* are the dominant floating plants in the region. Water lettuce is a floating plant that forms large infestations that prevent boating, fishing, and other uses of lakes, canals, and rivers. There is disagreement as to whether the plant is native to Florida; however, water lettuce is on FDEP's list of prohibited species, and as such, it is unlawful to possess or transport this plant in Florida.

3.6.1.2 Wetlands

Lake Okeechobee's emergent littoral zone is approximately 150 square miles. The majority of the littoral vegetation occurs along the southern and western borders of the lake (Milleson 1987; SFWMD undated). Herbaceous species dominate the emergent vegetation, including spikerush *(Eleocharis* spp.*)*, bulrush (*Scirpus californicus*), beakrush (*Rhynchospora* spp.), ludwigia (*Ludwigia leptocarpa*), sawgrass, duck potato (*Sagitteria* spp.), arrowhead (*Sagitteria latifolia*), maidencane (*Panicum hemitomon*), willow (*Salix* spp.), and pickerelweed (*Pontederia cordata*). Invasive exotic species include melaleuca (*Melaleuca quinquenervia*) and torpedograss *(Panicum repens*). Cattail *(Typha latifolia)* is a native species; however, it is considered invasive. Dominant species in the deeper littoral zone are cattail, spikerush, and torpedograss (USACE and SFWMD 2006). Cuban bulrush (*Scirpus cubensis*), spadeleaf *(Centella asiatica)*, and some ludwigia can also be found within deeper areas of littoral zone (USACE and SFWMD 2006). It is not agreed whether Cuban bulrush is native or non-native to Florida. Either way, it is considered a major source of food for waterfowl populations.

Hardwood swamps are found landward of the Herbert Hoover Dike, primarily on the western side of the lake. Typically the mixed hardwood forests and cypress swamps are found in areas surrounding the lake. Exotic and invasive vegetation species such as melaleuca, Australian pine (*Casuarina equisetifolia*), torpedograss, and cattail have encroached into

stands of native species that diminish biological diversity and existing aesthetics (USACE and SFWMD 2006).

3.6.1.3 Uplands

Development has altered upland areas surrounding Lake Okeechobee during the last century. Pine flatwoods were the primary natural upland community type surrounding the lake. Vegetation within the pine flatwoods mainly consisted of slash pine, cabbage palm, and saw palmetto (USACE and SFWMD 2006). Today, melaleuca is a common invasive species found around the lake. Old world climbing fern (*Lygodium microphyllum*), a non-native, is becoming a considerable problem in the farther reaches of the Okeechobee watershed. At this time, however, the invasive species does not appear to be a significant problem in upland areas immediately around the lake.

3.6.1.4 Disturbed/Exotic Communities

All of Lake Okeechobee's vegetation communities have been disturbed from development and water management practices. Invasive exotic species that are particularly disruptive to the lake's native vegetative communities are melaleuca, Brazilian pepper (*Shinus terebinthifolius*), torpedograss, water hyacinth, water lettuce, and hydrilla. These invasive species have quickly colonized areas that were once dominated by native vegetation by out-competing native species. Monocultures of exotic vegetation typically provide poor habitat for fish and wildlife. Management actions used to control invasive exotic vegetation within and adjacent to Lake Okeechobee include herbicides, prescribed burns, and manipulation of water levels.

3.6.2 Northern Estuaries

The Northern Estuaries include the St. Lucie and Caloosahatchee River Estuaries and the Indian River Lagoon. Vegetation communities include submerged aquatic resources, salt marshes, and mangrove fringes and forests.

3.6.2.1 Aquatic

The main SAV found in the Northern Estuaries is seagrass. Seagrasses are marine flowering plants that stabilize sediment, dissipate wave energy, and reduce turbidity, while providing habitat and food for numerous marine animals. In the St. Lucie Estuary, shoal grass *(Halodule wrightii)* is the dominant species of SAV. Shoal grass inhabits disturbed areas where conditions are too harsh for other seagrasses. Johnson's seagrass *(Halophila johnsonii)*, a threatened plant species, also occurs in the St. Lucie Estuary and Indian River Lagoon (USACE and SFWMD 2006). Johnson's seagrass is more tolerant of variation in salinity and temperature and of desiccation than other seagrasses in the area. It has an extremely narrow distribution and is found only in lagoons along a 124-mile stretch of

coastline in southeast Florida, extending from Sebastian Inlet to North Biscayne Bay (NMFS 2002). Turtle grass *(Thalassia testudinum)* occurs in waters deeper than 1 to 2 feet within the Indian River Lagoon (USACE and SFWMD 2006). Turtle grass is the most common type of seagrass off the coast of Florida and throughout the Caribbean. Typically, turtle grass occurs from the low tide level to depths of approximately 30 feet on sand- and rubble-covered bottoms.

Since the 1940s, seagrasses have experienced a 30 percent decline in Florida's estuaries, attributed to impacts associated with degraded water quality, prop scars, freshwater inputs, changes in salinity, and changes in temperature (Haddad and Sargent 1994). Discharges of high nutrient, polluted fresh water from Lake Okeechobee are altering the seagrass communities within the Northern Estuaries (USACE 1999).

Tape grass is a freshwater aquatic grass that is the primary SAV in the Caloosahatchee River (USACE and SFWMD 2006). Waterfowl, fish, birds, and mammals feed on tape grass and fish use the plant for spawning. Hydrilla and Eurasian watermilfoil (*Myriophyllum spicatum*) are two exotic species out-competing tape grass in certain areas of the river (USACE 1988).

3.6.2.2 Wetlands

Wetlands associated with the Northern Estuaries include salt marshes and mangroves. Mangroves are coastal trees that are adapted to growing in salt and brackish water. Mangroves forests are composed of mainly red mangroves (*Rhizophora mangle*), white mangroves (*Laguncularia racemosa*), black mangroves (*Avicennia germinans*), and green buttonwoods (*Conacarpus erectus*). They provide shoreline stabilization, habitat for numerous marine organisms, filtration, and organic matter (leaves) to the system. Mangroves and salt marshes are important nursery and feeding grounds for numerous fish and shellfish species. The Northern Estuaries are highly disturbed systems that have been affected by development and freshwater releases from Lake Okeechobee, resulting in changes in salinity and dissolved oxygen content, increased turbidity, pollution, nutrification, and loss of wetland habitats (SFWMD 2005).

3.6.3 Lake Worth Lagoon

Lake Worth Lagoon is one of the most important estuarine lagoon systems in Florida (PBCDERM 2007). It is located in central in Palm Beach County and is approximately 20 miles long and 0.5 miles wide, with an average depth of 6 feet (PBCDERM 2007). Originally a freshwater lagoon, this system is now connected to the Atlantic Ocean via two inlets located at the north and south ends of the lagoon, known as the Lake Worth Inlet and the South Lake Worth Inlet, respectively. The region is highly developed which is evident from the 28 marinas and hundreds of private docks in the lagoon (PBCDERM undated).

Approximately 65 percent of the shoreline is bulkheaded, with only 19 percent of mangrove shoreline remaining (PBCDERM undated). In 1925, the West Palm Beach Canal (C-51), constructed to drain and allow development of the Everglades west of the lagoon, was completed. Today, the majority of fresh water discharged into the lagoon is from this canal (PBCDERM 2007).

3.6.3.1 Aquatic

Seagrasses cover approximately 22 percent of the submerged bottom in the Lake Worth Lagoon (PBCDERM 2002). A comparison of the earliest Lake Worth Lagoon seagrass survey done in 1940 and the most recent seagrass assessment done is 2001 from examination of true color aerial photographs, indicates that this is only approximately 38 percent of the seagrass area that existed pre-development (Table 3-4). The central region of the Lake Worth Lagoon where the C-51 Canal is located has the least acres and lowest cover of seagrass compared to the northern and southern regions. This could be attributed to the reduced water quality and light attenuation from the high nutrient and sentiment discharges from the C-51 Canal and runoff from the highly developed surrounding areas (PBCDERM 2007).

Table 3-4. Acres of Seagrass in Lake Worth Laggon From 1940 to Present

Year of Seagrass Assessment	Area of Seagrass in Acres
1940	4,271
1990	2,110
2001	1,626

Note: due to gross differences in survey methods, decent value should only be used to indicate an order of magnitude change.

3.6.3.2 Wetlands

Waterfront shorelines are commonly armored to prevent erosion resulting in a substantial shift of shoreline characteristics from mangroves and natural communities to vertical bulkheads or other fixed shoreline stabilization structures that provide little to no habitat value for marine organisms. In the Lake Worth Lagoon, for example, approximately 65 percent of the shoreline is bulkheaded, with only 19 percent of mangrove shoreline remaining (PCDERM undated).

3.6.3.3 Uplands

Upland vegetation with in the Lake Worth Lagoon was not assessed because construction of STAs will not affect upland environments in this region.

3.6.4 Water Conservation Areas 1, 2A, and 3A

The WCAs are surface water impoundments located south of Lake Okeechobee and the EAA and are located within Palm Beach, Broward, and Miami-Dade Counties. The WCAs were developed to provide water storage, flood control, and wildlife conservation (SFWMD 2007).

WCAs are primarily grass-dominated wetlands with scattered tree islands and willow strands (USACE and SFWMD 2006).

The three primary types of marsh communities that exist within the WCAs include (1) sawgrass marsh, (2) wet prairie, and (3) aquatic slough, which are described below.

(1) Sawgrass Marsh: Sawgrass marshes are dominated by sawgrass, cattail, maidencane, arrowhead, pickerelweed, Carolina willow, buttonbush *(Cephalanthus occidentalis)*, wax myrtle, and saltbush *(Baccharis baccharis halimifolia.)*.

(2) Wet prairies are typically shallow water areas with short emergent vegetation including beak rush, spikerush (*Eleocharis quadrangulata)*, maidencane, string lily *(Crinum americanum)*, and white waterlily make up the wet prairies.

(3) Aquatic sloughs are typically deeper water areas devoid of emergent vegetation. Vegetation within the aquatic sloughs is primarily floating vegetation such as white waterlily, floating hearts *(Nymphoides aquatica)*, spatterdock, waterhyssop *(Bacopa* spp.*)*, and bladderwort (USACE and SFWMD 2006).

The forested wetlands within the WCAs include both wetland strands and hydric hammocks. Forested wetland strands are dominated by cypress and willow trees. Other species found within this community include pond cypress *(Taxodium ascendens)*, bald cypress *(Taxodium distichum)*, Carolina willow, buttonbush, wax myrtle *(Myrica cerifera)*, sawgrass, and royal fern *(Osmunda regalis)*. Vegetative species associated with the hydric hammocks include sweet bay, red bay *(Persea borbonia)*, cocoplum *(Chrysobalanus icaco)*, strangler fig *(Ficus aurea)*, wax myrtle *(Myrica cerifera)*, Carolina willow, elderberry *(Sambucus nigra)*, hackberry *(Celtis laevigata)*, cabbage palm, red maple *(Acer rubrum)*, false nettle *(Boehmeria cylindrical)*, water oak *(Quercus nigra)*, hornbeam *(Carpinus caroliniana)*, and needle palm *(Rhapidophyllum hystrix)* (USACE and SFWMD 2006).

3.6.4.1 WCA 1 (The Refuge)

The Refuge is located in Palm Beach County and was established in 1951 under the Migratory Bird Conservation Act of 1929 (USFWS undated). This area includes 145,800 acres and is managed under a lease agreement between the SFWMD and DOI. The Refuge is part of the historical Everglades system and is as an important wildlife habitat. Small tree islands, sawgrass, and wet prairie make up the Refuge. The Refuge receives runoff from the EAA through STA 1E and STA 1W at the northern portion of the area. Current inflows are primarily point source discharge and water quality is a main concern. As a result of increased phosphorus in the water column, particularly the canals that border the Refuge to the west, cattails and Carolina willow are prevalent. The Refuge also has approximately 11 percent coverage by exotic plant species, primarily *Melaleuca* sp. and *Lygodium* sp.

3.6.4.2 WCA 2A

WCA 2A is currently made up of drowned tree islands, open water sloughs, large monoculture areas of sawgrass, and sawgrass intermixed with dense cattail strands. Tree islands can be found at higher elevations in the northwestern corner of WCA 2A. Drowned tree islands that result from water control are dominated by Carolina willow and are scattered throughout the central and southern sections of WCA 2A. Altered hydroperiods have promoted sawgrass encroachment into traditional sloughs and wet prairies. The northeastern portion of WCA 2A exhibits more than 50 percent cattail coverage (USACE and SFWMD 2006). Cattails have been shown to out-compete sawgrass in high nutrient waters and higher water conditions, as documented in WCA 2A (USACE 2006).

3.6.4.3 WCA 3A

Vegetative communities typical of the historical Everglades ecosystem exist within the central and southern portions of WCA 3A. These areas of WCA 3A are a mosaic of tree islands, wet prairies, sawgrass stands, and aquatic sloughs (USACE and SFWMD 2006). In the northern portion of WCA 3A, shortened hydroperiods that result from improvements to the Miami Canal and the surrounding levees have increased the frequency of severe peat fires. The historical mosaic of tree islands, aquatic sloughs, and wet prairie habitats has transitioned to a sawgrass monoculture (USACE 2006). Additionally, upland species such as saltbush, dog fennel *(Eupatorium* spp.*)*, and broomsedge *(Andropogon virginicus)* have invaded this area. Melaleuca has become established in the southeastern corner of WCA 3A and is spreading to the north and west (USACE and SFWMD 2006). Elevated water levels occur in southern WCA 3A as a result of the sloping topography from north to south creating more slough habitat than typical wet prairie habitat. Elevated water levels in southern WCA 3A are also the result of insufficient conveyance across Tamiami Trail into ENP.

3.6.5 Everglades Agricultural Area

Until the 1930s, vast pond apple (Annona galabra) swamps existed south of Lake Okeechobee where the Okeechobee gourd (Cucurbita okeechobeensis spp. Okeechobeensis small) commonly grew (Small 1930, as cited in USFWS 1999). Most of the pond apple swamps and sawgrass marshes that once existed south of Lake Okeechobee have been converted to agricultural fields. The native plant communities that remain in the EAA are highly disturbed.

3.6.5.1 Aquatic

Open water areas encompass 17 percent of the EAA (USACE 2006). Water in the EAA is managed to provide flood protection, irrigation, and fresh water for the EAA and surrounding environmentally sensitive areas through a series of canals, levees, culverts, gates, and pumps (USACE and SFWMD 2004). The primary canals that carry water from Lake Okeechobee to

the WCAs include the West Boundary, Hillsboro (L14-15), North New River (L-18-20), West Palm Beach (L-10, L-12, L-7 EXT), and L-8 Canals. There are also a series of secondary canals, smaller canals that connect primary canals, and agricultural canals that provide water management for individual farming operations. Vegetation along canal banks includes common ragweed (*Ambrosia artemisiifolia)*, beggar tick (*Bidens alba)*, frog fruit (*Phyla nodiflora*), torpedograss, smutgrass (*Sporobolus indicus*), sugar cane (*Saccharum officinarum*), Brazilian pepper, saltbush, and castor bean (*Ricunus communis*) (URS 2007b). The primary canals in the EAA are maintained free of vegetation to allow for the desired water flows; however, aquatic vegetation such as water hyacinth, water lettuce, and duckweed may be present in the water (URS 2007b).

3.6.5.2 Wetlands

Typical wetlands within the EAA include marshes with maidencane, arrowhead, pickerelweed, primrose willow *(Ludwigia peruviana)*, Brazilian pepper, baccharis *(Baccharis* spp.*)*, torpedograss, paragrass *(Urochloa mutica)*, and limpograss *(Hemarthria altissima)* (USACE and SFWMD 2006). Atypical agricultural wetlands are active and fallow agricultural fields that exhibit positive indicators of hydric soils and wetland hydrology but are lacking wetland vegetation. These atypical wetlands represent the majority of wetlands in the EAA (USACE 2006).

3.6.5.3 Uplands

Upland communities include dry prairie, hardwood hammock and forests, pinelands, and mixed hardwood pine forests. Dry prairies are plains with a dense ground cover of wiregrass, saw palmetto, and other grasses, herbs, and low shrubs and are virtually treeless. Trees in hardwood hammocks and forests in the EAA include laural and live oaks (*Quercqus laurifolia and virginiana*), with a shrubby subcanopy including wild coffee (*Psychotria nervosa*) and wax myrtle (*Myrica cerifera*). Pinelands are typically open canopy forests with a canopy of pines, a patchy understory of tropical and temperate shrubs and palms, and a ground cover of grasses and herbs. Uplands cover only 0.08 percent (486 acres) of the entire EAA (USACE and SFWMD 2006).

3.6.5.4 Disturbed Communities

The EAA has largely been converted to agricultural lands and has been degraded by encroachment of invasive plant species. Agricultural lands include pasture, row crops, sugar cane, citrus, and other uses. Shrub and brushland and exotic plant communities are also included within this disturbed communities group. Disturbed communities make up 69.5 percent of the EAA (USACE 2006), with the majority consisting of sugar cane (USACE and SFWMD 2006). As discussed in 3.6.5.2 above, some of the agricultural lands in the EAA are considered atypical wetlands.

3.6.6 Compartments B and C

Based on the SFWMD September 2007 final wetland evaluation report (URS 2007b), 9 upland and 10 wetland communities were identified within and adjacent to the Compartments B and C Project study areas. These communities are identified in Table 3-5, and the locations are shown in Figures 3-9a and 3-9b.

The Compartment B Build-out is located in southern Palm Beach County and consists of 6,700 acres of effective treatment area. This parcel comprises man-made open water ponds, agricultural ditches and canals, freshwater marshes, atypical wetlands, and upland communities.

The Compartment C build-out is located in Hendry County and consists of 6,200 acres of effective treatment area and is located west of the RWMA (URS 2007a,b). Compartment C includes man-made open water ponds, agricultural ditches and canals, freshwater marshes, scrub-shrub wetlands, atypical wetlands, and uplands. Note: Final acreages and Uniform Mitigation Assessment Method (UMAM) scores will be updated for Compartments B and C for the Final EIS.

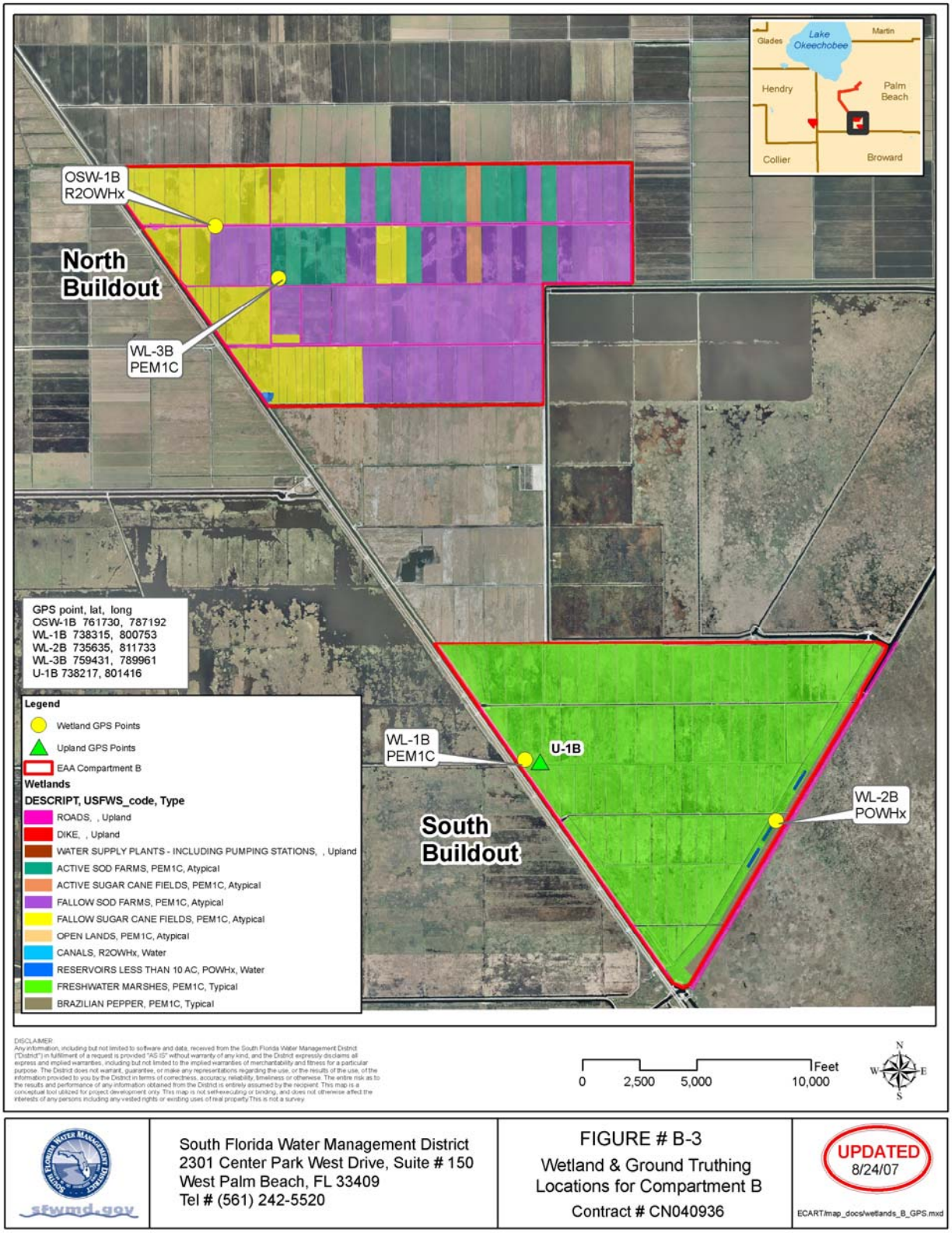
Table 3-5. Land Use Habitats within the Project Boundaries

FLUCFCS[1/]	USFWS Classification[2/]	Description[1/]	Comp B (%)	Comp C (%)
260	Not Applicable	Field Crops	-	-
261	Not Applicable	Sod Farms	-	5.00
329	Not Applicable	Other Shrubs and Brush	-	0.001
747	Not Applicable	Fallow Crop Land	0.70	1.27
814	Not Applicable	Roads and Highways	1.70	1.00
Subtotal			**2.40%**	**7.27%**
215	Palustrine, Emergent, Persistent, Seasonally Flooded	Field Crops	0.70	-
242	Palustrine, Emergent, Persistent, Seasonally Flooded	Sod Farms	6.50	-
260	Palustrine, Emergent, Persistent, Seasonally Flooded	Other Open Lands (Rural)	0.50	0.02
261	Palustrine, Emergent, Persistent, Seasonally Flooded	Fallow Crop Land	49.60	55.30
422	Palustrine, Scrub-Shrub, Broad Leaved Evergreen, Seasonally Flooded	Brazilian Pepper	0.80	-
510	Riverine, Lower Perennial, Open Water/Unknown Bottom, Permanently Flooded, Excavated	Streams and Waterways	4.50	6.00
534	Palustrine, Open Water/Unknown Bottom, Permanently Flooded, Excavated)	Reservoirs Less than 10 acres	0.10	0.01
631	Palustrine, Scrub-Shrub, Broad Leaved Deciduous, Seasonally Flooded	Wetland Scrub	-	5.00
641	Palustrine, Emergent, Persistent, Seasonally Flooded	Freshwater Marsh	34.90	26.40
Subtotal			**97.60%**	**92.73%**

Notes:
[1/] Florida Department of Transportation 1999.
[2/] Cowardin et al. 1979.

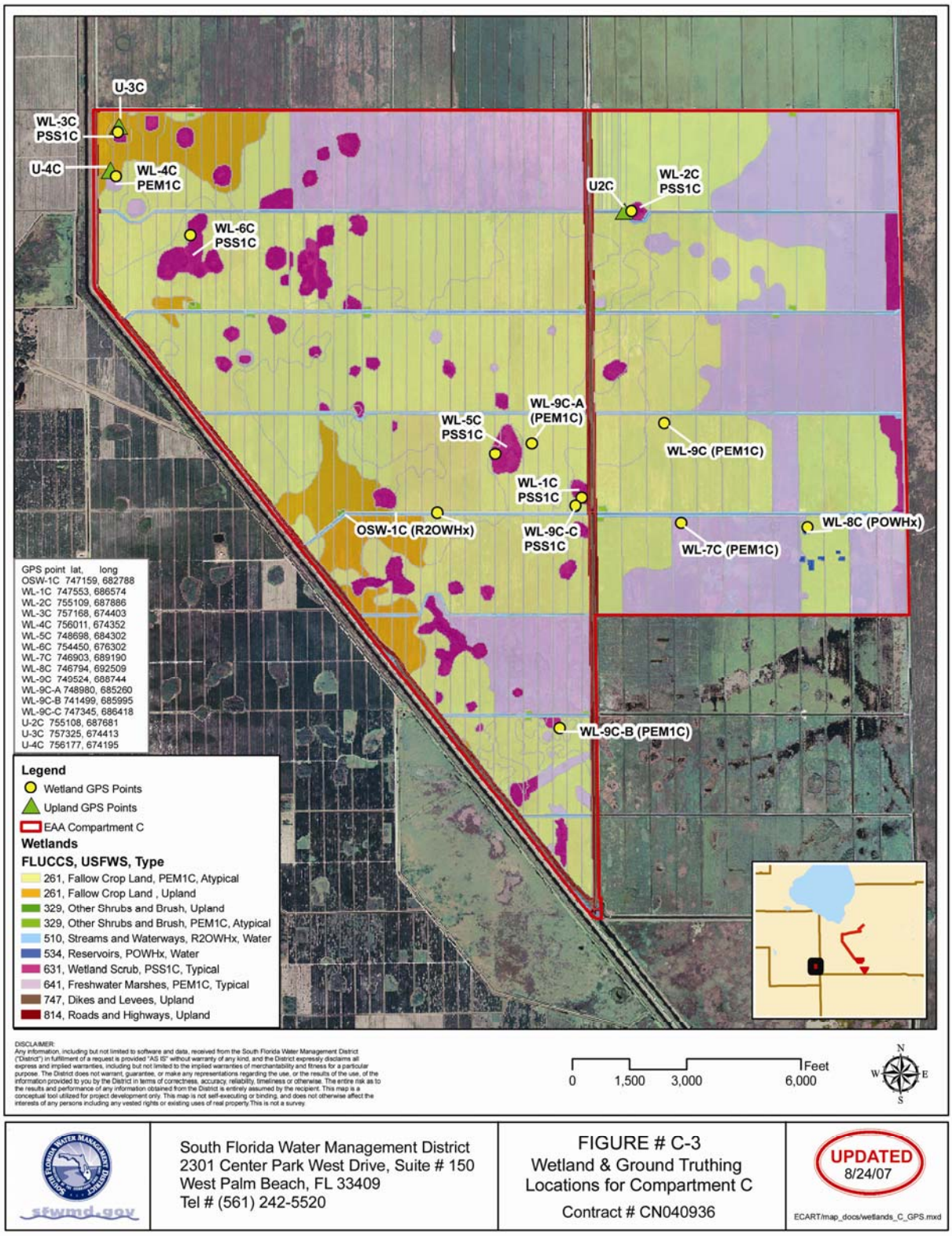
Source: URS 2007a,b

Figure 3-9a. Habitat Classifications Compartment B



sfwmd.gov	South Florida Water Management District 2301 Center Park West Drive, Suite # 150 West Palm Beach, FL 33409 Tel # (561) 242-5520	FIGURE # B-3 Wetland & Ground Truthing Locations for Compartment B Contract # CN040936	UPDATED 8/24/07 ECART/map_docs/wetlands_B_GPS.mxd

Figure 3-9b. Habitat Classifications Compartment C



3.6.6.1 Aquatic

Compartment B—Three man-made, isolated lakes (totaling 13 acres) are located within the southern section of Compartment B and adjacent to a large freshwater marsh. These lakes are mainly open water with a vegetated littoral zone.

A total of 319 acres of agricultural ditches and canals run north to south and east to west within Compartment B. Open water dominates the center channel, with less than 1 percent coverage of floating vegetation such as water hyacinth and water lettuce. Canal banks are vegetated herbaceous and shrubby vegetation including common ragweed, frogfruit, torpedograss, smutgrass, beggar tick, saltbush, Brazilian pepper, and castor bean.

Compartment C—Six man-made reservoirs (totaling 4.4 acres), sparsely vegetated with cattails, are located within the southeast corner of Compartment C. Compartment C is also divided by a series of man-made agricultural canals and ditches, totaling 365 acres that run north to south and east to west in a grid pattern. Dominant vegetation within the open water portion of the canals consists of water hyacinth, water lettuce, and torpedograss. Beggar's tick, ragweed, dog fennel, and sugar cane occur on the banks.

3.6.6.2 Wetlands

Compartment B—The SBO of Compartment B contains a 3,217-acre freshwater herbaceous wetland dominated by cattail interspersed with several isolated open-water ponds. Other vegetative species observed within this marsh system includes primrose willow, Brazilian pepper, Carolina willow, saltbush, torpedograss, common ragweed, and flat sedge (*Cyperus* spp.).

The NBO of Compartment B contains 4,049 acres of atypical wetlands, consisting of active and fallow sugar cane, sod farms, open lands, and Brazilian pepper. Dominant vegetation within these wetlands consists of sugar cane, Brazilian pepper, various turfgrasses, and bahiagrass (*Paspalum notatum).*

UMAM (Chapter 62-345 FAC) was applied to evaluate the quality of the wetlands within Compartments B and C. UMAM scores of 0.50 for the marsh and 0.23 for the atypical wetlands were presented and evaluated by the USACE, and the SFWMD, in April 2007. Interpretation of the UMAM scores indicates that the freshwater marsh has substantially better function and value including fish and wildlife habitat than the atypical wetlands and provides approximately 50 percent of the function and value of a fully functioning Everglades marsh system.

Compartment C—There are several scrub-shrub wetlands within Compartment C, totaling 317 acres. The dominant vegetation within these wetlands include Carolina willow, primrose willow, saltbush *(Baccharis halimifolia)*, cattail, Brazilian pepper, and elderberry (*Sambucus*

canadensis), with an understory of nuttall thistle (*Cirsium nuttallii)*, bog hemp (*Boehmeria cylindrical)*, smartweed (*Polygonum aviculare)*, arrowhead, and para grass.

A total of 1,689 acres of freshwater marshes are present within Compartment C. These herbaceous wetlands are dominated by maidencane, smartweed, arrowhead, thistle *Cirsium* spp.*)*, purple loosestrife *(Lythrum alatum)*, button bush, camphorweed, nuttail thistle, dog fennel, and wild taro *(Colocasia esculenta)*. Several of these features contained an outer fringe of Carolina willow, Brazilian pepper, and elderberry. Wild taro dominates the northwest section of Compartment C. Compartment C also contains 3,544 acres of atypical wetlands, consisting of fallow sugar cane, located on hydric soils.

Florida UMAM scores of 0.47 for the scrub-shrub, 0.37 for the marsh, and 0.20 for the atypical wetlands were assessed by the interagency team. Interpretation of the UMAM scores indicates that the scrub-shrub and marsh wetlands provide substantially better function and value including fish and wildlife habitat than the atypical wetlands, but provide less than 50 percent of the function and value of a fully functioning Everglades marsh scrub system.

3.6.6.3 Uplands

Compartment B—Upland areas (193 acres) exist adjacent to roads that previously accommodated equipment or structures or on canal bank levees. Dog fennel and low-growing herbaceous species such as beggar's tick, bahiagrass, and bermudagrass (*Cynodon dactylon)* are now present in these areas.

Compartment C—Many upland areas (476 acres) exist adjacent to roads that previously accommodated equipment or structures or on canal bank levees. Dog fennel and low-growing herbaceous species such as beggar's tick, bahiagrass, and Bermuda grass are now present in these areas. Compartment C also contains a small amount of agricultural fields that lack positive indicators of hydric soils and wetland hydrology. As such these fields are classified as uplands.

3.6.7 Alternative Lands

Alternative lands being considered to meet the project purpose are active or fallow cropland that contains marshes, ditches, and access roads. Lands west of STA 1W are located in the EAA and would consist of agricultural lands with a network of ditches and canals and uplands adjacent to canal banks or roads. Because specific lands have not been designated, it is not known whether the agricultural fields would be considered atypical wetlands or non-jurisdictional uplands. Vegetative communities for the EAA are further discussed in section 3.6.5 above.

Alternative lands east of STA 1E include Acme Basin B-Section 24, which is discussed in this section. The following information on Acme Basin B-Section 24 is from the SFWMD Draft Environmental Assessment for DA permit application SAJ-2004-3561 (SFWMD 2006).

3.6.7.1 Aquatic

Acme Basin B-Section 24—23.80 acres of canals/ditches are present in Acme Basin B-Section 24. Three main east-west canals are present at the north border, south of border, and center of the property are connected by a series of smaller ditches running north-south. Vegetation within the canals/ditches include water lettuce and cattails in deeper areas and other herbaceous wetland plant species, such as maidencane and smartweed, in shallower areas.

3.6.7.2 Wetlands

Acme Basin B-Section 24—66.80 acres of herbaceous wetlands and atypical wetlands are in Acme Basin B-Section 24. The 66.80 acres of herbaceous wetlands are dominated by herbaceous wetland vegetation including maidencane, smartweed, pinebarren flatsedge (*Cyperus retorsus*), torpedo grass, and rosy camphorweed (*Pluchea rosea*). Other vegetation includes dog fennel and bahiagrass. The remaining agricultural fields are a-typical wetlands with muck soils and vegetative cover of beans that were previously cultivated, bahiagrass, southern crabgrass (*Digitaria ciliaris*), common purslane (*Portulaca oleracea*), and Mexican tea (*Chenopodium ambrosioides*)

3.6.7.3 Uplands

Acme Basin B-Section 24—Uplands in Acme Basin B-Section 24 are mainly the banks of perimeter canals that contain Melaleuca, Brazilian pepper, and torpedo grass.

3.7 FISH AND WILDLIFE

The Everglades and associated areas provide habitat for a variety of fish and wildlife species, including wading birds, amphibians, reptiles, mammals, insects, and invertebrates. Table 3-6 at the end of the section on fish and wildlife provides a list of fish and wildlife species documented during studies conducted within the study area or that are expected to occur within the geographic regions identified. The scientific name of each fish and wildlife species is listed in Table 3-6 rather than in the text of this section. The affected areas discussed in this section include Lake Okeechobee, the Northern Estuaries, Lake Worth Lagoon, the EAA, WCAs, Compartment B, Compartment C, and Alternative Lands.

3.7.1 Lake Okeechobee

Lake Okeechobee and surrounding areas provide shelter and foraging habitat for a wide variety of fish and wildlife, including wading and migratory birds, mammals, amphibians, reptiles, and prey species such as crayfish *(Cambarus* spp.*)*, prawns (*Macrobrachium* spp.*)*, apple snails *(Pomacea paludosa)*, and aquatic insects. USACE conducted a wildlife survey within the western littoral zone of the lake as part of the Lake Okeechobee Regulation Schedule Study EIS (USACE 1999). Baseline data were gathered for reptiles, amphibians, and migratory and resident birds in key habitat types.

3.7.1.1 Fish and Aquatic Resources

Numerous ecologically and commercially important fish species were observed during the 1999 USACE survey of the western littoral zone (USACE 1999). Cyprinodontids such as the golden topminnow, the least killifish, and the American/Florida flagfish are important food resources for wading birds, amphibians, and reptiles. Commercially significant fish species included white catfish, bluegill, redear sunfish, largemouth bass, and black crappie. Farther offshore in the upper regions of the water column, where light penetrates the water (the limnetic zone), species include threadfin shad, black crappie, Florida gar, gizzard shad, white catfish, redear sunfish, and bluegill (Bull et al. 1995).

Lake Okeechobee fishing reports indicate that sport and forage fish populations are declining. The FFWCC trawl sampling catches for 2006 have resulted in the lowest black crappie numbers since sampling began for this species began in 1973 (FFWCC 2006a), and young-of-the-year bass were all but absent, with one collected in 16 hours of electro-fishing (FFWCC 2006b). The public and recreational fishermen report that shiners *(Luxilus cornutus)*, an important bait fish, are becoming more difficult to find (USACE 2006). Declining numbers of important fish species are likely a result of habitat loss. Bulrush, spikerush, peppergrass, and other SAV that provide valuable fish habitat have been lost or replaced by exotic species such as torpedograss and hydrilla (USACE 2006).

The macroinvertebrate species observed within the region included apple snail (*Pomacea paludosa*), crayfish, grass shrimp (*Palaemonetes* spp.), and Dytiscid beetles that are all vital components the food web (USACE 2006). The apple snail is the primary food source of the federally endangered everglade snail kite (*Rostrhamus sociabilis plumbeus*) and is found in freshwater marshes and shallow vegetated littoral zones of lakes. Apple snails feed, breed, and lay eggs on emergent vegetation in waterbodies that are flooded continuously for longer than 1 year (USFWS 1999). Several factors can affect apple snail distributions in Lake Okeechobee, including (1) high water levels that drown or erode wetland vegetation, (2) low water levels that dry out littoral zones, and (3) high nutrient levels that allow invasive plant species to out-compete native vegetation.

3.7.1.2 Wildlife

A number of bird species use the western littoral zone of the lake for foraging and nesting habitat. Studies have recorded birds such as wood stork, snail kite, great blue heron, white ibis, pied-billed grebe, great egret, snowy egret, little blue heron, tricolored heron, and common moorhen in the western littoral zone (Smith and Collopy 1995; David 1994). The littoral zone may also be used by the bald eagle, black skimmer, brown pelican, American white pelican, double-crested cormorant, and anhinga (USACE 2006).

Amphibian and reptile diversity is high in the lake littoral zone (USACE 1999). Amphibians present include the southern leopard frog, the green tree frog, and the squirrel tree frog. The southern leopard frog can be found in shallow freshwater habitats with dense vegetation for camouflage. The two species of tree frogs prefer wet hammocks, marshes, mixed hardwood swamps, and cypress swamps. The greater siren is a nocturnal eel-like amphibian that spends the day under debris or burrowed in mud or thick vegetation. The greater siren feeds on annelid worms, insects, snails, and small fish.

Reptiles observed include green water snake, banded water snake, American alligator, and Florida soft-shelled turtle. Non-native species of lizards, such as the green iguana (*Iguana iguana*), the spiny-tailed iguana, and the brown basilisk have been noted by local residents (USACE 1999). Habitat for the green water snake includes water with dense vegetation, weed-choked marshes, hyacinth-choked waterways, and grassy areas around ponds, lakes, and along canals. The banded water snake prefers the shallow waters of swamps, marshes, ponds, and lakes.

Mammals observed within or around the lake include West Indian manatee, river otters, bobcats, and Florida water rats or round-tailed muskrat. The manatee occurs within the Okeechobee Waterway (a channel system that runs along the perimeter of Lake Okeechobee, and includes a channel through the lake as well) (USACE 2006). Manatees consume several hundred pounds of vegetation daily from shallow waters and near shorelines. The river otter feeds on fish, small mammals, and terrestrial and aquatic invertebrates. Bobcats are found in forests, swamps, and hammocks and feed on rodents, reptiles, birds, and insects. The Florida round-tailed muskrat inhabits shallow grassy freshwater marshes, such as dense stands of maidencane and pickerelweed. These rats are herbivores that eat roots and stems of aquatic and semiaquatic vegetation, such as arrowhead, pickerelweed, waterlily, maidencane, sedges, and grasses.

3.7.2 Northern Estuaries and Lake Worth Lagoon

The Northern Estuaries and the Lake Worth Lagoon are discussed together in the following sections due to the similarities of fish and wildlife within these regions. The Northern

Estuaries include the St. Lucie Estuary, which flows into the southern end of the Indian River Lagoon, and the Caloosahatchee Estuary. Salt marshes, mangroves, and seagrass beds provide important habitat within the Northern Estuaries, but these habitats are highly disturbed and altered by development, dredge and fill, runoff, and freshwater releases from Lake Okeechobee. The result of these activities are changes in salinity and in dissolved oxygen content, increased turbidity, and nutrification in the estuaries (SFWMD 2005), which lead to lower species diversity. Species diversity is highest at inlets that receive full tidal flushing and lower in areas that experience freshwater inputs, sedimentation, and turbidity, and where natural habitats have been lost (USACE 1999).

3.7.2.1 Fish and Aquatic Resources

Minnows, bullhead catfish, and sunfish are the dominating freshwater fish recorded within the lagoon system. These species were found in the tributary streams, including the streams that feed the St. Lucie (USACE 1999). Several other fish species documented in this region are provided in Table 3-5. Fish species in the creek-mouth habitats included yellowfin, menhaden, gulf killifish, striped killifish, mosquitofish, sailfin molly, lined tarpon, snook, and many others (USACE 2006).

The estuaries and Indian River Lagoon are home to a number of shellfish, including blue crabs, stone crabs, hard clams, and oysters. These shellfish are all important commercial species. Oysters are an indicator species because they are extremely sensitive to changes in salinity (USACE 2006).

Aquatic resources within the Caloosahatchee River Estuary include seagrasses, oyster beds, open bottom community, and mangrove-lined shorelines that are important habitat for many species. Manatees, sea turtles, fish, waterfowl, and wading birds feed in seagrass habitats. Seagrass communities also provide a nursery for a variety of fish and shellfish. Oyster bars provide important habitat for a large number of species, improve water quality, and stabilize bottom areas. Open bottom communities contain macroinvertebrates that provide food for wading birds, shorebirds, and fish. Red mangroves support fish and macroinvertebrate communities by providing a protected nursery area. Species that use red mangrove roots during a portion of their life cycle include snook, snapper, tarpon, jack, sheepshead, red drum, ladyfish, blue crab, and shrimp (USACE 2006).

3.7.2.2 Wildlife

Manatees, waterfowl, wading birds, and shorebirds use the Northern Estuaries for foraging and nesting. Mangrove forests within the Caloosahatchee Estuary, St. Lucie Estuary, and Indian River Lagoon provide foraging and nesting habitat for a variety of bird species. The shallow waters and exposed mudflats of the mangroves make this habitat ideal for probing shoreline birds, such as plovers and sandpipers. Long-legged wading birds, such as herons,

egrets, bitterns, spoonbills, limpkins, and ibis, use these and deeper waters along mangrove-lined waterways to search for food. Permanent and migratory birds of prey such as the southern bald eagle, osprey, and peregrine falcon depend on mangroves in south Florida. The bald eagle (state threatened) and osprey (state species of special concern) feed extensively on the fishes that occur in mangrove wetlands. Numerous federal and state listed avian species nest within the mangrove tree canopies of the Northern Estuaries, including wood storks, limpkins, white ibis, reddish egret, tricolored herons, southern bald eagle, and osprey (USACE 2006).

Marine mammals found along mangrove-lined waterways include the bottlenose dolphins and federally endangered West Indian manatee. The diet of bottlenose dolphins consists of fishes associated with mangrove systems, and manatees feed on seagrasses and other submerged aquatic plants often found associated with mangroves. Manatees are also frequently observed swimming in canals, coastal rivers, and other waters close to mangroves (Florida Museum of Natural History 2007).

3.7.3 Water Conservation Areas

The WCAs are inhabited by a number of wildlife species that are affected by the fluctuating water levels within these systems. Many important species of fish and wildlife use the WCAs for foraging and nesting; the WCAs are designated critical habitat for the federally endangered Everglade snail kite. WCAs are primarily dominated by grass wetlands, tree islands, and willow stands (USACE 2006). Unseasonal fluctuations in water level may affect the availability of foraging or nesting habitat for these species.

3.7.3.1 Fish and Aquatic Resources

The fish community in the WCAs includes both forage fish and sportfish. Forage fish species include the American/Florida flagfish, bluefin killifish, least killifish, shiners, mosquito fish, and sailfin molly. Sportfish are mainly present in canals surrounding marshes (USACE 1999) and consist of largemouth bass, sunfish, oscar, gar, bowfin, and catfish (USACE 2006). Fish community structures depend on water levels (USACE 1999). During dry periods, fish concentrate in deeper canals and then disperse into wetlands when water levels are elevated. Fish in the WCAs are prey for many wading birds, birds of prey, reptiles, mammals, and larger fish.

3.7.3.2 Wildlife

The WCAs are important feeding and nesting areas for wading birds and other water birds, including herons and egrets, two species of ibis, wood stork, roseate spoonbill, and of the endangered snail kite, which is further discussed in the threatened and endangered species section (section 3.8). Yellow and black crowned night herons, limpkins, bitterns, common

snipe, anhingas, and many resident and migratory waterfowl have also been observed within the WCAs. Based on aerial surveys, the white ibis, great egret, great blue heron, wood stork, little blue heron, snowy egret, cattle egret, and glossy ibis are the most common wading bird species within the WCAs (USACE 2006). Wading bird numbers are highest during January when the water levels are receding and concentrating prey in the wetlands. Waterfowl such as the blue-winged teal and mottled duck can be found in deeper sloughs.

Wading bird populations in south Florida have declined, mostly as a result of the loss of suitable wetland habitat from development, degraded water quality, and water management practices. It is estimated that wading bird populations have decreased 85 to 90 percent through changes in the ecological integrity of habitats from water management (C&SF Restudy 1999, as cited in USGS undated). Wading birds nest in mixed-species colonies close to productive feeding areas (Smith 1995) and over water to reduce predation from terrestrial predators and possibly as protection from fire (SFWMD 1999).

In the greater Everglades region (WCAs and ENP), wading bird nesting success in 2007 decreased approximately 36 percent from 2006 and 50 percent from 2002 (Sklar et al. 2007). The number of wood stork, tricolored heron, and snowy egret nests in 2007 declined more than 85 percent, and white ibis nesting declined 21 percent from 2006 counts. Wading birds are adapted to foraging in shallow waters of coastal and freshwater wetlands and waters. Wading birds require waters shallow enough to concentrate prey items but deep enough to support prey items for foraging to be effective, especially during nesting season (Kushlan 1976; Custer and Osborne 1978). Dry conditions in 2007, which resulted in a reduction of foraging habitat and increased predation from terrestrial predators, are believed to be the primary cause for these recent declines (Sklar et al. 2007). A nesting site, Alley North, located in northeast WCA 3A, was not used in 2007, where in past years it supported one of the larger rookeries in south Florida. Abandonment of the Alley North rookery may have lead to the increase in nesting documented in the Refuge. In addition to the 2007 drought, prey densities were low in WCAs 2A and 3A because of a long 2006 dry season; therefore, foraging conditions were not optimal.

Reptiles that inhabit the WCAs include American alligator and many species of turtles, lizards, and snakes. The American alligator performs a valuable ecological function by creating and maintaining depressions in the muck, which provide a sanctuary for aquatic organisms during drought and concentrates food sources for wading birds (Woodard et al. 1989). Turtles found in the WCAs include snapping turtle, striped mud turtle, cooter, Florida chicken turtle, and Florida softshell turtle (SFWMD 2006). The green anole can be found in the central Everglades, and other skinks are generally observed in the terrestrial habitats. Florida brown snake, southern ringneck snake, southern black racer, scarlet snake, eastern

indigo, Florida pine snake, diamondback rattlesnake, and pigmy rattlesnake can be found in the drier habitats. Snakes found in wetland habitats include the water snake, green water snakes, mud snake, eastern garter snake, ribbon snake, rat snake, and Florida cottonmouth (Pritchard 1978).

Amphibians include the Everglades bullfrog, Florida cricket frog, southern leopard frog, southern chorus frog, narrow-mouth toad, and various tree frogs. Salamanders, such as the greater siren and the Everglades dwarf siren, can be observed in the densely vegetated, still, or slow-moving waters of the sawgrass marshes and wet prairies (USACE 2006).

Mammals observed in the WCAs include white-tailed deer, the endangered Florida panther, and the marsh rabbit. Dry habitats and tree islands may provide habitat for feral hogs (USACE 2006).

3.7.4 Everglades Agricultural Area

The EAA is dominated by disturbed habitats, primarily consisting of active or fallow agricultural lands. Although they are not a natural community, agricultural lands provide foraging and nesting habitat for some species. The EAA also contains wetlands and surface waters that provide some native habitat for fish and wildlife species. Published research is lacking for fish and wildlife studies within the EAA (USACE 2006). The RWMA and HLWMA provide the primary habitat for fish and wildlife within the EAA. Totaling 64,110 acres, these WMAs are made up of Everglades marsh wetlands that have been altered by changes to the natural hydroperiod and excessive nutrient inputs from agricultural production in the EAA. Note: Final acreages and UMAM scores will be updated for Compartments B and C for the Draft Final EIS.

3.7.4.1 Fish and Aquatic Resources

Fish communities in the EAA occur in the man-made canals, ditches, and ponds and the WMAs. Common fish species include largemouth bass, mosquitofish, bluefin killifish, bowfin, Florida gar, and sunfish.

3.7.4.2 Wildlife

Birds found in the aquatic and wetland habitats of the EAA include ducks, wading birds, great terns, passerines, and raptors. Herbaceous wetland habitats attract many species of birds, such as the common yellowthroat, red-winged blackbird, boat-tailed grackle, least bittern, king rail, green heron, limpkin, Everglade snail kite, and red-tailed hawk. Woody swamps provide habitat for the barred owl, pileated woodpecker, red-bellied woodpecker, white-eyed vireo, yellow-rumped warbler, and red-shouldered hawk. Open dry prairies attract birds such as the common ground dove, eastern meadowlark, and crested caracara (USACE 2006).

American alligator is one of the more common reptiles in open water areas of the EAA. Water moccasins, water snakes, Florida cooters, southern leopard frog, and green tree frog inhabit herbaceous wetlands. The rough green snake, eastern indigo, water moccasin, and southern toad *(Bufo terrestris)* are common in woody swamps (USACE 2006).

Mammals that are typically found within the aquatic and wetland habitats of the EAA include many of the mammals listed in Table 3-5. River otters are able to traverse over land and therefore may be found in many different aquatic habitats. Mammals found within forested and shrub swamps and dry prairies include white-tailed deer, marsh rabbit, Florida panther, cotton mouse, raccoon, fox squirrel, and Florida black bear. Raccoons and Florida panthers are also known to inhabit dry prairies (USACE 2006).

In the past, manatees have entered the EAA canal; however, the recent installation of manatee barriers at water control structures S-351, S-352, and S-354 preclude manatee from entering. Additionally, provisions have been made to release manatees that have become trapped behind the barriers after they were installed, so manatees are not expected to occur within the EAA since these barriers were put in place.

3.7.5 Compartment B

The primary communities in the Compartment B Build-out footprint that provide habitat for fish and wildlife include man-made open water ponds and canals and wetlands. Wetlands include both typical native Everglades wetlands in the SBO and atypical wetlands, which are active or fallow agricultural fields that exhibit hydric soils and wetland hydrology but that are lacking wetland vegetation in the NBO.

3.7.5.1 Fish and Aquatic Resources

Three man-made, isolated lakes (totaling 13 acres) are located within the southern section of Compartment B, and a total of 319 acres of agricultural ditches and canals run north to south and east to west within Compartment B. It is anticipated that these surface water features contain common fish species, including largemouth bass, mosquitofish, bluefin killifish, bowfin, Florida gar, and sunfish.

3.7.5.2 Wildlife

The freshwater marshes and vegetated littoral zones of ponds and canals in Compartment B provide foraging habitat for wading bird species. Species observed in these habitats include wood storks, little blue heron, white ibis, tricolored herons, snowy egret, yellow-crowned night heron, and roseate spoonbill. An American alligator was observed in one of the lake reservoirs. Although the habitat value of atypical wetlands is less than of natural wetlands, they provide some wildlife value. Birds observed using sod farms in Compartment B include wood storks and white ibis.

3.7.6 Compartment C

The Compartment C Build-out footprint provides habitat for fish and wildlife within its surface waters and wetlands. These communities include man-made open water ponds and canals and both natural and atypical wetlands.

3.7.6.1 Fish and Aquatic Resources

Six man-made reservoirs (totaling 4.4 acres) and a series of man-made agricultural canals and ditches (totaling 365 acres) are present within Compartment C. It is anticipated that these surface water features contain common smaller fish species, such as mosquitofish, bluefin killifish, bowfin, and sunfish.

3.7.6.2 Wildlife

Freshwater marshes typically offer foraging habitat for wading birds; however, during the 2007 URS wildlife surveys (Appendix C) the freshwater marshes in Compartment C were dry, and wading birds were not using this area. The wading birds were observed foraging in the ditches and canals. Species observed in Compartment C include wood stork, little blue heron, white ibis, tricolored heron, snowy egret, great egret, yellow-crowned night heron, and roseate spoonbill. The wetland scrub offers habitat for wild hog and white-tailed deer that are prey for the endangered Florida panther. Alligators were also observed on the banks of and in waters.

Although the habitat value of atypical wetlands is less than that of typical wetlands, these areas provide habitat for various birds, small mammals, and reptiles (Table 3-5). Audubon's crested caracara prefers open upland communities but may also forage in certain atypical wetlands, such as the fallow solid fields in the NBO. During the wildlife evaluation study, a crested caracara was observed flying over a portion of Compartment C and landing on a levee adjacent to Compartment C during 1 of the 7 days of field work. The eastern indigo snake may inhabit upland areas of fallow cropland throughout Compartment C (Easley and Murray 2007).

3.7.7 Alternative Lands

The Alternative Lands considered provide minimal habitat for fish and wildlife within surface waters and wetlands. Alternative lands west of STA 1W are located in the EAA and fish and wildlife for this area are described in section 3.7.4 above. Alternative lands east of STA 1E include Acme Basin B-Section 24, which is discussed in this section. The following information on Acme Basin B-Section 24 is from the SFWMD Draft Environmental Assessment for DA permit application SAJ-2004-3561 (SFWMD 2006).

These communities include man-made canals and ditches, marsh wetlands dominated by herbaceous vegetation, and atypical wetlands.

3.7.7.1 Fish and Aquatic Resources

Canals within the Alternative Lands provide minimal habitat for fish species typical of the EAA such as the golden topminnow, bluefin killifish, sailfin molly, mosquitofish, and flagfish. Macro invertebrates anticipated include amphipods, freshwater prawn, crayfish, and apple snails. Wading birds and prey birds would be expected in these canals foraging on these prey species.

3.7.7.2 Wildlife

The marshes in Acme Basin B-Section 24 provide habitat for macroinvertebrates and are foraging areas for birds. Although the habitat value of atypical wetlands is less than that of typical wetlands, these areas provide habitat for various birds, small mammals, and reptiles (Table 3-5). The same species would be anticipated in other Alternative Lands since the features of the land are similar and they are located in the same region.

Bird species observed in Acme Basin B-Section 24 include anhinga, green-backed heron, brown-crowned night heron, boat-tailed grackle, long-billed marsh wren, limpkin, red-winged blackbird, American bittern, yellowthroat, wood stork, great egret, snowy egret, white eyed this, glossy ibis, great blue heron, tricolored heron, and least bittern. Mammals include raccoons, opossums, river otter, white-tailed deer, rice rat, cotton mouse, hispid cotton rat, and marsh Rabbit. Amphibians include the squirrel tree frog, green tree frog, southern leopard frog, siren, salamander, green anole, read-bellied turtle, mud turtle, alligator, cricket frog, pig frog, peninsular newt, swamp snakes, water snakes, and Florida cottonmouth. (USACE 2004). Other species identified and/or expected in the EAA, but not directly observed in the Alternative Lands, also would be anticipated.

Table 3-6. Species Observed or Expected in the Project-affected Regions Listed Alphabetically by Common Name

		Observed/Expected Occurrence			
Scientific Name	**Common Name**	**Lake Okeechobee**	**Northern Estuaries & Lake Worth Lagoon**	**Water Conservation Areas 1, 2A, 3A**	**Everglades Agricultural Area**
Mammals					
Lynx rufus	Bobcat	X	X	X	X
Tursiops truncatus	Bottlenose dolphin		X		
Peromyscus gossypinus	Cotton mouse	X	X	X	X
Sus scrofa	Feral hogs	X	X	X	X
Ursus americanus	Florida black bear	X	X	X	X

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Scientific Name	**Common Name**	**Lake Okeechobee**	**Northern Estuaries & Lake Worth Lagoon**	**Water Conservation Areas 1, 2A, 3A**	**Everglades Agricultural Area**
floridanus					
Felis concolor coryi	Florida panther	X	X	X	X
Neofiber alleni	Florida water rat	X	X	X	X
Sciurus niger	Fox squirrel	X	X	X	X
Sylvilagus palustris	Marsh rabbit	X	X	X	X
Procyon lotor	Raccoon	X	X	X	X
Lontra canadensis	River otter	X	X	X	X
Trichechus manatus latirostris	West Indian manatee	X	X		
Odocoileus virginianus	White-tailed deer	X	X	X	X
Birds					
Pelecanus erythrorhynchos	American white pelican	X	X		
Anhinga anhinga	Anhinga	X	X	X	X
Haliaeetus leucocephalus	Bald eagle	X	X	X	X
Strix varia	Barred owl	X	X	X	X
Ixobrychus spp.	Bitterns	X	X	X	X
Rynchops niger	Black skimmer	X	X	X	X
Nycticorax nycticorax	Black-crowned night heron	X	X	X	X
Anas discors	Blue-winged teal	X	X	X	X
Quiscalus major	Boat-tailed grackle	X	X	X	X
Pelecanus occidentalis	Brown pelican	X	X		
Ammodramus maritimus mirabilis	Cape Sable seaside sparrow			X	
Bubulcus ibis	Cattle egret	X	X	X	X
Columbina passerine	Common ground dove	X	X	X	X
Gallinula chloropus	Common moorhen	X	X	X	X
Gallinago delicata	Common snipe	X	X	X	X
Geothlypis trichas	Common yellowthroat	X	X	X	X
Caracara plancus audubonii	Crested caracara	X	X	X	X
Phalacrocorax auritus	Double-crested cormorant	X	X	X	X
Sturnella magna	Eastern meadowlark	X	X	X	X
Rostrhamus sociabilis plumbeus	Everglades snail kite	X	X	X	X
Speotyto cunicularia floridana	Florida burrowing owl	X	X	X	X
Grus canadensis pratensis	Florida sandhill crane	X	X	X	X
Plegadis falcinellus	Glossy ibis	X	X	X	X
Ardea Herodias	Great blue heron	X	X	X	X
Ardea alba	Great egret	X	X	X	X
Butorides virescens	Green heron	X	X	X	X

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Scientific Name	**Common Name**	**Lake Okeechobee**	**Northern Estuaries & Lake Worth Lagoon**	**Water Conservation Areas 1, 2A, 3A**	**Everglades Agricultural Area**
Butorides striatus	Green-backed heron	X	X	X	X
Rallus elegans	King rail	X	X	X	X
Sterna antillarum	Least tern	X	X	X	X
Aramus guarauna	Limpkin	X	X	X	X
Egretta caerulea	Little blue heron	X	X	X	X
Anas fulvigula	Mottled duck	X	X	X	X
Pandion haliaetus	Osprey	X	X	X	X
Falco peregrinus	Peregrine falcon	X	X	X	X
Podilymbus podiceps	Pied-billed grebe	X	X	X	X
Dryocopus pileatus	Pileated woodpecker	X	X	X	X
Melanerpes carolinus	Red-bellied woodpecker	X	X	X	X
Egretta rufescens	Reddish egret	X	X	X	X
Buteo lineatus	Red-shouldered hawk	X	X	X	X
Buteo jamaicensis	Red-tailed hawk	X	X	X	X
Agelaius phoeniceus	Red-winged blackbird	X	X	X	X
Ajaia ajaja	Roseate spoonbill	X	X	X	X
Egretta thula	Snowy egret	X	X	X	X
Falco sparverius paulus	Southeastern American kestrel	X	X	X	X
Egretta tricolor	Tricolored heron	X	X	X	X
Eudocimus albus	White ibis	X	X	X	X
Vireo griseus	White-eyed vireo	X	X	X	X
Mycteria Americana	Wood stork	X	X	X	X
Nyctanassa violacea	Yellow-crowned night heron	X	X	X	X
Dendroica coronata	Yellow-rumped warbler	X	X	X	X
Reptiles and Amphibians					
Alligator mississippiensis	American alligator	X	X	X	X
Nerodia fasciata pictiventris	Banded water snake	X	X	X	X
Basiliscus vittatus	Brown basilisk	X	X	X	X
Crotalus adamanteus	Diamondback rattlesnake	X	X	X	X
Thamnophis sirtalis sirtalis	Eastern garter snake	X	X	X	X
Drymarchon coaris couperi	Eastern indigo snake	X	X	X	X
Rana grylio	Everglades bullfrog	X	X	X	X
Pseudobranchus axanthus belli	Everglades dwarf siren	X	X	X	X
Storeria dekayi	Florida brown snake	X	X	X	X
Deirochelys reticularia chrysea	Florida chicken turtle	X	X	X	X
Pseudemys floridana	Florida cooter	X	X	X	X
Agkistrodon piscivorus	Florida cottonmouth	X	X	X	X

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		Observed/Expected Occurrence			
Scientific Name	**Common Name**	**Lake Okeechobee**	**Northern Estuaries & Lake Worth Lagoon**	**Water Conservation Areas 1, 2A, 3A**	**Everglades Agricultural Area**
conanti					
Acris gryllus dorsalis	Florida cricket frog	X	X	X	X
Pituophis melanoleucus	Florida pine snake	X	X	X	X
Apalone ferox	Florida soft-shelled turtle	X	X	X	X
Gopherus polyphemus	Gopher tortoise	X		X	X
Siren lacertina	Greater siren	X	X	X	X
Anolis carolinensis	Green anole	X	X	X	X
Iguana iguana	Green iguana	X	X	X	X
Chelonia mydas	Green sea turtle		X		
Hyla cinerea	Green tree frog	X	X	X	X
Nerodia floridana	Green water snake	X	X	X	X
Eretmochelys imbricata imbricate	Hawksbill sea turtle		X		
Lepidochelys kempii	Kemp's Ridley sea turtle		X		
Dermochelys coriacea	Leatherback sea turtle		X		
Caretta caretta	Loggerhead sea turtle		X		
Farancia abacura	Mud snake	X	X	X	X
Gastrophryne carolinensis	Narrow-mouth toad	X	X	X	X
Sistrurus miliarias barbouri	Pygmy rattlesnake	X	X	X	X
Elaphe obsolete	Rat snake	X	X	X	X
Thamnophis sauritus	Ribbon snake	X	X	X	X
Opheodrys aestivus	Rough green snake	X	X	X	X
Cemophora coccinea	Scarlet snake	X	X	X	X
Eumeces egregious spp.	Skinks	X	X	X	X
Chelydra serpentina osceola	Snapping turtle	X	X	X	X
Coluber constrictor priapus	Southern black racer	X	X	X	X
Pseudacris nigrita nigrita	Southern chorus frog	X	X	X	X
Rana sphenocephala	Southern leopard frog	X	X	X	X
Diadophis punctatus punctatus	Southern ringneck snake	X	X	X	X
Bufo terrestris	Southern toad	X	X	X	X
Ctenosaura similis	Spiny-tailed iguana	X	X	X	X
Hyla squirella	Squirrel tree frog	X	X	X	X
Kinosternon bauri bauri	Striped mud turtle	X	X	X	X
Agkistrodon piscivorus	Water moccasin	X	X	X	X
Fish					
Chloroscombrus chrysurus	Atlantic bumper		X		
Gobiomorus dormitor	Bigmouth sleeper	X	X	X	X
Pomoxis nigromaculatus	Black crappie	X	X	X	X
Lucania goodei	Bluefin killifish	X	X	X	X

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Scientific Name	**Common Name**	**Lake Okeechobee**	**Northern Estuaries & Lake Worth Lagoon**	**Water Conservation Areas 1, 2A, 3A**	**Everglades Agricultural Area**
Lepomis macrochirus	Bluegill	X	X	X	X
Amia calva	Bowfin	X	X	X	X
Ameiurus natalis	Bullhead catfish	X	X	X	X
Syngnathus louisianae	Chain pipefish	X	X		
Dormitator maculates	Fat sleeper	X	X	X	X
Cantherhines spp.	Filefish		X		
Jordanella floridae	Florida flagfish	X	X	X	X
Lepisoteus osseus	Florida gar	X	X	X	X
Bagre marinus	Gafftopsail catfish	X	X	X	X
Dorosoma cepedianum	Gizzard shad	X	X	X	X
Elacatinus spp.	Gobies	X	X		
Fundulus chrysotus	Golden topminnow	X	X	X	X
Lutjanus griseus	Gray snapper		X		
Sphyraena barracuda	Great barracuda		X		
Fundulus grandis	Gulf killifish	X	X	X	X
Syngnathinae spp.	Gulf pipefish	X	X		
Menidia beryllina	Inland silverside	X	X	X	X
Diapterus auratus	Irish Pompano		X		
Caranx hippos	Jack		X		
Elops saurus	Ladyfish		X		
Micropterus salmoides	Largemouth bass	X	X	X	X
Heterandria formosa	Least killifish	X	X	X	X
Hippocampus erectus	Lined seahorse		X		
Achirus lineatus	Lined sole		X		
Gambusia affinis	Mosquitofish	X	X	X	X
Belonidae spp.	Needlefish		X		
Microphis brachyurus lineatus	Opossum pipefish	X	X		
Astronotus ocellatus	Oscar	X	X	X	X
Trachinotus carolinus	Pompano		X		
Lagocephalus lagocephalus	Puffer		X		
Sciaenops ocellatus	Red drum		X		
Lepomis microlophus	Redear sunfish	X	X	X	X
Poecilia latipinna	Sailfin molly	X	X	X	X
Archosargus probatocephalus	Sheepshead		X		
Luxilus cornutus	Shiner	X	X	X	X
Eucinostomus gula	Silver jenny		X		
Pristis pectinata	Smalltooth sawfish		X		
Centropomus undecimalis	Snook		X		
Fundulus majalis	Striped killifish		X		
Megalops atlanticus	Tarpon		X		

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		Observed/Expected Occurrence			
Scientific Name	**Common Name**	**Lake Okeechobee**	**Northern Estuaries & Lake Worth Lagoon**	**Water Conservation Areas 1, 2A, 3A**	**Everglades Agricultural Area**
Dorosoma petenense	Threadfin shad	X	X	X	X
Ameiurus catus	White catfish	X	X	X	X
Brevoortia smithi	Yellowfin menhaden		X		
Shellfish					
Callinectes sapidus	Blue crab		X		
Mercenaria spp.	Hard clams		X		
Crassostrea virginica	Oysters		X		
Menippe mercenaria	Stone crab		X		
Macroinvertebrates					
Pomacea paludosa	Apple snail	X	X	X	X
Cambarus spp.	Crayfish	X	X	X	X
Family: Dystiscidae	Dytiscid beetles	X	X	X	X
Palaemonetes spp.	Grass shrimp	X	X	X	X
Macrobrachium spp.	Prawn	X	X	X	X

3.8 THREATENED AND ENDANGERED SPECIES

The geographic regions considered in the analysis of threatened and endangered species and designated critical habitat include the EAA (including the Compartments B and C build-out footprint and alternate lands adjacent to STA 1W); Lake Okeechobee; the St. Lucie River Estuary; the Indian River Lagoon; the Caloosahatchee River Estuary; the Acme Basin B-Section 24; and WCAs 1, 2A, and 3A. Listed species and designated critical habitat discussed are those that may be affected by the proposed project. URS conducted surveys for wetland jurisdiction, wildlife, and threatened and endangered species for USACE and SFWMD in 2007. Observed or expected occurrences of threatened and endangered species were recorded and documented. These reports are included as Appendix C for this EIS.

3.8.1 Federally Listed Species and Designated Critical Habitat

The federal endangered, threatened, and species of special concern list is maintained by the USFWS and the National Marine Fisheries Service (NMFS) in accordance with the Endangered Species Act (ESA). In the ESA, “endangered” species are in danger of extinction throughout all or a significant portion of its range, “threatened” species are likely to become endangered within the foreseeable future throughout all or a significant portion of its range, and “species of special concern” might need concentrated conservation actions. A

list of federally designated critical habitat for protected species is also maintained by the USFWS and NMFS in accordance with the ESA. The ESA defines "critical habitat" as (1) the specific areas within the geographical area occupied by the species at the time it is listed on which are found physical or biological features essential to the conservation of the species and which may require special management considerations or protection; and (2) specific areas outside of the geographical areas occupied by the species at the time it is listed upon a determination that such areas are essential for the conservation of the species. Table 3-7 lists the species considered their listing status, and any designated critical habitat considered for analysis. The table is followed by descriptions of each species and critical habitat, where appropriate.

Table 3-7. List of Federally Protected Species and Critical Habitat in the Project-affected Regions that may be Affected by the Proposed Project

		Listing Status		Designated Critical Habitat in Project-Affected Regions
Scientific Name	**Common Name**	**Federal**	**State**	
Mammals				
Felis concolor coryi	Florida panther	E	E	
Trichechus manatus latirostris	West Indian manatee	E	E	X
Birds				
Ammodramus maritumus mirabilis	Cape Sable Seaside Sparrow	E	E	
Caracara plancus audubonii	Crested caracara	T	T	
Rostrhamus sociabilis plumbeus	Everglade snail kite	E	E	X
Mycteria Americana	Wood stork	E	E	
Reptiles				
Alligator mississippiensis	American alligator	T (S/A)	SSC	
Drymarchon coaris couperi	Eastern indigo snake	T	T	
Chelonia mydas	Green sea turtle	T	E	
Eretmochelys imbricate imbricate	Hawksbill sea turtle	E	E	
Lepidochelys kempii	Kemp's Ridley sea turtle	E	E	
Dermochelys coriacea	Leatherback sea turtle	E	E	
Caretta caretta	Loggerhead sea turtle	T	T	
Fish				
Microphis brachyurus lineatus	Opossum pipefish	SSC	N/A	
Pristis pectinata	Smalltooth sawfish	E	N/A	
Plants				
Halophila johnsonii	Johnson's seagrass	T	N/A	X
Cucurbita okeechobeensis	Okeechobee gourd	E	E	

Legend: E- Endangered, T- Threatened, SSC- Species of Special Concern

Johnson's Seagrass (*Halophila johnsonii eiseman*)

Seagrasses are marine flowering plants that stabilize sediment, dissipate wave energy, and reduce turbidity, and that provide habitat and a source of food for numerous marine animals. Johnson's seagrass is one of 12 species of seagrass in the genus *Halophila,* distinguished by a pair of leaves at each node. Johnson's seagrass has an extremely narrow distribution and is found only in lagoons along a 124-mile stretch of coastline in southeast Florida, extending from Sebastian Inlet to North Biscayne Bay (NMFS 2002). Because Johnson's seagrass has only been recently identified a distinct species, no historical information exists related to its past distribution and efforts at monitoring the species have only recently begun (NMFS 2002).

Suitable habitat for Johnson's seagrass requires sufficient water quality, salinity, water clarity, and stable sediments (USACE and SFWMD 2006). It grows in waters ranging from the intertidal zone to 3 meters deep in non-contiguous monotypic patches or in mixed patches with paddle grass (*H. decipiens*), shoal grass (*Halodule wrightii*), and manatee grass (*Syringodium filiforme*) (NMFS 2002). Reproduction is through asexual branching, not seeding, making it particularly vulnerable to habitat fragmentation and loss.

The criteria for critical habitat for Johnson's seagrass include populations that have persisted for 10 years, have persistent flowering populations, are in the northern and southern limits of the species, have unique genetic diversity, and have a high abundance of Johnson's seagrass compared to other species. Ten areas have been designated as critical habitat for Johnson's seagrass: (1) a portion of the Indian River Lagoon, north of the Sebastian Inlet Channel (approximately 5.7 acres); (2) a portion of the Indian River Lagoon, south of the Sebastian Inlet Channel (approximately 2.0 acres); (3) a portion of the Indian River Lagoon near the Fort Pierce Inlet (approximately 4.3 acres); (4) a portion of the Indian River Lagoon, north of the St. Lucie Inlet (approximately 2,770 acres); (5) a portion of Hobe Sound (approximately 900 acres); (6) a site on the south side of Jupiter Inlet (approximately 4.3 acres); (7) a site in central Lake Worth Lagoon (approximately 15 acres); (8) a site in Lake Worth Lagoon, Boynton Beach (approximately 95.5 acres); (9) a site in Lake Wyman, Boca Raton (approximately 20 acres); and (10) a portion of Biscayne Bay (approximately 18,757 acres) (NMFS 2002).

Okeechobee Gourd (*Cucurbita okeechobeensis* spp. *Okeechobeensis small*)

Until the 1930s, vast pond apple (*Annona galabra*) swamps existed south of Lake Okeechobee where the Okeechobee gourd commonly grew (Small 1930, as cited in USFWS 1999). The pond apple trees provided support for the vines of the Okeechobee gourd above the water during the wet season. Elimination of the pond apple trees is one of the primary

reasons for its endangered status, the other being the managed water levels in Lake Okeechobee (USFWS 1999). Today, distribution of the Okeechobee gourd is known to be limited to two wild populations, one along the St. Johns River and the second along the shoreline of Lake Okeechobee (USFWS 1999).

The Okeechobee gourd requires fluctuations in water levels for survival. High water levels destroy competing weeds and distribute seeds, and seeds quickly germinate during low water levels (Walters and Decker-Walters 1991). Water management practices in Lake Okeechobee are the primary threat to the Okeechobee gourd today. The colonization of invasive exotic species, such as dense melaleuca stands, threatens the species by preventing seed establishment (USFWS 1999). The gourd is ephemeral and will occupy an area only while conditions are favorable.

The southern shores of Lake Okeechobee are a designated USFWS Okeechobee gourd consultation area. No Okeechobee gourds were observed during the 2007 Wildlife Evaluation Report surveys.

Opossum Pipefish (*Microphis brachyurus lineatus*)

Pipefishes, relatives of the seahorse, are slender fish with an elongated snout. In south Florida, adults inhabit banks of freshwater tributaries with dense emergent vegetation, primarily made up of smart weed (*Polygonum* spp.) and panic grass (*Panicum* spp.*) (*Gilmore and Gilbert 1992), where they mate and release their larvae during the wet season (USACE and SFWMD 2006). Larvae must spend their first 2 weeks in waters with salinity of 18 parts per thousand to survive and are carried downstream to estuarine and marine waters (Frias-Torres 2002). Juveniles inhabit ocean and coastal environments and migrate into freshwater tributaries during the dry season (NOAA 2007).

The opossum pipefish was federally listed as a species of special concern in 1991 and is threatened by multiple factors. Their freshwater habitats are frequently viewed as weedy and sprayed with herbicides. Seawall, dock, and riprap construction also destroy habitat for opossum pipefish. Water control structures block migration paths, and altered water flows may affect their ability to migrate because they are poor swimmers. Degraded water quality and disease are also factors in population declines.

Pipefish are found circumtropically. In Florida, opossum pipefish are particularly notable in the Indian River Lagoon, but have historically occurred in all estuarine and freshwater tributaries, and in coastal waters along the entire coastline of the state (NOAA 2007). This subspecies has been documented in Lake Okeechobee (Gilmore and Gilbert 1992).

Smalltooth Sawfish (*Pristis pectinata*)

The smalltooth sawfish is a ray with a shark-like appearance and an extended, flattened, facial feature (rostrum) with protruding horizontal teeth, giving this feature a chainsaw-like appearance. Their distribution is circumtropical, including marine and estuarine waters of the peninsula and panhandle of Florida (NMFS 2006). The main constraints to their distribution are their inability to survive in water temperatures lower than 16 to 18°C and the availability of appropriate coastal habitat (NMFS 2006).

Originally, it was thought that habitat for smalltooth sawfish was limited to shallow (less than 32 feet) muddy and sandy bottoms of sheltered bays, shallow banks, estuaries, and river mouths (NMFS 2000), but recent research found that the habitat depends on their size. Juveniles (less than 39 inches) spend their time mostly on mud or sand banks less than 1 foot deep and likely in mangrove roots that provide protection (NMFS 2006). As they grow, their association to shallow waters lessens. Adults inhabit similar habitats but may also be found in waters up to 400 feet deep (Poulakis and Seitz 2004). The diet of the smalltooth sawfish includes small schooling fish and crustaceans and other bottom dwellers.

The main threat to smalltooth sawfish is bycatch mortality from commercial fishing (Seitz and Poulakis 2006). Other threats include entanglement with marine pollution (Seitz and Poulakis 2006), loss of habitat such as destruction of mangrove forests, and dredge and fill (USFWS 1999). The species at one time flourished throughout Florida and its range extended from Texas to North Carolina. However, it currently can only be found with any regularity in south Florida between the Caloosahatchee River and the Florida Keys as a result of the various threats described previously (NMFS 2006). Smalltooth sawfish would be anticipated in the Caloosahatchee and St. Lucie River Estuaries, the Indian River and Lake Worth Lagoons, and coastal waters.

American Alligator (*Alligator mississippiensis*)

The American alligator is a large, carnivorous reptile related to crocodiles that currently inhabits and has historically inhabited freshwater lakes, ponds, marshes, sloughs, swamps, canals and, occasionally, brackish waters throughout the southeastern United States. A distinguishing characteristic from the American crocodile, a close relative, is that only the upper teeth are visible with the mouth closed, while both the upper and lower teeth are visible on the American crocodile.

In 1985, alligators in Florida were down-listed in Florida from “threatened” to status of “threatened due to similarity of appearance” because of its similarity to the endangered American crocodile (*Crocodylus acutus*). This listing status is defined for species that are not currently biologically threatened but that are believed likely to become endangered in the future (50 CFR Part 17).

The American alligator is commonly found in freshwater aquatic habitats, including marshes, swamps, lakes, and rivers and, occasionally, brackish waters. It has a high potential to be found in Lake Okeechobee, the EAA, the Caloosahatchee River, the St. Lucie River Estuary, and the Acme Basin B-Section 24. During the wildlife evaluation study, American alligators were observed in the footprint of both Compartment B and C and in and on canal banks within the EAA.

Eastern Indigo Snake (*Drymarchon corais couperi*)

The Eastern indigo snake is a large, black, non-venomous snake that reaches lengths up to of 265 cm (Ashton and Ashton 1981). Its historical range extended throughout Florida and the coastal plains of Mississippi, Alabama, and Georgia (USFWS 1999). Today, it is found only in Georgia and the Florida panhandle, with rare sightings throughout Florida.

The Eastern indigo snakes preferred habitats are uplands (flatwoods, dry prairies, tropical hardwood hammocks, and coastal dunes). They are not usually found in Everglades wetlands (Steiner et al. 1983), but can be found on the edges of freshwater marshes and in agricultural fields (USFWS 1999). They are extremely susceptible to desiccation and cold. In dry, cold habitats (Georgia, Alabama, and the Florida panhandle), eastern indigo snakes depend on the holes of the gopher tortoise (*Gopherus polyphemus*), which provide protection from cold and dry conditions (Layne and Steiner 1996). Throughout the warmer environment of peninsular Florida, Eastern indigo snakes may exist in any terrestrial habitats with low urban development (USFWS 1999).

Initially, the population decline of Eastern indigo snakes was from over-collecting for the pet trade (43 FR 4028), but current major threats to the Eastern indigo snake include loss and fragmentation of habitat from increased development (USFWS 1999). Other threats to the Eastern indigo snake associated with development include increased mortality from vehicular collisions, domestic pets, and people, and bioaccumulation of pesticides (USFWS 1999).

Eastern indigo snakes were not observed during the 2007 Wildlife Evaluation Report surveys, and the FFWCC and the Florida Natural Areas Inventory have no documented accounts of Eastern indigo snakes in the EAA. However, they have been observed on canal banks during the construction of the EAA A-1 Reservoir Project (URS 2007a,b). There is a potential for Eastern indigo snakes to be present in uplands, at edges of marshes, and fallow crop lands in the EAA, including the Compartments B and C Build-out footprints (URS 2007a,b) and Acme Basin B-Section 24 (USACE 2004).

Sea Turtles

Sea turtles are marine reptiles found through out tropical, subtropical, and temperate waters. Five species of sea turtle can be found in estuaries and coastal waters along peninsular

Florida. In order from least to most abundant, the five species include Kemp's Ridley sea turtles, Hawksbill sea turtles, leatherback sea turtles, green sea turtles, and loggerhead sea turtles. Only leatherback, green, and loggerhead sea turtles nest regularly on Florida's beaches. The nesting season for the sea turtle in Florida extends from March 1 to October 31. Three of the sea turtles (green, leatherback, and hawksbill) have critical habitat designated by NMFS; however, no sea turtle critical habitat currently exists in the state of Florida; therefore, this species is not considered further.

Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)

Kemp's Ridley sea turtles are the smallest sea turtle, weighing on average less than 100 pounds (45 kg) (USFWS 1999). They are the most endangered sea turtles in the Western Hemisphere (USACE and SFWMD 2006) and are extremely rare in Florida. In the summer, juveniles and subadults have been observed on Florida's east coast while they travel north to foraging grounds in Georgia (Ogren 1989). They feed primarily on shallow-water benthic organisms (USFWS 1999). Very few Kemp's Ridley nests have been documented in Florida.

Hawksbill Sea Turtles (*Eretmochelys imbricate imbricate*)

Hawksbill sea turtles are also a smaller sea turtle. Their range is limited to the tropics and subtropics. A pointed, hawk-like beak allows them to obtain food from crevices in coral reefs and hard-bottom habitats. They primarily eat sessile animals (sponges and anemones). Hawksbill sea turtle hatchlings seek refuge in weed lines in the pelagic oceans, returning to coastal waters at approximately 20 to 25 cm in carapace length to feed mainly on sponges, reefs, rocky outcrops, and high-energy shoals (USFWS 1999). Hawksbill sea turtles are observed along Florida's coast, but nesting in Florida is extremely rare. The carapace (shell) is amber with unique radiating patterns of orange, brown, or yellow and has serrated edges toward the tail. Killing hawksbill sea turtles for its shell is a serious threat to the species.

Leatherback Sea Turtles (*Dermochelys coriacea*)

Leatherback sea turtles are the largest sea turtles, with an estimated weight range of 450 to 1,534 pounds (204 to 696 kilograms) (USFWS 1999). Leatherback sea turtles are highly migratory, and their range is the greatest among sea turtle species. They nest along the shores of the Atlantic, Pacific, and Indian Oceans (USFWS 1999). Nesting along Florida's coasts occurs almost exclusively on Florida's east coast, with 50 percent of leatherback nests occurring in Palm Beach County (FMRI undated[a]), although not in the same numbers as green and loggerhead sea turtles. Jellyfish are the leatherback sea turtles' primary food source. The leatherback's carapace is flexible and rubber-like, unlike the bony and hard

shells of other sea turtles. This flexible shell allows the leatherback to withstand immense water pressure while they dive for deepwater jellyfish.

Green Sea Turtles (*Chelonia mydas*)

Green sea turtles are the second most common sea turtle in Florida. Green sea turtles are named for the greenish color of their body fat and are large turtles, weighting up to 300 pounds. Nesting occurs throughout Florida, but is most common along the east coast from Valusia to Broward Counties during June to late September. Green sea turtle habitat includes high-energy beaches, convergent zones in the open ocean, shallow protected feeding grounds, and hard bottom areas (USFWS 1999). They eat primarily seagrass and algae and may feed on jellyfish and shellfish during migration in the pelagic zone (NMFS and USFWS 1995).

Loggerhead Sea Turtles (*Caretta caretta*)

The most common species of sea turtle in Florida is the loggerhead. Loggerhead sea turtles are most easily distinguished from other sea turtles by their proportionately large heads and heart-shaped carapace (USFWS 1999). Loggerhead sea turtle nests make up 90 percent of all nests statewide (FMRI undated[a]), with 45 percent of all loggerhead nests in 2006 occurring from Brevard to Broward counties (FMRI undated[b]). Nesting in Florida has declined 22.3 percent from 1989 to 2005 (FWRI undated a). Hatchlings from the Florida population swim to the North Atlantic Gyre that begins a transoceanic migration. They return to Florida's coastal feeding grounds several years later as juveniles. Loggerhead sea turtles eat primarily benthic invertebrates and can be found in a variety of habitats, ranging from seagrass beds, coral reefs, sand shoals, river mouths, estuaries, to bays (USFWS 1999).

Sea turtles face numerous threats both in the marine environment and on nesting beaches. Collisions with boats, entanglement in and ingestion of floating debris, entrapment in fishing nets, and harvesting shells for decorations (poaching) are some of the primary marine threats. Beach and shoreline development is decreasing the suitability of nesting beaches in Florida. Artificial lights from beachfront developments disorient hatchlings and nesting females, shoreline armoring accelerates beach erosion, and beach nourishment projects may result in sand and beach profiles.

Audubon's Crested Caracara (*Polyborus plancus audubonii*)

The Audubon's crested caracara is a large non-migratory raptor. Its overall distribution includes the southern United States, Mexico, and Central America to Panama. Historically, the crested caracara was found in Florida as far north as north Nassau County, and as far south as Collier County. Current available data suggest the range of the species, and the most abundant populations of crested caracara, in Florida are located in Glades, Desoto,

Highlands, Okeechobee, and Osceola Counties, all of which are located north and west of Lake Okeechobee (USFWS 1999). Caracara are most commonly found in dry or wet prairies with occasional cabbage palms (*Sabal palmetto*) or that are lightly wooded. Prey include insects and other small invertebrates, and small mammals, reptiles, and fish. Because of changes in land use, the crested caracara also now uses improved or semi-improved pastures (USFWS 1999). The primary threat to the crested caracara is in the conversion from dried prairies to agriculture and development.

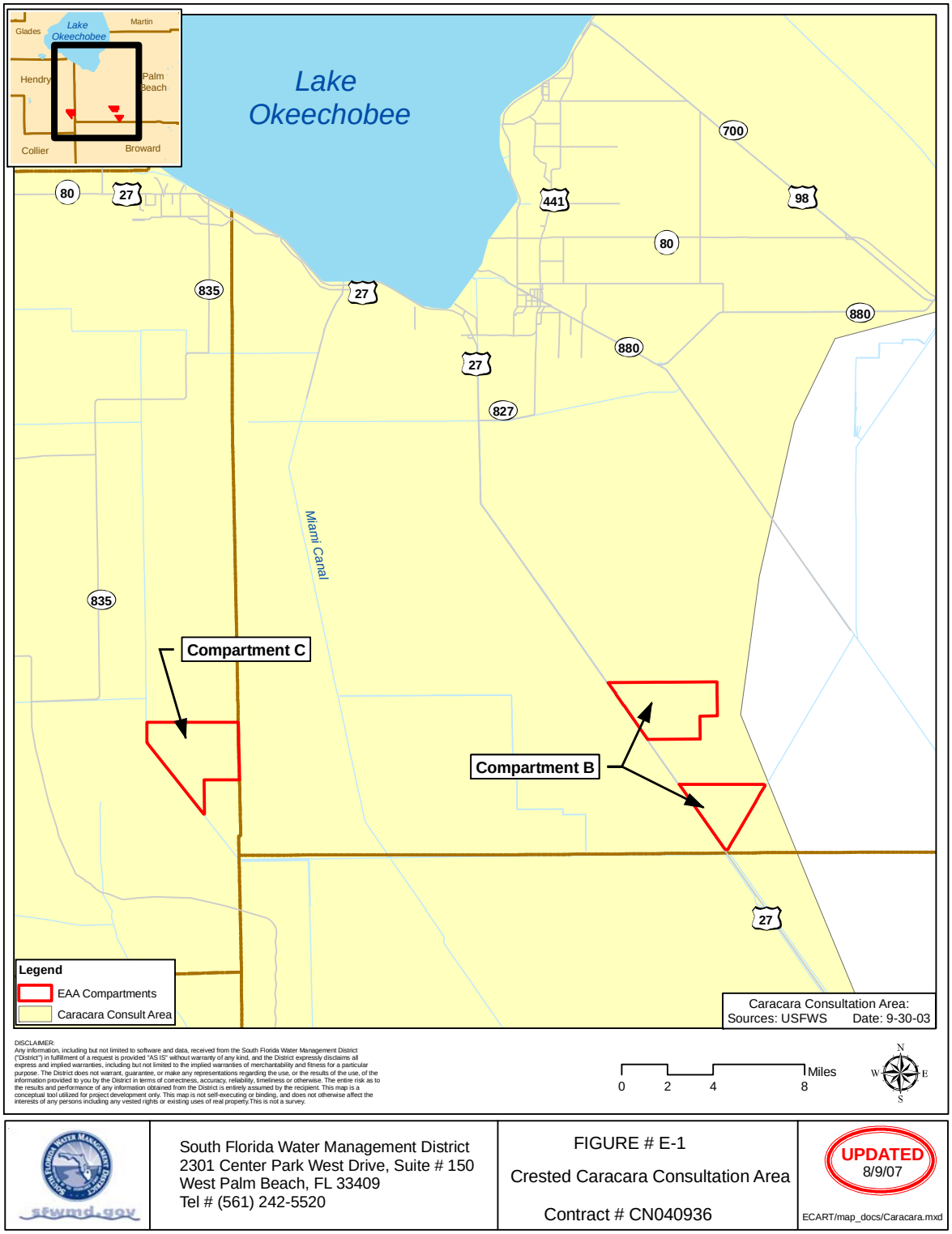
The EAA, including Compartments B and C and Alternative Lands, is located within a USFWS crested caracara consultation area (Figure 3-10). The USFWS Standard Local Operating Procedures for Endangered Species (SLOPES) defines the primary protection zone for the species as 985 feet outward from a nesting tree with a secondary zone 6,600 feet from an active nesting tree. During the field surveys for the 2007 Wildlife Evaluation Report, a crested caracara was observed during 1 of the 7 days of field work flying over a portion of Compartment C; it then landed on a levy adjacent to Compartment C. All free-standing palm trees within the Compartment B and C were checked for nesting activity, and no signs of previous or new crested caracara nesting activity were recorded. There are no known nest sites located in the EAA or in or within 6,600 feet of the build-out footprints (USACE and SFWMD 2006).

Cape Sable Seaside Sparrow (*Ammodramus maritumus mirabilis*)

The Cape Sable seaside sparrow is a medium-sized sparrow, 13 to 14 cm in length, which is light grey to white on the underside with a dark olive grey breast and sides. Only eight subspecies of the seaside sparrow inhabit the east coast from Massachusetts to southern Florida, and from southeast Texas to Florida's west coast along the Gulf Coast. However, Cape Sable seaside sparrows are non-migratory birds found exclusively in the ENP and in Big Cypress National Preserve (Figure 3-11). Historically, the Cape Sable seaside sparrow primarily bred on Cape Sable, but because of shifts from freshwater vegetative communities, the Cable Sable sparrow no longer uses this area. The Cape Sable sparrow is a dry-season breeder and will abandon its nest if flooding occurs. Currently, this sparrow inhabits marl prairies of the southern Everglades (ENP and Big Cypress Preserve) and prefers open areas devoid of trees and shrubs to breed.

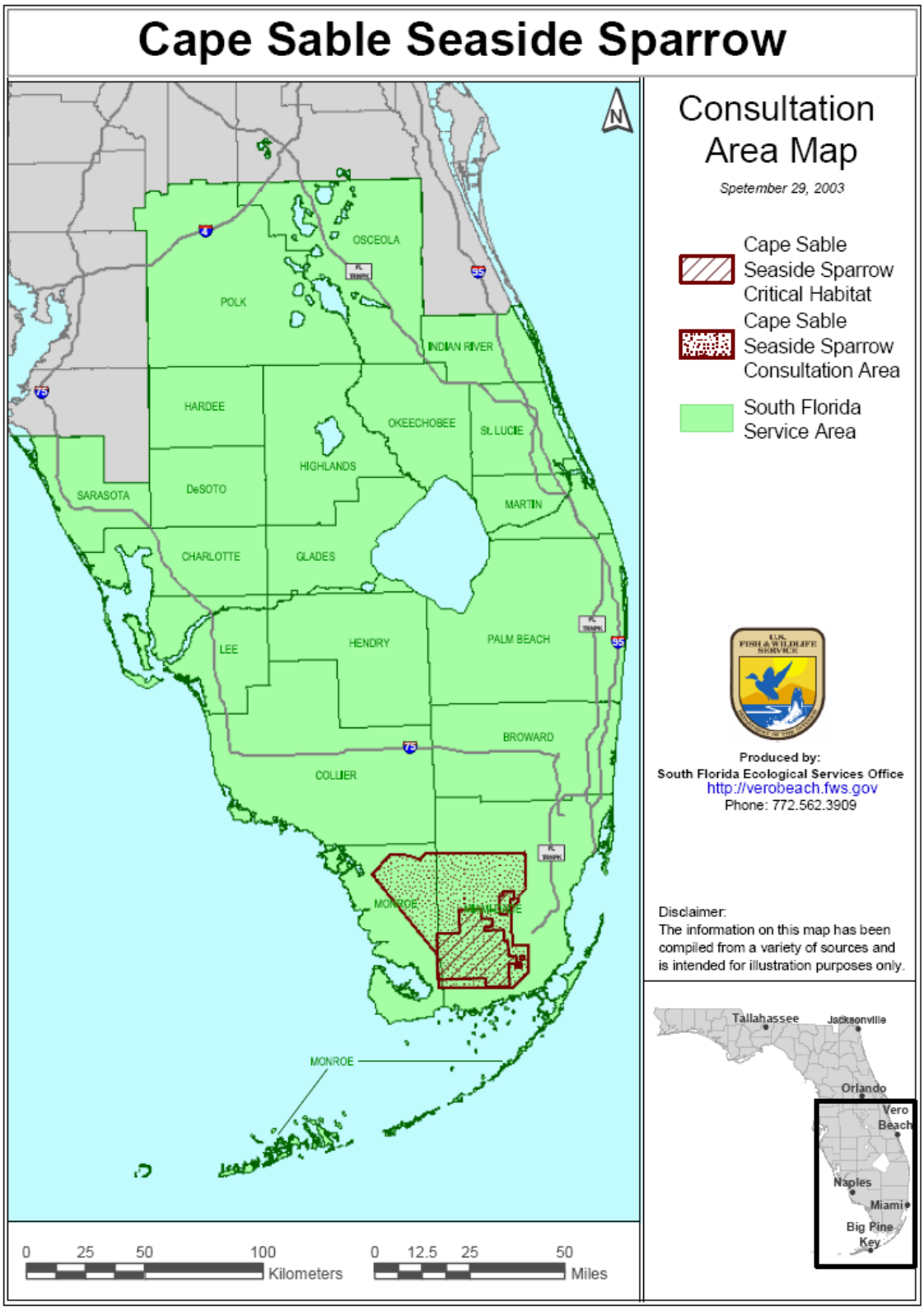
The Cape Sable seaside sparrow breeds during the dry season when the water table is low, primarily from March to June (Nott et al. 1998). It has been observed that there is a direct correlation with breeding behavior and increased water levels. Male Cape Sable sparrows will sing to attract females. Singing birds were not heard when water levels exceeded 10 cm (Bass and Kushlan 1982, as cited in Nott et al. 1998).

Figure 3-10. Crested Caracara Consultation Area



Source: URS 2007a,b

Figure 3-11. Cape Sable Seaside Sparrow Consultation Area



Source: USFWS undated(c)

The Cape Sable seaside sparrow builds new nests for each brood in a season, usually one or two, but possible three if water conditions are favorable. Sparrow will typically construct the nests from sawgrass, as a base, and finer grass for the lining of the nest (USFWS 1999). The nest cups are approximately 14 cm above the ground (Werner 1975 and Lockwood et al. 1997, as cited in USFWS 1999). The Cape Sable seaside sparrows feeds primarily on insects such as spiders, caterpillars, beetles, dragonflies, wasps, and other soft-bodied insects (Stevenson and Anderson 1994, as cited in USFWS 1999).

Development and water management practices have altered the vegetation and hydrology of the Everglades, affecting the sparrow habitat. Water levels, duration, and quality are concerns in conservation. Although water levels must allow for appropriate nesting sites and be adequate to support populations of the Cape Sable seaside sparrow, these populations are not within the affected area of this project.

The Cape Sable seaside sparrow is found exclusively in the ENP and Big Cypress National Preserve. ENP is also the only region containing designated critical habitat for the species (Figure 3-11). Suitable habitat for the Cape Sable seaside sparrow (marl prairies) does not occur within the EAA, the project footprints for Compartments B and C, or within the other affected areas for the project alternatives.

Everglade Snail Kite (*Rostrhamus sociabilis plumbeus*)

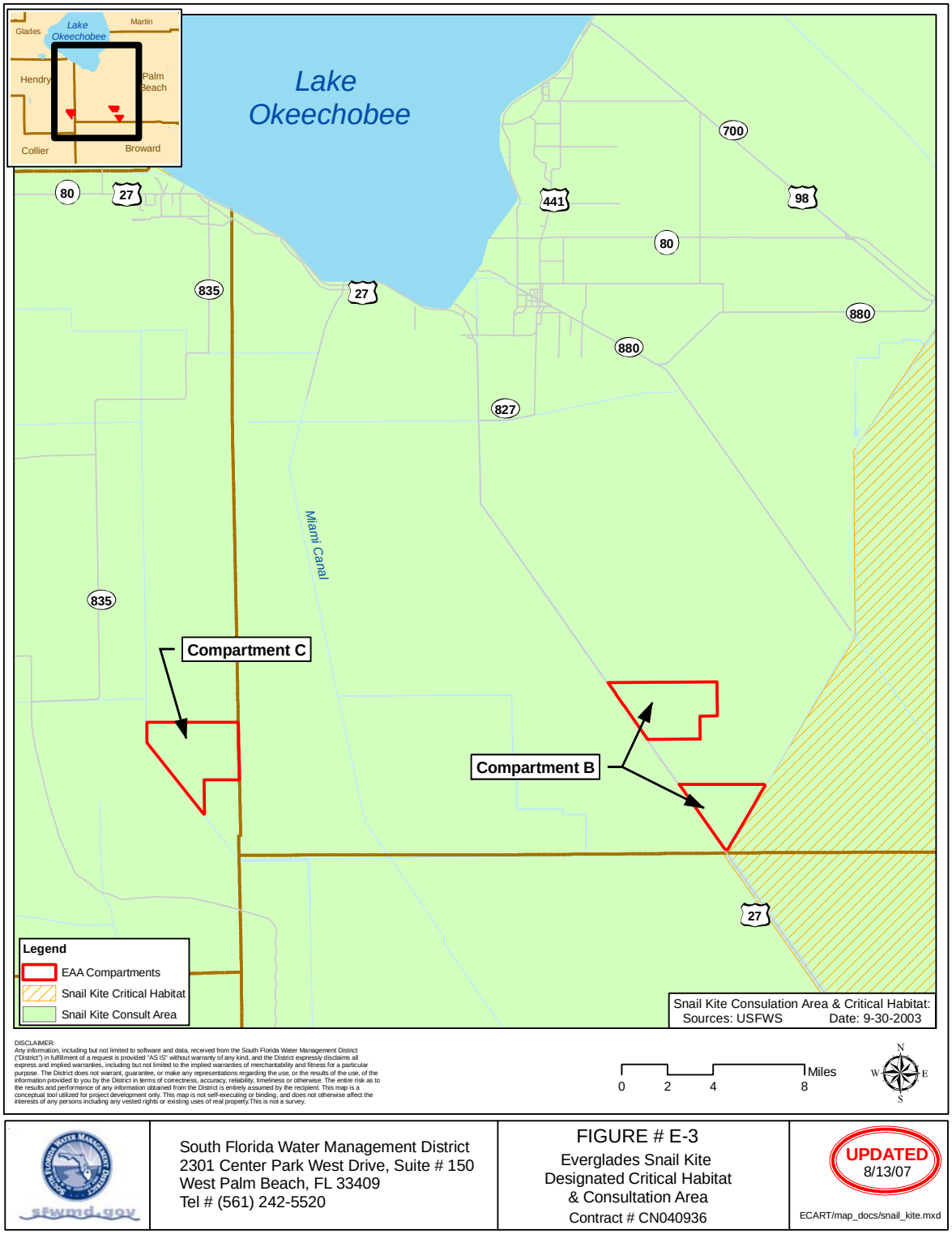
Everglade snail kites are medium-sized, non-migratory hawks. Everglade snail kites are found in lowland freshwater marshes throughout tropical and subtropical Florida, Cuba, and Mexico south to Argentina and Peru. Of the three subspecies of Everglade snail kite, *Rostrhamus sociabilis plumbeus* is found only in central and south Florida, Cuba, and northwestern Honduras. It is currently the only subspecies found in Florida, and has experienced a fluctuating distribution over time, with historical populations occurring in north-central Florida and as far west as the Wakulla River. Current populations are limited to central and southern portions of the state. This trend is mainly attributable to a loss of preferred habitat. (*Pomacea paludosa*; USFWS 1999). In Florida, Everglade snail kites forage almost exclusively on apple snails that are found in freshwater marshes and shallow vegetated littoral zones of lakes. Apple snails eat, feed, breed, and lay eggs on emergent vegetation in waterbodies that are flooded continuously for longer than 1 year (USFWS 1999). Everglade snail kites forage by either still-hunting from a perch or by flying above the water surface and visually locating prey. Relatively clear and open marshes and littoral zones with low profile marshes (3 meters or less in depth) and shallow open water are ideal foraging habitat for the Everglade snail kite (USFWS 1999). Increased levels of phosphorus in Lake Okeechobee and the Everglades have resulted in dense stands of emergent invasive vegetation that has replaced the foraging habitat for the Everglade snail kite.

Everglade snail kite nests are almost always located over water (USFWS 1999) on woody vegetation such as cypress, pond apple, and swamp. Sturdy trees provide the necessary support for nests sites, and the water below minimizes nest predation (USFWS 1999). Under short hydroperiods or low water level conditions, however, Everglade snail kites will choose minimizing predation over sturdy vegetation and nest on the less-sturdy herbaceous vegetation located farther waterward from shore and usually still in water (USFWS 1999). Typically, this vegetation cannot support nests, and the vegetation collapses under the weight of the nests. These nests are also closer to anthropogenic impacts from water-dependent activities.

Loss and degradation of habitat are the primary threat to snail kites. Water levels, duration, and quality are primary concerns in Everglade snail kite conservation. Water levels must allow for appropriate nesting sites, durations of water levels must be sufficient to support apple snail populations, and water quality must be such that invasive species do not take over Everglade snail kite foraging habitat (USFWS 1999). Critical habitat is for the snail kite is designated in the Refuge, and in portions of WCA 2, WCA 3, ENP, the western shores of Lake Okeechobee, the Strazulla and Cloud Lake Reservoirs in St. Lucie County, and in the St. John's Marsh in Indian County.

The EAA including Compartments B and C and Alternative Lands near STA 1W, Acme Basin B-Section 24, the Refuge, WCA 2A, and WCA 3A are all within Everglade snail kite USFWS consultation area, with Compartment B and portions of the Acme Basin B-Section 24 bordering designated critical habitat in the Refuge (Figure 3-12). Everglade snail kites are present in the EAA, Lake Okeechobee, and the WCAs. No evidence of Everglade snail kite nesting or foraging was observed in Compartments B and C during the surveys for the 2007 Wildlife Evaluation Report. It is likely that snail kites use the freshwater marshes in these areas for foraging.

Figure 3-12. Snail Kite Critical Habitat Area



Source: URS 2007a,b

Wood Stork (*Mycteria Americana*)

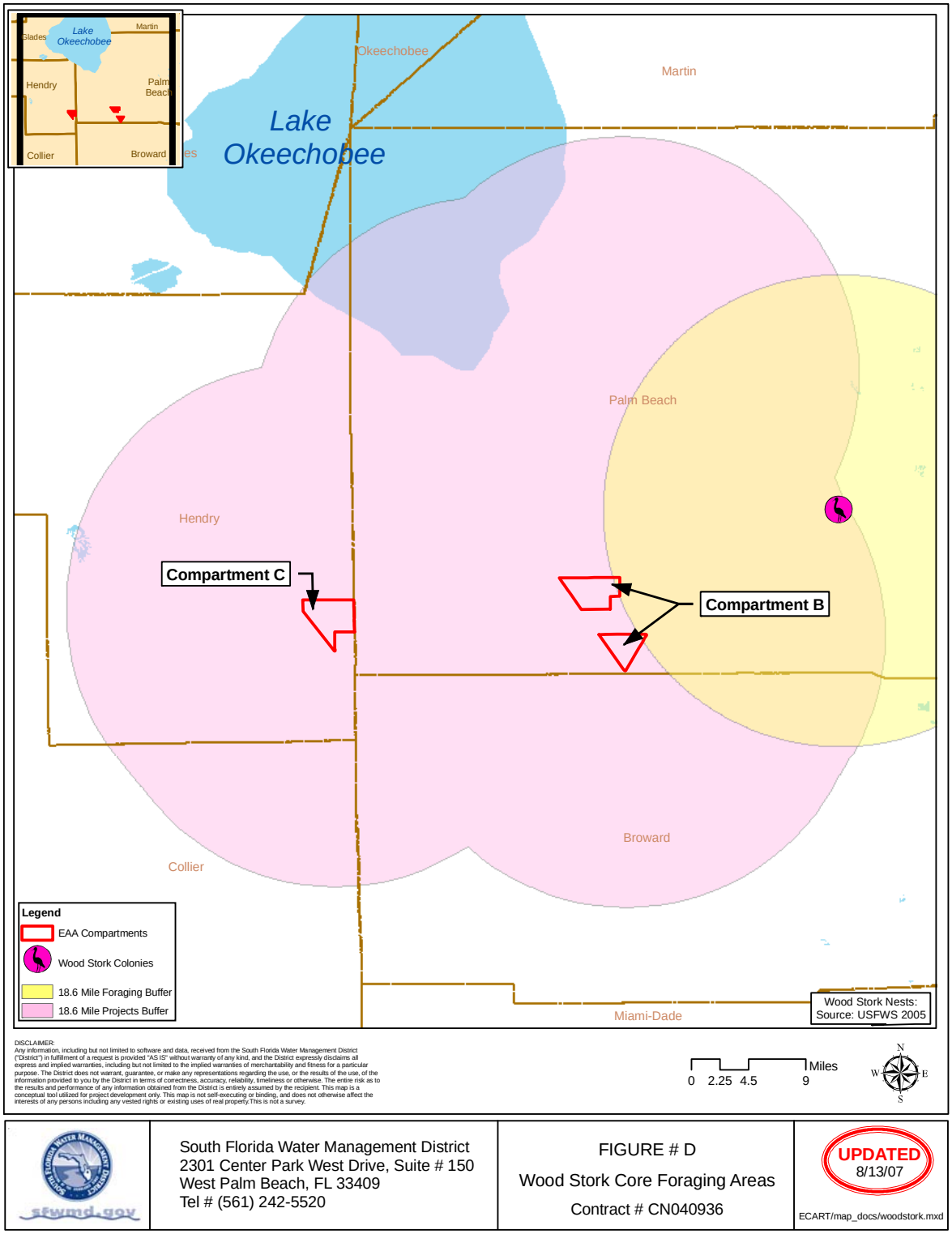
Wood storks are tall, long-legged wading birds. In the United States, their non-breeding season range extends throughout the continental United States and they inhabit a variety of freshwater and estuarine wetlands (USFWS 1999). Historically, breeding colonies existed in coastal states from Texas to South Carolina, but today breeding colonies are limited to Georgia, Florida, and coastal South Carolina (USFWS 1999).

The timing, duration, and quantity of water affect wood stork distribution for two reasons: (1) shallow waters with high prey densities are needed for feeding; and (2) they prefer nesting sites surrounded by deep water. The primary prey of wood storks is small fish. During feeding, wood storks immerse their bill, partly open, in water and snap it shut when it contacts a prey item (Kahl 1964, as cited in USFWS 1999). This feeding behavior, known as tactolocation or grope feeding, requires high prey concentrations found after drying events that concentrate fish to smaller areas. Nesting colonies of wood storks are usually established in stands of medium to tall trees, such as cypress stands or mangrove forests, surrounded by deeper water marshes (Palmer 1962; Rogers et al. 1996; and Ogden 1991, as cited in USFWS 1999). These areas provide protection from terrestrial predators. Core foraging areas include an 18.6-mile radius around breeding colonies (USFWS SLOPES).

The USFWS 5-year review of the wood stork recommended reclassification from endangered to threatened because the number of nesting pairs reached the reclassification goal of 6,000 nesting pairs and the annual regional productivity was greater than 1.5 chicks per nest (both calculated over a 3-year average) (USFWS 2007). The nesting populations in south Florida have increased significantly, although they remain unchanged in central and north Florida (Brooks and Dean in press).

Wood stork foraging and nesting habitat occurs in the EAA, WCAs, Lake Okeechobee, the Northern Estuaries, and Acme Basin B-Section 24. Wood storks were observed in Compartment B during the surveys for the 2007 Wildlife Evaluation Report (Figure 3-13). No known wood stork nests occurred in Compartments B and C, but the eastern boundary of Compartment B overlaps the outer edge of a core foraging areas associated with an active wood stork colony to the northeast.

Figure 3-13. Wood Stork Foraging Areas



Source: URS 2007a,b

West Indian Manatee (*Trichechus manatus*)

The West Indian manatee is a large grey marine mammal that navigates the brackish, fresh water, and marine waters of the southeastern United States, the Greater Antilles, Central America, and South America. Manatees migrate seasonally to warm water and reside year-round in the United States only in the coastal regions of Florida and Georgia. Water colder than 20 °C increases the susceptibility of manatees to cold stress and cold-induced mortality (USFWS 1999). Four factors contribute to manatee distribution in Florida: (1) proximity to warm water during cold weather, (2) location of freshwater sources, (3) the availability of aquatic vegetation, the manatees' prime food source, and (4) canals of at least 2 meters deep necessary for swimming.

Manatees are found year-round in the Indian River, Biscayne Bay, Everglades, 10,000 Islands area, Estero Bay, and Caloosahatchee River, and in the summer are found from Rhode Island to Texas (USFWS 1999). Designated critical habitat for the West Indian manatee includes the western portion of the Caloosahatchee River in Lee County, the Loxahatchee River and its headwaters in Martin and Palm Beach Counties, the southern portion of the Indian River, as well as territorial waters up and down portions of the Florida Atlantic coast including St Lucie, Martin, and Palm Beach Counties (50 CFR part 17.95). In colder winter months, they frequent warm springs and man-made sources of warm water such as power plants. Their primary diet consists of SAV, but manatees are opportunistic feeders that will also feed on floating vegetation or leaves on mangrove tree branches that overhang waterways (Hurst and Beck 1988 and Smith 1993, as cited in USFWS 1999).

The greatest threat to this slow-moving mammal is collisions with watercraft, while entrapment in culverts, injury from flood control structures, and navigational locks are also threats (USFWS 1999). Despite these threats, West Indian manatee populations are currently stable or increasing throughout Florida, with the exception of the Southwest Region, which is probably a result of a lack of data in the southernmost part of this region and the fewer historical data sets (USFWS 2007). Population growth rates are reported as 4.0 percent in the Northwest Region, 6.2 percent in the Upper St. Johns River Region, 3.7 percent in the Atlantic Coast Region, and -1.1 percent in the Southwest Region (Runge et al. 2004). Based on these stable and increasing populations and implementation of systematic conservation measures to reduce threats to manatees, in 2007 USFWS recommended down-listing the West Indian manatee from an endangered to a threatened species.

The CERP Interagency Manatee Task Force, made up of representatives from USFWS, FFWCC, USACE, USGS, the National Park Service, the Miami-Dade Department of Environmental Resources Management, and private researchers, showed that manatees navigate through the Okeechobee Waterway and access the EAA canals through the gates at

the S-351, S-352, and S-354 structures (USACE and SFWMD 2006). Manatee barriers have been installed at these control structures as a result. No manatees were observed during the surveys for the 2007 Wildlife Evaluation Report. The potential for manatees within the EAA canals is small, although there is a high likelihood for manatees within the Caloosahatchee and St. Lucie River Estuaries, Lake Okeechobee, and the Indian River Lagoon.

Florida Panther (*Puma concolor coryi*)

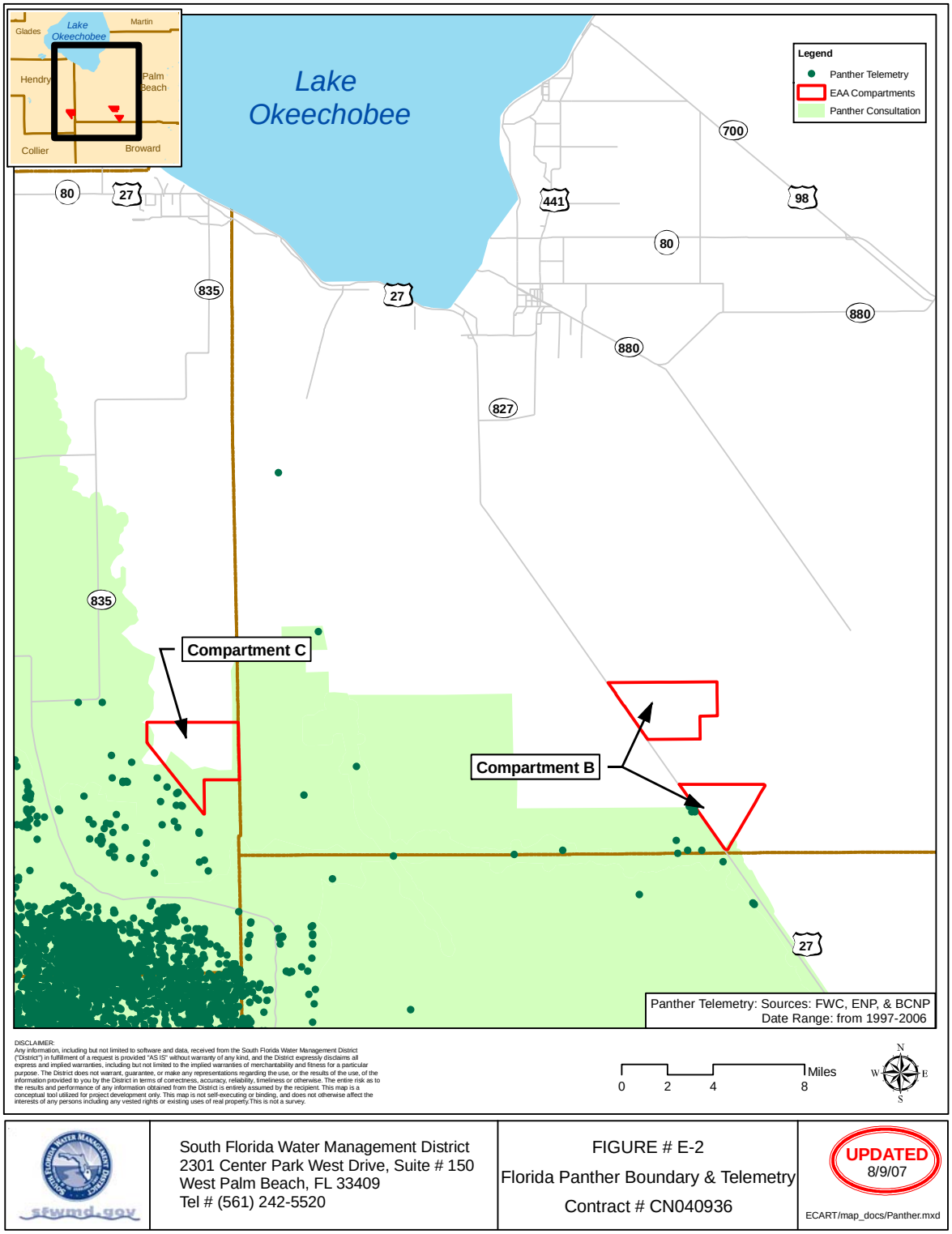
The Florida panther, a medium-sized tawny-colored long tailed puma, is one of the most endangered land mammals. At one time, the panther's range extended through Arkansas, Louisiana, Mississippi, Alabama, Georgia, southern Tennessee, South Carolina, and Florida. Today, the only existing population is found in a 2 million acre area in central and south Florida with population estimates of only 80 total individuals, 30 to 50 adults and approximately 30 subadults (USFWS 1999). The Big Cypress Swamps/Everglades has the only known breeding panther population (USFWS 1999).

The Florida panther, a subspecies of the mountain lion, is Florida's designated state mammal. Male panthers weigh 102 to 154 pounds and reach 7 feet in length, while the smaller females weigh 50 to 108 pounds and reach 6 feet in length (Roelke 1990). Panther's preferred habitats are hardwood hammocks and pine flatwoods, but they can also be found in wetlands and disturbed habitat (USFWS 1999). The panther diet includes feral hogs (*Sus scrofa*), white-tailed deer, raccoon (*Procyon lotor*), and armadillo (*Dasypus novemcinctus*) (Maehr et. al. 1990).

Habitat loss and fragmentation from development are the largest threat to panthers and have lead to inbreeding, reduced prey availability, and mortality from vehicle strikes. An individual panther range may extend on average 200 square miles for males and 74 square miles for females (Land 1994). The panther's wide-range recovery plan cites three conditions necessary for the survival and recovery of the species: (1) protection and enhancement of existing populations, habitats, and prey resources; (2) improving genetic health and population viability; and (3) re-establishing a minimum of two more reproducing populations within the historical range.

Panther telemetry data from 1981 to 2005 show panthers in the EAA, including areas directly adjacent to the Compartment B and C, in WCA 3-A, and around the Caloosahatchee River (USFWS 2006). Figure 3-14 describes Panther telemetry data from 1997 through 2006 (URS 2007a,b). Panthers were not observed during the surveys for the 2007 Wildlife Evaluation Report. Approximately 65 acres of Compartment B and 2,300 acres of Compartment C are located in the USFWS panther consultation area. Panthers may hunt in Compartments B and C, but it is unlikely that they would use these areas for any extended length of time because of the lack of suitable long-term panther habitat (URS 2007a,b).

Figure 3-14. Florida Panther Telemetry Data form 1997-2006



Source: URS 2007a,b

3.8.2 State-Listed Species

Florida enacted its state endangered species act in 1976, which is implemented by FFWCC in accordance with Chapter 68A-27. Table 3-8 lists the state-listed animal species that have the potential to be affected by the build-out of Compartments B and C or Alternative Lands. Species previously discussed in Section 3.8.1 above are not repeated in Table 3-8. The scientific names of the threatened and endangered species are listed in Table 3-8 rather than in the text of this section.

Table 3-8. State-Listed Species Occurring in Project Affected Regions that may be Affected by the Proposed Project and are not Already Discussed in the Federally Listed Species Section

Scientific Name	Common Name	Listing Status	
		Federal	State
Mammals			
Ursus americanus floridanus	Florida black bear	N/A	T
Birds			
Ajaia ajaja	Roseate spoonbill	N/A	SSC
Aramus guarauna	Limpkin	N/A	SSC
Egretta caerulea	Little blue heron	N/A	SSC
Egretta thula	Snowy egret	N/A	SSC
Egretta tricolor	Tricolored heron	N/A	SSC
Eudocimus albus	White ibis	N/A	SSC
Flaco peregrinus	Peregrine falcon	N/A	E
Falco sparverius paulus	Southeastern American kestrel	N/A	T
Grus canadensis pratensis	Florida sandhill crane	N/A	T
Haliaeetus leucocephalus	Bald eagle	N/A	T
Pandion haliaetus	Osprey	N/A	SSC
Pelecanus occidentalis	Brown pelican	N/A	SSC
Sterna antillarum	Least tern	N/A	T
Speotyto cunicularia floridana	Burrowing owl	N/A	SSC
Reptiles			
Pituophis melanoleucus mugitus	Florida pine snake	N/A	SSC
Storeria extenuatum	Florida brown snake	N/A	T
Thamnophis sauritus sackeni	Florida ribbon snake	N/A	T
Gopherus polyphemus	Gopher Tortoise	N/A	T

Legend: E- Endangered, T- Threatened, SSC- Species of Special Concern

Wading Birds

The most common group of state listed species present in all affected regions is wading birds. State-listed wading birds considered and that were not already discussed in the federally listed sections include roseate spoonbill, limpkin, little blue heron, snowy egret, tricolored heron, and white ibis. All of these species are designated as species of special concern (SSC) by the State of Florida. Wading birds nest in suitable areas throughout the affected project area and mainly forage on fish and aquatic invertebrates along canal edges, streams, rivers,

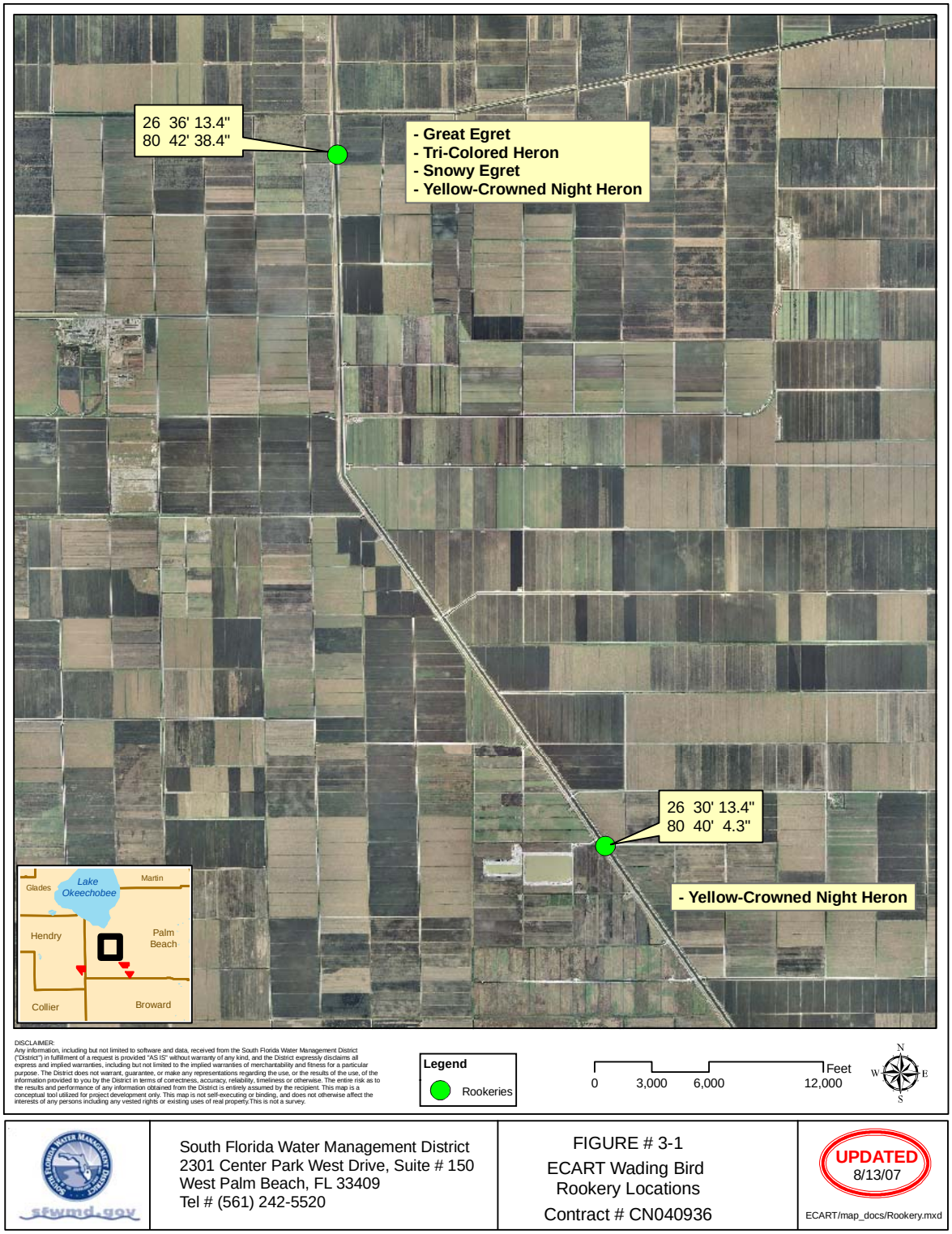
lakes, freshwater wetlands, and coastal areas throughout the project-affected regions. No wading bird nests were observed in the Compartment B and C footprints during the surveys for the 2007 Wildlife Evaluation Report; however, two bird rookeries were identified within the NNRC, which is west and north of Compartment B (Figure 3-15). One rookery contained multiple species, including tricolored heron, snowy egret, great egret, and yellow-crowned night heron, but the other contained only yellow-crowned night heron. Wading birds are further discussed in Section 3.6.3.2, on fish and wildlife.

Prey Birds and Other Avian Species

State-listed prey birds that utilize habitat in the project-affected regions and were not discussed in the federally-listed species section include the bald eagle, osprey, peregrine falcon, Florida sandhill crane, and the southeastern American kestrel. The bald eagle, sandhill crane, and southeastern American kestrel are all state-listed threatened species, while the peregrine falcon and the osprey are state-listed endangered and species of special concern, respectively. Note: The bald eagle was recently de-listed from a federally threatened status. Some prey birds, including bald eagle, osprey, and peregrine falcon, may utilize the littoral zone around Lake Okeechobee in addition to mangroves in coastal areas (USACE 2006). Freshwater marshes in Compartments B and C are also potential prey bird habitat, especially for the Florida sandhill crane (URS 2007a,b); however, no species were observed during the surveys for the 2007 Wildlife Evaluation Report, and no nests were observed. The closest documented bald eagle nest (Figure 3-16) to the project footprint was 3.2 miles west of Compartment C (FFWCC 2007; URS 2007a,b). The southeastern American kestrel may utilize farmland and other open habitats within the EAA; however, none were observed within Compartments B and C during the surveys for the 2007 Wildlife Evaluation Report.

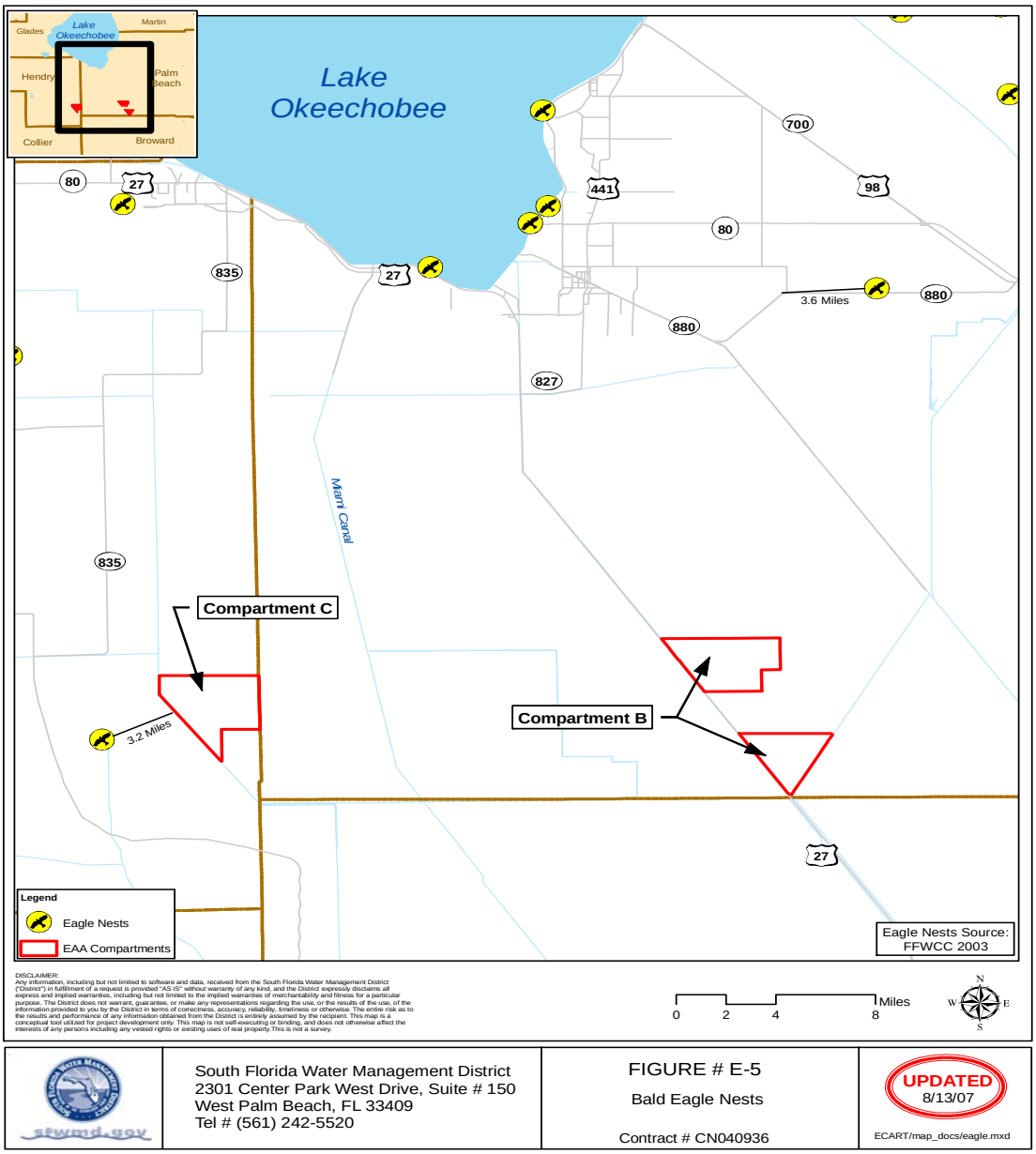
Two state-listed seabirds considered were the brown pelican and the least tern. Brown pelicans are designated as a species of special concern by the state of Florida, while the least tern is designated as threatened. While seabirds are usually exclusive to coastal environments, these two species have also been documented along the western littoral zone of Lake Okeechobee (USACE 2006; FFWCC 2007); therefore they are considered for potential impacts. No brown pelicans or least terns were observed in the Compartment B and C Build-out footprints during the surveys for the 2007 Wildlife Evaluation Report.

Figure 3-15. Wading Bird Rookery Locations



Source: URS 2007a,b

Figure 3-16. Bald Eagle Nest Locations

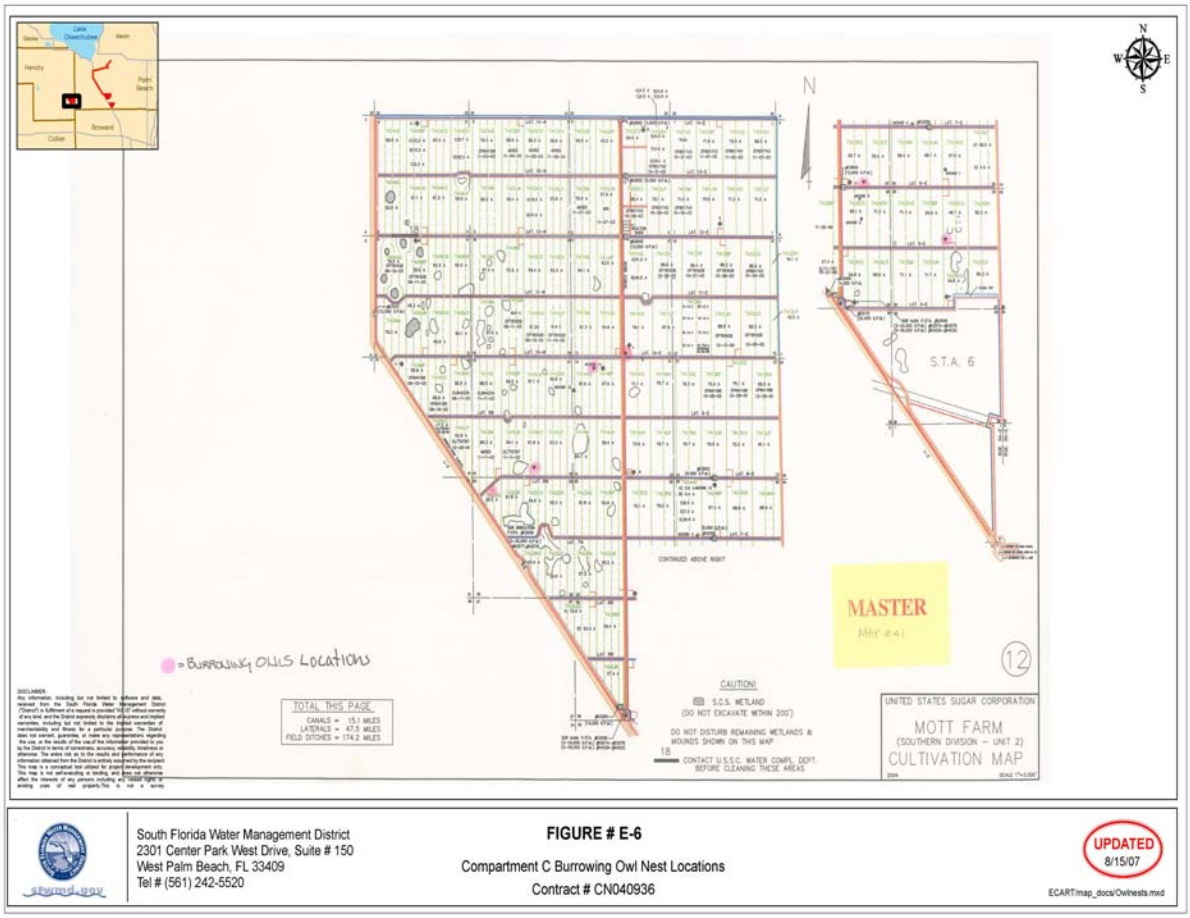


Source: URS 2007a,b

Burrowing owls are also known to occur in sandy open areas with sparse low herbaceous vegetation, agricultural fields, and golf courses in the affected regions. Suitable habitat was not identified within Compartment B in the 2007 Wildlife Reports (URS 2007a,b). However, burrowing owls were observed by URS field personnel within Compartment B during other studies, and reported to SFWMD (SFWMD 2008b). Burrowing owls have also historically used Compartment C. A 2004 map produced by U.S. Sugar Corporation (URS 2007a,b) identifies several burrows within Compartment C, but it is unclear if these burrows were

active at that time (Figure 3-17). It was determined during the surveys for the 2007 Wildlife Evaluation Report in Compartment C that the locations of burrowing owl nests shown on the map were no longer suitable habitat because tall vegetation was present. In addition, no burrowing owls were found during field inspections of existing burrowing owl habitats within Compartment C.

Figure 3-17. Compartment C Burrowing Owl Nest Location



Source: URS 2007a,b

Reptiles

Four state-listed reptiles considered were the Florida pine snake, Florida brown snake, Florida ribbon snake, and the gopher tortoise. The Florida brown snake, the Florida ribbon snake, and the gopher tortoise are state-listed threatened species, while the Florida pine snake is a state-listed SSC.

The gopher tortoise and the Florida pine snake are often found in dry, sandy habitats such as longleaf pine (*Pinus palustris*), dry oak (*Quercus* spp.), and sandhills. These species may also inhabit scrub, dry hammock, pine flatwoods, dry prairie, coastal grasslands and dunes, mixed hardwood-pine communities, and a variety of disturbed habitats (FFWCC 2006c).

Based on the lack of suitable dry, upland habitat, they are not likely in Compartment B and C and were not observed during the surveys for the 2007 Wildlife Evaluation Report.

Other state-listed snakes, including Florida brown snake and the Florida ribbon snake, utilize various aquatic and wetland habitats throughout the project-affected regions including freshwater marshes, aquatic slough, wet prairie, canals, and other disturbed areas in the EAA, the WCAs, and Acme Basin B-Section 24. No state-listed snake species were observed in Compartments B and C during the surveys for the 2007 Wildlife Evaluation Report

Mammals

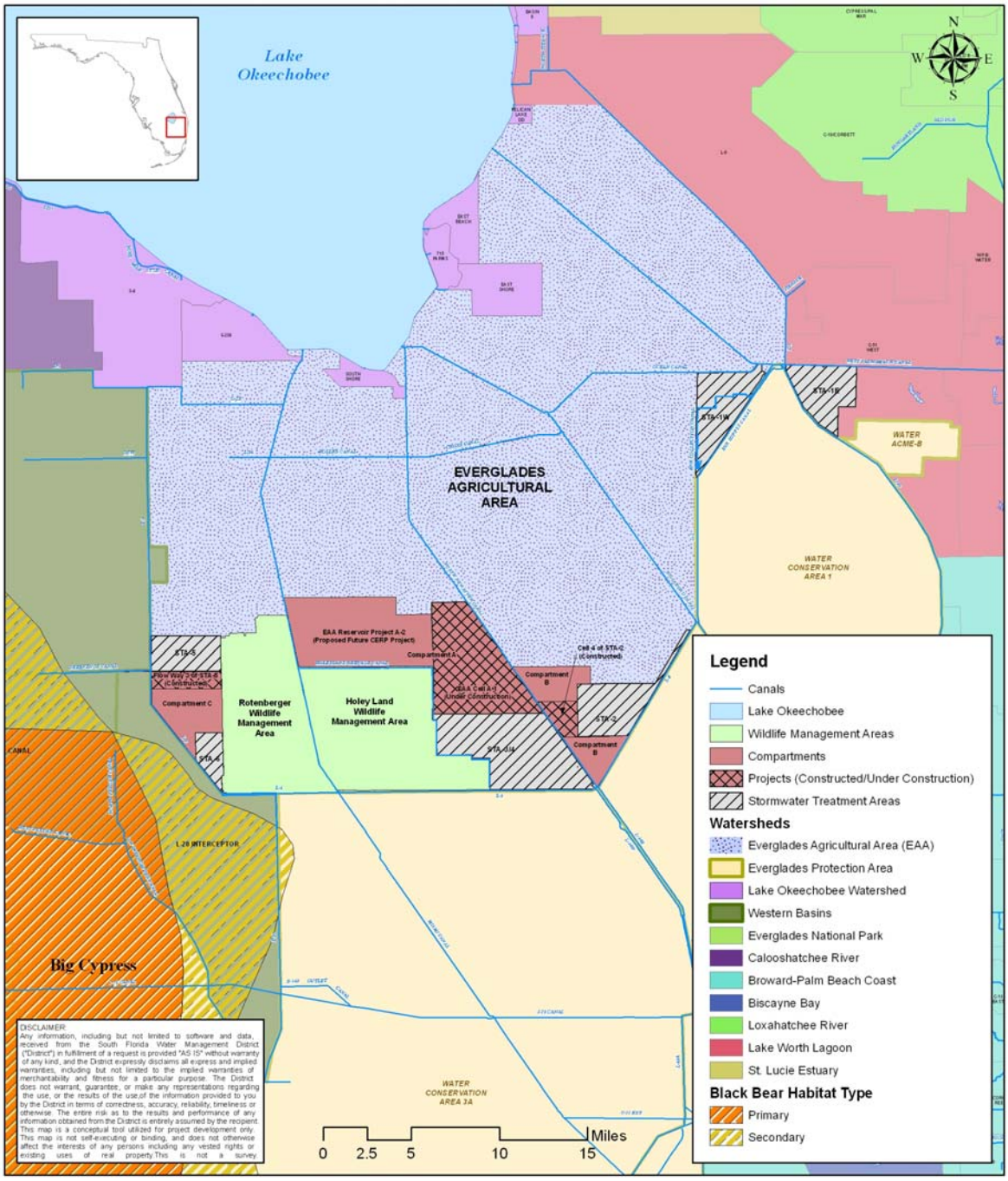
One state-listed mammal, the Florida black bear, was considered. Florida black bears are listed as threatened by the state of Florida. Florida black bears depend on forest vegetation and prefer forested areas with intermixed open areas (such as meadows). Compartment C borders secondary habitat for the Big Cypress black bear population (Figure 3-18), but it is not anticipated within the project footprint or the EAA based on the lack of suitable forested habitat. Furthermore, no evidence of black bears was observed during the surveys for the 2007 Wildlife Evaluation Report.

3.9 ESSENTIAL FISH HABITAT (EFH)

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) directed NMFS and the Fisheries Management Council to include identification and protection of EFH in all federal fishery management plans. NMFS implements and enforces MSFCMA through consultation with federal agencies required for any federally funded, permitted, or proposed work that may affect EFH. The MSFCMA defines EFH as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity" (NMFS 1999). Essential Fish Habitat- Habitat Areas of Particular Concern (EFH-HAPC) is a subset of the EFH designation for areas considered particularly vulnerable to degradation by human activities or are environmentally stressed (NMFS 1999).

EFH is present along the Atlantic and Gulf Coasts of Florida, and in the St. Lucie River Estuary, the Lake Worth and Indian River Lagoons, areas outside the Port St. Lucie and Fort Pierce Inlets along the Atlantic Coast, and the Caloosahatchee River Estuary on the Gulf Coast. Figure 3-19 is a map that depicts the Northern Estuaries listed above. The following sections describe Florida coastal habitat. However, the proposed project is an extended distance from EFH and no EFH exists within the project footprint. Therefore, EFH consultation is not required for the Compartments B and C Build-out project.

Figure 3-18. Florida Black Bear Habitat



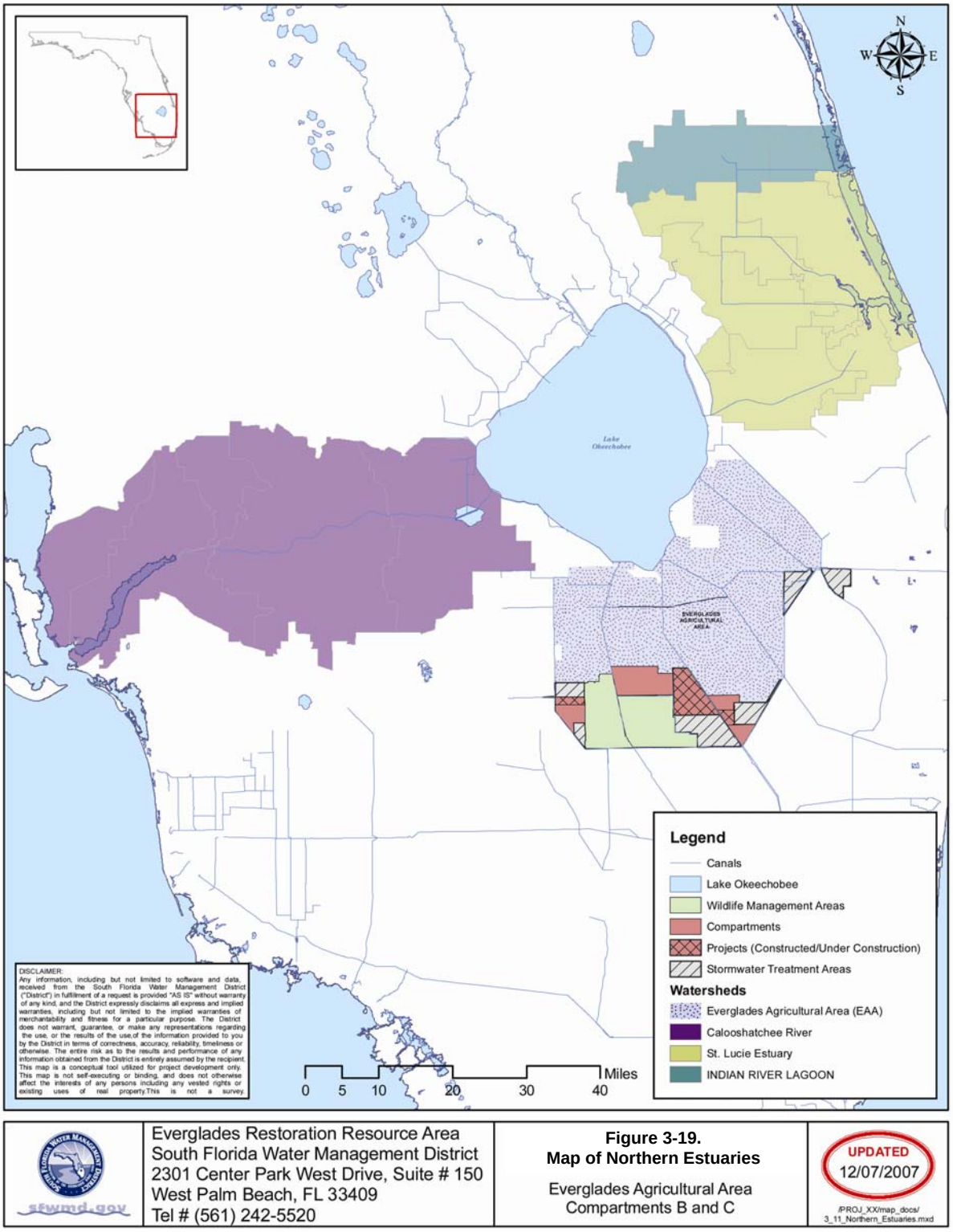
Everglades Restoration Resource Area
South Florida Water Management District
2301 Center Park West Drive, Suite # 150
West Palm Beach, FL 33409
Tel # (561) 242-5520

Figure 3-18.
Florida Black Bear Habitat

Everglades Agricultural Area
Compartments B and C

UPDATED
12/10/2007

Figure 3-19. Map of Northern Estuaries



3.9.1 Atlantic Coast

The South Atlantic Fisheries Management Council (SAFMC) designates EFH for the South Atlantic Region. Areas of the St. Lucie River Estuary and the Indian River and Lake Worth Lagoons are EFH for brown shrimp (*Penaeus aztecus*), white shrimp (*Penaeus setiferus*), pink shrimp (*Penaeus duorarum*), red drum (*Sciaenops ocellatus*), Goliath grouper (*Epinephelus itajara*), grey snapper (*Lutjanus griseus*), mutton snapper (*Lutjanus analis*), Spanish mackerel (*Scomberomorus maculatus*), cobia (*Rachycentron canadum*), and spiny lobster (*Panulirus argus*). The estuaries areas are further designated as EFH-HAPC for snappers, groupers, and red drum (*Sciaenops ocellatus*).

The areas in Port St. Lucie and Fort Pierce Inlets and the surrounding ocean waters (up to 12 meters water depth) are designated as EFH for white shrimp pink shrimp, brown shrimp, red drum, Goliath grouper (*Epinephelus itajara*), red snapper (*Lutjanus campechanus*), grey snapper, mutton snapper (*Lutjanus analis*), blackfin snapper (*Lutjanus buccanella*), silk snapper (*Lantjanus vivanus*), white grunt (*Haemulon plumieri*), Spanish mackerel, cobia, spiny lobster, and corals. The areas in and outside the two inlets are further designated as EFH-HAPC for spiny lobster, corals, snappers, groupers, red drum, and shrimp.

3.9.2 Gulf Coast

The Gulf of Mexico Fishery Management Council (GMFMC) designates EFH for the Gulf region. The GMFMC defines EFH in estuaries as “all estuarine waters and substrates (mud, sand, shell, rock, and associated biological communities), including the subtidal vegetation (seagrasses and algae) and the adjacent intertidal vegetation (marshes and mangroves)” (GMFMC 1998). Habitats in the Caloosahatchee River Estuary are designated as EFH for pink shrimp, black grouper, gag grouper, grey snapper, yellowtail snapper (*Ocyurus chrysurus*), lane snapper (*Lutjanus synagris*), Spanish mackerel, cobia, and stone crab (*Menippe mercenaria*).

3.10 LAND USE

The general pattern of land use within the region of south Florida surrounding the proposed project sites consists of an expanding zone of urban development within the coastal strip adjacent to the Atlantic Ocean; a large area dominated by intensive agricultural use east, south, and west of Lake Okeechobee; and a band of largely undeveloped land within the EPA situated between the two zones of development. The following discussion addresses existing land use patterns within that region, and the land use plans and policies of the government jurisdictions that are applicable to the area.

3.10.1 Land Use Patterns

3.10.1.1 Everglades Agricultural Area

The EAA is the affected area for the Proposed Action. The designated boundary of the EAA includes approximately 620,800 acres of lands (USACE 2006) located immediately south and southeast of Lake Okeechobee (see Figure 3-20). Historically, the area that is now the EAA was Everglades swampland, which provided the rich organic peat and muck soil that makes the area highly productive for agriculture today. The State of Florida established the EAA in the 1940s, when approximately 700,000 acres of state-owned land were drained and opened for farming. Large-scale agricultural use was established in the 1950s (USACE and SFWMD 2004), and development of the EAA canals and levee system and conversion of lands to agriculture was substantially completed in 1962 (SFWMD 2001).

Most of the EAA is located within western Palm Beach County in the area west of the WCAs and south of Lake Okeechobee, but also includes the area southeast of Lake Okeechobee between the L-8 Canal and SR 80 west of Twenty Mile Bend. A strip of land 4 miles wide along the western edge of the EAA, including the area identified as Compartment C, is located in eastern Hendry County (Snyder 2004). Currently, 505,540 acres of lands are farmed in the EAA, with 90 percent of the acreage in Palm Beach County and 10 percent in Hendry County (USACE and SFWMD 2006).

Specific agricultural land uses in the area include sugar cane (468,800 acres), row crops (16,347 acres), sod (9,846 acres), miscellaneous crops (6,970 acres), pastures (2959 acres), and nurseries (618 acres; USACE and SFWMD 2006). Sugar cane is by far the largest crop in the EAA, accounting for 92.7 percent of the crop-yielding acres (USACE 2006). The current EAA acreage in sugar cane represents a marked expansion from 40,000 to 50,000 acres existing in 1950 (USACE and SFWMD 2006).

The overall population density of the EAA is quite low, as residential uses in most areas are limited to on-farm residences that are scattered widely throughout the area. Urbanized development in the EAA is limited to the incorporated cities of Pahokee, Clewiston, Belle Glade, Belle Glade Camp, South Bay and the unincorporated community of Lake Harbor, as shown in Figure 3-21. These communities grew out of early agricultural settlements and are located on or near the shores of Lake Okeechobee in the northern part of the EAA. Demographic and economic characteristics for the study area are addressed in Section 3.14.

Figure 3-20. Map of EPA, WCAs, and Big Cypress National Preserve

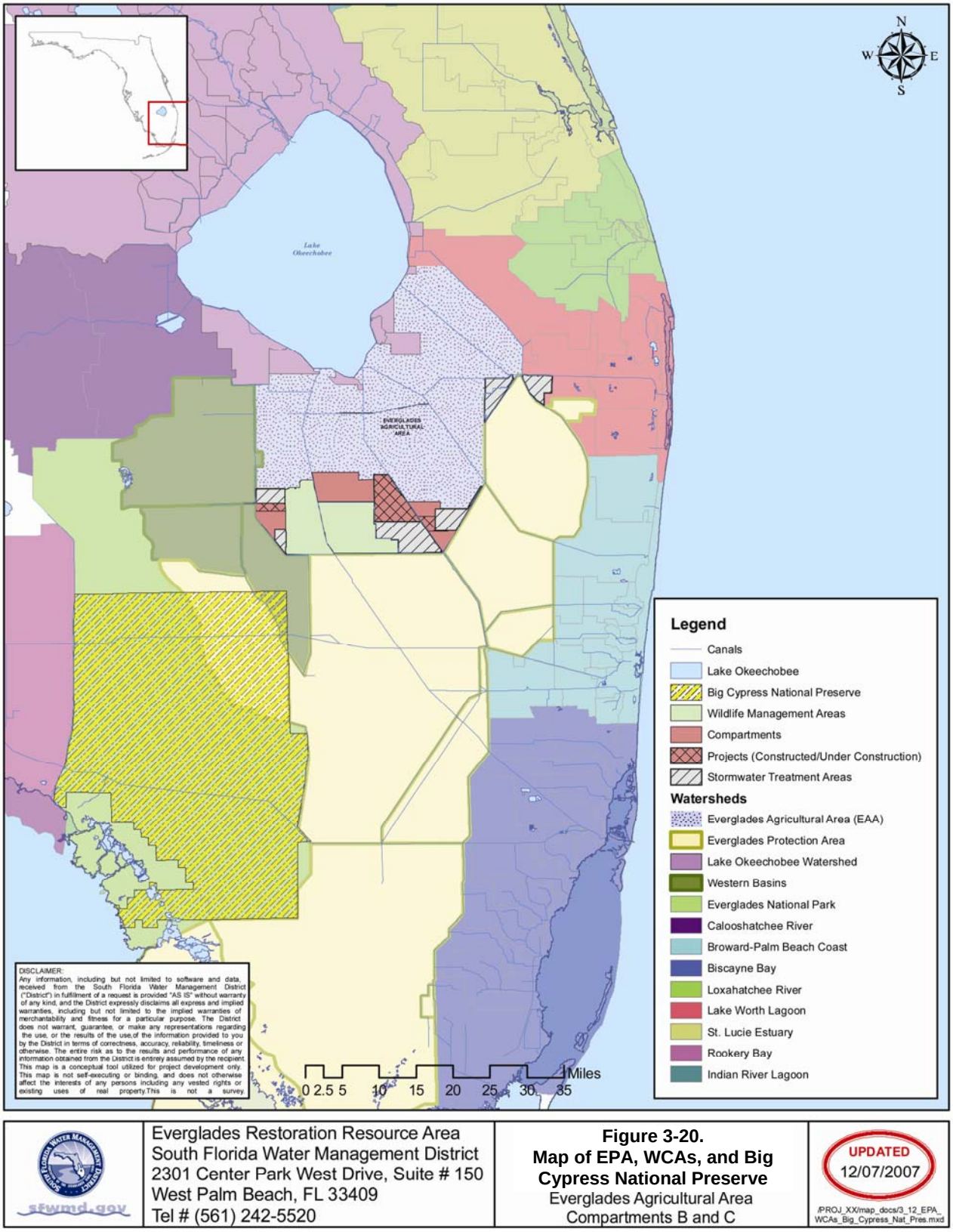
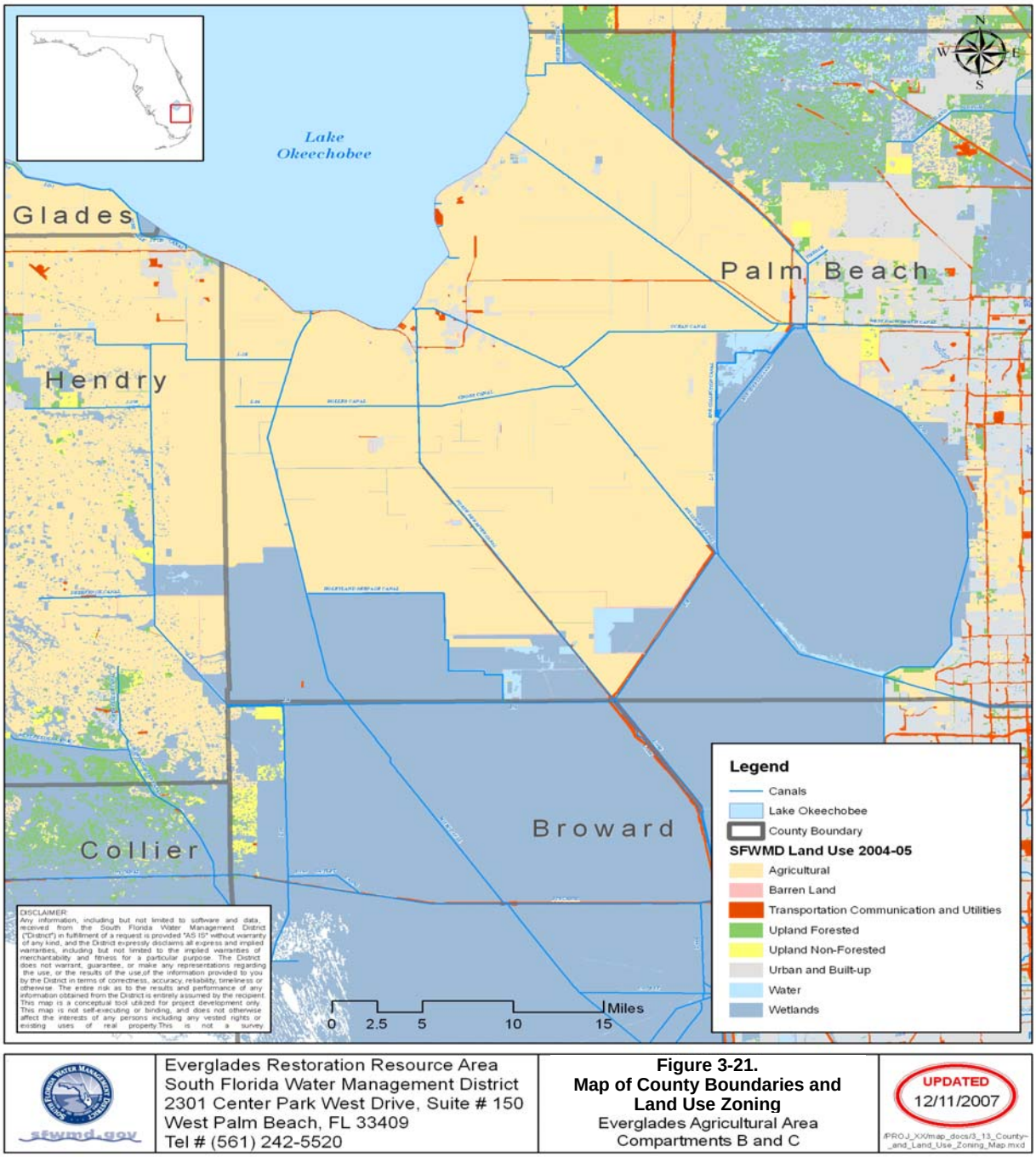


Figure 3-21. Map of County Boundaries and Land Use Zoning



Land uses in the EAA are expected to shift somewhat in future years, in response to a variety of factors. One source of expected change is the conversion of agricultural land to conservation-related uses. SFWMD estimates that purchase of agricultural lands for restoration projects in the EAA will result in a 9.2 percent reduction of sugar cane acreage (USACE and SFWMD 2006).

Water in the EAA is managed to provide flood protection, irrigation, and fresh water for the EAA and surrounding environmentally sensitive areas through a series of canals, levees, culverts, gates, and pumps (USACE and SFWMD 2004). Physical factors associated with soil conditions and agricultural practices, especially water use, also are likely to influence future land use patterns in the EAA. Projections indicate that soil subsidence may affect agriculture in the EAA. EAA soils are characterized as Histosols, which are organic soils formed under anaerobic conditions in systems with high amounts of organic matter (Snyder 2004). Soils in the EAA are oxidizing and subsiding under current and historical irrigation and drainage conditions. Snyder (2004) estimates that less than 8 inches of topsoil will remain by 2050 in one-half of the EAA, making sugar cane production difficult and costly. Based on assumed continuation of current agricultural practices, in the year 2050 only 507,675 acres of the EAA would be suitable for crops, and 71 percent (407,053 acres) of that acreage would be suitable only for water-tolerant crops (Snyder 2004). Implementing soil-conserving farming practices could substantially retard subsidence and could reduce the area that would be suitable only for water-tolerant crops in the future.

3.10.1.2 Lands Adjacent to the EAA

Some lands within the statutory boundary of the EAA have been assigned a different management status and are not now considered part of the EAA. This situation applies to the RWMA (25,000 acres) and the HLWMA (35,500 acres), and to six existing STAs. Current land use and cover conditions in the RWMA and HLWMA are incorporated into the discussion of those units in Section 3.11.1. Land use conditions for the STAs are described in Section 3.10.1.3.

The EAA is bordered to the south and southeast by the EPA, a special land-use designation intended to provide an undeveloped buffer between ENP and the developed lands to the north (see Figure 3-20). The EPA is subdivided into a series of WCAs. From north to south, WCAs 1 (the Refuge), 2, and 3 abut the eastern, southeastern, and southern boundaries of the EAA. The Refuge adjoins the east side of the EAA and is situated between the EAA and the developed coastal areas to the east. The western edge of the Refuge is 6 miles northeast of Compartment B. STA 1E is located outside the EAA and adjacent to the northeastern edge of the Refuge.

WCA 2A adjoins the southeastern boundary of the EAA and is therefore adjacent to the southeastern edge of Compartment B. WCA 3A extends along the majority of the EAA's southern boundary; WCA 3A is adjacent to the southern tip of Compartment B and extends to within 5 miles of Compartment C.

A portion of the Big Cypress Seminole Indian Reservation overlaps the northwestern corner of WCA 3A. The reservation extends to the west for a considerable distance and also abuts

part of the southern boundary of the EAA. To the north of the Big Cypress Reservation, lands located in Hendry County along the southwestern and western edges of the EAA are privately owned and are generally classified as agricultural lands. For water management, the area southwest of the EAA (and adjacent to Compartment C) is within the C-51 Basin, and the area immediately to the west is within the C-139 Basin.

3.10.1.3 Stormwater Treatment Areas

The primary function of the STAs is to filter pollutants from water as it leaves the EAA and enters the WCAs. In addition, the STAs provide wetland habitat. Physical features within the existing STAs include the constructed wetlands and the associated water management infrastructure (such as levees, canals, and water control structures). Land cover within the STAs is primarily a mixture of open water, emergent, and submergent marshes. Land use for these areas can be classified as public/institutional or conservation. To varying degrees, the STAs also support ancillary recreational uses such as hunting, fishing, and wildlife viewing.

Compartment B is a 9,585-acre, irregularly shaped parcel located west of the existing STA 2 and east of US-27, in south-central Palm Beach County. SFWMD acquired title to the entire parcel in March 1999 pursuant to Grant Agreement FB-4 with the DOI and has managed the property under agricultural leases as an interim land use with the approval of the DOI. The entire parcel was acquired with Federal Farm Bill funds through the DOI to conduct restoration activities in the Everglades ecosystem. The northern portion of Compartment B was used primarily for sod farming, with some acreage in sugar cane; the agricultural lease for this area was completed in August 2007. The southern portion of Compartment B was used primarily for sugar cane farming until about 4 years ago, when the lease was vacated. The land has since gone fallow and has begun to revert to a natural wetland system, with standing water present for much of the year (Brown and Caldwell 2007).

Physical site features include farm roads, canals, and levees. There are three primary east-west farm canals with associated roads across the proposed NBO area, and five primary east-west canals with associated farm roads across the proposed SBO area. Smaller drainage ditches run north-south between the farm roads. Miscellaneous infrastructure also is within both build-out areas. Two old farm pump stations are located within the NBO. The SBO has three abandoned farm pump stations, three old building slabs, and four cane loading ramps. Two existing bridges cross the North and New River Canal that currently provide access to both sites from US-27. The bridge to the NBO is referred to as the Woerner Bridge. It is a two-lane structure and its center span recently was replaced. The southernmost bridge, the Okeelanta Bridge, which currently provides direct access to the SBO, is a single-lane bridge and is restricted to a 33-ton maximum load for a single-unit truck. Each of the bridges is

currently undergoing structural evaluation and may be rehabilitated or replaced either in place, or in a new, nearby location (Brown and Caldwell 2007).

The Compartment C build-out area is a 6,200-acre, irregularly shaped parcel that lies between STAs 5-3 and 6-2 in the southwestern corner of Hendry County where Palm Beach, Broward, and Hendry Counties meet. The area of the proposed Compartment C build-out has been used for agricultural production, primarily sugar cane. The area was owned by the Unites States Sugar Corporation (USSC), but it was acquired with Federal Farm Bill funds through the DOI and title was transferred to the SFWMD pursuant to Grant Agreement FB-4 between the SFWMD and the DOI; it was recently vacated by USSC (URS 2007a,b). Physical site features in the Compartment C build-out area include farm roads, canals, and levees. Roads composed of compacted limerock have been excavated from adjacent farm drainage ditches and canals surround the production area. These roads, along with drainage, laterals, and smaller field ditches, create a geometric pattern that reflects agricultural production. There is no notable infrastructure within in this area (URS 2007a,b).

There is no resident human population within Compartments B and C or the existing STAs. The population in nearby areas is limited to households living in on-farm residences, which are distributed within the EAA at very low densities. The urbanized development in the area around Belle Glade, South Bay, Pahokee, and Clewiston is located more than 15 miles from either Compartment B or C.

3.10.1.4 Alternative Lands

The lands assumed to be used for stormwater treatment under Alternative E include (1) an undefined area of approximately 10,000 acres located within the EAA and west of STA 1W, and (2) Acme Basin B-Section 24, a 362-acre parcel located outside the EAA and adjacent to the southeastern corner of STA 1E.

Specific boundaries or parcels for lands west of STA 1W that would be developed as an STA under Alternative E have not been identified. In general, lands in this part of the EAA are actively being used for agricultural production. The distribution of land use in this area is similar to that described in Section 3.10.1.1 for the EAA as a whole. This portion of the EAA has a low-density resident population, similar to the previous discussion, and is approximately 12 miles from the urbanized development around Belle Glade.

Section 24 is located within the Acme Basin B, an elongated, generally rectangular area along the east side of STA 1E and within the C-51 Drainage Basin. The Acme Basin B and the adjacent STA 1E are both within the incorporated boundaries for the Village of Wellington, whereas most other lands in the affected area are within unincorporated Palm Beach County.

Acme Basin B-Section 24 comprises 362 acres of former agricultural lands that are currently fallow (USACE 2006). Past crop cultivation was primarily sugar cane, although the most recent production consisted of a crop of beans harvested in 2005. Prior to agricultural use the area was wetland, and the land is reverting to a mix of herbaceous wetland vegetation, beans and weed species typical of fallow fields. The SFWMD owns Acme Basin B-Section 24 and in 2004 under the Acceler8 Program had proposed to develop an impoundment on the site that, in conjunction with canal and pump modifications, would allow rerouting Acme Basin B discharge into STA 1E for treatment. It should be noted that as of May 9, 2008, the Acme Basin B-Section 24 lands are under a permit application review with the USACE for construction of an STA and recreational facility for the Village of Wellington. The project is being funded by the landowner, the SFWMD, but the Village of Wellington is the applicant and will be responsible for obtaining the necessary permits and the actual construction of the impoundment for the STA.

Acme Basin B-Section 24 is bordered on the west by STA 1E, and the Refuge is across the L-40 levee and canal from the southwestern corner of Acme Basin B-Section 24. The C-1 Canal and Flying Cow Road run along the east side of the site. Lands to the north of Acme Basin B-Section 24 (the remainder of the surrounding Acme Basin B area) and to the east are in mixed agricultural and low-density, rural residential use. The land immediately to the south of Acme Basin B-Section 24 is an undeveloped portion of the tract used to form STA 1E. The commercial and other more intensive uses in Wellington are located approximately 5 to 6 miles to the east of Acme Basin B-Section 24.

3.10.2 Applicable Land Use Plans and Policies

Regulation of land use within the affected area is primarily the responsibility of Hendry and Palm Beach Counties, the local governments with planning and zoning jurisdiction for virtually all of the EAA (Figure 3-21). One parcel of land included within Alternative E is located within the Village of Wellington.

3.10.2.1 Hendry County

Land use in Hendry County is primarily agricultural, including production of sugar cane (70,000 acres), citrus fruits (100,000 acres), vegetables, and cattle (Hendry County 1999). The Hendry County comprehensive plan establishes county-wide land use policies and general land use designations for the various areas of the county, while site-specific land uses are regulated under the zoning code.

The Hendry County 2010 land-use map (Hendry County 1999) designates the lands in the Hendry County portion of the EAA, including Compartment C, as agricultural. In the "Future Land Use Element" of the Hendry County comprehensive plan, the agricultural land-

use designation includes various uses defined as agriculture such as cultivation of crops, raising livestock, and producing and processing agricultural products. This designation may also include Planned Unit Developments of migrant farm labor communities and their associated commercial, recreational, and mixed uses; single-family residences developed at a maximum density of 1 unit per 5 acres; and public and quasi-public facilities.

The prior land use of the Compartment C Build-out was sugar cane farming. The presence of archeological mounds throughout the subject area is evidence that the area was used by Native Americans. A cultural and archaeological resource study has been conducted to assess the significance and integrity of the mounds, as well as their historic value for listing in the National Register of Historic Places (NRHP) and is included as Appendix D to this Draft EIS.

3.10.2.2 Palm Beach County

Palm Beach County's vision of community creation, enhancement, and maintenance is defined in the "Future Land Use Element" of the Palm Beach County (2006) comprehensive plan. It provides the framework for growth management and land planning in unincorporated Palm Beach County. The future land use element of the plan assigns county lands to five different categories, known as tiers, developed to recognize the diverse communities that share common characteristics within the county.

Palm Beach County lands within the EAA are allocated to the Urban/Suburban Tier and the Glades Tier (PBC 2006). EAA lands with the Urban/Suburban Tier designation occur within the Cities of Belle Glade, Pahokee, and South Bay and their surrounding urban service areas. Land uses within these areas consist primarily of low- to high-density residential development. The objectives for the Urban/Suburban Tier are to protect the character of the communities by allowing services and amenities consistent with the needs of an urban and suburban community, such as affordable housing, employment opportunities, open space, and recreational facilities.

The Glades Tier encompasses the majority of EAA lands in Palm Beach County, which are primarily used for agriculture. The main objectives for the Glades Tier are to protect the existing economically viable agricultural base and to preserve and enhance its unique characteristics. Land-use designations allowed in the Glades Tier include rural residential, agricultural, conservation, parks and recreation, commercial recreation, spoil, and transportation and utilities. EAA lands within the Glades Tier are mainly designated as agricultural, with residential densities not to exceed one dwelling unit per 10 acres.

Compartment B and the Alternative E lands located west of STA 1W are both within the Glades Tier of the EAA and have a land use designation of Agricultural Production (AP).

The purpose of the AP District is to conserve and protect areas for exclusive, bona fide agricultural- and farming-related operations, particularly where soil and water conditions favor continued agricultural production (PBC 2008). A wide range of agricultural activities and their accessory uses are to be permitted in the AP District in order to maintain the vitality of the agricultural industry in Palm Beach County. Minor utility uses, which include water reclamation treatment and storage facilities, can be permitted in the AP District with the approval of the PBC Development Review Officer (PBC 2008).

3.10.2.3 Village of Wellington

The lands assumed to be used for stormwater treatment under Alternative E include one parcel, known as Acme Basin B-Section 24, that is located within the incorporated boundaries of the Village of Wellington. STA 1E and the remainder of Acme Basin B north of Section 24 are also located within Wellington. This area of approximately 6,000 acres was formerly within unincorporated Palm Beach County, but was annexed into Wellington in 2005 (personal communication, D. Noll, Village of Wellington Department of Community Development, April 22, 2008). Prior to annexation Palm Beach County had designated this area as within the Agricultural Residential (AR) zoning district. The AR designation in the Palm Beach County code is to protect and enhance the rural lifestyle and quality of life of residents in areas designated rural residential; to protect watersheds and water supplies, wilderness and scenic areas, and conservation and wildlife areas; and to permit a variety of uses that require non-urban locations but do not operate to the detriment of adjoining lands devoted to rural and residential purposes (PBC 2008). Wellington has to date retained the Palm Beach County zoning designation for Acme Basin B-Section 24 and STA 1E, and has likewise adopted an AR district with the same purpose as defined in the Palm Beach County code (Village of Wellington 2005). It should be noted that as of May 9, 2008, the Acme Basin B – Section 24 lands are under a permit application review with the USACE for construction of an STA and recreational facility for the Village of Wellington.

3.11 RECREATIONAL RESOURCES

The study area for recreational resources includes the EAA, WCAs and the lands directly adjacent to Acme Basin B-Section 24. Recreational opportunities in the study area are based on a variety of resources, including the waterbodies within the area and several extensive tracts of publicly owned lands. Many of the water resources in the region are constructed features, primarily the extensive network of canals developed as key components of the water management system. The canals provide a resource for water-based activities such as fishing and boating. The network of access roads typically situated along the levees adjacent to the canals provides widespread access to these water resources and formal and informal boat ramps. A transportation network exists by combining levees and canals. Changes through

removal or additions of levees, canals, bridges, and water control structures will change public access abilities. The areas are large and remote and access to or loss of access to the same named area from different points greatly changes the public's real access. Wetlands constructed to provide stormwater treatment now include extensive areas of open-water habitat that, depending on site-specific management, supports selected recreational activities related to the fish and wildlife that use these habitats.

Recreation is allowed on several large areas of public lands within and surrounding the EAA. These areas include the Arthur R. Marshall Loxahatchee National Wildlife Refuge, several WMAs managed by the State of Florida, the Lake Harbor Public Waterfowl Area, the Florida National Scenic Trail, and some of the existing STAs. Although access for recreation may be limited within these areas, they offer the public a variety of recreational activities that can include hunting, fishing, camping, wildlife observation, interpretation, hiking, bicycling, canoeing, and airboating. The recreation areas closest to Compartments B and C and the Alternative Lands are discussed in the following subsections.

3.11.1 Wildlife Management Areas

The WMAs offer hunting, fishing, boating, wildlife viewing, camping, and limited hiking opportunities. Access to the interior areas of the WMAs is limited by the nature of the wetlands, and off-road vehicles (ORVs) or airboats are typically necessary to reach the interiors. Changes to hydrology causing depth and duration variations will affect the sportsman's ability when using airboats, tracked vehicles, or conventional boats into the remote areas, the internal access routes, and points of origin. The levee and canal systems provide perimeter access and opportunities for hunting, fishing, hiking, biking, and other resource-based recreation.

3.11.1.1 Rotenberger WMA

The RWMA is 28,760 acres located west of the Miami Canal (L-23), east of the Hendry-Palm Beach County line, and directly north of WCA 3A North (otherwise known as the Everglades and Francis S. Taylor WMA). The eastern boundary of Compartment C abuts this WMA. RWMA is primarily sawgrass marsh with intermediate tree islands and willow heads (FDEP 2001b). The main recreational activity is deer hunting, although hunting feral hog and waterfowl as well as frogging, camping, biking, and hiking are also allowed. Fishing is currently unlikely because of the lack of suitable habitat (FFWCC 2002), but the Rotenberger Hydropattern Restoration Project may result in increased water coverage and improved fish habitat (USACE and SFWMD 2006).

3.11.1.2 Holey Land WMA

The HLWMA is 35,350 areas located directly east of RWMA. The HLWMA is primarily sawgrass marsh, but it lacks the tree islands found in typical Everglades systems (FDEP 2001b). Currently, state agencies (FFWCC, SFWMD, and FDEP) are developing an updated management plan to address goals and objectives for restoration of the HLWMA. Recreation includes hunting, fishing, camping, frogging, hiking, and biking. The Holey Land Restoration Project that began in 1991 increased the hydroperiod in this WMA. In response, the primary recreational use in the WMA changed from hunting deer and feral hog to fishing in perimeter canals and hunting waterfowl (USACE and SFWMD 2006).

3.11.1.3 Everglades-Francis S. Taylor WMA

The Everglades-Francis S. Taylor WMA includes WCAs 2A, 2B, and 3A and is located immediately southeast and south of the EAA. The Francis S. Taylor WMA designation applies to WCA 3B, which occupies an area southeast of WCA 3A that is not adjacent to the EAA. The Everglades WMA is separated from adjacent areas by water control levees and canals, and its hydrology is highly managed. Its 671,831 acres of primarily Everglades marsh buffers ENP and Big Cypress National Preserve from agriculture in the EAA. The main recreational activity within the WMA is hunting, but the interior areas, levees, and canals also provide opportunities for fishing, frogging, hiking, biking, airboating, canoeing, and wildlife viewing. Common access to the western area of WAC 2A and the L-6 Canal between S6 and S7 is through the southern portion of Compartment B across the sportsman's crossing.

3.11.2 Arthur R. Marshall Loxahatchee National Wildlife Refuge

WCA 1 is otherwise known as the Arthur R. Marshall Loxahatchee National Wildlife Refuge, referred to as the Refuge. This 147,392-acre refuge includes more than 14,080 acres of Everglades habitat, a 400-acre cypress swamp that is the largest remaining remnant of a cypress strand that once separated the pine flatwoods in the east from the Everglades marshes, and recreational amenities (USFWS undated[b]). The refuge was named because it was connected to the Loxahatchee River by the Loxahatchee Slough, but this connection has been severed by dredge and fill. Public access to the Refuge is provided at the Refuge Headquarters, located west of the City of Boynton Beach and US-441, at the Hillsboro Area located on Route 827 (Loxahatchee Road) west of Deerfield Beach, and at the northwest tip at the 20-mile bend or S5A boat ramp. The Refuge includes the 12-mile biking trail along the L-40 levee, boardwalks, an overlook, a loop kayak trail from headquarters, and hiking/biking trails. A perimeter canal is open to the public, whereas internal access is only allowed in a designated southern portion of the Refuge. Waterfowl hunting is allowed in designated areas during the fall and winter. Boating, hunting, fishing, and canoeing are

permitted in the perimeter canal and internal access is accomplished through multiple routes in the southern portion of the refuge open to the public. Several boat access points exist, including boat ramps at the refuge headquarters, at the 20-mile bend (S5A boat ramp), and Loxahatchee public access area, which is the southern end of the bike trail.

3.11.3 Stormwater Treatment Areas

The STAs are wetlands constructed primarily to remove pollutants, primarily phosphorus, from the water before it is discharged from the EAA to the WCAs. The STA wetlands provide ideal habitat for fish, alligators, waterfowl and wading birds. Among the six STAs, hunting has been permitted in STA 1W, 2, 3/4, and 5. Bird watching has been allowed in STAs 5, 1W, and 1E. STA 5 and 1W are on FFWCC's Great Florida Birding Trail. Recreational plans developed for the STAs will ensure that permitted recreational uses are consistent with the primary STA goal — to improve water quality.

STA 2 and STA 3/4 are adjacent to the proposed Compartment B Build-out area, and STA 5 and STA 6 are adjacent to the proposed Compartment C Build-out area. STA 1W is in the northeastern part of the EAA and STA 1E is due east of STA 1W, but not within the EAA.

3.11.3.1 STA 3/4 Public Use Area

STA 3/4 and the public use or recreational facility is located in the western portion of Palm Beach County, just north of the L-5 Canal and directly north of the Palm Beach County line. The STA 3/4 recreational facility, known as the Harold A. Campbell Public Use Area, is located within the footprint of STA 3/4, between the Griffin Rock Pits and Treatment Cell 2B. The location of the public use area minimizes public access past the STA's water control structures and data equipment. This location also has minimal impacts to jurisdictional waters of the United States The Harold A. Campbell Public Use Area includes a vehicle barrier gate, road improvements, a boat ramp, an asphalt parking area, an information kiosk (sheltered), landscaping, a multi-purpose bridge, and a composting toilet. The public has access to a 4-mile loop trail during daylight hours on designated days. The boat ramp allows 7-day access during daylight hours to the external canals of STA 3/4 and those canals along the south side of the L-5 for a total of 27 miles of fishable canals.

3.11.3.2 STA 1W Public Use Area

The STA 1W Public Use Area includes a vehicle barrier gate, paved and unpaved parking areas, concrete sidewalks, a pedestrian bridge, a canoe launch, a hiking and biking trail along the STA 1W north seepage collection canal, an information kiosk/shade shelter, a composting toilet, a boardwalk with covered observation areas, landscape improvements, and turn lane improvements from Country Road 880. This facility is completely within the

footprint of STA 1W in Treatment Cell 5B. The public access site is open during daylight hours on designated days..

3.11.3.3 STA 1E Public Use Area

The STA 1E Public Use Area includes a levee trail, bank fishing, a vehicle barrier gate, both paved and unpaved parking areas, concrete sidewalks and guard rails, an information kiosk (with a shelter), a composting toilet, internal landscape improvements, and a turn lane from State Road 80. The public has access during daylight hours on designated days. STA 1E also enjoys bird tours conducted on weekends by a local nature center.

3.11.3.4 Alternative Lands

The lands that would be used as stormwater treatment areas under Alternative E do not currently provide public recreational opportunities. The undefined area of approximately 10,000 acres located west of STA 1W included in this alternative is currently in agricultural production and is not open to public use. The 362 acres in Acme Basin B-Section 24 are fallow agricultural lands that are not under active management and likewise are not open for recreational use (USACE 2006). The closest recreational opportunities to these sites are the Refuge. The nearest public access point to the Refuge is the boat ramp to the Refuge perimeter canal that is located between STA 1W and STA 1E. Nearby activities are those described above for STA 1W and STA 1E.

3.11.4 Other Recreational Resources

3.11.4.1 Lake Harbor Public Waterfowl Area

Lake Harbor Public Waterfowl Area (PWA) is located south of Lake Okeechobee in the Palm Beach County portion of the EAA. It is a 640-acre farm that the FFWCC manages for the dual purposes of providing rice crops and waterfowl habitat. The fields are flooded to support the first crop of rice, which is produced by a contracted farmer. After the rice harvest, the fields are re-flooded to provide habitat for ducks and other wetland wildlife. Waterfowl hunting is allowed on 320 acres of the WMA. The water is shallow, and no boats are permitted.

3.11.4.2 Florida National Scenic Trail

The Florida National Scenic Trail, designated under the National Trails System Act, is part of the Florida Greenways and Trails Program (Chapter 62 S-1 FAC) trail network managed by FDEP. The main goals of this conservation program are to establish an interconnected network of public and privately owned waterways, parks, and trails throughout the state. Two segments of the Florida National Scenic Trail, along the L2 Canal (18 miles) and L3 Canal (6.6 miles), are located along the western boundary of the EAA, adjacent to STAs 5 and 6 and the Compartment C Build-out area. This particular portion of the trail is used

primarily for hiking. The segment of the trail through this portion is now rerouted during construction to allow continued use.

3.12 AESTHETIC RESOURCES

The affected areas evaluated in this section include: (1) Lake Okeechobee; (2) the Northern Estuaries; (3) the Lake Worth Lagoon, (4) the EAA; (5) WCAs 1, 2A and 3A; (6) Compartment B; (7) Compartment C; and (8) Alternative Lands. The following information on aesthetic resources was taken from the EAA Storage Reservoirs Revised Draft Project Implementation Report EIS (USACE and SFWMD 2006) and basis of design reports for the Compartments B (Brown and Caldwell 2007) and C Build-outs (URS 2007a,b).

3.12.1 Lake Okeechobee

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, primarily on the west side of the lake, and some remnants of the historical willow swamp vegetation still can be found (Lodge 1994). Significant exotic and invasive vegetation species (melaleuca, Australian pine, torpedograss, and cattail) are intruding into stands of native species, which tends to diminish biological diversity and existing aesthetics in those areas. Expansion of torpedograss and cattail, particularly, has affected aesthetic qualities of the lake in the Indian Prairie region of the lake.

The Herbert Hoover Dike sideslopes are generally well grassed but contain some exotic 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 standing hundreds of acres of dead melaleuca forest, 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.

3.12.2 Northern Estuaries and the Lake Worth Lagoon

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 the 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.

Lake Worth Lagoon region is highly developed with residential development and docking facilities, and marinas. Approximately 65 percent of the shoreline is bulkheaded, with only 19 percent of mangrove shoreline remaining (PBCDERM undated). Eight causeways and bridges cross the Lake Worth Lagoon connecting the mainland to the barrier island.

The regional aesthetic overview for the Caloosahatchee River Basin 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 made up 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 also are an increasing concern to natural and aesthetic resources.

3.12.3 Water Conservation Areas

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. The Refuge is operated as a wildlife refuge and offers opportunities for observation of migratory game birds during the winter. 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 provide 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.

3.12.4 Everglades Agricultural Area

The visual characteristics of the EAA can simply be described as agricultural lands. The land is flat, with few natural topographic features. Much of the visible topographic features are associated with canals, levees, and agricultural fields. Agriculture is dominated by sugar cane 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 monotonous and of marginal value.

3.12.5 Compartment B

The NBO and SBO of Compartment B are primarily agricultural lands that are active or historically have been used for turf farming and sugar cane production, respectively. The NBO was used mostly for sod farming and some sugar cane; however, most of the area as been recently vacated. The SBO area was used for farming sugar cane, but has been vacated. There is standing water in the SBO area for most of the year, and the area has begun to revert back to a natural wetland system (SFWMD 2007d)

3.12.6 Compartment C

In Compartment C, the sugar cane fields stretch as far as the horizon, unless broken up by fields that are fallow or used for another crop. When the plants are younger and the cane is shorter, rows are seen from the perimeter roadways, and the individual rows and ditches create a rhythm along the road. The roads, canals, and ditches also create a visual line that stretches to the horizon. The visual quality may be characterized as simple, uniform, and monotonous. The prior use of the build-out was sugar cane cultivation, and only residual sporadic cane exists currently. Visually, sugar cane appears bamboo-like in dense stands, appearing as a mass of coarse grass. When the sugar cane matures, it produces a soft beige-colored plume at the top of the plant. During the later stages of growth, the cane undulates in the wind. The sugar cane cultivation area contrasts with the RWMA, which has a variety of annual and perennial grasses and herbs, woody plants, and sawgrass at the eastern edge of the build-out. The increase in visual diversity, especially with the presence of water, has been demonstrated to elicit a positive aesthetic response (Hettinger 2005, as cited in URS 2007a,b).

3.12.7 Alternative Lands

Lands west of STA 1W that would be used for stormwater treatment under Alternative E are located in the EAA; the aesthetic character of these lands are as described for the EAA in Section 3.12.4 above. The Alternative E lands located in Acme Basin B-Section 24 are visually characteristic of other fallow agricultural lands within the EAA, similar to the conditions described above for the Compartment B SBO area and Compartment C (USACE 2006). The landscape adjacent to Acme Basin B-Section 24 includes treatment cells in STA 1E to the west, and the C-1 Canal and agricultural/low-density residential areas to the east.

3.13 CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act, 1966, as amended, requires federal agencies to consider the effects of their actions on historic properties, and to provide state

historic preservation officers, tribal historic preservation officers, and, as necessary, the Advisory Council on Historic Preservation, a reasonable opportunity to review and comment on these actions.

Humans are known to have inhabited Florida as early as about 14,000 years ago, after the end of the last glacial epoch of the Pleistocene. The project's Area of Potential Effect (APE) has the potential to contain archaeological resources that relate to cultural periods that span the entirety of human occupation within southern Florida, which begins circa 12,000 B.C. and extends to the present.

3.13.1 Compartment B

The Phase I survey of Compartment B indicated no locales that could be characterized as having a high probability for containing archaeological resources. The survey was further substantiated by field investigations, including systematic shovel testing, that revealed no cultural resources within Compartment B (New South Associates 2003).

3.13.2 Compartment C

The Phase I background research and survey of Compartment C identified 16 prehistoric period archeological sites (Janus Research 2007; URS 2005). The field surveys revealed that three previously recorded prehistoric period archeological sites have been destroyed. A fourth site is mostly destroyed and was known to possibly to contain human remains. Of the 12 extant sites within the APE, three have been determined potentially eligible to the NRHP by the Florida's Division of Historical Resources (FDHR) and are known to contain human remains; two sites that are ineligible also contain human remains. These three sites and one other prehistoric period site that were not recommended as eligible to the NRHP contain human remains. The remaining eight sites determined not eligible to the NRHP by FDHR are not known to contain human remains.

No structures or cultural landscapes that are listed in or determined eligible to the NRHP have been recorded within the project's APE.

USACE has initiated tribal consultation with all concerned Native American tribes, including the Seminole Tribe of Florida and the Miccosukee Tribe of Florida. Consultation and coordination is discussed further in Chapter 6 of this Draft EIS.

3.13.3 Alternative Lands

A cultural resource survey has not been conducted for Alternative Lands. Based on the Acme Basin B-Section 24 Draft Environmental Assessment, it is unlikely historic properties

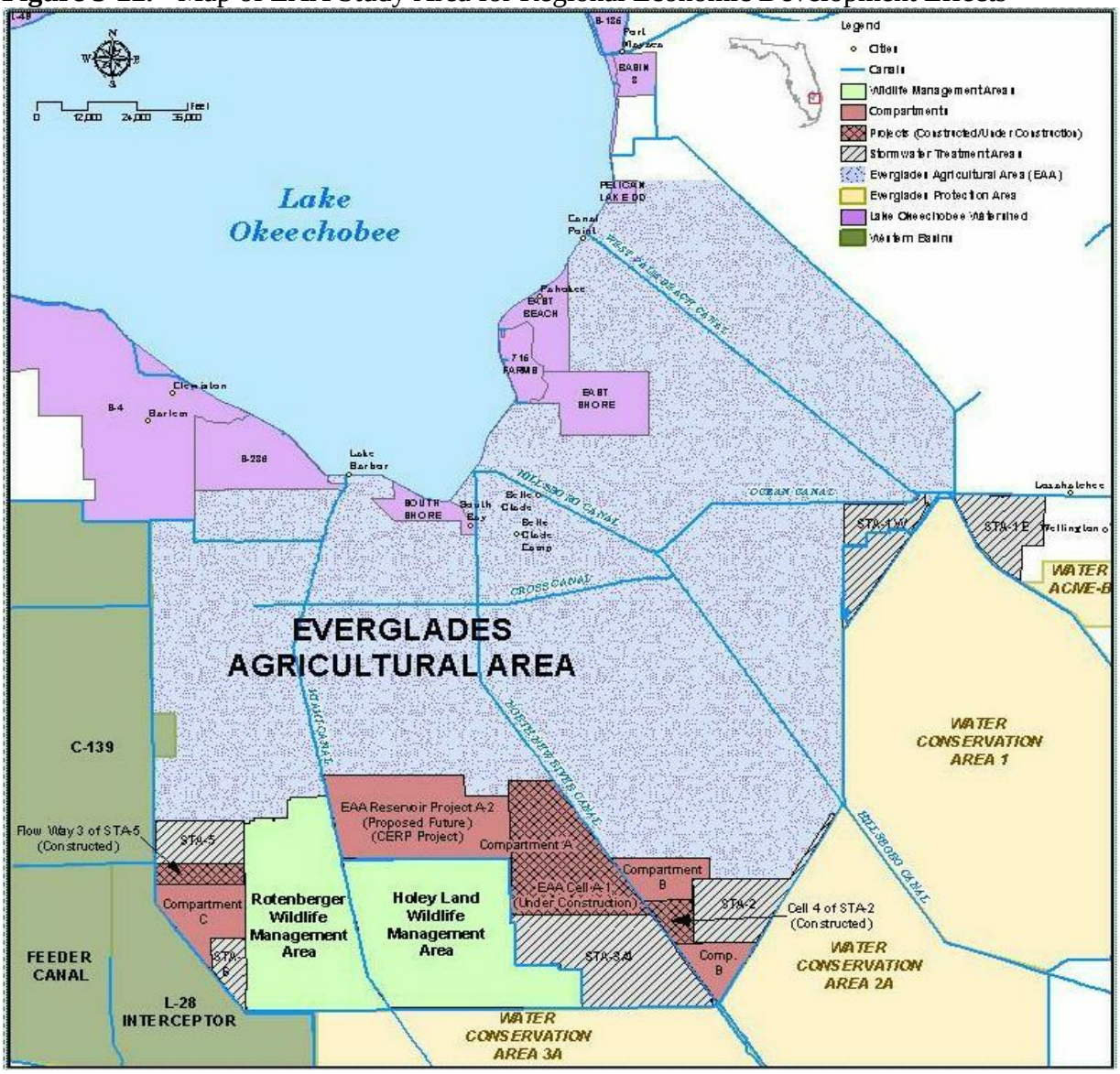
exist in Section 24 due to the history of land use and long-term regular agricultural disturbance from plowing.

3.14 SOCIOECONOMICS

This section provides an overview of the population, demographics, and economic conditions of the EAA. In addition, an economic impact analysis for each of the alternative scenarios is provided in the section titled "Regional Economic Development Effects."

The geography shown in Figure 3-22 is the geography analyzed as it pertains to the population, demographics, and economic conditions of the area.

Figure 3-22. Map of EAA Study Area for Regional Economic Development Effects



Source: SFWMD 2007

The areas included in the study are as follows:

- The acreage colored in lavender: B-4, South Shore, 716 Form B, EA BT Beach, EA BT Shore, Pelican Lake DO, Basin 3 and B 136
- The EAA
- Stormwater Treatment Areas – STA 2, STA 3/4, STA 5, and STA 6
- Compartments B and C
- EAA Reservoir Project A-2 (Proposed Future CERP Project)
- EAA Cell A-1 (Under Construction)
- RWMA
- HLWMA

As indicated by the map, the area analyzed is south of Lake Okeechobee, and the majority of lands are located within Palm Beach County. The total area for the geography is 1,068 square miles (683,585 acres). Demographics were analyzed for this entire market. The economic impacts associated with agriculture in the EAA focused on the EAA only.

Alternative Lands east of STA 1W include Acme Basin B-Section 24, which is discussed in the section. The following information on Acme Basin B-Section 24 is from the USACE memorandum of record for permit application SAJ-2004-3561 (USACE 2004).

3.14.1 Population Demographics

Profiles for population, demographics, and wealth were evaluated for the EAA study area. Table 3-9 provides a chart that compares the population growth, growth rates, and population density for the State of Florida, Palm Beach County, and the EAA study area.

Table 3-9. Population Profile of the EAA Study Area

	Florida	Palm Beach County	EAA Study Area
Population (1990)	12,937,941	863,523	45,742
Population (2000)	15,982,378	1,131,184	49,546
Population (2006)	18,071,861	1,298,590	57,292
Population (2011)	19,757,672	1,434,220	63,582
Percent Population Growth ('90-'00)	23.5	31.0	31.1
Percent Population Growth ('00-'06)	13.1	14.8	16.3
Percent Population Growth ('06-'11)	9.3	10.4	11.0
Geographic Area Size	56,850	2,223	1,068
Population Density (2006)	317.89	584.25	175.85

Source: iSite – Census-based Demographics Program

As the data indicate, the EAA study area shows population growth comparable to Palm Beach County, which exceeds the growth rate for the State of Florida. Not surprisingly, the population density of the EAA study area is far less of both Florida and Palm Beach County.

Table 3-10 summarizes the demographic profile of the EAA study area compared with Florida and Palm Beach County.

Table 3-10. Demographic Profile of the EAA Study Area

	Florida	Palm Beach County	EAA Study Area
Male (2006)	49.09%	48.68%	52.71%
Female (2006)	50.91%	51.32%	47.29%
Race: White (2006)	77.29%	78.12%	42.56%
Race: Black (2006)	15.31%	14.72%	45.29%
Race: Asian or Pacific Islander (2006)	2.22%	2.04%	0.62%
Race: Other Race (2006)	3.02%	2.89%	7.77%
Race: Two or More Races (2006)	2.16%	2.22%	3.75%
Ethnicity: Hispanic (2006)	20.11%	16.86%	33.32%
Median Age (2006)	38.55	40.90	28.46

Source: iSite – Census-based Demographics Program

3.14.2 Economic Conditions

The EAA began agricultural production in the early Twentieth Century. However, the freeze in 1917, the dredging of Lake Okeechobee in 1919, and the opening of the Palm Beach Canal marked the early days of farming and economic activity in the area.

Initially, most of the land was owned by the State of Florida or the Southern Land and Timber Company, and farmers were allowed to farm the land without purchasing property or paying rent, which resulted in the emergence of agricultural settlements in the area. These settlements evolved into the four local municipalities: Pahokee, Belle Glade, Clewiston, and South Bay.

In 1928, a hurricane came ashore and caused significant damage to the populated areas surrounding Lake Okeechobee. To combat this issue, flood controls were put into place, most notably the Herbert Hoover Dike. The dike's construction resulted in increased farming. The EAA was formerly created in the 1940s when 1.6 million acres of land was drained for agriculture. The most noted agricultural crop is sugar cane.

Sugar cane production began in 1929 with the establishment of the Clewiston Sugar Mill. The Cuban Revolution in 1959 resulted in a significant increase in sugar cane production. Before the Cuban Revolution, approximately 50,000 acres of the EAA were dedicated to sugar cane production. In the 1960s, the Cuban Embargo limited imports and resulted in migration of Cuban refugees skilled in sugar cane production. Finally, the removal of the production limitation imposed by the Sugar Act in 1974 enabled the EAA to become the leading producer of cane sugar in the nation. In 1995, more than 500,000 acres were devoted to sugar cane production.

Based on data provided by USACE and SFWMD, the majority of agriculture in the EAA is associated with sugar cane, while the remainder is associated with rice, sod, row crops, and other agricultural uses. Table 3-11 shows the acreage by crop in the EAA.

Table 3-11. Acreages of Crops in the EAA

Crop	Palm Beach County Acreage	Hendry County Acreage	Total Acreage	% of Total Acreage
Sugar cane[1/]	423,358	45,442	468,800	92.7%
Row[2/]	16,347	0	16,347	3.2%
Sod	9,846	0	9,846	1.9%
Nursery	618	0	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%**

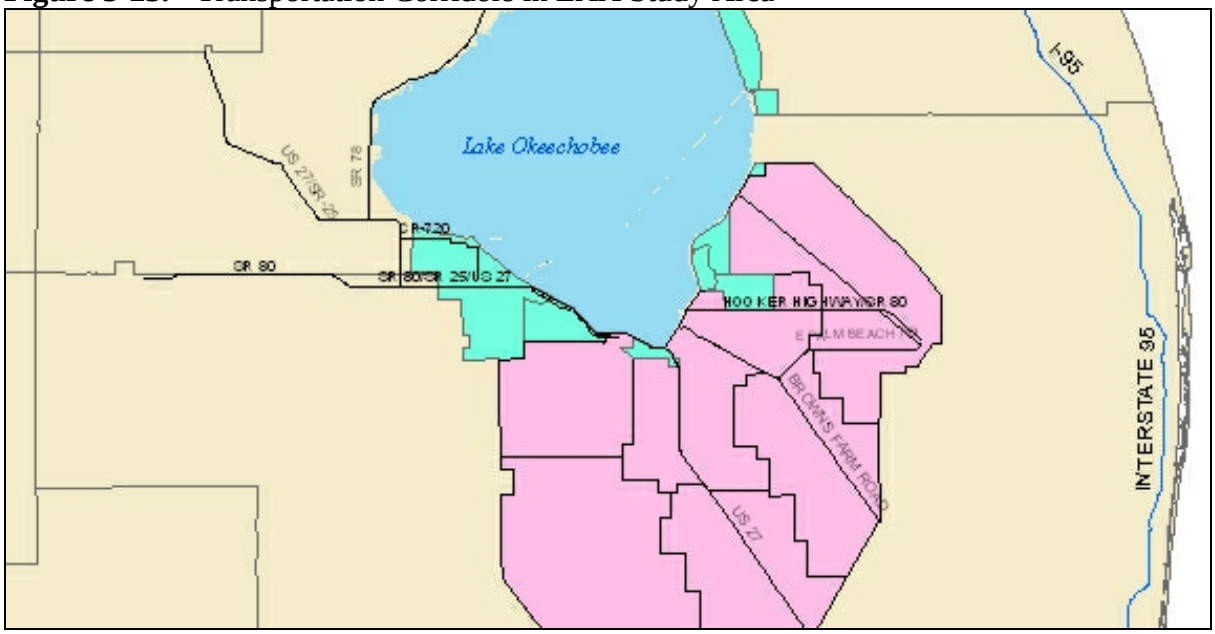
1/ Includes rice and corn grown as rotation crops.
2/ Includes 1,814 non-productive acres associated with service area for row crops.

Source: USACE and SFWMD

It is estimated that the annual agricultural sales associated with the EAA total $1.2 billion. This agricultural activity has an overall economic impact to the region (Palm Beach, Broward and Miami-Dade) of $2.2 billion based on applicable economic multipliers.

A major economic driver for the region involves transportation access. At this time, the major roads serving the area include the following: SR 80 and US-27. These roadways represent the major transportation corridors and are components of Florida's Strategic Intermodal System Plan (FDOT 2005). Both of these roads serve the municipalities within the EAA study area: Pahokee, Belle Glade, Clewiston, and South Bay. Figure 3-23 highlights the EAA study area and the roadways within the region.

Figure 3-23. Transportation Corridors in EAA Study Area



3.14.3 Environmental Justice

Based on 2006 demographic estimates, the EAA study area shows a much higher concentration of minority population, with more than 45 percent of its population as black, while Florida's black population is estimated at just over 15 percent and Palm Beach County's black population is just under 15 percent. In addition, the EAA study area shows that more than 33 percent of the population is Hispanic, while Florida's Hispanic population is just over 20 percent and Palm Beach County's is just under 17 percent. Lastly, the median age of the EAA study area is shown at 28.46, while Florida is 38.55 and Palm Beach County is 40.90.

Table 3-12 summarizes the wealth profile of the EAA study area compared with Florida and Palm Beach County.

Table 3-12. Wealth Profile of the EAA Study Area

	Florida	Palm Beach County	EAA Study Area
Median Household Income (1990)	$27,518	$32,513	$23,378
Median Household Income (2000)	$38,952	$45,069	$30,309
Median Household Income (2006)	$44,037	$51,578	$34,307
Median Household Income Growth (1990 to 2006)	60.0%	58.6%	46.7%
Per Capita Income (1990)	$14,489	$19,715	$8,703
Per Capita Income (2000)	$21,217	$28,503	$11,422
Per Capita Income (2006)	$23,883	$32,791	$14,168
Per Capita Income Growth (1990 to 2006)	64.8%	66.3%	62.8%
Average Household Income (1990)	$36,508	$46,570	$28,595
Average Household Income (2000)	$53,477	$67,978	$38,422
Average Household Income (2006)	$59,606	$76,586	$43,408
Average HH Income Growth (1990 to 2006)	63.3%	64.5%	51.8%

Source: iSite – Census-based Demographics Program

The wealth profile of the population base indicates that the EAA study area is less wealthy than Florida and Palm Beach County. Based on 2006 estimates, the median household income in the EAA study area is 22.1 percent less than of a household in the remainder of the State of Florida. On a 2006 per capita income basis, the population base of the EAA study area has 40.7 percent less income than the per capita income shown for residents of Florida as a whole. Lastly, on a 2006 average household income basis, the population base of the EAA study area has 27.2 percent less income than the average household income shown for households of Florida. In addition, the population base of the EAA study area has not shown the same rate of income growth since 1990 that the state or Palm Beach County has seen.

Taken together, the EAA study area is an economically depressed area that has a disproportionate share of minority population. In addition, the typical resident of this economically depressed area also is young compared with the state and Palm Beach County. This profile is not necessarily unexpected because of the heavy agricultural production in the

region. The combination of migrant workers and generally cheap and unskilled labor force has resulted in a population base that is generally less wealthy than the population base throughout the state and county.

3.15 TRANSPORTATION AND UTILITIES

The EAA is the affected area evaluated in this section.

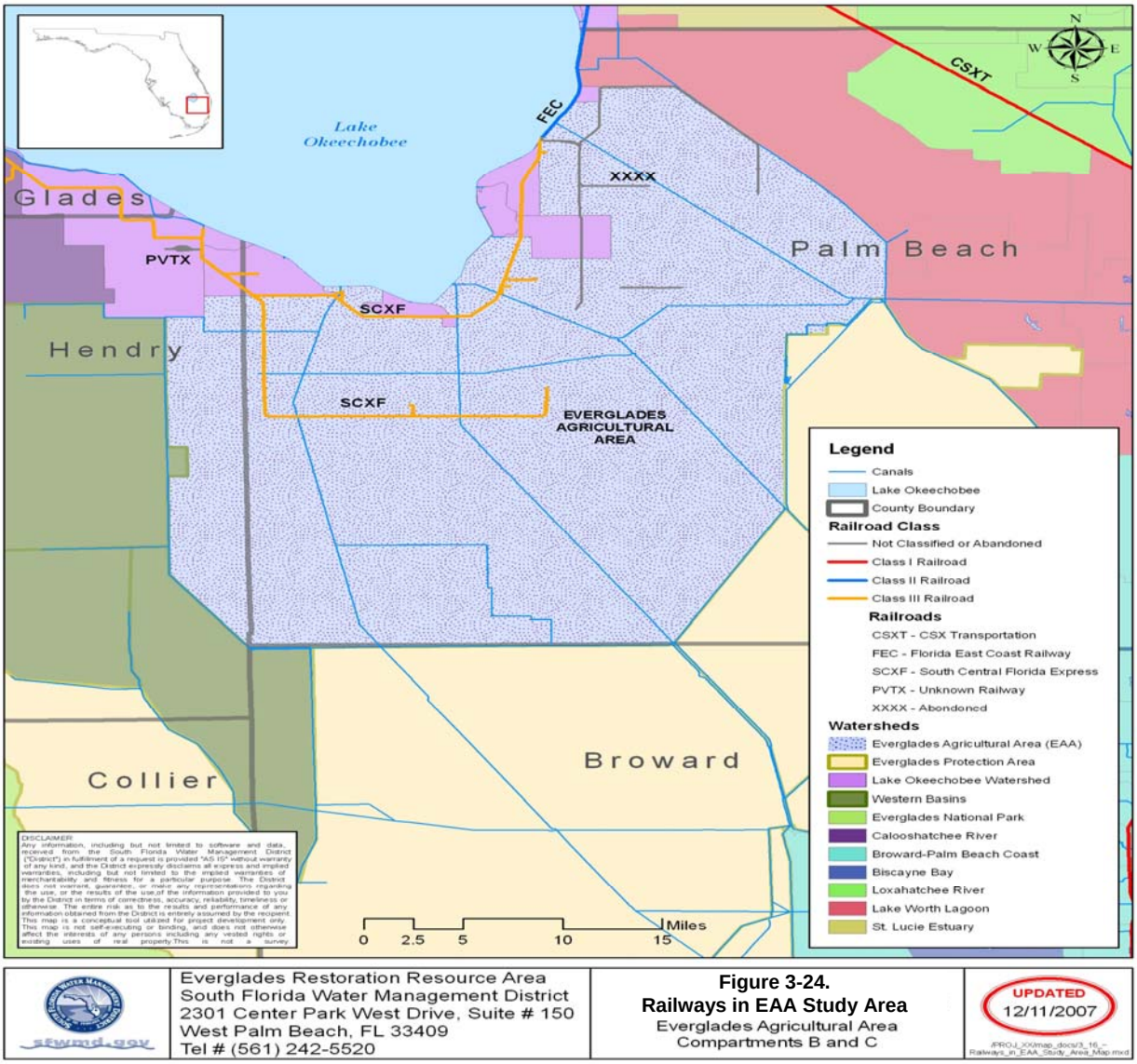
3.15.1 Highways

Highways within the EAA basin include US-441, SR 80, US-27, US-98, and CR 880. In Florida's Strategic Intermodal System Plan (FDOT 2005), these highways are considered critical to the enhancement of the EAA's economic competitiveness by providing corridors for people and freight to and from Pahokee, Belle Glade, Clewiston, Moore Haven, and South Bay (FDOT 2005). These roads also serve as major evacuation routes out of southern Florida. US-27 is a north-south oriented four lane highway that runs along the western and southern perimeter of the Lake Okeechobee to South Bay where it turns south and runs through the middle of the EAA. It is located immediately west of the North New River Canal and the Compartment C Build-out Area. At the Palm Beach and Broward County line, it continues south between WCA 2 and WCA 3 before heading southeasterly into the Weston area. US-441 and SR 80 are located in the vicinity of either of the build-out areas (Figure 3-23).

3.15.2 Railways

Two railway spurs, together known as the South Central Florida Express (SCFE), connect Lake Okeechobee's agricultural communities and businesses with the mainline railroads to the north and south. The EAA contains 120 miles of agricultural railways that are used to transport sugar cane directly from the fields to the milling and refining plants. These tracks then connect to the SCFE that runs around both sides of Lake Okeechobee. The west side of the SCFE connects to the CSX railway at the Town of Sebring, and the east side connects to the CSX railway at Lake Harbor, Florida and terminates at the Florida East Coast Railway in Ft. Pierce, Florida (Figure 3-24).

Figure 3-24. Railways in EAA Study Area



3.15.3 Florida Power and Light Facilities

The following information on Florida Power & Light (FPL) facilities is taken from the basis of design report for the Compartment B build-out (SFWMD 2007d). FPL facilities within the Compartment B SBO include power transmission lines, associated towers, and easements. Three main sets of FPL power transmission lines are within the Compartment B SBO. The 500-kV northeast-southwest running lines through the center of the Compartment B SBO are referred to as the Conservation Corbett (CC) lines (also known as the Levee Midway lines). The CC lines cross SFWMD property within a 200-foot easement granted to FPL. To access this central 200-foot easement, a number of existing interior easements branch off of the existing interior east-west levee roads. These interior easements provide

access to the individual FPL towers. Primary access to the property is from US-27 across the Okeelanta Bridge.

Two sets of 500-kV lines run parallel to one another along the eastern edge of the Compartment B SBO immediately west of the western L-6 Canal levee. From west to east, these lines are referred to as Andytown Martin and Andytown Corbett (AM&AC). The AM&AC lines for the northernmost 6,000 feet of the Compartment B SBO area are located on SFWMD property within a 500-foot easement granted to FPL. For the southern 11,000 feet of the AM&AC corridor, the lines are located in a fee parcel owned by FPL. This land is 500 feet wide and becomes slightly wider toward the south of the Compartment B SBO. The existing FPL towers, which support the CC and AM&AC lines, are two-leg steel structures that are fastened to concrete pedestal bases. The concrete pedestals extend above the surrounding natural ground approximately 2 to 4 feet. The towers are generally spaced 1,300 to 1,400 feet apart along the alignments.

As stated in the Compartment C Build-out design report (SFWMD 2007c), FPL facilities in Compartment C consist of overhead electricity power lines that have been recently installed up to the southernmost structure in STA 5 cell 3. Utilities such as overhead power, fiber-optic cable, potable water, wastewater, and natural gas do not exist in the Compartment C because it was formerly an agricultural production area.

From the Acme Basin B-Section 24 Draft Environmental Assessment for DA permit application SAJ-2004-3561 by the SFWMD:

An FPL distribution power line runs along the west side of Flying Cow Road but does not extend all the way to Section 24. Power to this distribution line is provided by the Loxahatchee Substation on the east side of the VOW C-1 Canal approximately 1800 feet south of SR 80 and just south of an existing east-west FPL transmission line corridor. Other FPL distribution power lines serve the residential areas east of Section 24 and the C-1 Canal.

Electrical feeder cables cross the C-1 Canal at three locations at a depth of 10 feet below the existing bottom of the canal. These cables are at an approximate elevation of -4.0 feet NGVD, which is within the rock layer and below the project work depth of 4.0 feet-NGVD. The first crossing occurs approximately 50 feet south of the FPL culvert and the second at approximately 650 feet south of the FPL culvert. The third occurs at the confluence of the C-1 and the C-15 Canals (USACE 1994).

Other utility companies that were identified as possibly having facilities in the project area are: Adelphia Communications Corp; Florida City Gas; Florida Power & Light (sub-aqueous); Level 3 Communications; and Bellsouth (USACE 1994).

3.16 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

The following sections summarize the potential for hazardous, toxic, and radioactive waste in the vicinity of Compartments B and C, located within the EAA. The information contained in the following paragraphs was summarized from the basis of design reports for Compartments B (Brown and Caldwell 2007) and C (URS 2007a,b), unless otherwise noted.

3.16.1 Compartment B

The land use of the Compartment B has been agricultural for the past 30 years. Some of this land is no longer in active cultivation, whereas some is still used for sod and sugar cane farming. The following are the parcels where Compartment B will be constructed:

- Woerner Farm 2-Tract # 100-001 (NBO)
- West Half of Section 11- Tract # D7-100-003 (SBO)
- WPM Farms- Tract# 100-106, 100-108 (SBO)

According to the basis of design report for Compartment B, Brown and Caldwell reviewed four documents that described the status of environmental assessments conducted within the footprint of Compartment B. The following tracts of land were identified during the review as areas with potential hazardous, toxic, and radioactive waste concerns.

3.16.1.1 Woerner Farm 2-Tract No. 100-001

Woerner Farm 2 consists of 4,300 acres in the NBO of Compartment B. The tract has been historically used to grow vegetables and sugar cane. Currently, the tract is mainly used for sod farming, with some sugar cane production.

The following summarizes the status of environmental assessments for this tract:

Maintenance Area—The maintenance area consists of 7 acres of land located in the southwestern corner of the NBO in Compartment B. Several environmental assessments have been prepared for the Woerner Farm 2 - Maintenance Area. The most recent was conducted by Environmental Consulting & Technology (ECT) in 2004. This limited contamination assessment report (LCAR) was prepared as required by the FDEP Pre-approval Advance Cleanup (PAC) Program to support the course of action from the Woerner Farm 2 maintenance facility. Based on the LCAR, 4 acres of soil are contaminated to a depth of 5.5 feet below grade. The high organic content of the contaminated soil (muck layer) limited remediation alternatives to excavation and off-site disposal. The total volume to be removed is reported as 35,385 cubic yards (46,137 tons). URS reported in November 2005 that a total volume of 15,800 tons of petroleum-contaminated soil has been removed and that the remaining contaminated soil would be removed by 2007. As part of the groundwater

assessment, ECT installed nine shallow and two deep temporary monitoring wells in addition to the 12 existing monitoring wells at the site. Most of the existing monitoring wells will be removed as a result of the source removal activities. To document the results of the site remediation, ECT has proposed to install a maximum of 10 new shallow wells and two new deep wells before source removal work would be initiated. According to ECT, the soil excavation was completed in September 2007. ECT is currently in its third quarter of groundwater monitoring, and no groundwater contamination has been detected thus far (ECT 2007). In the event that confirmation sampling indicates that contaminant levels in groundwater exceed regulatory guidelines, remediation (air sparging) will be implemented for 9 months followed by 12 months of post-remedial groundwater monitoring. If groundwater contamination persists, remediation will continue until about September 2009.

Cultivated Area—Concerns have also been raised about the concentration of toxaphene in the cultivated areas of the Woerner Farm 2. The cultivated area is present in the majority of the NBO area of Compartment B. URS conducted an ecological risk assessment (ERA) and extensive soil sampling in the cultivated areas in 2003. Based on discussions with SFWMD staff, the ERA was submitted to USFWS in October 2005 for review and concurrence. SFWMD's recommendation was for no further action because concentrations for toxaphene in soil samples were below the ERA calculated cleanup target level of 5.2 mg/kg. SFWMD is awaiting comments from USFWS on the ERA recommendation.

3.16.1.2 West Half of Section 11 – Tract No. D7-100-003

SFWMD selected ECT to conduct a Phase I and II environmental site assessment (ESA) of a parcel of land (Tract # D7-100-003) located in the SBO area of Compartment B. The parcel consists of 350 acres adjacent to the L-6 Canal, south of STA 2. This land was historically used for sugar cane farming, although farming is currently inactive in this area. The Phase I ESA evaluated whether historical activities on or near the property may have resulted in contamination by hazardous substances. Three areas of concern were identified from the Phase I ESA: former cultivated area, canal sediments, and former pump station. The Phase II ESA evaluated these areas for potential impacts to soil, sediment, and groundwater that resulted from a release of petroleum products, pesticides, or herbicides associated with farming. Analytical results for soil and groundwater from the Phase II ESA were reviewed to identify potential corrective actions required in these areas. The results reported no concerns for the former cultivated area and canals; however, the former pump station requires remediation based on petroleum impacts in the soil. ECT recommended removal of the contaminated soil (approximately 40 tons). No groundwater remediation was reported as being required, however. The soil removal at the former pump station is scheduled to occur before construction of Compartment B begins.

3.16.1.3 WPM Farms – Tract Nos. 100-106, 100-108

In 1999, SFWMD retained URS to conduct a Phase I and II ESA of two parcels of land (Tract# 100-106 &100-108) located in the SBO area of Compartment B. These parcels consist of 3,300 acres, which encompasses the majority of the SBO area. This land was historically used for sugar cane farming. Three areas of potential concern were identified in the Phase I ESA: the equipment staging area, pump stations, and cultivated crop areas. Samples were collected in these areas during the Phase II ESA. Sampling indicated elevated levels of zinc in the equipment staging area and cultivated areas. No contamination was identified in the pump station areas. Additional samples were collected in the cultivated areas and were evaluated for potential impacts to fish-eating birds. No significant risks were identified in the cultivated areas. Twenty-three tons of zinc-contaminated soil and rock were removed from the equipment staging area. After the additional sampling and analysis had been completed in the cultivated areas and the soil and rock had been removed in the equipment staging area, URS requested no further action status. USFWS and FDEP concurred with URS's no further action request for the equipment staging and cultivated crop areas. Additional ESAs were conducted by Professional Services Industries, Inc. (PSI) in 2003 within these parcels at other pump stations that had not been included in URS's original site assessments. These investigations did not show any contamination. No further action was requested and approved by USFWS and FDEP.

In addition, the EAA A-1 Final EIS noted two additional tracts of land in Compartment B that may have potential hazardous, toxic, and radioactive waste concerns, which are discussed in the following subsections.

3.16.1.4 WPM Farms – Tract No. 100-107

The 1999 Phase I Phase II ESA, conducted in March 1999 by URS, indicated that this area did not require additional assessments, corrective actions, or closures.

3.16.1.5 East Carroll – Tract No. 100-025

This tract consists of 1,280 acres of land that has been used as a commercial sod facility and subsequently for cattle ranching operations. A Phase I and Phase II ESA was also conducted on this property and 11 areas of concern were identified; however, these areas did not require any additional assessments, corrective actions, or closures.

3.16.2 Compartment C

3.16.2.1 Mott Farm – Tract No. 100-101

According to the draft basis of design report for Compartment C, URS was contracted by SFWMD in 1999 to conduct a Phase I and Phase II ESA, at the former USSC Unit 2 site (Compartment C) that is also referred to as the Mott Farms parcel. The findings of the Phase

I and Phase II ESA were provided in the URS *Report of Phase I – Phase II Environmental Site Assessment, Mott Farm USSC, Hendry County*, dated March 30, 1999. No toxic or radioactive wastes were found on this site. Sugar cultivation typically does not use toxic or radioactive compounds because it involves food crop production. Additionally, sugar cane production generally does not use the amount of herbicides or pesticides that typical agricultural operations use (URS 2007a,b).

In addition, the EAA A-1 Final EIS stated that the Mott Farm property is 10,800 acres of former sugar cane fields. Currently, the property is vacant and the fields are overgrown. It also states that two areas of concern were identified during the assessment, which required additional assessment. Pending these aboveground storage tank pump station closures, no additional assessment or corrective actions are required for this property (USACE 2006).

3.16.3 Alternative Lands

Available information regarding hazardous and toxic waste on Alternative Lands west of STA 1-W will be collected if it is determined Alternative E is the preferred action. For the purposes of this EIS, Alternative Lands west of STA 1W are assumed to be consistent with other EAA lands. The following information on hazardous materials in the Acme Basin B-Section 24 is from the SFWMD Draft Environmental Assessment for DA permit application SAJ-2004-3561.

A Phase 1 EA of the Moncado property was completed in January 13, 2003. The report indicated the presence of environmental concerns due to the application of agrochemicals used for the production of sugar cane. In addition, the projected future land use of the property warranted the necessity of a Phase II Assessment. The Phase II EA and additional soil sampling at the Camaro Farms property was conducted in December 2005 in accordance with USFWS sampling protocols. The sampling results were evaluated with respect to the Sediment Quality Assessment Guidelines, which the FDEP and USFWS Vero Beach office mandates. This report also included a summary of the Phase II Supplemental EA on the loading/staging area at the Camaro Farms parcel conducted in September 2005.

Analytical results did not detect pesticides, herbicides, volatile organics, or semi-volatile organic concentrations above laboratory detection limits. The Phase II EA study indicated that there are no contamination issues within the project site. This report was submitted to the USFWS office for review and comments in December 2005.

4.0 ENVIRONMENTAL EFFECTS

This chapter analyzes potential environmental impacts that could result from implementation of the No Action and Action Alternatives B, C, D, and E. Refer to Table 4-10 at the end of this Chapter for a summary of these potential impacts. It should be noted that the potential effects of the Action Alternatives will largely be a function of the manner in, and degree to which the Action Alternative features are used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. In Section 4.2, Water Resources, Alternative E is discussed based on recent Steady-state Model results that were received on December 19, 2007 in a draft report (Goforth 2007e). The draft report was reviewed by the USACE and finalized on December 23, 2007. Environmental impacts include both direct and indirect effects. Under the CEQ regulations, direct effects are "caused by the action and occur at the same time and place," while indirect effects are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 CFR 1508.8).

This chapter also includes sections that discuss potential impacts of this project in concert with other projects and associated/assumed system operations planned in the surrounding areas (cumulative impacts), unavoidable adverse impacts, effects to the resources that cannot or would not be reversed in a foreseeable amount of time (irreversible and irretrievable commitment of resources), any conflicts and controversy associated with this project, and environmental commitments. Mitigation and monitoring measures to avoid or reduce potential impacts are discussed in Section 5 this document.

The No Action Alternative predicts the environmental conditions in the regions affected by the project without the Proposed Action, but it considers other restoration projects planned and changes to management plans that will affect the regions involved. It is anticipated that a regional trend towards improvements in water quality, quantity, and timing may occur from planned restoration projects in the Everglades, such as CERP, Acceler8, Northern Everglades and Estuaries Restoration Program, Lake Okeechobee and Estuary Recovery (LOERP), and the Lake Okeechobee Regulation Release Schedule (LORSS). This will depend on the manner in, and extent to which, the treatment capacity provided by Action Alternative features is used in the context of other regional water management infrastructure and system

operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes.

DMSTA models provided quantitative analysis of the hydrologic response of the system for all of the alternatives and projected the phosphorous removal performance of the STAs under each alternative. The modeling reports are provided in Appendix H to this Draft EIS. The analysis of biological and physical environmental effects (geology, air resources, vegetation, fish and wildlife, threatened and endangered species, land use, recreational resources, cultural resources, socioeconomics, transportation and utilities, and hazardous, toxic, and radioactive waste) from the alternatives on regions affected by the project were evaluated based on scientific literature, direct observation, project design reports, reasonable scientific judgment, the scoping process, and other EIS documents for nearby projects. In addition, effects on vegetation, fish and wildlife, and threatened and endangered species in the WCAs and RWMA were also evaluated in part on the DMSTA modeling results for the volume and phosphorous loading and concentrations of water deliveries to areas. This analysis is based on the best information to date.

4.1 GEOLOGY, TOPOGRAPHY, AND SOILS

The following sections summarize the possible environmental effects of the no action and Action Alternatives on the geology, topography, unique land forms, and soils in the vicinity of Compartments B and C, located within the EAA. [Note: These sections will be expanded when additional information, such as depth of soil/cap-rock, soil/cap-rock to be removed, elevation of berms, levees, roads, canals, etc becomes available.]

4.1.1 Geology

Under the No Action Alternative, surficial geology is not anticipated to change. The areas will be converted back to active agriculture. The surficial geology within Compartments B and C, Alternative Lands near STA 1W, and Section 24 is not expected to be significantly affected by the Action Alternatives. The Action Alternatives may require removal of soil and surficial cap-rock for use in construction of the STAs. This material may be used in construction of berms, levees, canals, and roads; however, most of the soil and underlying geology in this region is expected to remain in place.

4.1.2 Topography

Under the No Action Alternative, there may be no changes to topography. Any change in land use of the property, including continuing the present use, must be approved by the DOI as discussed in the Draft EIS.

Under the build alternatives, the topography of Compartments B and C, Alternative Lands near STA 1W, and Section 24 would be converted from relatively flat agricultural-type land use to a water retention reservoir (the STAs). This conversion would result in three STAs with water depths ranging from 0.5 foot to 4.5 feet, with target water depths of 1.25 to 1.5 feet. In addition, higher-elevation levees would be constructed for water retention. The design for the 9 miles of levees proposed for Compartment B is a top width of 14 feet and crest elevations of 16 feet in the NBO and 15 feet in the SBO. Levee elevations have not been established for Compartment C or Alternative Lands near STA 1W. In addition, inflow and drainage canals are proposed for Compartments B and C under the Action Alternatives. Some of the existing agricultural canals will be back-filled during construction under all of the Action Alternatives. The soils located within the STA footprints will be inundated under the Action Alternatives, slightly lowering the topography from settlement. However, once these areas are inundated, it is expected that a layer of sediment and organic matter will accumulate at the bottom of the STA as it settles from the overlying water. This settlement is expected to result in a gradual increase of the floor elevation of the STAs over time.

Previous land use in Section 24 was agriculture. The topography is generally flat with rows and furrows from tilling the landscape. The topography in Section 24 and other Alternative Lands west of STA 1W would be similar to as described for Compartments B and C above with Alternative E.

4.1.3 Soils

Under the No Action Alternative, it is anticipated that Compartment B and C Buildout may revert back to agricultural use, such as sugar cane production and sod farming, and Alternative Lands near STA 1W will continue to be farmed in the future. Soil subsidence will likely continue to affect these areas. Section 24 will likely be converted to an STA/recreational facility for which applications have been made to the regulatory agencies. Anticipated impacts to soils are similar to those associated with other STA construction described in the next paragraph.

Soils are not expected to be significantly altered under the Action Alternatives. During construction, minor soil and cap-rock disturbance will occur within Compartments B and C, Alternative Lands near STA 1W, and Section 24. The soil and cap-rock will be redistributed within the STA footprints and used in the construction of berms, canals, levees, and roads.

Again, soils that remain undisturbed within the STA footprint may be affected during operations, as a layer of sediments and organic matter may accumulate on the STA floor.

The soils within the STAs are anticipated to remain hydric and retain muck properties or revert to muck properties under the Action Alternatives. In addition, the soils in this region may benefit under the Action Alternatives, as better water management practices may reduce the rate of soil subsidence. Overall, impacts to soils are anticipated to be minor and localized.

4.2 WATER RESOURCES

The WMS of the EAA is operated to provide supplemental irrigation, and flood protection for the EAA and the surrounding environmentally sensitive areas. The intent of this section of the EIS is to discuss the expected effects, if any, the SFWMD Preferred Alternative (Alternative B) and other Action Alternatives (Alternatives C, D, and E) will have on the existing hydrology, groundwater features, water quality, water supply, and management associated with flood protection.

It is important to note that Alternative E was modeled differently than the other alternatives. Alternatives B, C, and D were modeled using DMSTA, while Alternative E was modeled using the Steady-state Model Design, as described in Chapter 2 of this Draft EIS. To achieve an increase in water treatment under Alternative E like that achieved in Alternatives B through D, the specific amount of acreage adjacent to existing STAs was quantified; however, specific plots of land were not identified. However, once the modeling results for Alternative E were complete, and a specific acreage amount was identified, it was determined that areas of land in the vicinity of STA 1E and 1W would be the most beneficial for water treatment to assist in reducing nutrient levels. This conclusion was made because other STAs in the region are already connected to Compartments B and C. Furthermore, an STA in these conceptual locations could reduce costs by sharing infrastructure, such as inflow/outflow canals, pump stations, with 1E and 1W.

It is predicted that this conceptual location for the Alternative Lands for Alternative E would result in a greater contribution of treated water delivered to the Refuge and less untreated water being pushed out to tide, which negatively affects the estuaries. The water resource sections below describe the Steady-state Model Design results; however, discussions of effects on vegetation, fish and wildlife, and threatened and endangered species are presented based on the conceptual location of Alternative Lands.

4.2.1 Surface Water Hydrology

The buildout of Compartments B and C as STAs under Alternatives B, C, and D, and the construction of STAs under Alternative E would be operated to assist existing STAs in treating stormwater runoff from contributing basins and Lake Okeechobee. These actions

provide the opportunity for minor to major changes in the hydropatterns of the WCAs that otherwise would not be possible without the increased treatment capacity. Table 4-1 presents the treatment areas and contributing inflows to individual STAs for each of the alternatives.

Appendix I includes graphics illustrating the effect of water stage and depth on WCAs. Figures 2-1 through 2-4 in Chapter 2 describe the volume of water entering the WCAs. Table 4-2 below quantifies inflows to the WCAs.

4.2.1.1 No Action Alternative

The hydrologic response of the No Action Alternative (Alternative A) was modeled using the DMSTA assuming current practices of routing water will continue based on the proposed schedule of construction and design through 2010. Modeling further assumes there will be no buildout of Compartments B and C (Goforth 2007a). The volumes of water currently provided to the WCAs would be maintained as presented in Table 4-2. This alternative was assumed as the baseline condition for comparing the effects of Alternatives B, C, D, and E.

Table 4-1. Inflows (acre-feet per year) to Individual STAs

Area	Parameter	Alternative				
		Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
STA-1W	Treat. Area (ac)	6,670	6,670	6,670	6,670	6,670
	Total Inflow (ac-ft)	243,799	243,752	243,885	243,563	141,072
STA-1E	Treat. Area (ac)	5,132	5,132	5,132	5,132	5,132
	Total Inflow (ac-ft)	193,812	193,332	193,710	193,336	112,079
STA-2	Treat. Area (ac)	8,240	6,338	6,338	6,338	8,240
	EAA inflow	282,204	169,179	274,860	275,450	265,117
	WCA 2A Seepage	27,530	16,917	27,530	27,530	27,530
	Total Inflow (ac-ft)	309,734	186,096	302,390	302,980	292,647
Comp B	Treat. Area (ac)	N/A	8,620	8,620	8,620	N/A
	EAA inflow	0	237,656	105,613	131,657	0
	WCA 2A Seepage	0	10,613	0	0	0
	Total Inflow (ac-ft)	0	248,269	105,613	131,657	0
EAA-A1	Treat. Area (ac)	15,200	15,200	15,200	15,200	15,200
	Lake Inflow	318,145	378,190	328,689	378,697	318,145
	EAA inflow	221,145	193,729	219,311	192,696	221,145
	Total Inflow (ac-ft)	539,290	571,919	548,000	571,393	539,290
STA 3/4	Treat. Area (ac)	16,543	16,543	16,543	16,543	16,543
	Lake Inflow	0	0	0	0	
	EAA inflow	295,463	197,467	200,696	198,340	
	EAA SR A-1	360,658	395,639	371,569	395,010	
	C-139 Basin	13,176	13,211	13,231	13,208	
	Total Inflow (ac-ft)	672,549	610,797	589,905	610,905	702,869
STA-5	Treat. Area (ac)	6,095	10,940	10,940	10,940	6,095
	C-139 Basin	167,284	150,001	150,001	150,001	103,227
	Total Inflow (ac-ft)	167,284	150,001	150,001	150,001	103,227
STA-6	Treat. Area (ac)	2,284	2,754	2,754	2,754	2,284
	Total Inflow (ac-ft)	69,588	61,542	61,542	61,542	80,734
Additional Area	Treat. Area (ac)	0	0	0	0	11,107
	Total Inflow (ac-ft)	0	0	0	0	224,138

Note: EAA runoff includes runoff from the Ch. 298 Districts and 715 Farms
Source: Goforth 2007e

Table 4-2. Volume (acre-foot per year) of Water Delivered from STAs and EAA

Alternative	The Refuge	WCA 2A	WCA 3A	C-51 East	Rotenberger	Total
Alternative A	435,948	462,761	749,466	25,545	83,302	1,757,022
Alternative B	435,629	572,376	678,781	24,373	74,359	1,785,517
Alternative C	436,382	555,142	666,139	25,444	74,359	1,757,465
Alternative D	435,481	584,464	679,082	24,369	74,359	1,797,755
Alternative E	405,248	453,768	797,641	25,545	51,404	1,733,606

Source: Goforth 2007e

4.2.1.2 Action Alternatives

The alternatives to no action would likely facilitate potential minor and major effects to the volume of water delivered to WCAs. Compartment C would be operated in close coordination with existing STA-5 and STA-6 under Alternatives B, C, and D (NOI, Appendix E), although the treated areas would increase in size, as presented in Table 4-1. The total area defined in the DMSTA model for STA 2 will also change. Cell 4 of the existing STA 2, under Alternatives B, C, and D, will be treated as part of the NBO of Compartment B (Table 4-1). The area required to achieve the average phosphorus loading rate achieved from Alternatives B, C, and D was determined to evaluate Alternative E. Alternative E assumes potential STA sites adjacent to STA-1E and STA-1W. Alternative D1 is discussed in Chapter 2.

Alternatives B, C, and D would deliver water from STA-1W and STA-1E to the Refuge; STA-2 and Compartment B to WCA 2A, STA-3/4 to WCA 3A; and STA-5 and STA-6 to WCA 3A, C-51 East, and RWMA. The total volume delivered to the WCA 2A under Alternatives B, C, and D will likely increase by 20 percent or more (Table 4-3). This increase is a large effect on the hydrology of WCA 2A. The volume of water to other WCAs, as presented in Table 4-3, would likely have no to minor effects on the system hydrology.

Table 4-3. Percent Change from Alternative A in Volume of Water Delivered from STAs and EAA

Alternative	The Refuge	WCA 2A	WCA 3A	C-51 East	Rotenberger	Total
Alternative B	0%	24%	-9%	-5%	-11%	2%
Alternative C	0%	20%	-11%	0%	-11%	0%
Alternative D	0%	26%	-9%	-5%	-11%	2%
Alternative E	-7%	-2%	6%	0%	-38%	-1%

Source: Goforth 2007a

This increase in the total volume of water to WCAs may alter the type of vegetation, as discussed in later sections of this chapter. Table 4-4 presents the change in total volume delivered to WCAs from STAs, the EAA, and various other sources. Although the volume of water delivered from STAs increases, the total change to the WCA would likely be less than

20 percent for Alternatives B, C, and D depending on how the treatment capacity provided by Compartment B and C are utilized.

Table 4-4. Percent Change from Alternative A in the Total Volume of Water Delivered

Alternative	The Refuge	WCA 2A	WCA 3A	C-51 East	Rotenberger
Alternative B	0%	14%	-1%	-5%	-11%
Alternative C	0%	12%	-4%	0%	-11%
Alternative D	0%	16%	-1%	-5%	-11%
Alternative E	-7%	-3%	3%	0%	-38%

Source: Goforth 2007a

Alternative E utilizes land in the vicinity of STA-1W and STA-1E as additional treatment area. Inflows to STA-1W and STA-1E would be from agricultural lands within the S-5A basin. Therefore, the water delivered from STAs and the EAA to WCAs under Alternative E would change as defined in Table 4-2, with less water delivered to the RWMA, but more water would remain in the basin that could be available for delivery to the Refuge.

4.2.2 Groundwater Hydrology

The three principal aquifers in the EAA, the Biscayne Aquifer, the USA, and the Upper Floridan Aquifer, would be minimally, if at all, affected by the alternatives. The deep Floridan Aquifer would receive no effect from Alternatives B, C, D, and E. Alternatives B, C, D, and E would result in the construction and operation of STAs that may inundate 14,000 acres on a permanent basis. Under these conditions, water may be lost to the shallow USA and Biscayne Aquifers. The Biscayne Aquifer is one of the most permeable aquifers in the world. It is primarily recharged from rainwater infiltration and the system of canals from Lake Okeechobee (Fernald 1984). Canal seepage is considered in DMSTA modeling (Goforth 2007). However, the contribution of seepage that would occur has a minimal effect on groundwater. Expected contributions to seepage from Alternatives B, C, D, and E are equal to the contribution from Alternative A.

Broward and Palm Beach Counties have established wellhead protection ordinances to ensure that contamination to groundwater would not affect the water supply (Broward and Palm Beach 2007). The minimum contribution of seepage to groundwater and these ordinances ensure that there would be no effect on wellhead protection areas.

4.2.3 Water Quality

The goal of additional STAs in Compartments B and C or other areas of the EAA including lands in the vicinity of the STA 1W and 1E, is to assist existing STAs in achieving water quality goals for total phosphorus in the EPA.

4.2.3.1 No Action Alternative

The water quality response of STAs under Alternative A was modeled using the DMSTA assuming current practices continue and there would be no Build-out of Compartments B and C (Goforth 2007a). However, any change in land use, including continuing current practices, is dependent on future actions under Grant Agreement FB-4. The Grant Agreement states that lands acquired for public ownership under the Agreement will be used for purposes of Everglades ecosystem restoration as required by the 1996 Farm Bill. The total phosphorus loads delivered to the WCAs would be maintained as presented in Table 4-5. This alternative was assumed as the baseline condition for comparing the effect of the Preferred and Action Alternatives on water quality.

Table 4-5. Total Phosphorus Load (kg/year) Outflow

Alternative	STA 1E	STA1 W	STA2	Comp B	EAA A-1	STA 3/4	STA5	STA6	Additional Treatment Area	Total Treated	Diversion	Total
Alternative A	6,240	8,281	8,083	N/A	48,417	17,727	15,028	1,090	-	56,449	15,045	71,494
Alternative B	6,269	8,270	4,367	4,580	52,201	15,120	5,870	986	-	45,462	13,192	58,654
Alternative C	6,299	8,287	10,338	2,212	36,564	14,194	5,870	986	-	48,187	13,705	61,891
Alternative D	6,269	8,269	10,387	2,656	52,202	15,144	5,870	986	-	49,581	13,239	62,821
Alternative E	2,216	2,778	6,928	NA	48,417	20,340	5,474	2,027	5,663	45,427	15,045	60,472

4.2.3.2 Action Alternatives

The alternatives to no action present opportunities for potential minor and major effects to the total phosphorus load delivered to WCAs depending on how the added treatment capacity provided by Action Alternative features are operated in the context of regional water management infrastructure and system operations. Conservative assumptions were used in the DMSTA model if the modeled results fell below the calibration range (Goforth 2007a-e). This EIS assumed the minimum value of the range when the predicted model result was less than the calibration range. The minimum value of the calibration range for an SAV system was 15 ppb; therefore, when modeled results from Compartment B fell below this range, they were assumed to be 15 ppb.

The total phosphorus load delivered to the WCA 2A under Alternatives C and D would increase the load delivered by 30 percent or more (Table 4-6). This increase indicates an adverse effect from the total phosphorus to WCA 2A. Alternative B would increase the phosphorus load to WCA 2A by only 2 percent, and it would decrease slightly with Alternative E. This indicates only a minor effect on the total phosphorus delivered to WCA 2A from Alternatives B and E. Modeled results to WCA 3A indicate large decreases in the total phosphorus load from Alternatives B, C, and D, showing progress toward meeting the water quality goals for the EPA. Alternative E shows large decreases in load to the Refuge, RWMA, and C-51 East.

Table 4-6. Total Phosphorus Load (kg/year) Delivered from STAs and EAA

Alternative	The Refuge	WCA 2A	WCA 3A	Other*	Total
Alternative A	14,521	12,107	34,315	10,551	71,494
Alternative B	14,539	12,379	25,909	5,827	58,654
Alternative C	14,586	15,773	25,574	5,959	61,891
Alternative D	14,538	16,481	25,975	5,827	62,821
Alternative E	8,019	11,546	33,945	5,774	59,284

* Other is C-51 East and RWMA
Source: Goforth 2007(a-e)

4.2.4 Water Supply

As stated in Chapter 3 of this report, STAs will not be used to treat water supply deliveries. Therefore, any action will not have an effect on water supply. However, the western portion of Compartment C is slightly higher in elevation, which may lead to the necessity of requiring water withdrawals from adjacent canals to maintain hydration. Depending upon the quantity of water withdrawn and the canal providing the water, this could potentially affect water supply to the Seminal Indian Reservation. This potential effect will be re-evaluated in the Final EIS once updated design reports are released.

4.2.5 Flood Protection

Flood control in the EAA is maintained by routing water through conveyances to WCAs and in extreme events to Lake Okeechobee. If no action were to occur, these practices would continue. No new conveyances are proposed under the Action Alternatives; however, during the storm events the STAs can be staged up to 4 feet for a short period of time, providing flood protection. In modeling, flood control releases were simulated under existing conditions, or rather the No Action Alternative (Goforth 2007).

4.3 AIR RESOURCES

4.3.1 Climate

The Action Alternatives would result in the construction and operation of new STAs that would be inundated on a permanent basis. On a highly localized basis, the continuous presence of water within the affected areas could have a minor microclimatic effect. The air above and in the immediate vicinity of the STAs would likely tend to be slightly more humid and cooler than the air above nearby areas that are not covered with water, such as agricultural fields or terrestrial habitat. Although these differences might be measurable with appropriate instruments, it is unlikely the differences would be noticeable to human visitors, for example. Any such microclimatic effect would not extend beyond the immediate project area and would not vary among the Action Alternatives. Under all of the alternatives, including the No Action Alternative, weather and climate conditions within the EAA and

surrounding region would continue to be controlled by the external factors that currently drive these conditions. Similarly, any possible microclimatic effects from an Action Alternative would be so small and localized that they would have no discernible contribution to the broad, ongoing patterns of climate change that are likely to affect the region in the future.

Over the long term, future climatic conditions in the region surrounding the Proposed Action sites will be affected by global patterns of climate change, primarily a predicted long-term increase in global temperatures associated with greenhouse gas (GHG) emissions that has received substantial public attention in recent years. Multiple models and analyses of future climate conditions in the world and region are available, and there is a considerable range of uncertainty around the predicted future conditions. As summarized in one recent assessment (Stanton and Ackerman 2007), broad climatic trends in Florida are likely to include:

- An overall reduction in precipitation, with greater variability in rainfall distribution, longer dry spells, and greater probability of drought;
- An overall increase in temperatures, as measured on an annual average basis an by "heat index" measures that combine temperature and humidity. Expected temperature changes include reduced nighttime cooling, increased daily high temperatures, and more frequent and severe hot spells; and
- Increased hurricane intensity, with more frequent occurrences of strong (Category 4 and 5) hurricanes and greater damages from more intense storms.

Specific temperature and precipitation changes will depend to a degree on the ability to attain major reductions in the levels of GHG emissions over time. The Stanton and Ackerman (2007) analysis of a "business-as-usual" scenario (without major GHG reductions) predicts that the average annual temperature in Florida would increase by 5 ºF by 2050 and 10 ºF by 2010. The overall decrease in precipitation estimated for this scenario was approximately 10 percent. The degree of sea-level rise associated with the global drivers of these climatic changes ranged from approximately 18 to 28 inches by 2050, and 27 to 42 inches by 2075.

4.3.2 Air Quality

Potential air quality impacts associated with construction or operation of the proposed STAs could be considered significant if project-related air emissions would result in air pollutant concentrations that would exceed standards or thresholds established in air quality regulations. As indicated in the following discussion, this would not be the case for any of the alternatives.

4.3.2.1 No Action Alternative

Under the No Action Alternative (Alternative A), air quality conditions within the EAA and surrounding region would continue to be determined by current emissions sources and weather patterns. Information on existing air quality conditions provided in Section 3.5.1 indicates that air quality in the area affected by the Proposed Action is generally good and in compliance with standards.

4.3.2.2 Action Alternatives

Based on the nature of the possible air pollutant sources, potential air quality impacts from the Action Alternatives would be the same.

Construction for the Action Alternatives would result in air emissions from a variety of sources. These sources would primarily be associated with construction of the levees and water control structures needed to develop Compartments B and C or the Alternative Lands for use as STAs. Emissions would primarily include fugitive dust from grading and construction vehicle traffic, and particulates, nitrogen oxides and volatile organic compounds from operation of the construction equipment itself. The emissions would be intermittent and variable during the construction period, with emission volumes at a given time depending on the specific schedule of pollutant-emitting construction activities. The duration of this impact would be temporary, as it would only occur during the period of construction activity. Construction emissions would likely reduce air quality to a limited degree at times in the immediate vicinity of the construction activity. It is not likely that residents or agricultural workers in areas adjacent to the construction activity would notice or be adversely affected by the emissions, or that the intermittent air quality changes would be measurable within the surrounding region.

Long-term sources of air emissions from operation of the proposed STAs would essentially be limited to combustion compounds from diesel-powered pumps or generators used to provide backup power for electric-powered pumps. Pollutant volumes would be small, as the number and capacity of pumps used to operate the STAs would likewise be small. The equipment would produce emissions on a recurring basis throughout the operating period for the project. These emissions would represent a negligible contribution to existing emissions sources even on a localized basis, however, and would not constitute a significant impact to air quality.

4.3.3 Noise

Similar to air quality, potential noise impacts associated with the proposed STAs could result from construction or long-term operation of project equipment. Potential project-related noise impacts could be considered significant if they would result in noise levels that would

exceed state or local standards, which are generally based on sound levels at sensitive receptor locations. As indicated in the following discussion, this would not be the case for any of the alternatives.

4.3.3.1 No Action Alternative

Under the No Action Alternative (Alternative A), noise levels within the vicinity of Compartments B and C and lands near STA 1W and 1E would continue to be associated with current noise sources in the local area, which are primarily produced by agriculture and related activities and vehicle traffic on local roads.

4.3.3.2 Action Alternatives

Construction for the Action Alternatives would produce noise from operation of construction equipment. Specific sources of noise during construction would primarily be heavy equipment such as bulldozers, graders, front-end loaders, and heavy trucks. These types of equipment typically produce sound levels in the range of 70 to 90 decibels measured on the A-weighted scale (dBA) at a distance of 50 feet, and the sound is often audible at a distance of up to approximately 1 mile (USACE 1996).

The proposed STA sites in Compartments B and C (for Alternatives B, C, and D) are located in undeveloped portions of the EAA. The closest concentrations of developed uses are in Belle Glade and South Bay, which are more than 15 miles distant and well beyond the range at which receptors might experience project-related noise. Current agricultural uses are located adjacent to the north side of Compartment B and the west side of Compartment C, but no farm residences are located close enough to either project site that they would be exposed to noise from project construction. Based on the relationship between the locations of construction activity and potential noise receptors, project construction for Alternatives B, C, or D is not likely to result in any adverse noise impacts to the local human population.

Under Alternative E, virtually all of the area assumed to be converted to an STA is also located in an undeveloped portion of the EAA, specifically the existing agricultural area west of STA 1W. These lands are approximately 12 miles from the urbanized development around Belle Glade, and STA construction in this area would likewise affect only a small number of isolated receptors in the surrounding agricultural area. A minor exception to this overall condition applies to the 362 acres of assumed STA land in Section 24, to the east of STA 1E. This site in the Village of Wellington is adjacent to areas of existing low-density rural residential use immediately to the north of the site and to the east of Flying Cow Road. The minimum parcel size in these areas is 190 acres (Village of Wellington 2005). If all lands within the approximately 1-mile audible range of construction equipment were fully developed to the permissible density (an unlikely condition in the near future), a maximum of

less than 200 residences would be exposed to intermittent noise from project construction during the construction period for the project.

Construction noise can disrupt wildlife, and the Compartment B and C Build-out sites and Section 24 are located near areas that provide managed wildlife habitat. The southeastern edge of Compartment B is adjacent to WCA 2A, the southeastern edge of Compartment C is adjacent to the RWMA, and the southwestern corner of Section 24 is adjacent to the northern side of the Refuge. Noise from construction within portions of Compartments B and C would presumably be audible to wildlife within immediately adjacent portions of the WCA and WMA, and noise from construction within Section 24 (under Alternative E) would presumably be audible to wildlife within the immediately adjacent portion of the Refuge.

As indicated previously, typical construction equipment can produce sound levels of up to about 90 dB that can be audible at a distance of up to about 1 mile. At 1,000 feet from the source, sound levels from most types of construction equipment range from about 45 dB to 60 dB, while sound levels from equipment such as bulldozers could be up to 70 dB (EPA 1971). Corresponding sound levels at 5,000 feet from the source generally range from about 30 dB to 50 dB, and up to about 56 dB for bulldozers. At this distance, construction noise from the project would be within the range of background sound levels in the adjacent areas and would generally not be distinguished from other existing sound sources.

The applicable literature indicates that wildlife response to construction noise is highly variable (USACE 1996). If wildlife present in WCA 2A, the RWMA and the Refuge were disturbed by noise from project construction, it is possible they would temporarily abandon the areas that are within audible range of the construction noise. Taking 1 mile as the maximum extent of potential noise disturbance from construction activity, the area potentially affected would amount to approximately 2,000 acres of the 147,000-acre Refuge (1.4 percent of the total area), 3,800 acres of the 672,000-acre Everglades WMA (0.6 percent of the total area), or 3,200 acres of the 28,760-acre RWMA (11.1 percent of the total area). Given the temporary and intermittent nature of the noise sources and the relatively limited area of wildlife habitat that might be affected by this noise disturbance, it is unlikely that noise-related wildlife disturbance from any of the Action Alternatives would represent a significant impact to an affected wildlife population or key habitat area.

The primary long-term source of noise would be operation of pumping stations for the proposed STAs. The pumps would be located within enclosed buildings, and the types of pumps that are currently in use within the SFWMD infrastructure do not emit noise that is audible beyond the pump station compound. Therefore, no adverse noise impacts to humans or wildlife are expected from operation of the Build-out.

4.4 VEGETATION

This analysis of impacts to vegetation in the project-affected regions is based on changes in phosphorus loads and concentrations and in water levels, which greatly affect and define vegetative communities. Phosphorus is the limiting nutrient in Everglades' vegetation. The proliferation and distribution of invasive cattails in the Everglades is attributed to elevated phosphorus levels in the soil and high water levels (Newman et al. 1998), under which conditions cattails can out-compete sawgrass (Newman et al. 1998; USACE 2006). Different types of wetland habitat (marsh, prairie, slough, etc.) rely on the appropriate water levels to maintain the natural balance of vegetative diversity and composition for the specific wetland type. Altering the hydrology in a wetland system will disrupt this natural balance. For example, too much water in the Everglades may facilitate cattail infestation or drown native vegetation, and too little water may encourage colonization of melaleuca (Myers 1983) and other invasive and exotic species. The expected result of reduced phosphorus loading and concentrations is improved conditions for native vegetative communities, and the opposite would favor exotic and invasive species. Changes in hydrology may be beneficial or harmful to native vegetative communities, depending on the current hydrologic state of the system. For the purposes of this discussion, Alternative A, the No Action Alternative, sets the baseline against which the Action Alternatives (Alternatives B-E) are compared. Both the DMSTA modeling effort and the normalized hydrographs shown in Appendix I are considered in the evaluation.

4.4.1 No Action Alternative

Under the No Action Alternative (Alternative A), Compartments B NBO and C Build-out areas may be converted back to active agriculture. In total, 4,906 acres of freshwater marsh and scrub and shrub wetlands in the Compartments B and C Build-out would be converted to anticipated crops of sod and sugar cane. Compartment B SBO and Alternative Lands adjacent to STA 1W would remain in agriculture production. However, any change in land use of Compartment B and C, including continuing current practices, is dependent upon future actions under Grant Agreement FB-4. The Grant Agreement states that lands acquired for public ownership under the Agreement will be used for purposes of Everglades' restoration as required by the 1996 Farm Bill. Section 24 would likely be converted to an STA/recreational facility, for which applications have been made to the regulatory agencies.

The Village of Wellington is proposing to use Section 24 as an STA outside of this project, although a permit has not yet been issued. It is anticipated that the STA(s) associated with Alternative E will consist of wetland and aquatic refuge with emergent vegetation and SAV.

No significant changes in vegetative communities within developed portions of the EAA are anticipated. The EAA will continue to be used for agriculture, including pasture, row crops,

sugar cane *(Saccharum officinarum)*, and other crops. Currently, disturbed communities make up 69.5 percent of the EAA (USACE 2006), with the majority consisting of sugar cane (USACE and SFWMD 2006). In the future, crops may shift to more water-tolerant species (such as rice) as predictions of soil subsidence from current and historical irrigation and drainage conditions estimate that less than 8 inches of topsoil will remain in one-half of the EAA by 2050, making conditions wetter and sugar cane production difficult and costly (Snyder 2004). Based on assumed continuation of current agricultural practices, only 507,675 acres of the EAA would be suitable for crops in the year 2050, and 71 percent (407,053 acres) of that acreage would be suitable only for water-tolerant crops (Snyder 2004). Implementing soil-conserving farming practices could substantially retard subsidence, keeping the area suitable for the current crops.

A regional trend towards improvements in water quality, quantity, and timing may occur from planned restoration projects in the Everglades, such as CERP, Acceler8, Northern Everglades and Estuaries Restoration Program, LOERP, and the LORSS. These projects overall are expected to improve vegetative communities in the project-affected regions as defined in Section 3.1. This will depend on the manner in, and extent to which, the treatment capacity provided by Action Alternative features is used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations, but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. The increased ability to manage water levels in Lake Okeechobee to favor natural levels and fluctuations may improve vegetative communities in the littoral and SAV zones of Lake Okeechobee that today are being eroded and affected by rapidly changing water levels and prolonged extreme high and low water levels. Nutrient inputs that have degraded naturally occurring vegetative communities in the project-affected regions and allowed for invasive and exotic species to colonize will decrease, resulting in conditions that favor native plant species. Reduced regulatory releases to the Northern Estuaries will help normalize and stabilize salinity, turbidity, and dissolved oxygen in the estuaries, improving conditions for seagrasses. Although these projects will improve conditions for vegetative communities in the project-affected areas, the cumulative effect of all restoration projects and plans together, including the Compartments B and C Build-out, will result in the greatest ecological benefit.

Shortened hydroperiods from improvements made to the Miami Canal and the surrounding levees have led to drier conditions and have increased the frequency of severe peat fires in the northern portion of WCA 3A, while elevated water levels occur in southern WCA 3A as a result of the sloping topography from north to south creating more slough habitat than

typical wet prairie habitat. If this trend continues, a shift to more transitional vegetative communities would be anticipated in the northern reaches of the WCA and a shift towards more aquatic vegetation associated with open water and/or slough would be anticipated in the southern reaches.

4.4.2 Action Alternatives B, C, and D

Under Action Alternatives B, C, and D, the exotic vegetation within the Compartments B and C Build-out would be treated with herbicides and prescribed burns, and agricultural canals and ponds would be filled to prevent short-circuiting of the system. The cells within the system would consist of emergent vegetation and SAV. Upland vegetation will be limited to grass and herbaceous species on canal banks. To the maximum extent practicable, the water depths in the treatment cells of the Build-outs will be managed at target levels of 1.25 to 1.50 feet. This may provide more ecologically valuable habitat for wading birds (foraging habitat), aquatic invertebrates, aquatic reptiles, and amphibians than with the No Action Alternative

The build-out of Compartments B and C as STAs under Alternatives B, C, and D would be operated to assist existing STAs in treating stormwater runoff from contributing basins and Lake Okeechobee. These actions provide the opportunity for minor to major changes in the hydropatterns of the WCAs that otherwise would not be possible without the increased treatment capacity. The anticipated result of the Action Alternatives B, C, and D is an overall improvement in water quality discharged from the EAA into surrounding regions (Table 4-7). According to the DMSTA models, an approximate 18 to 12 percent overall reduction in phosphorus concentrations of water discharged from the EAA and a 12 to 22 percent reduction in phosphorus loading would occur overall, with the greatest improvements under the SFWMD's Preferred Alternative B. Although the state water quality standard of 10 ppb for water discharged into the Everglades will not be met with this project alone, it narrows the gap between discharge concentrations and the 10 ppb requirement. The reduction in phosphorus is expected to improve vegetative communities overall, both near discharge locations and downstream by creating conditions more favorable for native species.

Table 4-7. Summary of Water Volumes, Total Phosphorus Loads, and Total Phosphorus Concentrations, of Water Discharged from EAA to the Affected Regions under Alternatives A-D

Alternative	Parameter	Unit	The Refuge	WCA 2A	WCA 3A	C-51 East	Rotenberger	Total
Alternative A	Volume	AF/yr	435,948	462,761	749,466	25,545	83,302	1,757,022
	TP Load	kg/yr	14,521	12,107	34,315	3,037	7,514	71,494
	TP Conc	ppb	27	21	37	96	73	33
Alternative B	Volume	AF/yr	435,629	572,376	678,781	24,373	74,359	1,785,517
	TP Load	kg/yr	14,539	12,379	25,909	2,892	2,935	58,654
	TP Conc	ppb	27	18	31	96	32	27
Alternative C	Volume	AF/yr	436,382	555,142	666,139	25,444	74,359	1,757,465
	TP Load	kg/yr	14,586	15,773	25,574	3,024	2,935	61,891
	TP Conc	ppb	27	23	31	96	32	29
Alternative D	Volume	AF/yr	435,481	584,464	679,082	24,369	74,359	1,797,755
	TP Load	kg/yr	14,538	16,481	25,975	2,892	2,935	62,821
	TP Conc	ppb	27	23	31	96	32	28

Legend: AF/yr- Acre feet per year kg/yr- kilograms per year
ppb- parts per billion TP- total phosphorus
Source: DMSTA model results (Goforth 2007a-d)

When the specific vegetative regions are examined independently, anticipated changes in phosphorus loading and concentrations and water volumes vary. With Action Alternatives B, C, and D, there are no anticipated changes to vegetative communities within the developed portions of the EAA, the Refuge, Lake Okeechobee, and the Lake Worth Lagoon when compared to Alternative A (see Table 4-7 and Normalized Hydrographs, Appendix I) because there are no changes to the parameters in these regions. Substantial water quality improvements are anticipated to the WCA 3A and RWMA from large reductions in phosphorus loads and concentrations, but water deliveries are reduced with the exception of Alternative D1 as to WCA 3A. As noted in Chapter 3, cattail expansion throughout the WMAs is likely due to nutrient enrichment (FFWCC 2002); therefore, this anticipated phosphorous reduction should help control cattails in RWMA despite reduced water deliveries.

Vegetation, including SAV, in the Northern Estuaries and Lake Okeechobee is anticipated to improve with Alternative D, which contributes to reducing regulatory releases to the Northern Estuaries by restoring the ability of STA 3/4 to receive regulatory releases from Lake Okeechobee. Minimized high nutrient pulses in fresh water received by the Northern Estuaries would help restore salinity regimes and dissolved oxygen content and decrease turbidity, which would in turn improve conditions for seagrass and mangroves (USACE 2007b). In addition, the increased ability to manage water levels in Lake Okeechobee closer to natural conditions would enhance vegetative communities in the littoral and SAV zones of the lake. With Alternatives B and C, the conditions in Lake Okeechobee and the Northern Estuaries would be the same as for the No Action Alternative.

Changes to vegetative communities may occur in WCA 2A and 3A. According to the DMSTA modeling effort, the annual volume of water entering WCA 2 is substantially increased (20 percent) under all three Action Alternatives. With this increased water volume, phosphorus loading increases greatly with Action Alternatives C and D, but only minimally with Alternative B (the SFWMD's Preferred Alternative), in which phosphorus concentrations are also reduced. As discussed previously, cattails have been shown to out-compete sawgrass in high nutrient waters and higher water conditions (Newman et al. 1998; USACE 2006). WCA 2 already has greater than 50 percent cattail coverage (USACE and SFWMD 2006). The anticipated effect is that these changes and water quality and volume may increase in cattail coverage, density, and colonization compared with the current conditions and in the No Action Alternative; however, these changes would be less with Alternative B than with C and D. The normalized hydrographs indicate that the increase in water deliveries would only affect the northern portions of WCA 2 and not the central or southern portions. Even as water quality continues to improve as Compartment B is utilized, restoration in WCA 2A would be a long-term process because of historical phosphorus accumulations found in the sediments within these canals and adjacent impacted marsh areas.

In WCA 3A, the phosphorous load and concentrations from the receiving waters decreases substantially for Action Alternatives B, C, and D; however, the models also show an approximate 10 percent decrease in the annual volume of water sent to WCA 3A. Additionally, the reductions in phosphorus concentrations and loads from the Action Alternatives would provide additional downstream benefits for aquatic vegetative communities.

However, in Alternative D1, the operational intent to send more water to WCA 3A via a structure such as S-11, as an interim measure until the CERP spreader canal distributing water into WCA 3A is constructed, and to send less water to WCA 2A. This operational regime is desirable and consistent with Everglades ecosystem restoration goals.

4.4.3 Action Alternative E

Lands for Alternative E are proposed in the vicinity of STAs 1E and 1W. It is important to note that Alternative E was modeled differently than the other alternatives. Alternatives B, C, and D were modeled using DMSTA, while Alternative E was modeled using the Steady-state Model Design, as described in Chapter 2 of this Draft EIS. To achieve an increase in water treatment under Alternative E like that achieved in Alternatives B through D, the specific amount of acreage adjacent to existing STAs was quantified; however, specific plots of land were not identified. However, once the modeling results for Alternative E were complete, and a specific acreage amount was identified, it was determined that areas of land in the vicinity of STA 1E and 1W would be the most beneficial for water treatment to assist in

reducing nutrient levels. This conclusion was made because other STAs in the region are already connected to Compartments B and C. Furthermore, an STA in these conceptual locations could reduce costs by sharing infrastructure, such as inflow/outflow canals, pump stations, with 1E and 1W.

The build-out of STAs under Alternative E would be operated to assist existing STAs in treating stormwater runoff from contributing basins and Lake Okeechobee. These actions provide the opportunity for minor to major changes in the hydropatterns of the WCAs that otherwise would not be possible without the increased treatment capacity. It is predicted that this conceptual location for the Alternative Lands would result in a greater contribution of treated water delivered to the Refuge and less untreated water being pushed out to tide, which negatively affects the estuaries. The effects on vegetation discussed below are based on the conceptual location of Alternative Lands, not the modeling efforts discussed in Section 4.2.

This alternative would allow for Lake Okeechobee regulatory releases currently sent to tide through the C-51 Canal to the Lake Worth Lagoon to be captured. This would benefit SAV within the Lake Worth Lagoon. Minimized high nutrient pulses in fresh water received by the Northern Estuaries would help restore salinity regimes and dissolved oxygen content and decrease turbidity, which would in turn improve conditions for seagrass and mangroves.

In addition, it is anticipated that vegetation within the Refuge would improve. Water previously discharged to tide would be captured in the basin and, after treatment, could be delivered to the refuge as needed. It is anticipated that establishing this hydrologic regime that would more closely represent a natural system in both the quality and quantity of water deliveries in turn would result in an overall improvement to vegetative communities in the Refuge and reduce the abundance of cattails and other exotic vegetation.

It is anticipated that the STA(s) associated with Alternative E would consist of wetland and aquatic refuge with emergent vegetation and SAV, and would be managed at target levels of 1.25 to 1.50 feet as with Compartments B and C Build-out STAs. This may provide more ecologically valuable habitat for wading birds (foraging habitat), aquatic invertebrates, aquatic reptiles, and amphibians than with the No Action Alternative

The effects to the remaining affected regions would be the same as with the No Action Alternative.

4.5 FISH AND WILDLIFE

This section analyzes the anticipated effects of the proposed alternatives to fish and wildlife in relation to the habitat changes from water quality, quantity, and timing, and vegetation. Vegetative composition and water quality are directly related to the value of the habitat for fish and wildlife usage. Diversity is higher in aquatic habitats with appropriate native

vegetation than in habitats dominated by invasive and exotic vegetation. They provide the appropriate amount of structure for resting, egg laying, and refuge, while also allowing for adequate open water areas for migration of aquatic organisms, larger fish, and wading birds to forage. The monotypic and dense growth patterns of invasive and exotic vegetation do not afford the same habitat diversity. Furthermore, many aquatic organisms (such as oysters) and habitats (for example, seagrass beds) require adequate water quality to thrive. Turbidity, changes in salinity regimes, and low dissolved oxygen can affect both the vegetation that provides the habitat and the fish and wildlife that use the habitat. Alternatives that improve vegetative composition and water quality parameters would be expected to enhance habitat values. For the purposes of this discussion, Alternative A, the No Action Alternative, sets the baseline against which the Action Alternatives, Alternatives B through E, are compared. Both the DMSTA modeling effort and the normalized hydrographs shown in Appendix I are considered in the evaluation.

4.5.1 No Action Alternative

With the No Action Alternative, fish and wildlife habitat and use in the Compartment B SBO and C footprint might decrease. If converted back to active agriculture, it would result in the loss of 4,906 acres of marsh wetlands and 317 acres of scrub-shrub wetlands, both of which provide foraging habitat for wading bird species such as wood storks, little blue heron, white ibis, tricolor herons, snowy egrets, yellow-crowned night herons, and roseate spoonbills, and habitat for aquatic reptiles, amphibians, and macroinvertebrates. During elevated water levels, these wetlands may also provide habitat for fish species found in the agricultural canals and man-made lakes within the Compartments B and C Build-out. The 7,593 acres of atypical wetlands (active and fallow agricultural fields that exhibit wetlands soils and hydrology but that are lacking wetland vegetation) will remain, but these areas provide only minimal habitat value. Birds observed using atypical wetlands made up of sod farms in Compartment B include wood storks *(Mycteria americana)* and white ibis. Atypical wetlands may also contain habitat suitable for the crested carcara, which prefers open areas, as well as for indigo snakes. The 684 acres of agricultural ditches and man-made lakes would likely remain and continue to provide habitat for fish, aquatic reptiles, and other aquatic organisms. Fish and wildlife utilization of Compartment B NBO and lands in the vicinity of STA 1W would remain status quo as these areas might remain in agricultural production. However, any change in land use of Compartment B and C, including continuing current practices, is dependent on future actions under Grant Agreement FB-4. The Grant Agreement states that lands acquired for public ownership under the Agreement will be used for purposes of Everglades' ecosystem restoration as required by the 1996 Farm Bill. Section 24 will likely be converted to an STA/recreational facility, for which applications have been made to the regulatory agencies.

No change to fish and wildlife usage and habitat is anticipated within the developed portions of the EAA with the No Action Alternative, with the exception improved fish habitat from mandated land management practices that will reduce nutrient run-off into EAA canals. These land management practices may also enhance wetland and aquatic habitats within the Rotenberger and Holey Land WMAs, which receive water from the EAA canals. Generally, habitats would remain disturbed and would consist of primarily active or fallow agricultural lands that provide minimal foraging and nesting habitat for some species and agricultural ditches and man-made canals that provide some aquatic habitat for fish and aquatic species.

A regional trend towards improvements in water quality, quantity, and timing may occur from planned restoration projects in the Everglades, such as CERP, Acceler8, Northern Everglades and Estuaries Restoration Program, LOERP, and the LORSS. Overall, these projects are expected to improve vegetative communities in the project-affected regions as defined in Section 3.1. This will depend on the manner in, and extent to which, the treatment capacity provided by Action Alternative features is used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations, but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. As a result, improvements to fish and wildlife habitat in the project-affected regions are anticipated. Healthier seagrass and mangrove communities in the Northern Estuaries from reduced turbidity, nutrients, and freshwater inputs and normalized salinity regimes will increase the habitat values of these communities for prey animals such as juvenile fish, invertebrates, and shellfish. In turn, foraging habitat for predator animals (such as wading birds, sea turtles, birds of prey, shore birds, and bottlenose dolphins) will be enriched. Foraging habitat for manatees and sea turtles that feed on seagrass will also improve, and other aquatic resources, such as oysters that are hypersensitive to changes in salinity, will benefit from the superior water conditions.

Fish and aquatic wildlife habitat up-river in the Caloosahatchee and St. Lucie Rivers will also improve. For example, restored hydrologic regimes will greatly benefit the endangered opossum pipefish that relies on seasonal water patterns to carry larvae downstream to estuarine and marine waters and successful migration of juveniles back to freshwater tributaries. In Lake Okeechobee, regulatory releases more similar to natural hydrologic conditions would prevent erosion of wetland vegetation and desiccation of littoral zones, enhancing foraging and nursery habitats for prey and predator species. Nutrient inputs into the lake, however, will continue to promote proliferation of invasive plant species, limiting suitable habitat for fishes and wildlife. In addition, habitats in the WCAs should also benefit from the regional trends toward improved water quality, quantity, and timing. The expected

result is improved foraging and nesting habitat for fish and wildlife. Although restoration projects and plans in the affected areas will improve conditions for fish and wildlife, the cumulative effect of all restoration projects and plans together, including the Compartments B and C Build-out, will result in the greatest ecological benefit.

4.5.2 Action Alternatives B, C, and D

The build-out of Compartments B and C as STAs under Alternatives B, C, and D will be operated to assist existing STAs in treating stormwater runoff from contributing basins and Lake Okeechobee. These actions provide the opportunity for minor to major changes in the hydropatterns of the WCAs that otherwise would not be possible without the increased treatment capacity. The Action Alternatives B, C, and D may improve fish and aquatic wildlife habitat within Compartments B and C, the RWMA, and downstream in portions of the EPA. As discussed in Chapter 3, the fish and wildlife habitat in Compartments B and C is mainly man-made ponds, agricultural ditches, and 5,225 acres of freshwater and scrub-shrub wetlands. Atypical wetlands are present, but these areas provide only minimal wildlife habitat. With Alternatives B, C, and D, construction of STAs will consist of wetland and aquatic refuge with emergent vegetation and SAV, which will provide more ecologically valuable habitat for wading birds (foraging habitat), aquatic invertebrates, aquatic reptiles, and amphibians. Some of the existing agricultural canals and ponds will be filled to prevent short-circuiting of the system, but deeper canals (conveyance and collector canals) will continuously provide deeper-water fish habitat. Cells with emergent aquatic vegetation will provide fish bedding and spawning habitat during peak water levels. Aquatic fish and wildlife similar to the species that currently use the EAA are anticipated with all of these alternatives.

The anticipated result of the Action Alternatives B, C, and D is an overall improvement in water quality and vegetative communities, and in turn an overall improvement in fish and wildlife habitat and use in the project-affected area. When the regions are examined independently, however, effects on fish and wildlife may vary. With Action Alternatives B, C, and D, no changes are anticipated to fish and wildlife within the developed portions of the EAA because there are no changes to the parameters in this region. Improvements are anticipated to aquatic habitats in RWMA from expected reductions in exotic and invasive vegetation and improved water quality.

When compared with the No Action Alternative, fish and wildlife habitat and diversity in the Northern Estuaries and Lake Okeechobee may improve with Alternative D. Alternative D contributes to reducing regulatory releases to the Northern Estuaries by restoring the ability of STA 3/4 to receive regulatory releases from Lake Okeechobee. It is anticipated that fish and wildlife usage, diversity, foraging, nesting, and spawning would increase with the

expected improvements in SAV and mangrove habitats in the Northern Estuaries and SAV and littoral wetland habitats in Lake Okeechobee. Using Lake Okeechobee water management practices that more closely resemble natural hydrologic conditions would further prevent erosion of wetland vegetation and desiccation of littoral zones, enhancing foraging and nursery habitats for prey and predator species. With Alternatives B and C, the conditions in Lake Okeechobee would be the same as for the No Action Alternative.

Possible adverse impacts may occur in WCA 2A. With the Action Alternatives B, C, and D, it is anticipated that wading bird foraging and nesting may initially rise in WCA 2A from recent increased rises in water levels, as the increased water levels better sustain prey populations. However, if cattails continue to invade, foraging habitat and habitat for aquatic fish and wildlife species may decline as dense cattail stands replace shallow water foraging areas and native marsh vegetation. Even as water quality continues to improve as Compartment B is utilized, restoration in WCA 2A would be a long-term process because of historical phosphorus accumulations found in the sediments within these canals and adjacent impacted marsh areas.

In WCA 3A, avian use may change with the Action Alternatives B, C, and D. Wading birds require open waters shallow enough to concentrate prey items but deep enough to support prey items for foraging to be effective, especially during nesting season (Kushlan 1976; Custer and Osborne 1978). Wading bird nesting in 2007 was not successful in the Greater Everglades Region (WCAs and ENP) and decreased approximately 36 percent from 2006 and 50 percent from 2002 (Sklar et al. 2007). Reduced foraging habitat from dry conditions and increased predation from terrestrial predators are believed to be the primary causes for these recent declines (Sklar et al. 2007). Although phosphorus loading to WCA 3A may be reduced with Action Alternatives B through D, the reduction in water deliveries to WCA 3A may further reduce suitable habitat for wading birds and other aquatic species in WCA 3A.

In Alternative D1, the intent is to send more water to WCA 3A via a structure such as S-11, as an interim measure until the CERP spreader canal distributing water into WCA 3A is constructed, and to send less water to WCA 2A. This operational regime is desirable and consistent with Everglades ecosystem restoration goals.

4.5.3 Action Alternative E

It is important to note that Alternative E was modeled differently than the other alternatives. Alternative B, C, and D were modeled using DMSTA, while Alternative E was modeled using the Steady-state Model Design, as described in Chapter 2 of this Draft EIS. To achieve an increase in water treatment under Alternative E like that achieved in Alternatives B through D, the specific amount of acreage adjacent to existing STAs was quantified; however, specific plots of land were not identified. However, once the modeling results for Alternative E were

complete, and a specific acreage amount was identified, it was determined that areas of land in the vicinity of STA 1E and 1W would be the most beneficial for water treatment to assist in reducing nutrient levels. This conclusion was made because other STAs in the region are already connected to Compartments B and C. Furthermore, an STA in these conceptual locations could reduce costs by sharing infrastructure, such as inflow/outflow canals and pump stations, with 1E and 1W.

The build-out of STAs under Alternative E would be operated to assist existing STAs in treating stormwater runoff from contributing basins and Lake Okeechobee. These actions provide the opportunity for minor to major changes in the hydropatterns of the WCAs that otherwise would not be possible without the increased treatment capacity. It is predicted that this conceptual location for the Alternative Lands would result in a greater contribution of treated water delivered to the Refuge and less untreated water being pushed out to tide, which negatively affects the estuaries. The effects on fish and wildlife discussed below are based on the conceptual location of Alternative Lands, not the modeling efforts discussed in section 4.2.

With the anticipated improved hydrologic regime, water quality, and vegetative composition in the Lake Worth Lagoon, and the Refuge with Alternative E, improvements to aquatic habitat in these regions is also anticipated. It is anticipated that fish and wildlife usage, diversity, foraging, nesting, and spawning would increase with the expected improvements in SAV and mangrove habitats in the Lake Worth Lagoon, less exotic vegetation and improved water quality within the Refuge, and a hydrologic regime similar to natural conditions.

While managed at anticipated target water levels of 1.25 to 1.50 feet, the STA under Alternative E would provide wetland habitat with emergent vegetation and SAV, which would provide habitat for wading birds (foraging habitat), aquatic invertebrates, aquatic reptiles, and amphibians. Existing agricultural canals and ponds would be filled to prevent short-circuiting of the system, but deeper canals (conveyance and collector canals) would continuously provide deeper-water fish habitat. Cells with emergent aquatic vegetation would provide fish bedding and spawning habitat during peak water levels. Aquatic fish and wildlife similar to the species that currently use the EAA are anticipated with all of these alternatives.

The effects to the remaining affected regions would be the same as with the No Action Alternative.

4.6 THREATENED AND ENDANGERED SPECIES

The following sections document potential impacts to federal- and state listed threatened and endangered species, species of special concern (SSC), and designated critical habitat that

could occur for the No Action and Action Alternatives B, C, D, and E. The impact analysis includes listed species that have the potential to occur within the project-affected regions (Lake Okeechobee, the Northern Estuaries, the EAA, the Refuge, WCA 2A, WCA 3A, Compartments B and C Build-out, and Alternative Lands) or that could be affected by the Build-out. It also assesses the Cape Sable seaside sparrow, which does not occur in the affected regions but is extremely sensitive to changes in hydrology. Refer to Chapter 3, Table 3-7, for a summary of listed species and critical habitats potentially affected. USACE is preparing a separate biological assessment (BA) for the project alternatives in accordance with Section 7(c) of the Endangered Species of Act of 1973. This EIS will serve as the baseline for the BA, which will also assess all direct and indirect effects on listed species and will provide USACE's final effects determination for these species as well. The BA will be appended to the Final EIS.

Direct impacts are defined as impacts that occur within the footprints of the proposed STAs during or as a direct result of construction activities. Indirect impacts are defined as impacts that occur outside of the footprints of the proposed STAs but are still within the affected regions, or that occur within the footprints of the proposed STAs but not directly associated with construction activities. The build-out of Compartments B and C as STAs under Alternatives B, C, and D, and the construction of STAs under Alternative E will be operated to assist existing STAs in treating stormwater runoff from contributing basins and Lake Okeechobee. These actions provide the opportunity for minor to major changes in the hydropatterns of the WCAs discussed under indirect impacts that otherwise would not be possible without the increased treatment capacity.

It is important to note that Alternative E was modeled differently than the other alternatives. Alternative B, C, and D were modeled using DMSTA, while Alternative E was modeled using the Steady-state Model Design, as described in Chapter 2 of this Draft EIS. To achieve an increase in water treatment under Alternative E like that achieved in Alternatives B through D, the specific amount of acreage adjacent to existing STAs was quantified; however, specific plots of land were not identified. However, once the modeling results for Alternative E were complete, and a specific acreage amount was identified, it was determined that areas of land in the vicinity of STA 1E and 1W would be the most beneficial for water treatment to assist in reducing nutrient levels. This conclusion was made because other STAs in the region are already connected to Compartments B and C. Furthermore, an STA in these conceptual locations could reduce costs by sharing infrastructure, such as inflow/outflow canals, pump stations, with 1E and 1W.

It is predicted that this conceptual location for the Alternative Lands would result in a greater contribution of treated water delivered to the Refuge and less untreated water being pushed

out to tide, which negatively affects the estuaries. The effects on listed species discussed below are based on the conceptual location of Alternative Lands, not the modeling efforts discussed in section 4.2.

4.6.1 Federally Listed Species

4.6.1.1 American Alligator (*Alligator mississippiensis*)

The American alligator is found within freshwater and brackish aquatic habitats in Lake Okeechobee, the EAA, the Alternative Lands, the Caloosahatchee, and St. Lucie River Estuaries. During the surveys for the wildlife evaluation report, American alligators were observed in the footprint of both the Compartments B and C Build-out and in and on canal banks within the EAA.

No Action Alternative

Direct impacts from Alternative A (No Action) are the conversion of 4,982.78 acres of freshwater marsh to active agriculture, decreasing the amount of available aquatic foraging and nesting habitat for alligators within Compartments B and C.

Indirect impacts may occur depending on the manner in, and extent to which, the treatment capacity provided by Action Alternative features is used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. Anticipated regional trends toward restored water quality, quantity, and timing from other restoration projects in the region (see Section 4.14), is expected to improve vegetative communities and fish and wildlife habitat in the project-affected regions. These anticipated improvements would result in enhanced alligator foraging and nesting habitat, as well as increased prey densities.

Action Alternatives

Direct impacts to the American alligator with Alternatives B, C, D, and E are not anticipated. Alligators would be temporarily displaced from Compartments B and C and Alternative Lands during construction of the STAs. However, once STA construction is complete, there would be an 8,854.65-acre increase in aquatic foraging habitat available to the alligator from the conversion of atypical (fallow sod and sugar cane fields) wetlands to treatment wetlands with emergent vegetation and SAV for Alternatives B, C, and D, and a similar increase in habitat with Alternative E. Existing agricultural canals and ponds within the Compartments B and C Build-out would be filled to prevent short-circuiting of the

system, but alligators would be able to use Build-out canal features (conveyance and collector canals) for foraging and resting.

Indirect impacts from the Action Alternatives may occur depending on the manner in, and extent to which, the treatment capacity provided by Action Alternative features is used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations, but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. Overall, alligator habitat within the affected regions should improve as the effects of other projects in combination with the STA Build-outs improve water quality, quantity, timing, and deliveries to the affected regions. Improvements to alligator nesting and foraging habitat, and prey availability throughout the region are anticipated.

Indirect impacts with Alternatives B, C, D, and E are anticipated mostly within the WCAs. As discussed in Sections 3.6 (Vegetation) and 3.7 (Fish and Wildlife) above, improvements to vegetative communities, habitat diversity, and fish and wildlife utilization are anticipated within the Refuge with Alternative E. The projected indirect impacts to American alligators include enhanced nesting and foraging habitat, and prey availability throughout the WCAs. Increased/accelerated cattail invasion within WCA 2A from increased phosphorous loading and water deliveries and decreases in hydrology in the northern portions of WCA 3A may decrease the suitability of alligator habitat within these areas.

With Alternatives D and E, indirect impacts are anticipated within the northern Everglades and Lake Worth Lagoon, respectively. Alternative D would restore the capacity of STA 3/4 to receive regulatory releases from Lake Okeechobee and Alternative E would allow the STA 1W to receive regulatory releases from Lake Okeechobee via the L-8 Basin. The resulting reduced freshwater releases to the Northern Estuaries and better managed water levels in Lake Okeechobee would enhance the vegetation and aquatic fish and wildlife in these regions, thereby improving alligator nesting and foraging habitat as well as prey availability.

4.6.1.2 Eastern Indigo Snake (*Drymarchon corais couperi*)

Upland and dry habitats (flatwoods, dry prairies, tropical hardwood hammocks, and coastal dunes) are the preferred habitats of Eastern indigo snakes (USFWS 1999). While drier, upland habitat is limited in the project-affected regions, these species may also forage along the edges of freshwater marshes and in agricultural fields in the EAA. They were not observed during the surveys for the 2007 wildlife evaluation report; however, there is potential for them to be present in the EAA, in the Section 24 Alternative Lands, and in the Compartments B and C Build-out areas.

No Action Alternative

No **direct impact** on the Eastern indigo snake is expected with the No Action Alternative. Although 5,299.33 acres of wetlands within the Compartments B and C Build-out would be converted to agricultural fields, which Eastern indigo snakes may use as alternative habitat, they provide little habitat value compared with the snake's preferred natural upland habitat.

Indirect impacts could be attributed to soil subsidence. As stated in Section 4.5.1, wetter conditions are expected in the EAA by 2050 because of soil subsistence, making conditions more suitable for water-tolerant crops. Subsidence could therefore cause conditions in the EAA in the future to be less favorable for the Eastern indigo snake, which prefers drier, upland habitats.

Action Alternatives

Action Alternatives B, C, and D are anticipated to have a **direct impact** on the Eastern indigo snake. Construction of the Compartments B and C Build-out would result in the conversion of 7,593 acres of atypical (fallow sod and sugar cane fields) wetlands to STAs. Atypical wetlands may be utilized by Eastern indigo snakes, but are not preferred habitat. The Eastern indigo snakes may forage along the edges of the STAs during drier periods, but conditions within the STAs would generally not be suitable because these areas are permanently inundated. Alternative E would result in similar impacts to the Eastern indigo snake by converting potential habitat i.e., agricultural lands in the vicinity of STA 1W and STA 1E to permanently inundated STAs.

No Indirect impacts from the Action Alternatives to the Eastern indigo snake are anticipated. The Action Alternatives would not result in conversion of suitable Eastern indigo snake habitat to unsuitable habitat, nor would it create suitable habitat from currently unsuitable habitat, outside of the project footprint.

4.6.1.3 Audubon's Crested Caracara (*Caracara plancus audubonii*)

The EAA including Compartments B and C, and some Alternative Lands in the vicinity of STA 1W, and Section 24, are located within a USFWS consultation area for the crested caracara (Figure 3-10), but no juvenile gathering areas are located within these areas. During field surveys, one crested caracara was observed flying over a portion of Compartment C and landing on a levee adjacent to Compartment C (URS 2007a,b).

No Action Alternative

No **direct** or **indirect impacts** to caracara are anticipated under the No Action Alternative. Caracaras prefer dry and wet prairies with scattered cabbage palms but have adapted well to improved pasture (USFWS 2004). Although the existing vegetative communities within the Build-out footprints may provide some foraging habitat for caracara, it is primarily fallow

cropland with taller and woody vegetation that is not preferred for foraging. The vegetative communities would remain as is or would return to active agriculture. Depending on the use, it may either have no effect or may moderately improve caracara foraging habitat.

Action Alternatives

No **direct impacts** to caracara are anticipated with construction of the Compartments B and C Build-out under Alternatives B, C, and D or with construction of the Alternative Lands Build-out under Alternative E. The EAA and Compartments B and C Build-outs are located within a USFWS consultation area for the crested caracara but outside known juvenile gathering areas (Figure 3-10). The *Species Conservation Guidelines for Crested Caracara* (USFWS 2004) state that no effect from the project is anticipated on the caracara if on-site surveys of suitable habitat within the consultation area do not detect caracara nests. All freestanding palm trees within the Compartment B and C Build-out were checked for nesting activity during the surveys for the 2007 wildlife evaluation report, and no signs of previous or new crested caracara nesting activity were recorded. No known nest sites are located in the EAA or in or within 6,600 feet of the Build-out footprints (USACE and SFWMD 2006). The Build-out of Compartments B and C or the Alternative Lands may improve foraging habitat for caracara in the shallow created wetlands. However, Compartments B and C and the Alternative Lands in both the existing and Build-out conditions are not and would not be high-use areas for caracara. If Alternative E is the chosen alternative, a survey for caracara nests will be performed once the specific parcels for the STA are identified.

No indirect impacts from the Action Alternatives to the caracara are anticipated. The Action Alternatives would not result in conversion of suitable caracara habitat to unsuitable habitat, or conversely they do not create suitable habitat from currently unsuitable habitat, outside of the project footprint.

4.6.1.4 West Indian Manatee (*Trichechus manatus*)

West Indian manatees have a high likelihood to occur within the Caloosahatchee and St. Lucie River Estuaries, Lake Okeechobee, Lake Worth Lagoon, and the Indian River Lagoon. Designated West Indian Manatee critical habitat exists in the western portion of the Caloosahatchee River; the Loxahatchee River and its headwaters; the southern portion of the Indian River; and in coastal waters along St. Lucie, Martin, and Palm Beach Counties. The occurrence of manatees within the EAA canals, however, is unlikely because of the recent installation of manatee barriers at water control structures S-351, S-352, and S-354, which prevent manatees from accessing the Hillsboro, North New River, West Palm Beach, and Miami Canals. Additionally, provisions have been made to release manatees that have become trapped behind the barriers after they were installed, so manatees are not expected to occur within the EAA since these barriers were put in place.

No Action Alternative

No **direct impacts** to manatees or its critical habitat are anticipated from the No Action Alternative because manatees can no longer access the EAA canals.

Indirect impacts can be anticipated depending on the manner in, and extent to which, the treatment capacity provided by Action Alternative features is used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. An overall regional trend toward restored water quality, quantity, and timing from other restoration projects, described in Section 4.14, is expected to improve vegetative communities within Lake Okeechobee and the Northern Estuaries. Minimized freshwater releases from Lake Okeechobee to the Northern Estuaries will result in normalized salinity regimes and dissolved oxygen content and decreased turbidity and nutrification that will favor growth and establishment of seagrass in the Northern Estuaries, including those portions designated as manatee critical habitat. Seagrass is the primary food source of the West Indian manatee. The increased ability to manage water levels in Lake Okeechobee to favor natural levels and regimes will improve vegetative communities in the littoral and SAV zones of the lake and therefore will enhance habitat conditions for manatees foraging in the lake as well.

Action Alternatives

No **direct impacts** to manatees or its critical habitat would likely occur under Alternatives B, C, D, and E because manatees can no longer access EAA canals or canals adjacent to Section 24 of the Alternative Lands. Alternatives B and C would have no effect on the Northern Estuaries; however, the benefits from the other water regulation improvement projects described in the No Action Alternative would still occur.

Indirect impacts to manatees and its critical habitat could be anticipated to be made possible depending on the manner in, and extent to which, the treatment capacity provided by Alternatives D and E is used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. This could occur by restoring the capacity of STA 3/4 (in the case of Alternative D) or STA 1W (in the case of Alternative E) to receive regulatory releases from

Lake Okeechobee, which would contribute to the improvements to the Northern Estuaries discussed in the No Action Alternative.

4.6.1.5 Okeechobee Gourd (*Cucurbita okeechobeensis* spp. *Okeechobeensis Small*)

The Okeechobee gourd is associated with Lake Okeechobee and historical pond apple forests. At least 95 percent of Okeechobee gourd habitat has been eliminated through conversion of pond apple forest to agriculture, expansion of exotic and nuisance vegetation, and changes to water regulation practices (USFWS 1999). The Okeechobee gourd is now limited to the two wild populations that occur along Lake Okeechobee and the St. Johns River.

No Action Alternative

No **direct impacts** on the Okeechobee Gourd are anticipated as a result of the No Action Alternative because it does not occur within the EAA canals.

Indirect impacts are anticipated to be made possible depending on the manner in, and extent to which, the treatment capacity provided by Action Alternative features is used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. An overall improvement is anticipated as a result of other projects, including the Lake Okeechobee Protection Program and Lake Okeechobee and Estuary Recovery Program. The Okeechobee gourd would benefit from improved timing, depth, and duration of water regulation. These programs would improve the habitat for the gourd along Lake Okeechobee, aid in seed germination, and help control nuisance or exotic vegetation.

Action Alternatives

No direct or indirect impacts to the Okeechobee gourd would likely occur within Compartments B and C, the WCAs, or the Alternative Lands because of its limited distribution to two populations along Lake Okeechobee and the St. Johns River. Therefore, it would be unaffected by Action Alternatives B, C, D, and E. The benefits from the other water regulation improvement projects described in the No Action Alternative would also apply to these Action Alternatives. Improvements to the gourd habitat are possible depending on the manner in, and extent to which, the treatment capacity is provided by Alternative D.

4.6.1.6 Florida Panther (*Puma concolor coryi*)

Today, the only existing Florida panther population is found in a 2 million-acre area in central and South Florida, with population estimates of only 80 total individuals (USFWS 1999). The Big Cypress Swamps/Everglades has the only known breeding panther population (USFWS 1999). Florida panther prefers large forested wetland and upland habitats.

Panther telemetry data from 1981 to 2005 show panthers in the EAA, including areas directly adjacent to the Compartment B and C Build-out footprints, in WCA 3-A, and around the Caloosahatchee River (USFWS 2006). Panthers were not observed during the surveys for the 2007 wildlife evaluation report. Approximately 65 acres of Compartment B and 2,300 acres of Compartment C are located in the USFWS panther consultation area. Panthers may hunt in the Compartments B and C Build-outs, but it is unlikely that they would use these areas for any extended length of time based on the lack of suitable long-term panther habitat (URS 2007a,b).

No Action Alternative

No anticipated **direct impacts** in the form of mortality, injury, or loss of habitat to the Florida panther would occur with conversion of Compartments B and C Build-out areas (including 4,906 acres of freshwater marsh, 317 acres of scrub/shrub wetland, and 7,593 acres of fallow sod and sugar cane farms) to active agriculture because these areas are not preferred habitat for the Florida panther. Although panthers may traverse through Compartments B and C, they are not expected to use these areas for an extended period because of a lack of suitable, long-term habitat. Nevertheless, panthers would still be able to traverse through these lands or use them for resting after they are converted.

Indirect impacts are anticipated as a result of loss of habitat for prey items as well as a cumulative loss of ranging, resting, and foraging habitat in the EAA as a result of other CERP and Acceler8 projects in the EAA. Conversion of 317 acres of scrub/shrub wetland to active agriculture would reduce suitable habitat for feral hogs and white-tailed deer, two prey items for the panther. Although this habitat is not ideal for panther foraging, this conversion would decrease the hunting ability of the panther within Compartment C and would result in an indirect effect through decreased prey availability within Compartment C. The cumulative effect of other CERP and Acceler8 projects in the EAA and surrounding areas — including construction of reservoirs, STAs, and widening of canals — may force the panther to cross greater distances through portions of the EAA. The cumulative effect also may result in a loss of potential ranging, resting, and foraging habitat with the conversion of wetland, agricultural, or other terrestrial areas within the EAA to aquatic reservoirs and treatment areas. However, improved habitat conditions in the WCAs and areas south of the

EAA are expected to result from these projects as well, which may provide beneficial effects to the panther in the form of improved preferred habitat and higher prey densities.

Action Alternatives

Direct impacts from the construction of Compartments B and C Build-out under Alternatives B, C, and D would likely occur from a loss of potential ranging, resting, and foraging habitat in these areas through conversion of 4,906 acres of freshwater marsh, 317 acres of scrub/shrub wetland, and 7,593 acres of fallow sod and sugar cane fields to wetland treatment areas with emergent vegetation and SAV. Similar loss of habitat would occur in the alternative land parcels under Alternative E. In addition to becoming permanently inundated, the Build-out areas would not be as accessible to the Florida panther because of the network of canals and ditches, causing panthers to travel longer distances to cross these portions of the EAA. No direct impacts to panthers are anticipated with Alternative E. The Alternative Lands are not within panther consult area and no panthers have been identified in this area from the telemetry data (Figure 3-14).

Indirect impacts on panthers are only anticipated within the EAA. Conversion of 317 acres of scrub/shrub wetland to aquatic wetland treatment area with emergent vegetation and SAV as a result of construction of the Compartments B and C Build-out under Alternatives B, C, and D would reduce suitable habitat for feral hogs and white-tailed deer, two prey items for the panther. Although this habitat is not ideal for panther foraging, this conversion would decrease the hunting ability of the panther within Compartment C and would result in an indirect effect through the decreased prey availability within Compartment C and adjacent areas, similar to the No Action Alternative. In addition, construction of the Build-out areas would contribute to the cumulative effect of other CERP and Acceler8 projects, causing panthers to travel longer distances through portions of the EAA. These cumulative effects also may result in losses of potential ranging, resting, and foraging habitat for panthers with the conversion of wetland, agricultural, or other terrestrial lands to reservoirs and aquatic treatment areas.

It is anticipated that Alternatives B, C, and D would each increase water deliveries and phosphorus loading to WCA 2A. Increased phosphorous loading and concentration are expected to increase invasive cattail coverage (especially within the northern section of WCA 2A). This increase in invasive cattail coverage expected in WCA 2A should not affect the prey of the panther or the panther itself, which would still be able to forage along the edges of marshes and use these areas for resting.

It is anticipated that Action Alternatives B, C, and D would decrease the volume of water that enters WCA 3A by about 10 percent, according to the DMSTA models (see Table 2-3); however, this decrease in water volume is offset by other projects (see normalized

hydrographs for WCA 3A (Appendix I). There is little difference between water levels in WCA 3A with the Action Alternatives compared to the No Action Alternative. No changes to panther habitat within WCA 3A are anticipated. However, Alternative D would make progress towards restoration by providing Compartment B outflows to WCA 3A by initially distributing water from Compartment B into WCA 3A through S-11, or other appropriate structures, until the spreader canal distributing water into WCA 3A when part of CERP is constructed.

Because the only existing population is found in a 2 million-acre area in central and South Florida (USFWS 1999) indirect impacts to panthers in the other affected regions are not anticipated.

4.6.1.7 Everglade Snail Kite (*Rostrhamus sociabilis plumbeus*)

Compartments B and C, the EAA, Alternative Lands, and WCA 2 and 3A are all within Everglade snail kite USFWS consultation area, with Compartment B and portions of the Section 24 Alternative Lands bordering designated critical habitat in the Refuge (Figure 3-12). Everglade snail kites are present in the EAA, Lake Okeechobee, and the WCAs, although no evidence of Everglade snail kites nesting or foraging were observed in Compartments B and C during field assessments for the 2007 wildlife evaluation report, or in Section 24 of the Alternative Lands during the permitting process (USACE undated). Snail kites most likely forage in the freshwater marshes of both compartments, but probably more so in Compartment C, where encroachment of invasive vegetative species is not as extensive as in Compartment B.

No Action Alternative

No **direct impacts** to snail kites or designated critical habitat would be expected from conversion of Compartments B and C Build-out areas from marsh and scrub wetlands back to agricultural lands. Although apple snail populations may occur within remnant natural wetlands, ditches, and canals within Compartments B and C, no apple snail egg casings were observed in the surveys for the 2007 wildlife evaluation report, which indicates it is unlikely that Everglade snail kites use this area for foraging (URS 2007a,b).

Indirect impacts are anticipated to be made possible depending on the manner in, and extent to which, the treatment capacity provided by Action Alternative features is used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. An overall anticipated regional trend toward restored water quality, quantity, and timing from other

projects discussed in section 4.15 is anticipated. Modifications to the WSE regulation schedule through the LORSS study are expected to improve vegetative communities in Lake Okeechobee, the Northern Estuaries, the C-51 Basin, the WMAs, and the WCAs. Periods of prolonged deep water in Lake Okeechobee, lake draw-downs that cause rapidly receding water levels, and nutrient inputs to receiving waters would diminish with these projects. The expected result is a reduction in the colonization rate and presence of invasive and exotic vegetation and improved native vegetative communities. Juvenile snail kite survival has been demonstrated to have a positive relationship with water level (Johnson et al. 2007). Thus, there is potential for improved habitat for apple snail and foraging for snail kites as a result of these expected improvements.

Action Alternatives

Direct impacts to snail kites from construction of the Compartments B and C Build-out under Alternatives B, C, and D would be conversion of 4,982.78 acres of freshwater marsh, 316.55 acres of scrub/shrub wetland, and 8,854.65 acres of atypical wetlands consisting of fallow sod and sugar cane fields in Compartments B and C to aquatic wetland treatments areas with emergent vegetation and SAV. These new wetland systems would provide better habitat for apple snails and thus the Everglade snail kite as well. The anticipated water depths within the cells are 0.5 foot minimum, 1.25 to 1.5 feet normal, and 4.5 feet maximum. Alternative E would result in similar habitat conversion for the Alternative Lands Build-out.

Johnson et al. (2007) identified several studies that showed apple snails used a variety of aquatic and wetlands plants to deposit eggs but preferred sawgrass, pickerelweed, and duck potato. Apple snail clutches occurred at a greater density along the edges of sawgrass marshes and were not found in deep marsh habitats. In a marsh in central Florida, apple snail clutches usually occurred on plants with broad stems (exceeding 6 millimeters in diameter). These vegetative species are anticipated within the emerging vegetation cells of the Build-outs.

Any effects from construction would be avoided or minimized by adherence to the USFWS-approved snail kite management guidelines. These guidelines may prohibit certain activities during snail kite nesting season from December 1 to July 1. Use of these guidelines during construction would also prevent any unintentional impact to designated critical habitat that borders the eastern side of compartment B or to the west of Section 24 Alternative Lands.

Indirect impacts from Alternatives B, C, and D could include overall improvements to foraging habitat within the WCAs through the decreased overall phosphorous loads and concentrations entering the WCAs; however, impacts as well as benefits vary within each WCA region and may affect the snail kite differently.

Apple snails need emergent vegetation to thrive. Both apple snail and snail kite population success are directly affected by depth and duration of marsh flooding (Johnson et al. 2007). It is anticipated that Alternatives B, C, and D would each increase the volume of water deliveries and increase phosphorus loading to WCA 2A; however, the phosphorus loading is minimal with Alternative B and a result of the increased water deliveries. The anticipated impacts to vegetative communities in WCA 2A are a possible increase in cattail coverage, density, and colonization rate from Alternative A; therefore, conditions for snail kites and their prey would degrade within WCA 2A for each of the Action Alternatives.

It is anticipated that all of the Action Alternatives would result in decreased phosphorous loads and concentrations entering WCA 3A, but reductions in water volume into this region are expected as well, with the exception of D1. This decrease in water volume may expedite the succession of aquatic slough and wet prairie areas to more sawgrass monoculture and upland vegetation, a trend that is already occurring in the northern sections of WCA 3A. Apple snail abundance has been documented to have recently substantially declined within WCA 3A, and snail kite foraging habitat has declined overall throughout its range (USFWS 2007). Further decreases in the volume of water that enters WCA 3A as result of the Action Alternatives would continue to degrade habitat for Everglade snail kite in the northern sections. Alternative C may have the greatest effect because this alternative would cause the highest reduction in water volume (around 11 percent). However, the decreased phosphorous loads and concentrations should result in overall improvements to downstream habitats with each of the Action Alternatives.

Foraging habitat in Lake Okeechobee and the Northern Estuaries may improve with Alternative D, which, by restoring the capacity of STA 3/4 to receive regulatory releases from Lake Okeechobee, would contribute to the improvements to vegetation and fish and wildlife within Lake Okeechobee and the Northern Estuaries that are expected from the projects discussed earlier. No impacts to Lake Okeechobee or the Northern Estuaries are anticipated for Alternatives B and C; however, benefits from the other projects discussed for the No Action Alternative would still occur.

Foraging habitat in Lake Okeechobee and the Northern Estuaries may improve with either Alternative D or Alternative E, which, by restoring the capacity of STA 3/4 (in the case of Alternative D) or STA 1W (in the case of Alternative E) to receive regulatory releases from Lake Okeechobee, would contribute to the improvements to vegetation and fish and wildlife within Lake Okeechobee and the Northern Estuaries that are expected from the projects discussed earlier. No impacts to Lake Okeechobee or the Northern Estuaries are anticipated for Alternatives B and C; however, benefits from the other projects discussed for the No Action Alternative would still occur.

4.6.1.8 Wood Stork (Mycteria americana)

Wood stork foraging and nesting habitat occurs in the EAA, WCAs, Lake Okeechobee, the Northern Estuaries, and in the Section 24 Alternative Lands. Wood storks were observed in the Compartments B and C Build-out footprints during the surveys for the 2007 wildlife evaluation report. No known wood stork nests occurred in Compartments B and C, but the eastern boundary of Compartment B overlaps the outer edge of a core foraging area (CFA) associated with an active wood stork colony to the northeast.

No Action Alternative

Direct impacts from Alternative A (No Action) include decreasing the amount of preferred aquatic foraging habitat for wood storks from the conversion of 4,906 acres of freshwater marsh habitat and 317 acres of scrub/shrub wetlands within Compartments B and C to active agriculture. Atypical sod and sugar cane fields would still provide foraging habitat, but would be of a lower quality than the freshwater marsh and wetland scrub habitat that exists there currently.

Indirect impacts are anticipated to be made possible depending on the manner in, and extent to which, the treatment capacity provided by Action Alternative features is used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. An overall anticipated regional trend toward restored water quality, quantity, and timing from other restoration projects, described in Section 4.14, is expected to improve vegetative communities, water quality, and fish and wildlife habitat in Lake Okeechobee and the Northern Estuaries. It is anticipated that this improvement will likewise enhance wood stork foraging habitat and access to prey items in these areas.

A project of specific importance to wood storks is the LORSS. LORSS is the re-evaluation of the WSE, which will provide managers with greater flexibility in timing releases. Periods of prolonged high water levels in Lake Okeechobee, lake drawdowns that would cause rapidly receding water levels, and nutrient inputs to receiving waters will diminish with implementation of the LORSS. A direct correlation between lake levels and wood stork densities has been made. Data gathered by Smith et al. (1995) indicate that wood storks are attracted to the lake in large numbers only when the stage is dropping below 15 feet. A lake stage above 15 feet NGVD eliminates most of the foraging habitat available to wading birds on the lake (Aumen and Gray 1995), whereas a lake stage below 11.8 feet NGVD reduces the diversity of available foraging habitats and the number of acceptable nesting colony sites

(Smith et al. 1995). Normalized lake levels as a result of LORSS should allow for moderately paced drawdown in water level coincident with the dry season and the usual wading bird nesting season.

Action Alternatives

Anticipated **direct impacts** from construction of the Compartments B and C Build-out under Alternatives B, C, and D would likely be an increase in preferred aquatic foraging habitat available to the wood stork in Compartments B and C from the conversion of 7,593 acres of atypical wetlands (fallow sod and sugar cane fields) to flooded cells with emergent vegetation and SAV, which may include areas over open water and appropriate water depths for foraging. The target water depths within the cells are 1.25 to 1.5 feet with a 0.5 foot minimum, and 4.5 feet maximum while routing storm of events through the system. This conversion would result in beneficial effects for wood storks by replacing lower-quality foraging habitat with higher-quality shallow, inundated wetlands. Existing agricultural canals and ponds within the Compartments B and C Build-out areas would be filled to prevent short-circuiting of the system, but deeper canals (conveyance and collector canals) would continue to be in use and available to the wood stork. Alternative E would result in the same impacts to wood storks in Compartments B and C Build-out as Alternative A because these areas would be converted back to active agriculture, reducing the amount of wood stork foraging habitat in these areas; however, Alternative E would result in increased aquatic foraging habitat in the Alternative Lands regions through conversion of these areas to STAs and offset the loss of foraging habitat within the Compartments B and C Build-out.

Indirect impacts from the Action Alternatives would likely be overall improvements to foraging and nesting habitat as a result of improved vegetative communities and fish and wildlife with reductions in total phosphorous loads and concentrations entering the WCAs. However, benefits as well as impacts vary within each region for the Action Alternatives and may affect the wood stork differently.

It is anticipated that Alternatives B, C, and D would each increase the volume of water delivered and the phosphorus loading to WCA 2A, although phosphorous load increases are minimal with Alternative B and are a result of increased water deliveries. Alternative D1 would not increase the volume of water delivered to WCA 2A. Increased phosphorous loading and concentration are expected to increase invasive cattail coverage (especially within the northern section of WCA 2A) and result in lower habitat quality for wood storks and their prey within WCA 2A.

All of the Action Alternatives would likely decrease the phosphorous loads and concentrations that enter WCA 3A, although overall water volume is expected to decrease as well except with Alternative D1. This decrease in water volume may expedite the succession

of aquatic slough and wet prairie areas to more sawgrass monoculture and upland vegetation, a trend that is already occurring in the northern sections of WCA 3A. Succession would result in a decrease of foraging and nesting habitat for the wood stork in the northern sections of WCA 3A. However, the decreased phosphorous loads and concentrations should improve downstream habitats with each of the Action Alternatives.

Nesting and foraging habitat in the Northern Estuaries would likely improve with either Alternative D or Alternative E, which, by restoring the capacity of STA 3/4 (in the case of Alternative D) or STA 1W (in the case of Alternative E) to receive regulatory releases from Lake Okeechobee, would contribute to the improvements to the Northern Estuaries discussed in the No Action Alternative.

4.6.1.9 Cape Sable Seaside Sparrow

The Cape Sable seaside sparrow is found exclusively in the Florida ENP and Big Cypress National Preserve.

No Action Alternative

No suitable or critical habitat for the Cape Sable seaside sparrow (marl prairies) occurs within the EAA, including the project footprints for Compartments B and C, lands in the vicinity of STA 1W, or Section 24; therefore, the Cape Sable seaside sparrow would be unaffected by the No Action Alternative.

Action Alternatives

No direct or indirect impacts to the Cape Sable seaside sparrow are anticipated with any of the Action Alternatives because water deliveries would not be altered such that they would affect the Cape Sable seaside sparrow habitat. This is supported with the normalized hydrographs (Appendix I).

4.6.1.10 Northern Estuary Species

In this section, potential impacts to the species that occur only in the Northern Estuaries, with the exception of the opossum pipefish, are assessed together because all impacts from the No Action Alternative and the Action Alternatives are interrelated and are a result of decreased freshwater releases to the Northern Estuaries. The species discussed in the following sections include Johnson's seagrass and its critical habitat, sea turtles, and the smalltooth sawfish. The opossum pipefish is discussed in a separate section below due to varying habitats utilized during various stages of development.

Johnson's seagrass has an extremely narrow distribution and is found only in lagoons along a 124-mile stretch of coastline in southeast Florida, extending from Sebastian Inlet to North Biscayne Bay (NMFS 2002). Of the 10 areas designated as critical habitat for Johnson's seagrass, four are located in the Indian River Lagoon, which is the only project-affected area

where Johnson's seagrass is expected. Sea turtles occur in brackish portions of the Caloosahatchee and St. Lucie River estuaries and in the Indian River Lagoon. Only leatherback, green, and loggerhead sea turtles nest regularly on Florida's beaches. The smalltooth sawfish is listed as endangered by NMFS and is anticipated in the Caloosahatchee and St. Lucie River estuaries, the Indian River Lagoon, and coastal waters.

No Action Alternative

No **direct impacts** to Johnson's seagrass, Johnson's seagrass critical habitat, sea turtles, or smalltooth sawfish will result from the No Action Alternative because these species occur in the Northern Estuaries and are therefore not affected by agricultural practices in the EAA.

Indirect impacts are anticipated to be made possible depending on the manner in, and extent to which, the treatment capacity provided by Action Alternative features is used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. An anticipated overall regional trend toward restored water quality, quantity, and timing from other restoration projects, described in Section 4.14, is expected to minimize freshwater releases from Lake Okeechobee into the Northern Estuaries, resulting in normalized salinity regimes and dissolved oxygen content, and decreased turbidity and nutrification. These improvements will favor the growth and establishment of seagrass beds, including Johnson's seagrass, which are commonly interspersed with algae. These improvements may also benefit critical habitat for Johnson's seagrass in the Indian River Lagoon. It is anticipated that the distribution and composition of aquatic organisms, such as macroinvertebrates, small fish, and crustaceans, that use the improved seagrass habitat will also improve. As a result, foraging habitat for sea turtles will improve because sea turtles (mostly loggerhead, Kemps Ridley, and hawksbills) feed on seagrass, algae, and aquatic invertebrates. Improvements to both seagrass and mangrove habitat within the Northern Estuaries will also improve foraging and nursery habitat for smalltooth sawfish, which frequent these areas in search of small fish and crustaceans. As a result, improvements to estuarine conditions should result in beneficial effects to juvenile and adult smalltooth sawfish, as well as its prey items.

Action Alternatives

No **direct impacts** to Johnson's seagrass, Johnson's seagrass critical habitat, sea turtles, or smalltooth sawfish would occur from construction of STAs on Compartments B and C, lands in the vicinity of STA 1W, or Section 24 because these species are present in the Northern Estuaries region and are not present in the EAA.

Indirect impacts to Johnson's seagrass, Johnson's seagrass critical habitat, sea turtles, and smalltooth sawfish may occur with either Alternative D or Alternative E, which, by restoring the capacity of STA 3/4 (in the case of Alternative D) or STA 1W (in the case of Alternative E) to receive regulatory releases from Lake Okeechobee via the L-8 Basins, would contribute to the improvements to the Northern Estuaries discussed in the No Action Alternative.

4.6.1.11 Opossum Pipefish (*Microphis brachyurus lineatus*)

In South Florida, adult opossum pipefish inhabit banks of freshwater tributaries with dense emergent vegetation, primarily smart weed (*Polygonum* spp.) and panic grass (*Panicum* spp.; Gilmore and Gilbert 1992), where they mate and release their larvae during the wet season (USACE and SFWMD 2006). Larvae must spend their first 2 weeks in waters with salinity of 18 ppt to survive and are carried downstream to estuarine and marine waters (Frias-Torres 2002). Juveniles inhabit ocean and coastal environments and migrate into freshwater tributaries during the dry season (NOAA 2007). The species may occur in the affected study area within the estuarine and freshwater environments of the Northern Estuaries as well as within Lake Okeechobee.

No Action Alternative

No **direct impacts** to opossum pipefish from the conversion of Compartments B and C Build-out to active agriculture are anticipated because opossum pipefish are not known to occur in the Compartments B and C project footprint.

Indirect impacts are anticipated to be made possible depending on the manner in, and extent to which, the treatment capacity provided by Action Alternative features is used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. An overall anticipated regional trend toward restored water quality, quantity, and timing from other restoration projects, described in Section 4.14, is expected to improve hydrology and vegetative communities for the opossum pipefish within Lake Okeechobee and the Northern Estuaries. Adult pipefish prefer dense emergent bank vegetation to spawn and feed (NOAA 2007). The increased ability to manage water levels in Lake Okeechobee to more natural conditions will enhance vegetative communities in the littoral and SAV zones of the lake, thereby improving spawning and feeding habitat for opossum pipefish within Lake Okeechobee. Furthermore, reduced regulatory releases into the Northern Estuaries will help restore natural water flows and facilitate the migration of larval opossum pipefish

downstream during the wet season and the migration of sub-adults upstream during the dry season.

Action Alternatives

Direct impacts to opossum pipefish from Alternatives B, C, D, and E are not anticipated because opossum pipefish are not known to occur in the EAA canals or Alternative Lands.

Indirect impacts to opossum pipefish may occur with either Alternative D or Alternative E, which, by restoring the capacity of STA 3/4 (in the case of Alternative D) or STA 1W (in the case of Alternative E) to receive regulatory releases from Lake Okeechobee, would contribute to the improvements to the Northern Estuaries discussed in the No Action Alternative. This would be possible depending on the manner in, and extent to which, the treatment capacity provided by Action Alternative D and E features is used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. Alternatives B and C would have no effect on the Northern Estuaries; however, the benefits from the other water regulation improvement projects described in the No Action Alternative would still occur.

4.6.2 State-Listed Species

4.6.2.1 Wading Birds

This section discusses potential impacts of the alternatives on state-listed wading bird species that were not already discussed in the federally listed species sections, including roseate spoonbill, limpkin, white ibis, little blue heron, tricolored heron, and snowy egret. These wading bird species are known to forage and nest in the EAA, the Section 24 Alternative Lands, the WCAs, Lake Okeechobee, and the Northern Estuaries. Existing freshwater marshes in Compartment C and B offer foraging habitat for wading birds; however, during the 2007 URS wildlife surveys (Appendix C), the freshwater marshes in Compartment C were dry, and wading birds were not using this area. The wading birds were observed foraging in the ditches and canals. No known wading bird nests were observed in Compartments B and C during the 2007 wildlife evaluation report surveys; however, two bird rookeries were identified northwest of Compartment B build-out in the NNRC. One rookery contained multiple species, including tricolored heron, snowy egret, and other non-listed species such as great egret and yellow-crowned night heron, while the other contained only yellow-crowned night heron. Impacts to wading birds are further discussed in Section 4.5, on fish and wildlife.

No Action Alternative

Direct impacts from Alternative A (No Action) include decreasing the amount of preferred aquatic foraging habitat for wading birds from the conversion of 4,906 acres of freshwater marsh habitat and 317 acres of scrub/shrub wetlands within Compartments B and C to active agriculture. Atypical sod and sugar cane fields would still provide foraging habitat, but would be of a lower quality than the freshwater marsh and wetland scrub habitat that exists there currently.

Indirect impacts are anticipated to be made possible depending on the manner in, and extent to which, the treatment capacity provided by Action Alternative features is used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. An overall anticipated regional trend toward restored water quality, quantity, and timing from other restoration projects, described in Section 4.14, is expected to improve vegetative communities, water quality, and fish and wildlife habitat in Lake Okeechobee and the Northern Estuaries. It is anticipated that this improvement will likewise enhance foraging habitat for wading birds and access to prey items in these areas.

A project of specific importance to wood storks is the LORSS. LORSS is the re-evaluation of the WSE, which will provide managers with greater flexibility in timing releases. Periods of prolonged high water levels in Lake Okeechobee, lake drawdowns that would cause rapidly receding water levels, and nutrient inputs to receiving waters will diminish with implementation of the LORSS project. A lake stage above 15 feet NGVD eliminates most of the foraging habitat available to wading birds on the lake (Aumen and Gray 1995), whereas a lake stage below 11.8 feet NGVD reduces the diversity of available foraging habitats and the number of acceptable nesting colony sites (Smith et al. 1995). Normalized lake levels as a result of LORSS should allow for moderately paced drawdown in water level coincident with the dry season and the usual wading bird nesting season.

Action Alternatives

Direct impacts from construction of the STAs on Compartment B NBO and Compartment C under Alternatives B, C, and D and construction of STA on lands near STA 1W under Alternative E are anticipated to be positive. Managed at the target water depths of 1.25 to 1.5 feet, it is anticipated that the STAs would contain emergent vegetation and SAV, which may include areas over open water and appropriate water depths for foraging. This is anticipated to provide habitat equal to or more suitable than the existing wetlands and more suitable than

the existing atypical wetlands. In Compartments B and C, 7,593 acres of atypical wetlands (fallow sod and sugar cane fields) and 5,223 acres of wetlands would be converted to STA and potentially 10,137 acres of atypical wetlands with Alternative E would be converted to STA. The specific acreage of wetlands and other Alternative Lands west of STA 1W are unknown at this time, but it is anticipated that these lands would be mainly agricultural.

Wading birds require open waters shallow enough to concentrate prey items but deep enough to support prey items for foraging to be effective, especially during nesting season (Kushlan 1976; Custer and Osborne 1978). The target water depths within the stormwater treatment cells for Alternatives B, C, D, and E are from 1.25 to 1.5 feet with a 0.5 foot minimum, and a 4.5 feet maximum while routing storm events through the system. This conversion would result in beneficial effects for wading birds by replacing lower-quality foraging habitat with higher-quality shallow, inundated wetlands. Some of the existing agricultural canals and ponds would be filled to prevent short-circuiting of the system, but deeper canals (conveyance and collector canals) would continue to be in use and available to various wading birds.

Indirect impacts from the Action Alternatives are overall improvements to foraging and nesting habitat as a result of improved vegetative communities and fish and wildlife with reductions in total phosphorous loads and concentrations entering the WCAs. However, benefits as well as impacts vary within each region for the Action Alternatives and may affect wading birds differently.

Alternatives B, C, and D would each increase the volume of water that enters WCA 2A, and would increase total phosphorous loading into WCA 2A by 2 percent with Alternative B, 30 percent with Alternative C, and 36 percent with Alternative D. Alternative B would reduce the phosphorous concentration, while Alternatives C and D would increase concentrations in addition to total loading and volume into WCA 2A. Increased phosphorous loading and concentration are expected to increase invasive cattail coverage (especially within the northern section of WCA 2A) and result in lower habitat quality for wading birds and their prey within WCA 2A.

Action Alternatives B, C, and D would decrease the phosphorous loads and concentrations that enter WCA 3A, although overall water volume is expected to decrease as well. This decrease in water volume may expedite the succession of aquatic slough and wet prairie areas to more sawgrass monoculture and transitional vegetation, a trend that is already occurring in the northern sections of WCA 3A. Succession may result in a decrease of foraging and nesting habitat for bald eagles, ospreys, peregrine falcons, and Florida sandhill cranes in the northern sections of WCA 3A, while possibly increasing the amount of habitat available to burrowing owls and southeastern American kestrels in the region.

However, in Alternative D1 the intent is to send more water to WCA 3A via a structure such as S-11, as an interim measure until the CERP spreader canal distributing water into WCA 3A is constructed, and to send less water to WCA 2A.

Alternative E would result in the greatest benefits to wading birds in the Refuge by decreasing both phosphorous loads and concentrations. These reductions would increase aquatic habitat value for wading birds through improved water quality and expected decreases in exotic and invasive species coverage.

Nesting and foraging habitat in the Northern Estuaries and Lake Okeechobee would improve with either Alternative D or Alternative E, which, by restoring the capacity of STA 3/4 (in the case of Alternative D) or STA 1W (in the case of Alternative E) to receive regulatory releases from Lake Okeechobee, would contribute to the improvements to the Northern Estuaries discussed in the No Action Alternative.

4.6.2.2 Prey Birds and Other Avian Species

State-listed prey birds such as bald eagle, osprey, peregrine falcon, Florida sandhill crane, and southeast American kestrel may nest and forage in the EAA, the Section 24 Alternative Lands, the Northern Estuaries, and the littoral zone of Lake Okeechobee (USACE 2006). No prey birds or nests were observed in Compartments B and C Build-out during the 2007 wildlife report surveys.

Two state-listed seabirds, the Brown pelican and the least tern, are usually exclusive to coastal environments; however, current studies also suggest that these species also utilize the western littoral zone of Lake Okeechobee for foraging habitat (USACE 2006; FFWCC 2007). No brown pelicans or least terns were observed in the Compartment B and C Build-out footprints during the surveys for the 2007 wildlife evaluation report.

Burrowing owls were recently sited in the NBO of Compartment B, and burrowing owls have historically used Compartment C. During the surveys for the 2007 wildlife evaluation report, it was determined that locations of previous burrowing owl nests were no longer suitable habitat because tall vegetation was present. In addition, no burrowing owls were found during field inspections of existing burrowing owl habitats within Compartment C during the surveys for the 2007 wildlife evaluation report.

No Action Alternative

Direct impacts from Alternative A (No Action) include decreasing the amount of preferred aquatic foraging habitat for bald eagles, ospreys, peregrine falcons, and Florida sandhill cranes from the conversion of 4,906 acres of freshwater marsh habitat and 317 acres of scrub/shrub wetlands within Compartments B and C to active agriculture. Atypical sod and sugar cane fields would still provide foraging habitat, but would be of a lower quality than

the freshwater marsh and wetland scrub habitat that exists there currently. Conversion of these areas to active agriculture could possibly increase the habitat available to burrowing owls and southeastern American kestrels by providing drier, open areas with decreased vegetation coverage. Sea birds would be unaffected because they do not utilize the EAA for nesting or foraging.

Indirect impacts are anticipated to be made possible depending on the manner in, and extent to which, the treatment capacity provided by Action Alternative features is used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide operations but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. An overall anticipated regional trend toward restored water quality, quantity, and timing from other restoration projects, described in Section 4.14, is expected to improve vegetative communities, water quality, and fish and wildlife habitat in Lake Okeechobee and the Northern Estuaries. It is anticipated that this improvement will likewise enhance foraging habitat for prey birds and seabirds, including enhanced access to prey items in these areas.

A project of specific importance is the LORSS. LORSS is the re-evaluation of the WSE, which will provide managers with greater flexibility in timing releases. Periods of prolonged high water levels in Lake Okeechobee, lake drawdowns that would cause rapidly receding water levels, and nutrient inputs to receiving waters will diminish with implementation of the LORSS project. Normalized lake levels as a result of LORSS should allow for moderately paced drawdown in water level coincident with the dry season could increase the foraging ability of prey birds and seabirds in the Lake Okeechobee region.

For the burrowing owl and the southeastern American kestrel, indirect impacts could also be attributed to soil subsidence in the EAA over time. As stated in Section 4.5.1, wetter conditions are expected in the EAA by 2050 because of soil subsistence, making conditions more suitable for water-tolerant crops. Subsidence could therefore cause conditions in the EAA in the future to be less favorable for these species, which prefer dry, open habitats.

Action Alternatives

Direct impacts from Alternatives B, C, and D would be a likely increase in preferred aquatic foraging habitat available to bald eagles, ospreys, peregrine falcons, and Florida sandhill cranes in Compartments B and C from the conversion of 7,593 acres of atypical wetlands (fallow sod and sugar cane fields) to flooded cells with emergent vegetation and SAV, which may include areas over open water and appropriate water depths for foraging. The target water depths within the proposed stormwater treatment cells are from 1.25 to 1.5 feet with a

0.5 foot minimum, and a 4.5 feet maximum while routing storm events through the system. This conversion would result in beneficial effects for bald eagles, ospreys, peregrine falcons, and Florida sandhill cranes by replacing lower-quality foraging habitat with higher-quality inundated wetlands for all of the Action Alternatives. Direct impacts associated with Alternative E are anticipated to be similar to those for Alternatives B, C, and D discussed above. This would be a result of an increase in preferred aquatic habitat from the potential conversion of 10,137 acres of agricultural lands to similar aquatic habitat described above.

Alternatives B, C, D, and E would result in decreased habitat for burrowing owls and southeastern American kestrels, which both prefer drier, open habitat. Sea birds would not receive any direct impacts from the Action Alternatives because they do not currently utilize the EAA or Alternative Lands for nesting or foraging.

Indirect impacts from the Action Alternatives may be an overall improvement to foraging and nesting habitat for prey birds and other avian species as a result of improved vegetative communities and fish and wildlife with reductions in total phosphorous loads and concentrations entering the WCAs. However, benefits as well as impacts vary within each region for the Action Alternatives and may affect these species differently.

It is anticipated that Alternatives B, C, and D would each increase the volume of water that enters WCA 2A, and would increase total phosphorous loading into WCA, although this increase is minimal with Alternative B and is a result of increased water deliveries. Increased phosphorous loading and concentration are expected to increase invasive cattail coverage (especially within the northern section of WCA 2A) and result in lower habitat quality for bald eagles, ospreys, peregrine falcons, and Florida sandhill cranes within WCA 2A.

It is anticipated that Action Alternatives B, C, and D would decrease the phosphorous loads and concentrations that enter WCA 3A, although overall water volume is expected to decrease as well. This decrease in water volume may expedite the succession of aquatic slough and wet prairie areas to more sawgrass monoculture and upland vegetation, a trend that is already occurring in the northern sections of WCA 3A. Succession may result in a decrease of foraging and nesting habitat for bald eagles, ospreys, peregrine falcons, and Florida sandhill cranes in the northern sections of WCA 3A while possibly increasing the amount of habitat available to burrowing owls and southeastern American kestrels in the region.

In Alternative D1 the operational intent is to send more water to WCA 3A via a structure such as S-11, as an interim measure until the CERP spreader canal distributing water into WCA 3A is constructed, and to send less water to WCA 2A.

Alternative E would likely result in the greatest benefits to prey birds in the Refuge by decreasing both phosphorous loads and concentrations by 45 percent and 41 percent, respectively. These reductions would increase aquatic habitat value for bald eagles, ospreys, peregrine falcons, and Florida sandhill cranes through improved water quality and expected decreases in exotic and invasive species coverage.

Nesting and foraging habitat for prey birds and seabirds in the Northern Estuaries and Lake Okeechobee would improve with either Alternative D or Alternative E, which, by restoring the capacity of STA 3/4 (in the case of Alternative D) or STA 1W (in the case of Alternative E) to receive regulatory releases from Lake Okeechobee, would contribute to the improvements to the Northern Estuaries discussed in the No Action Alternative.

4.6.2.3 Reptiles

State-listed reptiles—including the Florida pine snake, Florida brown snake, Florida ribbon snake and the gopher tortoise—utilize portions of the EAA (including lands near STA 1W), the WCAs, the Northern Estuaries, and the Section 24 lands. Gopher tortoises and Florida pine snakes prefer dry, sandy habitats and therefore are not expected to occur within Compartment B but may occasionally utilize scrub habitat in Compartment C. No Gopher tortoises were observed during the wildlife surveys. Florida brown snakes and Florida ribbon snakes prefer freshwater marshes and other aquatic habitats that occur throughout the project-affected regions. No state-listed reptiles were observed during the surveys for the 2007 wildlife evaluation report. Alternative Lands near STA 1W are anticipated to have similar utilization of reptiles as with Compartments B and C and the remainder of the EAA.

No Action Alternative

Direct impacts from Alternative A (No Action) include decreasing the amount of available foraging habitat for state-listed reptiles from the conversion of 4,982.78 acres of freshwater marsh habitat and 316.55 acres of scrub/shrub wetlands within Compartment B SBO and Compartment C to active agriculture. This would reduce habitat for aquatic reptile species, but on the other hand this would benefit terrestrial reptile species. Atypical sod and sugar cane fields would still provide foraging habitat, but would be of a lower quality than the freshwater marsh and wetland scrub habitat that exists there currently. Conversion of these areas to active agriculture could possibly increase the habitat available to gopher tortoises and Florida pine snakes by providing drier, open areas with decreased vegetation coverage.

Indirect impacts are anticipated to be made possible depending on the manner in, and extent to which, the treatment capacity provided by Action Alternative features is used in the context of other regional water management infrastructure and system operations made possible by the presence of additional treatment capacity. The construction and proposed use of the additional STAs is in no way intended to direct or mandate a change in system-wide

operations but to provide additional treatment capacity that would permit such changes in system operations as determined in the future for restoration-related purposes. An overall anticipated regional trend toward restored water quality, quantity, and timing from other restoration projects, described in Section 4.14, is expected to improve vegetative communities, water quality, and fish and wildlife habitat in Lake Okeechobee and the Northern Estuaries. It is anticipated that this improvement would likewise enhance foraging habitat for state-listed snake species in these regions.

For the gopher tortoise and Florida pine snake, indirect impacts could also be attributed to soil subsidence in the EAA over time. As stated in Section 4.5.1, wetter conditions are expected in the EAA by 2050 because of soil subsistence, making conditions more suitable for water-tolerant crops. Subsidence could therefore cause conditions in the EAA in the future to be less favorable for these species, which prefer drier upland and sandy habitats.

Action Alternatives

Direct impacts from Alternatives B, C, D, and E would likely be an increase in preferred aquatic foraging habitat available to Florida brown snakes and Florida ribbon snakes. Conversion of 7,593 acres of atypical wetlands (fallow sod and sugar cane fields) in Compartments B and C to STAs with flooded cells, and emergent vegetation and SAV would occur with Alternatives B through D. Alternative E would likely result in a similar increase in preferred aquatic habitat available to these species similar to Alternatives B, C, and D from the anticipated conversion of 10,137 acres of agricultural land to STAs habitat.

Gopher tortoises and Florida pine snakes were not observed during the wildlife surveys in Compartments B and C, although these species occasionally utilize scrub as alternative habitat and may utilize levees and other upland habitats throughout the EAA. Direct impacts to gopher tortoises and Florida pine snakes from Alternatives B, C, and D may occur through conversion of 317 acres of scrub habitat in Compartment C to STAs and any impacts to similar habitat in Alternative Lands under Alternative E.

Indirect impacts from the Action Alternatives are anticipated to be overall improvements to foraging habitat for state-listed snakes and other reptiles as a result of improved vegetative communities and fish and wildlife with reductions in total phosphorous loads and concentrations entering the WCAs. However, benefits as well as impacts vary within each region for the Action Alternatives and may affect these species differently.

It is anticipated that Alternatives B, C, and D would each increase the volume of water deliveries and phosphorous loads entering WCA 2A. Increased phosphorous loading is expected to increase invasive cattail coverage (especially within the northern section of WCA

2A) and result in lower habitat quality for Florida brown snakes and Florida ribbon snakes within WCA 2A.

It is anticipated that Action Alternatives B, C, and D would decrease the phosphorous loads and concentrations that enter WCA 3A, although overall water volume is expected to decrease as well. This decrease in water volume may expedite the succession of aquatic slough and wet prairie areas to more sawgrass monoculture and upland vegetation, a trend that is already occurring in the northern sections of WCA 3A. Succession may result in a decrease of foraging habitat for Florida brown snakes and Florida ribbon snakes in the northern sections of WCA 3A, while possibly increasing the amount of habitat available to Florida pine snakes and gopher tortoises in the region.

As stated earlier, the operational intent of Alternative D1 is to send more water to WCA 3A via a structure such as S-11, as an interim measure until the CERP spreader canal distributing water into WCA 3A is constructed, and to send less water to WCA 2A.

Alternative E would likely result in the greatest benefits to Florida brown snakes and Florida ribbon snakes in the Refuge through increased aquatic habitat value for these species by expected decreases in exotic and invasive species coverage.

Foraging habitat for Florida brown snakes and Florida ribbon snakes in the Northern Estuaries and Lake Okeechobee would improve with either Alternative D or Alternative E, which, by restoring the capacity of STA 3/4 (in the case of Alternative D) or STA 1W (in the case of Alternative E) to receive regulatory releases from Lake Okeechobee, would contribute to the improvements to the Northern Estuaries discussed in the No Action Alternative.

4.6.2.4 Mammals

The Florida black bear was the only state-listed mammal considered for impacts. Florida black bears depend on forest vegetation and prefer forested areas with intermixed open areas (such as meadows) (FFWCC 2003). Compartment C borders secondary habitat for the Big Cypress black bear population (Figure 3-18), but it is not anticipated within the project footprint or the EAA based on the lack of suitable forested habitat. Furthermore, no evidence of black bears was observed during the surveys for the 2007 wildlife evaluation report.

No Action Alternative

No **direct** or **indirect** impacts to Florida black bears would be anticipated with Alternative A as black bears do not currently utilize habitat in the EAA or other project-affected regions.

Action Alternatives

No **direct** impacts to Florida black bears would be anticipated with any of the Action Alternatives because black bears do not currently utilize habitat in the EAA, including Compartments B and C, lands in the vicinity of STA 1W and STA 1E, or Section 24 lands.

Indirect impacts could possibly occur with Alternatives B, C, D, and E through succession of habitat in certain WCA regions by way of decreases in water volume delivery. Overall water volume is expected to decrease in WCA-3A with Alternatives B, C, and D. This decrease in water volume may expedite the succession of aquatic slough and wet prairie areas to more sawgrass monoculture and upland vegetation, a trend that is already occurring in the northern sections of WCA 3A. Succession may result in increased upland foraging habitat for Florida black bears in the northern sections of WCA 3A.

As stated earlier, the operational intent of Alternative D1 is to send more water to WCA 3A via a structure such as S-11, as an interim measure until the CERP spreader canal distributing water into WCA 3A is constructed, and to send less water to WCA 2A.

4.7 LAND USE

Action Alternatives B, C, D, and E would result in the construction and operation of new STAs that would cover approximately 14,000 acres or 11,000 acres, in the case of Alternative E, that would be inundated on a permanent basis. This long-term operating condition would change the land use of Compartments B and C, or the agricultural and fallow areas that would be used for stormwater treatment under Alternative E. This direct effect at the project site would result in some degree of change to land use patterns in the region surrounding the new STAs. It is also conceivable that changes in water level associated with operation of the new STAs might result in changes to land use conditions elsewhere in the region. These potential direct and indirect impacts are discussed below, along with the consistency of the Action Alternatives with applicable land use plans and policies.

4.7.1 Land Use Patterns

The lands within the Compartments B SBO and C Build-out areas are former agricultural lands that are currently inactive, as described in Section 3.10. Portions of the Build-out areas have taken on the appearance of fallow fields or former fields that are reverting to natural wetland systems and other forms of vegetative cover because cropping on this acreage has ceased and some of the acreage has been inactive for several years. Both compartments include extensive areas of freshwater marsh. Compartment B NBO and the lands that would be used for stormwater treatment in Alternative E are predominantly agricultural lands that are currently in production, as described in Section 3.10.1.4.

4.7.1.1 No Action Alternative

Under the No Action Alternative (Alternative A), the land use and cover in Compartments B and C may convert back to active agriculture, making these areas less desirable for wildlife-oriented activities in the future. It is possible that SFWMD would issue new leases for agricultural use of the lands in Compartments B and C, which would result in future active production of sugar cane and other crops. However, any change in land use of Compartments B and C, including continuing current practices, is dependent on future actions under Grant Agreement FB-4. The Grant Agreement states that lands acquired for public ownership under the Agreement will be used for purposes of Everglades ecosystem restoration as required by the 1996 Farm Bill. The Alternative Lands in the EAA west of STA 1W would presumably remain in agricultural production if Alternative E were not implemented. Section 24 will likely be converted to an STA/recreational facility for which applications have been made to the regulatory agencies.

4.7.1.2 Action Alternatives

Based on the nature of the sources of change, potential effects from the Action Alternatives on local and regional land use patterns would be largely the same. These effects would include temporary disturbance on nearby land uses during construction and the long-term effects from land use conversion in the Compartments B and C Build-out areas or on the Alternative Lands.

Alternatives B, C, and D

No existing uses would be displaced by construction for the new STAs in Compartments B and C and the SBO under Alternatives B, C or D, because the Build-out areas are currently not in active use. It is anticipated that with Alternatives B through D approximately 3,922 acres of active agricultural land in the NBO would be changed to STA.

Construction for all Action Alternatives would produce noise from operation of construction equipment, as discussed in Section 4.4. The proposed STA sites are located more than 15 miles distant from the closest concentrations of developed uses, which are well beyond the range where they might experience project-related noise. No farm residences are located close enough to either project site that they would be exposed to noise from project construction. Based on the relationship between the locations of construction and potential noise receptors, project construction is not likely to result in any adverse noise impacts that would disrupt existing land uses in the local area. Modifications to traffic and infrastructure associated with project construction might disrupt ongoing activities for adjacent agricultural uses. These disruptions would be intermittent and for short duration during the construction period and would not represent a significant inconvenience for these uses.

The long-term effect of Action Alternatives B, C, and D on existing land use patterns would be the conversion of the acreage within the Compartments B and C Build-out areas from inactive agricultural land to wetlands actively used for stormwater treatment. A loss of agricultural production would not be an effect of Action Alternatives B, C, or D because the change from active to inactive agricultural use has already occurred, as a consequence of the lease terms in the Build-out areas.

Conversion of the Compartments B and C Build-out areas to active STAs would increase the total acreage of STAs in the EAA region from approximately 36,000 acres to 50,000 acres. With that change, the combined acreage in STAs would increase from just under 6 percent of the total EAA acreage at present to slightly more than 8 percent in the future. The proportion of EAA land in active agricultural use (81 percent of the total) would remain the same. Based on the nature and magnitude of the change, Action Alternatives B, C, and D would not have a significant effect on existing regional land use patterns.

Alternative E

Existing agricultural uses on approximately 11,000 acres in the EAA west of STA 1W may be displaced by construction for a new STA under Alternative E. This would reduce the area of active agricultural production in the EAA (currently about 506,000 acres) by approximately 2 percent. The current landowners would be compensated through the acquisition process and conceivably would shift the existing production activities to other locations, depending on the availability of land and water supplies. To the extent this did not occur, there would be a net long-term loss of agricultural production under Alternative E.

Potential indirect land use effects from Alternative E would be similar to those described above for the other Action Alternatives. STA construction would produce noise from operation of construction equipment, as discussed in Section 4.3.3. The area west of STA 1W is located among active agricultural uses and at least 12 miles distant from the closest concentrations of developed uses, and STA construction in this area would create minimal project-related noise. The Section 24 site that would be converted for STA use under Alternative E is located adjacent to an area of low-density residential use; as discussed in Section 4.3.3, temporary noise impacts in this area from project construction would be insignificant. Modifications to traffic and infrastructure associated with construction for Alternative E might disrupt ongoing activities for adjacent agricultural and (near Section 24 only) residential uses. These disruptions would be intermittent and for short duration during the construction period and would not represent a significant inconvenience for these uses.

Conversion of the Alternative Lands to active STAs would increase the total acreage of STAs in the EAA region from approximately 36,000 acres to 47,000 acres. With that change, the combined acreage in STAs would increase from just under 6 percent of the total EAA

acreage at present to nearly 8 percent in the future. The proportion of EAA land in active agricultural use would decrease slightly, to just under 80 percent of the total. Based on the nature and magnitude of the change, Alternative E would not have a significant effect on existing regional land use patterns.

4.7.2 Applicable Land Use Plans and Policies

Section 3.10.2 summarizes land use plans and policies that directly apply to the Action Alternatives. The following discussion addresses the consistency of the Action Alternatives with those plans and policies. The key provisions are those at the local government level that have been adopted by Henry and Palm Beach Counties and the Village of Wellington.

4.7.2.1 Hendry County

Lands within the Hendry County portion of the EAA, which includes the Compartment C Build-out area, are designated as agricultural under the comprehensive plan (Hendry County 1999) and the 2010 land-use map (Hendry County 2007). Objective 2.1 of the "Future Land Use Element" of the comprehensive plan establishes that the future land-use map will direct the pattern for future development and redevelopment of the unincorporated area of Hendry County. Under Policy 2.1.1, the agriculture category applies to lands used for cultivation of crops and other agricultural products and several types of related uses, including environmental services facilities. The latter are defined to include "water drainage, pumping and retention facilities, and similar facilities designed to protect and enhance the environmental impacts of development and land use" (Hendry County 1999). Based on the purpose and functions of the proposed STAs, they would meet the definition of environmental service facilities established in Policy 2.1.1. Therefore, Action Alternatives B, C, and D would be consistent with the land use policies established in the Hendry County comprehensive plan.

The "Environmental Services Element" and the "Conservation Element" of the Hendry County comprehensive plan include goals, objectives, and policies that address various considerations, including stormwater management, conservation of natural resources, and protection of wetlands, groundwater, and wildlife habitat. Although these goals, objectives, and policies do not directly apply to the specific use represented by the Action Alternatives, development of STAs in the Compartment C Build-out area would support these additional elements of the Hendry County comprehensive plan.

4.7.2.2 Palm Beach County

Most lands within the Palm Beach County portion of the EAA, including Compartment B and virtually all of the lands affected by Alternative E, are within the Glades Tier as established by the comprehensive plan (Palm Beach County 2006). Planning direction for

the Glades Tier is intended primarily to maintain and support continued large-scale agricultural operations. Per Objective 1.6, Palm Beach County works with the communities in the Glades Tier to preserve and enhance the unique characteristics of the Glades and protect the economically viable agricultural base of the area.

Compartment B and the Alternative Lands located west of STA 1W, and most of the adjacent lands, are designated as agricultural production (AP) on the future land use map (Palm Beach County 2007). Policy 2.2.5a (Agricultural) of the "Future Land Use Element" of the comprehensive plan directs that the AP category be applied to the EAA to protect areas for bona fide agriculture and related farming operations, and that AP uses will be protected from encroachment of incompatible urban land uses. Under the implementation guidance, the comprehensive plan identifies permitted AP uses that include "Parks and Recreation uses, Institutional uses and Utilities and Transportation designed to serve Countywide, regional and/or state needs [that] may be permitted subject to the siting criteria of the appropriate regulatory authorities." Utility uses are defined to include "a full range of utility uses such as water and sewage treatment plants, solid waste transfer stations and facilities, and electrical transmission facilities, towers, sub-stations and power plants" (Palm Beach County 2006).

Policy 2.2.7a (Conservation) of the "Future Land Use Element" of the comprehensive plan directs that the county will apply the Natural Areas Conservation (CON) or the Water Resource Area (WRA) land use categories at appropriate locations (Palm Beach County 2006). The policy states that the CON category will apply to natural areas used to protect natural resources or environmental quality, including environmental restoration and preservation, while the WRA category will apply to areas being used for regional and local water management that includes stormwater attenuation, seepage management, wetland enhancement and mitigation, and water quality treatment.

The Palm Beach County (2007) future land use map shows a Conservation designation for an area including the existing STA-2, although the AP designation is indicated for the other existing STAs. Based on the implementation guidance of the comprehensive plan for permitted AP uses, it appears that a stormwater management facility would fall within the definition of a Utility use, and therefore would be a permitted use within the AP designation. Based on the description of the Conservation designation and uses established in Policy 2.2.7a, the proposed STAs would clearly meet the purposes defined for either the CON or the WRA designations. Therefore, it may be appropriate or advisable for SFWMD to propose a CON or WRA designation for the Compartment B Build-out areas. In either event, Action Alternatives B, C, D, and E would be consistent with the land use policies established in the Palm Beach County comprehensive plan.

4.7.2.3 Village of Wellington

As described in Section 3.10.2.3, the Section 24 parcel that would be converted to STA use under Alternative E is located within the Village of Wellington, as a result of an annexation action in 2005. The Village has retained the former Palm Beach County AR zoning designation for this parcel and the adjacent STA 1E, and has not yet adopted land use regulations specific to this area. Based on the equivalent provisions of the AR district in the Palm Beach County and Wellington codes, conversion of Section 24 to STA use would likely be considered a minor utility use and would be consistent with the Wellington land use regulations.

4.8 RECREATIONAL RESOURCES

Action Alternatives B, C, and D would result in the construction and operation of new STAs that would cover approximately 14,000 acres that would be inundated on a permanent basis. Alternative E would result in the construction and operation of new STAs that would cover approximately 11,000 acres. This long-term operating condition would change the surface character of the interior of Compartments B and C or the Alternative Lands from a mix of freshwater marsh and inactive cropland (or, predominantly active cropland, in the case of Alternative E) to extensive open-water areas. The direct effect of the Action Alternatives on recreation would relate to any changes from existing uses to future uses with the project. Changes to levees, canals, loss of crossings, and construction of water control structures or the rights to access across these features will affect the access to adjacent WMAs.

Potential changes in the southern portions of Compartment B may eliminate and/or lessen access to the WCA 2 and the L-6 Canal between S6 and S7. Sportsman now drive in through this project area, cross the canal at a culverted crossing called Sportsman's Crossing as described in FWC's Everglades and Francis S. Taylor 2007 – 2008 hunt brochure. Once across the L-6 Canal the public may drive along the eastern banks of the L-6 either north or south to hunt and bank fish or launch boats at informal boat ramps. Removing southern portions of the L-6 to allow sheet flow into WCA 2 will lessen the ability of the sportsman to access that portion of the Francis S. Taylor WMA. Removing the Sportsman's Crossing to increase flow capabilities removes access to the east bank causing all loss of walk-in hunting access and loss of boat and bank fishing to the north when a roller gate and other pump stations are constructed.

Any changes to access along the L3 will affect the public's ability to access the HLWMA and RWMA from the west.

It is also conceivable that changes in water level associated with operation of the new STAs would indirectly result in changes to recreational use conditions elsewhere in the surrounding

region. Recreation activities with WMAs is closely related to the wildlife present and changes may enhance one recreation activity and diminish another or change what mode of ORV is viable.

4.8.1 Direct Effects

Direct effects on recreation resources from Action Alternatives B, C, D or E would be limited to the acreage within the new STAs. Managed recreational use does not currently occur in any of the areas that would be used for stormwater treatment under the Action Alternatives. Current recreational use values within a project boundaries where crops were produced are non-existent, or are limited to infrequent, incidental passive use by people who may happen to travel past on foot or in a vehicle. The perimeter canals and levees serve as a transportation infrastructure for bank fishing access, boat launching, parking and through access to the adjacent WMAs. In general, the existing character of these areas is similar to the EAA as a whole, as described in Section 3.10. The landscape is flat and has a predominantly uniform and organized appearance. Portions of the Compartment B and C Build-out areas and Section 24 have taken on the appearance of fallow fields or former fields that are reverting to other forms of vegetative cover because cropping on this acreage has ceased and some of the acreage has been inactive for several years. Compartments B and C also have extensive areas of freshwater marsh, which are more natural in appearance than the inactive agricultural lands. As such, they are probably providing somewhat higher-quality wildlife habitat than they did in agricultural use.

4.8.1.1 No Action Alternative

Under the No Action Alternative (Alternative A), use of the Compartments B and C Build-out areas or the Alternative Lands could remain similar to the current condition.. No recreational uses would be displaced by construction and conversion of the lands for use as STAs because there are essentially no existing recreational uses at present on interior lands of the project area. As (or if) the current mix of freshwater marsh and fallow fields in Compartments B and C slowly changed to more natural, non-cultivated cover types, these areas might take on an appearance and habitat value similar to the lands within the RWMA, adjacent to Compartment C. As a result, it is possible that selected types of wildlife-oriented recreation might be desired within the Build-out areas at some point in the future. It is also possible that SFWMD would issue new leases for agricultural use of these lands, which would result in future active production of sugar cane and other crops. The lands west of STA 1W that would be developed for stormwater treatment under Alternative E would presumably remain in agricultural use for the foreseeable future. However, any change in land use of Compartments B and C, including retaining agriculture on the lands, is dependent on future actions under Grant Agreement FB-4. The Grant Agreement states that lands

acquired for public ownership under the Agreement will be used for purposes of Everglades' ecosystem restoration as required by the 1996 Farm Bill.

4.8.1.2 Action Alternatives

Based on the nature and sources of change, potential direct effects from the Action Alternatives on recreation resources would be essentially the same. Once the STAs are in operation, the long-term condition of the Build-out areas would consist of expansive areas of open water bordered by a variety of constructed features, including levees, roads along the tops of the levees, and water control structures, culverts, bridges, and pump stations spaced at varying intervals. In conjunction with development of the areas for stormwater treatment, Action Alternatives B, C, D and E include provisions for future recreational uses that are consistent with the primary purpose for the new STAs.

With respect to recreation management, Compartments B and C or the Alternative Lands would support nature- based recreation consistent with SFWMD policies. In the planning and design phases of the new STAs, SFWMD would select the recreational activities and supporting facilities that would be appropriate within internal STA treatment areas, external STA canals, or on STA levees. Activities to be considered include hunting, fishing, hiking, biking, wildlife viewing, limited non-motorized boat use within interior waters, and motorized boat use in the exterior canals. The SFWMD (2007) *Recreation Management and Partnership Plan, Land Stewardship and Management Division 2007-2011* provides additional information on the types of activities and facilities that have been considered acceptable for STAs.

After the appropriate recreational activities for the STAs have been defined, SFWMD would identify and plan the necessary recreation facilities to support these activities. The recreation management and partnership plan describes several types of generic recreation facilities that would serve many different activities.

It is assumed that SFWMD would develop a parking area for public access at each STA, with these facilities sited as close as possible to a public road and at an exterior edge of the STA. An access site of approximately 1 or 2 acres on the western boundary of the project at Deer Fence Road would likely be considered for Compartment C. A similar public access site for Compartment B would likely be located on the west side of the STA adjacent to the NNRC, near the rebuilt Okeelanta Bridge, or directly east on the far east side of the project where SAV would provide bird watching opportunities and the site would support bank fishing, and access to the Everglades and Francis S. Taylor WMA could potentially be maintained. If Alternative E were implemented, a suitable public access location would likely be selected after specific lands to be converted to STA use had been identified. The exact locations and features of these project facilities would be established during the design process for each

project. The recreation management and partnership plan documents design standards for facilities associated with public access sites, including roads and vehicle bridges to access parking areas, parking area size and configuration (for example, it should allow space for a school bus to turn around), and pedestrian- and equestrian-capable bridges if needed to provide access across canals and within the project. These standards also apply to toilet facilities, information kiosks, benches, and signage.

Protective fencing would be installed throughout the project in areas open to the public to prevent contact with sensitive equipment. SFWMD would control the areas of the STAs open to the public and would limit access to specified times; acceptable operating hours have typically been on weekends during daylight hours. FFWCC officers would enforce the recreational rules adopted for the STAs to ensure the approved activities occurred as planned, as provided under State Rule 40E-7 FAC.

Based on the lack of existing recreational use and the plans to accommodate managed recreation at the proposed STAs, Action Alternatives B, C, and D would represent a positive impact in the form of expanded recreational opportunities and the provision of facilities to support these opportunities.

4.8.2 Indirect Effects

Construction and operation of the proposed STAs may benefit or have long-term positive effects on recreation resources in the areas around Compartments B and C with alternatives B through D, and on Alternative Lands near STA 1W and Section 24 with Alternative E, by increasing the recreational opportunities in these areas. However, short term negative effects may occur. One source of potential short term indirect effects would be disturbance of existing recreational activities in areas adjacent to the STAs during construction. In addition, operation of the EAA water management system to route water into the new STAs for treatment could indirectly affect hydrologic conditions elsewhere in the system.

A segment of the Florida National Scenic Trail (FNST) is located on the levee adjacent to the L-3 Canal, along the western edge of the Compartment C Build-out area. This trail segment is currently rerouted due to earlier construction of STA 5 flow-way 3 and will remain so during this planning period and any following construction period for Compartment C. Specific construction management plans have not yet been developed, but the re-route for the trail continues at this time. Construction of Compartment C would result in continued re-route of the FNST through completion of the project.

The southern Build-out area of Compartment B is adjacent to a portion of WCA 2A, Compartment C is adjacent to the west side of the RWMA, and Section 24 is tangent to a portion of the Refuge. Recreation resources and existing activities in these two management

areas are described in Section 3.11. In general, recreational use in these areas is of low intensity and consists primarily of fishing and hunting. Recreational users (and wildlife) in these areas could be disturbed by noise and other evidence of construction during the construction periods for the new STAs. (See additional discussion in Section 4.4.) These disturbance effects would be limited to the adjacent portions of the WMA, WCA, and the Refuge, and would cease when construction is complete.

If operation of the new STAs changes flow volumes and timing that resulted in noticeable changes in stage height in other waterbodies in the region, the attractiveness of these waterbodies for recreational use could be modified, at least on a temporary or intermittent basis. The model results for Action Alternatives B, C, D and E indicate that relatively modest volumes of water would be routed through the new STAs and changes in flows routed through the existing STAs would be relatively minor. Consequently, changes in flows and stages within the downstream water conservation areas (including the Refuge) would be limited, and it is unlikely that the changes would be of a sufficient magnitude or duration to adversely influence water-related recreation in those areas.

4.9 AESTHETIC RESOURCES

Action Alternatives B, C, D, and E would result in construction and operation of new STAs that would cover approximately 14,000 acres (or, approximately 11,000 acres in the case of Alternative E) that would be inundated on a permanent basis. This long-term operating condition would change the visual character of the landscape in the immediate vicinity of the new STAs. This direct effect at and near the project site would be the primary aesthetic impact of the proposed project. It is also conceivable that changes in water level associated with operation of the new STAs would result in changes to aesthetic conditions elsewhere in the regional landscape.

4.9.1 Compartments B and C Build-out

The existing aesthetic character of the Compartments B and C Build-out areas is similar to the EAA as a whole, as described in Section 3.11. The landscape is flat and has a predominantly uniform and organized appearance. The view of each Build-out area is generally limited to the floor of the compartment and the adjacent levee structures. Portions of the Build-out areas have taken on the appearance of fallow fields or former fields that are reverting to other forms of vegetative cover because cropping on this acreage has ceased and some of the acreage has been inactive for several years. Both compartments also include extensive areas of freshwater marsh, which are more natural in appearance than the inactive agricultural lands.

4.9.1.1 No Action Alternative

Under the No Action Alternative (Alternative A), the aesthetic character of the Compartments B and C Build-out areas may remain similar to the current condition, which can be summarized as a mix of freshwater marsh and fallow fields that are slowly changing to non-cultivated cover types. Over a period of many years, these areas might take on an appearance similar to the lands within the RWMA, adjacent to Compartment C.

4.9.1.2 Action Alternatives

Based on the nature of the sources of change, potential aesthetic effects from the Action Alternatives would be the same. Any of the Action Alternatives would involve an initial period when construction would be evident to people within viewing range of the project sites. Views of construction equipment, dust plumes, exposed excavations, and partially completed culverts and other structures would be visible to residents and workers who pass near the construction sites in the course of their regular activities, and to motorists traveling on roads adjacent to the project sites. In terms of volume, this occurrence would be most common for motorists on US-27. They would not represent a significant adverse aesthetic impact, however, because these views would be temporary and in character with agriculture and construction occurring elsewhere within the EAA.

Once the STAs were in operation, the long-term appearance of the Build-out areas would consist of expansive open water areas bordered by a variety of constructed features, including levees; roads along the tops of the levees; and water control structures, culverts, bridges, and pump stations spaced at varying intervals. The local landscape would retain the uniform and organized character that currently exists, while the current mix of marsh and vegetated areas would be replaced by open water. Although the future condition with the project would result in less overall visual diversity, the presence of additional water area would likely be perceived as a positive change or of more visual interest when compared with the current condition (Hettinger 2005, as cited in URS 2007a,b). On balance, the long-term aesthetic change resulting from the project would not be a significant adverse impact.

4.9.2 Alternative E Lands

The existing aesthetic character of the areas to be converted to STA use under Alternative E is similar to the EAA as a whole, as described in Section 3.11. The landscape is flat and has a predominantly uniform and organized appearance. The lands west of STA 1W, which account for virtually all of the subject acreage, have an appearance similar to active agricultural fields elsewhere in the EAA. Section 24 consists predominantly of fallow fields that are similar in character to much of the area within Compartments B and C. Under the No Action Alternative, the current aesthetic conditions in these areas may presumably continue for the foreseeable future. If Alternative E were implemented, the short-term

(construction period) and long-term (operational period) effects would be essentially the same as described above in Section 4.9.1.2, but would occur in different locations.

4.9.3 Regional Landscape

Operation of the EAA water management system to route water into the new STAs for treatment could indirectly affect hydrologic conditions elsewhere in the system. If these changes in flow volumes and timing resulted in noticeable changes in stage height in other waterbodies, the aesthetic character of the waterbodies could be modified, at least on a temporary or intermittent basis. Based on the relatively modest volumes of water that would be routed through the new STAs, it is unlikely that stage changes would be of a sufficient magnitude or duration that they would modify the aesthetic appearance of other waterbodies in the region.

4.10 CULTURAL RESOURCES

Adverse effects to cultural resources include altering, directly or indirectly, any characteristics of a historic property for inclusion to the NRHP. These effects may include:

- physical damage or destruction, alteration of a property;
- removal of a property from its historic location;
- change in the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
- introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;
- neglect of a property resulting in its deterioration; or
- transfer, lease, or sale of property out of federal ownership or control without adequate enforceable restrictions in place to ensure long-term preservation of the property's historic significance.

No archeological resources were identified as a result of surveys within Compartment B. Therefore, a determination of no adverse effects to Compartment B has been made. Three archeological sites within Compartment C have been determined potentially eligible to the NRHP. These and two additional archeological sites contain human remains. When consulted about this project, FDHR recommended that SFWMD and USACE avoid impacts to these sites. A Memorandum of Agreement (MOA) exists between the USACE, the District, and State Historic Preservation Officer (SHPO), which addresses adverse effects the project will have on site.

4.10.1 No-Action Alternative

Alternative A, No Action, will allow the project APE to revert to farmland. NRHP-eligible sites located within Compartment C may become degraded if farming encroaches onto them. With this alternative, no measures are proposed to protect site areas. However, any change in land use of Compartments B and C, including continuing current practices, is dependent on future actions under Grant Agreement FB-4. The Grant Agreement states that lands acquired for public ownership under the Agreement will be used for purposes of Everglades ecosystem restoration as required by the 1996 Farm Bill.

4.10.2 Action Alternatives

Alternatives B, C, and D involve the same physical preparation of Compartment C through grading, modifying ditches, and building up berms. Project impacts that may result from implementation would be the same for Alternatives B, C, and D. The USACE performed an archeological site avoidance analysis and archeological site impact minimization analysis. The conclusion of these analyses is that the archeological sites cannot be avoided without severely impairing the ability of the project to meet its goals. Minimization of effects to the sites, such as through construction of double berms, would hamper project operations to the point that it would not achieve the stipulated project goals. An additional minimization measure assessed would involve grading around some sites, leaving sites in place. This measure would leave extant archeological sites sitting on slightly higher ground than the surrounding terrain. It is anticipated that the low flow of water around the sites would result in little erosional effect. Although the archeological sites would affect water flow to some degree, the project could still be managed to achieve its objectives.

One site in particular that contains human remains is located immediately in the path of Build-out features and would be adversely affected by construction of Alternatives B, C, and D. Implementation of Alternatives B, C, and D would result in an adverse effect to a historic property that is eligible to the NRHP. USACE recommends excavation of this one site and proposes re-interment of the site's human remains within a designated burial place. SFWMD would assign a portion of its nearby property to be dedicated in perpetuity as a re-interment area. Procedures to be employed for disinterment and re-interment would be in keeping with the CERP and Accelor8 human remains policy. Once the specific re-interment property is identified, SFWMD would perform a cultural resource survey to confirm the absence of any undiscovered cultural properties, which would result in site intermingling. The study would also evaluate project impacts that may result from re-interment.

Through its analyses, USACE demonstrates that full avoidance of archeological sites is not possible while still maintaining acceptable project function and that adverse effects to one NRHP-eligible archeological site would result. SFWMD therefore proposes to mitigate these

effects through data recovery and re-interment of human remains. SFWMD would develop a site treatment plan in consultation with FDHR, the Advisory Council on Historic Preservation, and concerned Native American Tribes, including the Seminole Tribe of Florida and the Miccosukee Tribe of Florida.

4.11 SOCIOECONOMICS

An overview of the population, demographics, economic conditions, and environmental justice of the EAA has been provided in Chapter 3 of this EIS. In this chapter, the direct and indirect impacts of the development scenarios are evaluated. The geography displayed in Figure 3-18 is the geography analyzed as it pertains to the population, demographics, and economic conditions of the area.

4.11.1 Population and Demographics

Population profile, demographic profile, and the wealth profile were evaluated for each of the alternatives, including No Action, in the EAA study area and are provided in Chapter 3, Section 3.14.1. The analysis does not indicate a substantive change in population or demographics as a result of development in the EAA and development impacts in Compartments B and C under each of the alternatives, including No Action. Increased traffic access via improved roadways is necessary in tandem with creation of employment centers in the region to witness substantial shifts in the population or demographics in this region. Ultimately, the EAA is not designed for these purposes and will likely see the current population and demographics for the foreseeable future.

4.11.2 Economic Conditions

A history of the EAA is provided in Chapter 3, Section 3.14.3, culminating with estimates of economic activity generated by the agricultural industry in the region. Under Alternatives B, C, D, and E, direct impacts from the Build-out of Compartments B and C and possible indirect impacts to the EAA will not be substantial to the agricultural industry. Under the No Action Alternative, the majority of the lands in Compartments B and C would remain affected agricultural lands, which do not represent significant value to the agricultural community. However, any change in land use of Compartments B and C, including continuing current practices, is dependent on future actions under Grant Agreement FB-4. The Grant Agreement states that lands acquired for public ownership under the Agreement will be used for purposes of Everglades' ecosystem restoration as required by the 1996 Farm Bill.

The annual agricultural sales associated with the EAA total would continue under each of the alternatives, including No Action Alternative, at roughly $1.2 billion. This agriculture will

continue to have an overall economic impact to the region (Palm Beach, Broward, and Miami-Dade Counties) of $2.2 billion, based on applicable economic multipliers.

4.11.3 Environmental Justice

Environmental Justice in the EAA is discussed in Chapter 3, Section 3.14.3. As discussed in the sections on population demographics and economic conditions, the net direct and indirect impacts of Action Alternatives B, C, D, and E would be negligible in the region on an ongoing basis because impacts are related to a shift in wealth profile among the current population base. As discussed below in "Regional Economic Development," there will be temporary direct and indirect construction impacts in the region with an increase in necessary construction jobs; however, the construction employment dissipates once the project concludes. Overall, the wealth profile of the current and future population will not shift as a result of the No Action Alternative or Action Alternatives B, C, D, and E in the EAA or Compartments B and C.

4.11.4 Regional Economic Development

As part of this Draft EIS, regional effects were identified that are associated with the current state of the EAA as it pertains to the alternatives, including the No Action Alternative. The basis of design report for Compartment C indicates that the construction costs for the various project alternatives range from $157.7 million to $173.0 million, with an average of $166.3 million. The construction of Compartment C is estimated to require 3 years. Although these construction costs are high, they are capital intensive, rather than labor intensive, thus limiting the economic impacts in the region.

SFWMD estimates that the annual construction labor associated with Compartment C would include 70 employees (50 construction workers with 20 engineering and design staff). In addition, Compartment C would require annual operation and maintenance (O&M). The O&M costs for the various project alternatives range from $1.9 million to $2.3 million, with an average construction cost of $2.1 million.

The preliminary basis of design report for Compartment B indicates that the construction costs would total approximately $258.5 million. The construction of Compartment B is estimated to require 3 years. SFWMD estimates that the annual construction labor associated with Compartment B would be similar to Compartment C and would require 70 employees (50 construction workers with 20 engineering and design staff). In addition, Compartment B would require annual O&M. The annual O&M costs are estimated at $3.2 million. Using this information, the annual economic impacts to the region were estimated as a result of the construction and O&M of Compartments B and C.

A systematic analysis of state and local economic impacts is essential for effective planning in the public and private sectors. In the 1970s, the Bureau of Economic Analysis (BEA) developed a method known as RIMS (Regional Input-Output Multiplier System), which measures these economic impacts. The RIMS method uses I-O tables — the distribution of the inputs (I) purchased and the outputs (O) sold — to analyze these economic effects. RIMS II (2004) was used for this analysis.

This study relies on data gathered from the following sources:

- Estimated Construction Cost and O&M Data
- Primary Survey Data
- RIMS II

The economic impacts of construction take place during the construction period only. These impacts would cease after the construction term. The ongoing impacts associated with O&M would continue, however, resulting in sustained economic impacts within the region.

The impacts are in the form of "output," which is value-added dollars and wage earnings spent and re-spent as a result of the project. "Earnings" are wage earnings by employment associated directly and indirectly with the project, and "employment" is the jobs created directly and indirectly as a result of the project. Table 4-8 summarizes the construction and O&M impacts.

As the data show, the annual direct and indirect economic impacts associated with construction of the project within the region are estimated at $18.7 million, with an estimated $5.8 million in annual earnings and the direct and indirect employment of 279 workers. On an ongoing basis, O&M would result in $2.2 million in economic output on an annual basis, with an estimated $700,000 in earnings and total employment of 33.

Table 4-8. Summary of Economic Impacts for the Construction and O&M of Compartments B and C

	Direct Impacts		Indirect Impacts		
	Employees	**Output**	**Output**	**Earnings**	**Employees**
Construction	140	$9,547,329	$18,705,127	$5,859,196	279
Construction O&M	16	$1,115,361	$2,185,215	$684,497	33
Total	156	$10,662,689	$20,890,341	$6,543,692	311
Permanent O&M	16	$1,115,361	$2,185,215	$684,497	33

Source: RIMS, SFWMD and Fishkind and Associates, Inc.

4.12 TRANSPORTATION AND UTILITIES

4.12.1 Highways and Railways

Highways could experience short-term impacts with Action Alternatives B, C, and D for the Build-out of Compartments B and C through an increase in construction traffic on roadways during development of the Build-out. These impacts could be considered negligible considering the scope of construction work for the Compartments B and C Build-out. Any impacts from construction traffic would be short term and would not cause extended delays on adjacent highways.

Railways that exist in the EAA to transport sugar cane and the mainline railroad, SCFE, are not anticipated to be affected by Action Alternatives B, C, and D based on their distance from Compartments B and C (Figure 3-20).

4.12.1.1 No Action Alternative

Under the No Action Alternative (Alternative A), road traffic and railways would continue in normal patterns or with the presence of agricultural vehicles and equipment on roadways for the compartment Build-outs.

4.12.1.2 Action Alternatives

The Action Alternatives would present the same potential highway impacts. Construction for the Action Alternatives would increase construction vehicles and equipment during construction operations, but these impacts would be short term.

Construction features, including the new levee systems, pump stations and facilities, and roadway easements, are all occurring within or along the perimeter of Compartments B and C. The scope of construction to establish the STAs on Compartments B and C would involve blasting for construction of levees and canals and land clearing. It is anticipated that sections of US-27 that are adjacent to blasting within Compartment B would be required to shut down during blasting operations. However, effects would be considered negligible to roadway traffic. The Compartment C Build-out footprint is not immediately adjacent to any state or county highway and would not affect traffic or roadway integrity.

All fill material for the Build-out of Compartments B and C would come from the project site, limiting the need to transport material in trucks. Equipment would be stored on site in designated areas, which would prevent traffic congestion and roadway wear and tear on adjacent highways. On-site staging areas for construction equipment at Compartments B and C would be established, and locations would be included in the final design reports.

4.12.2 Florida Power and Light Facilities

FPL facilities within the Compartment B south Build-out area include power transmission lines, associated towers, and easements. These facilities are described in detail in Section 3.14.3.

4.12.2.1 No Action Alternative

Under the No Action Alternative (Alternative A), FPL facilities would continue to operate under current conditions. Although roads and levees would not be constructed as in Action Alternatives B, C, and D, future agricultural uses of the land may influence reconfiguration of roads or new levees. However, any change in land use, including the continued presence of agriculture, is dependent on future actions under Grant Agreement FB-4. The Grant Agreement states that lands acquired for public ownership under the Agreement will be used for purposes of Everglades ecosystem restoration as required by the 1996 Farm Bill.

4.12.2.2 Action Alternatives

Effects to FPL facilities would be consistent for each of Action Alternatives B, C, and D. From the Compartment C Build-out, an FPL 500-kV transmission line is contained in a 330-foot-wide easement crossing STA 6-1 from southeast to northwest in Compartment C. A levee and access road for power line maintenance also serve as the division between the STA 6-1 cells. The FPL transmission lines would not be disturbed by STA construction and operation unless modifications to the levee are required as part of the STA design.

Compartment B Build-out would require a perimeter levee to be constructed along the eastern property line of the SBO and would exclude the 500-foot-wide FPL easement. A new access road for the FPL transmission lines would also be constructed through the center of the SBO in Compartment B, replacing the existing access FPL access road. In addition, a new collector canal, spreader canal and un-gated culverts to convey flow from the west side of the SBO across the new FPL access road to the eastern portion of the SBO would be constructed (URS and SFWMD 2007).

The Compartments B and C Build-out would require electrical service from FPL, and SFWMD would coordinate with FPL to establish operations and schedule. FPL would require considerable lead time, potentially up to 2 years, to complete construction needed to fulfill the SFWMD power requirements (URS and SFWMD 2007).

4.13 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

4.13.1 No Action Alternative

The current land use within Compartments B and C is inactive agricultural lands or open space. Under the No Action Alternative, the land use may remain primarily agricultural;

however, it would become active. There is the potential for release of petroleum or agricultural chemicals in these areas with active agricultural land use. However, any change in land use, including the continued presence of agriculture, is dependent on future actions under Grant Agreement FB-4. The Grant Agreement states that lands acquired for public ownership under the Agreement will be used for purposes of Everglades ecosystem restoration as required by the 1996 Farm Bill.

4.13.2 Action Alternatives

Three STAs are proposed to be constructed under the Action Alternatives for Compartments B and C. These water reservoirs would likely create an ecosystem that includes foraging and wading birds and other avian species. Therefore, soil or groundwater contamination in these areas needs to be addressed before the STAs are constructed and operated. Current areas of known contamination are described in Chapter 3 of this document.

The Action Alternatives would include the use of heavy equipment for construction of the STAs and associated structures. Operation of this equipment may result in the release of petroleum products, such as fuel and hydraulic fluid. Fueling areas may experience spills when equipment and tanks are filled or possible spills from fuel tank leaks. The use of equipment could result in the release of hazardous and toxic materials or waste into the project area. However, a BMP may be implemented during construction to reduce the risk of release of hazardous, toxic, or radioactive materials or waste.

4.14 CUMULATIVE IMPACTS

Sec. 1508.7 of the CEQ regulations defines a cumulative impact as:

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

Many projects will affect the northern and southern Everglades in the future, many of which are components of CERP and Acceler8. These projects focus on restoration of natural hydrology and improved water quality in the project-affected environment, as well as in other physiographic regions within the study area. Cumulatively, these restoration efforts will provide substantial improvements in water quality, water deliveries, and timing of these deliveries. These efforts also will improve habitat for fish and wildlife, including threatened and endangered species such as the Cape Sable seaside sparrow and the snail kite, and the composition of vegetative communities to the affected regions. Among the specific ecological benefits from these projects, freshwater releases to the Northern Estuaries will diminish, helping to normalize salinity and dissolved oxygen and reduce turbidity and

nitrification. In addition, Lake Okeechobee water levels will be restored to normal conditions and periods of prolonged high water levels, lake draw-downs that cause rapidly receding water levels, and nutrient inputs will be minimized. Furthermore, STAs, storage reservoirs, and aquifer storage recovery (ASR) wells will improve the quality of water in the region (WCAs, estuaries, and C-51 East Basin). Finally, implementation of BMPs to treat agricultural runoff prior to discharge will reduce phosphorus levels in EAA waters.

Described as the world's largest ecosystem restoration effort, CERP includes more than 60 major components. The goal of CERP is to capture fresh water that now flows unused to the ocean and the gulf and redirect it to areas that need it most. The major components are surface water storage reservoirs, water preserve areas, and management of Lake Okeechobee as an ecological resource. Other major components include improved water deliveries into the estuaries, underground water storage, treatment wetlands, improved water deliveries to the Everglades, removal of barriers to sheet flow, storage of water in existing worries, re-use of wastewater, pilot projects, improved water conservation, and additional feasibility studies.

Acceler8 projects are designed to expedite restoration of the Everglades and to achieve the benefits ahead of the CERP schedule. Construction and operation of Acceler8 projects will be consistent with CERP. The Acceler8 projects are designed to provide immediate environmental benefit for water quality and quantity and flood control and water supply.

All regional restoration projects, but specifically those described below, will produce extensive cumulative beneficial effects to the affected regions. For more information on CERP and Acceler8 projects, refer to the CERP Web site found at http://www.evergladesplan.org, and the Acceler8 Web site found at https://my.sfwmd.gov/portal/page?_pageid=1855,2830547,1855_2831083&_dad=portal&_schema=PORTAL&navpage=home.

The **Everglades Construction Project (ECP)** includes construction of more than 44,000 acres of STAs in the EAA. The ECP will improve the volume, timing, quality, and distribution of water as it enters the Everglades and will reduce the volume of undesirable discharge to the Caloosahatchee and the St. Lucie Estuaries, and the Indian River Lagoon and Lake Worth Lagoon.

The **Everglades Agricultural Area STA Expansion** project will expand the size and enhance the performance of existing STAs created as part of the ECP. Constructed wetlands in the STAs naturally reduce pollution in the water before it is released to the Everglades. Overall, this project will add 18,000 acres of treatment area to the existing EAA STAs. Phase 1, the initial construction of the STAs, has been completed; Phase 2, the STA Build-out, is the project proposed in this EIS.

The **Indian River Lagoon South Restoration Project** is designed to reverse the impacts of pollution and unnaturally large freshwater flows to the surrounding waterbodies. The project will assist in achieving a balance of fresh and salt water in the Indian River Lagoon and St. Lucie Estuary (USACE 2007a).

The **Lake Okeechobee Watershed Project (LOWP)** will in part address phosphorous loads to the lake and also provide alternative storage locations (reservoirs) so that water levels in the lake can be regulated for greater environmental benefits while still serving water supply and other water resource functions. The LOWP is intended to reduce the phosphorous load by 53 metric tons per year and store approximately 273,000 acre-feet of water. The load reduction will assist in meeting the TMDL goals for Lake Okeechobee (USACE 2007a).

The **Kissimmee River Restoration** project is currently undergoing restoration efforts that will return a significant portion of the Kissimmee River to its historical riverbed and floodplain. These actions will provide a more natural fluctuation of water levels in both the upper and lower basins.

The **Acme Basin B** project involves construction of reservoirs and conveyance features to provide surface water to the refuge that would otherwise be routed through Basin A to C-51 and lost to tide. It would add new source of clean fresh water to the Refuge and reduce harmful discharges to the Lake Worth Lagoon. It is also a component of the Acceler8 WPA projects discussed below.

The **C-44 (St. Lucie Canal) Reservoir/Storm Water Treatment Area** project involves construction of a 3,400-acre, 15-foot-deep aboveground reservoir that will provide significant water storage for the C-44 basin and a 6,300-acre STA to capture and treat stormwater runoff before it enters the St. Lucie Canal. The project will decrease flows and improve water quality to the St. Lucie Estuary.

The **C-43 (Caloosahatchee River) West Reservoir** project involves construction of an aboveground reservoir to capture and store stormwater runoff from the C-43 Basin (Caloosahatchee River Watershed) and Lake Okeechobee releases, minimizing freshwater flows and water discharges to the Caloosahatchee Estuary.

The **Everglades Agricultural Area Reservoir A-1 and Bolles and Cross Canals Improvements** project involves construction of an aboveground reservoir for water storage with a capacity of 190,000 acre-feet located in the southern portion of EAA and increasing the conveyance capacity of the Bolles and Cross Canals needed to enhance storage in the EAA Storage Reservoir and STAs. The Bolles and Cross Canal improvements are currently being addressed under CERP. Some of the project purposes include capturing and diverting Lake Okeechobee regulatory releases and EAA stormwater runoff to the reservoir, reducing

water levels in Lake Okeechobee, and improving operational flexibility to move water within the EAA. Environmental benefits include reducing the volume and frequency of harmful discharges to coastal estuaries, improving the quantity, timing, and distribution of water deliveries to the WCAs and ENP, assisting in restoring the hydrology within Lake Okeechobee, and allowing improved timing of deliveries to the STAs.

The **Water Preserve Areas** project is composed of the following five components: the Site 1, C-9, and C-11 impoundments; the Acme Basin B; and WCA 3A/3B. It includes construction of aboveground impoundments, a wetland buffer strip, pump stations, culverts, canals, water control structures and seepage control systems. Environmental benefits from the project include improved hydropatterns in the WCAs and flows into ENP, increasing the spatial extent of wetlands and enhancing existing wetlands adjacent to the Everglades, and reducing seepage from the EAA to surrounding developed areas. The benefits further include reducing the amount of water released to tide in Broward and Palm Beach Counties, and improving Everglades' water quality by diverting urban runoff into impoundments.

The **Picayune Strand (Southern Golden Gate Estates) Restoration** project involves restoration of natural water flow across 85 square miles in western Collier County. Environmental benefits from this project include enhancing and restoring wetlands in Picayune Strand and adjacent public lands by reducing over-drainage, restoring natural sheetflow to the Ten Thousand Islands National Wildlife Refuge, and the resulting improved fish and wildlife habitat, and improving the quality and volumes of water delivered to coastal estuaries.

The **Biscayne Bay Coastal Wetlands-Phase 1** project is part of a larger project that will expand and restore the wetlands adjacent to Biscayne Bay in Miami-Dade County, thus enhancing the ecological health of Biscayne National Park. This project consists of design and construction of two essential flow-ways, located at Deering Estate and Cutler Ridge. The project will assist in restoring the quantity, quality, timing, and distribution of fresh water to Biscayne Bay and Biscayne National Park. It also will capture, treat, and redistribute freshwater runoff from the watershed into Biscayne Bay, creating more natural water deliveries and result in improved salinity distribution near the shoreline, which will re-establish productive nursery habitat for shrimp and shellfish.

The **C-111 Spreader Canal** project is located in south Miami-Dade County and involves features designed to provide for ecosystem restoration of freshwater wetlands, tidal wetlands, and near-shore habitat and the degradation of existing levees to enhance sheetflow across the restored area.

The **Lake Okeechobee and Estuary Recovery (LOER) Plan** will address water resource needs and the ecological health of Lake Okeechobee and of the Northern Estuaries. It is

meant to fast-track capital projects by using state funds and incorporates construction projects, studies, and policy changes. The construction components include reservoirs, STAs, and re-routing water flows. The combined storage and phosphorus reduction benefits are estimated at 48,000 acre-feet and 65 to 75 metric tons. Some of the other components include establishing TMDL for Lake Okeechobee tributaries, implementing mandatory fertilizer BMPs for agriculture and urban use, establishing revised Environmental Resource Permit (ERP) criteria for new development in the Lake Okeechobee and Estuaries Watershed Basins, and, as discussed in the next paragraph, revisions to the Lake Okeechobee Regulation Schedule. For more information on LOER, visit the following Web site: https://my.sfwmd.gov/portal/page?_pageid=2814,19613298,2814_19613476&_dad=portal&_schema=PORTAL.

A relevant management component of LOER that is part of the C&SF project and is closely related to depends on Acceler8 and CERP projects is the **Lake Okeechobee Regulation Release Schedule Study** (LORSS). The WSE schedule regulates freshwater releases from Lake Okeechobee and has not allowed water managers the flexibility to handle extreme wet weather conditions, resulting in high lake levels and subsequent larger releases to the Northern Estuaries. LORSS is the re-evaluation of the WSE, which will provide managers with greater flexibility in timing of releases. Periods of prolonged high water levels in Lake Okeechobee, lake drawdowns that cause rapidly receding water levels, and nutrient inputs to receiving waters will diminish with implementation of the LORSS project. LORSS depends on STAs and storage reservoirs associated with the other restoration projects for water conveyance, storage, and treatment. The full benefit of the LORSS will occur only with implementation of STAs, reservoirs, and canal conveyance projects associated with Acceler8 and CERP projects. For more information on LOER, visit the following Web site: http://www.saj.usace.army.mil/ cco/lorss_desc.htm.

4.15 UNAVOIDABLE ADVERSE IMPACTS

STAs in Compartments B and C Build-out with Alternatives B, C, and D, and Alternative Lands with Alternative E would cause short-term disturbance and both short- and long-term displacement of resources associated with the human and natural environment. Agricultural lands would be converted to STAs resulting in long-term positive impacts for the Everglades water quality.

4.15.1 Land Use

Agricultural lands would be removed from production and used as STAs. Compartment B and C combined would result in the loss of 13,983 acres of agricultural lands and it is anticipated that Alternative E would result in the loss of 10,137 of agricultural lands. The

STAs, however, would provide enhanced opportunities for recreation by expanding these lands for bird watching, hunting, or other recreation, as well as enhancing wetland habitat for wildlife and vegetation.

4.15.2 Wetlands

Under UMAM, "functional loss" pertains to the loss of ecological function to the impact assessment area as a result of the project, and "functional gain" pertains to the net gain in functional benefit from the proposed mitigation. The functional values, or UMAM score, of the wetlands within Compartments B and C build-out were analyzed in the wetland evaluation report (URS 2007a,b). UMAM values for each wetland type and functional losses from the project are provided in Table 4-9. Alternatives B, C, or D would result in 12,815.66 acres of direct wetland impacts and a corresponding 4,386.4 functional loss units.

Table 4-9. Summary of Direct Wetland Impacts with Alternatives B through D and UMAM Assessment Scores

	Direct Impacts								
	Freshwater Marsh			Atypical Wetland			Scrub-Shrub Wetland		
	Acres	UMAM Score	Functional Loss	Acres	UMAM Score	Functional Loss	Acres	UMAM Score	Functional Loss
Comp. B	3217.48	0.4	1286.9	4048.85	0.39	1579.1	n/a	n/a	n/a
Comp. C	1688.66	0.4	675.5	3544.12	0.2	708.8	316.55	0.43	136.1

Because specific plots of land for Alternative E have not yet been identified, jurisdictional determinations have not been performed; therefore, specific wetland impact acreages have not been determined and UMAM functional assessments have not been performed. It is anticipated that all or some of the agricultural lands in the Alternative Lands associated with Alternative E would be considered atypical wetlands and jurisdictional, and that additional wetland habitats may also be present.

4.15.3 Wildlife

Localized disturbances are expected during construction of STAs for all of the Action Alternatives. Modification of habitat would result in permanent dislocation for some species that primarily thrive in agriculture lands or dry conditions; however, impacts to species that use agricultural areas are expected to be negligible based on surveys of Compartments B and C for the 2007 wildlife evaluation report. Habitat for wading birds, waterfowl, and other species that use Everglade's marshes and wetlands would increase. Water quality improvements in the EPA would enhance habitat conditions for wildlife.

4.15.4 Threatened and Endangered Species

Temporary displacement of threatened and endangered species is expected during construction but is not expected to pose adverse impacts. USFWS will recommend

conservation and protection measures for species that could occur within Compartments B and C or on Alternative Lands.

4.15.5 Cultural Resources

Cultural resource surveys were conducted on Compartment B and C land. Consultation is occurring with Native American Tribes, and BMPs are being implemented for significant sites located within Compartment C. No unavoidable impacts to cultural resources are anticipated within section 24 Alternative Lands; however, cultural resources similar to those in Compartments B and C may be present on Alternative Lands adjacent to STA 1W. If Alternative E is the chosen alternative, the SHPO will be consulted once specific plots of lands are identified.

4.15.6 Water Quality

The Compartments B and C Build-out project is expected to provide beneficial impacts to water quality as it enters the EPA. Under each of Action Alternatives B, C, and D, existing STAs 3/4, 5, and 6 would be relieved from overloading by water entering from the EAA with the additional treatment capacity of Compartments B and C. This additional treatment capacity is expected to improve water quality in the EPA. BMPs to control turbidity, sedimentation, and erosion would be employed during construction.

4.15.7 Recreation

Recreation such as hunting, fishing, and bird watching would be affected for the short term during construction operations. The Compartments B and C Build-out project is expected to provide beneficial impacts for recreational opportunities by providing additional acreage for bird watching, hunting, and other recreation. Alternative E would provide similar recreational facilities as planned by SFWMD for Compartments B and C.

4.15.8 Aesthetic Resources

The Build-out of Compartments B and C associated with Alternatives B, C, and D or construction of STAs on lands near STA 1W and STA 1E associated with Alternative E would result in negligible changes to visual features. Levees, canals, and pump stations already exist and would be improved and built in areas within the footprint of the compartment lands. The landscape would revert from agricultural to a more natural view.

4.16 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Under NEPA guidelines, the EIS analysis includes a discussion on irreversible and irretrievable commitment of resources as it pertains to the Action Alternatives. An irreversible commitment of resources refers to effects to the resources that cannot be reversed

or that would not be reversed in a foreseeable amount of time. An example would be when a species becomes extinct. Irretrievable commitment of resources describes a resource that is lost for a period of time or as long as the action exists. For example, fishing productivity would be lost in an area closed to be converted to oil exploration for as long as the oil exploration remains.

Action Alternatives B, C, and D would result in the loss of 6,200 acres (Alternative C) and 7,783 acres (Alternative D) of agricultural land in Compartments B and C, and up to 10,371 acres with Alternative E. Existing wetlands that are located in areas excavated for levees and canals would be irreversibly lost; however, land, including wetlands within the compartments, would be converted or would remain wetland. Cultural resources that are not removed from lands within Compartments B and C and, if applicable, within Alternative Lands, would result in an irretrievable loss of resources for the period the lands are inundated with water.

Although temporary, and possibly permanent, displacement would occur for some natural and human resources during construction operations, there would be no irreversible commitment of resources with the conversion of Compartments B and C to STAs. If Alternative E were selected, irreversible and irretrievable commitment of resources would be assessed at that time.

4.17 LOCAL SHORT-TERM USES AND MAINTENANCE/ ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Under Action Alternatives B, C, and D, the long-term productivity of the Compartment B and C lands would not be affected by the short-term use or resource impacts for lands converted to STAs. Agricultural lands are being converted; however, the SBO of Compartments B and C lands are fallow and have been purchased under a MOA for Everglades restoration.

Alternative B has the potential to result in the conversion of 3,922 acres of active agricultural lands to STA and Alternative E has the potential to result in up to the conversion of 10,137 acres of active agricultural lands to STA. Using the lands for STAs, however, is an effort to improve water quality, providing beneficial impacts to the system.

4.18 CONFLICTS AND CONTROVERSY

To be included after this Draft EIS has been released and comments from public and agencies have been collected.

4.19 ENVIRONMENTAL COMMITMENTS

To be included after this Draft EIS has been released and comments from public and agencies have been collected.

4.20 IMPACT COMARISON AND CONCLUSIONS

The build-out of Compartments B and C or STAs on Alternative Lands would result in short-term impacts to and displacement of the natural environment. In addition, some temporary, short-term effects would likely occur during the construction phase of the build-outs, including recreational and roadway impacts. The Compartment B and C Build-outs would have long-term positive affects on water quality, recreation, and for species that utilize the STAs, as discussed in Chapters 3 and 4. Even as water quality continues to improve as Compartment B is utilized, restoration in WCA 2A would be a long-term process because of historical phosphorus accumulations found in the sediments within these canals and adjacent impacted marsh areas. WCAs 2A and 3A may experience negative impacts during seasonal weather patterns, especially in the northern regions of the WCAs, where the WCAs experience droughts. Simulations of conditions in WCA 2A using DMSTA predicts more water would be delivered to WCA 2A, which is currently experiencing wet patterns, and less water would be delivered to WCA 3A, which is currently in drought. However, the operational intent of Alternative D1 is to send more water to WCA 3A via a structure such as S-11, as an interim measure until the CERP spreader canal distributing water into WCA 3A is constructed, and to send less water to WCA 2A.

However, total phosphorus loads and concentrations in WCA 2A would decrease under Alternative B and would increase under Alternatives C and D compared with the No Action Alternative; while in WCA 3A, loads and concentrations decrease in all of the Action Alternatives compared to the No Action Alternative. The Refuge would experience no differences from the No Action Alternative and Alternatives B, C, and D. However, under Alternative E additional water would remain in the basin that could be treated and delivered, as needed. This flexibility is predicted to improve vegetation and fish and wildlife habitat in the Refuge. Alternative E could result in less untreated water being pushed out to tide, which negatively affects the estuaries.

The following sections describe a summary of impacts to natural and human resources that could occur with implementation of each of the alternatives. Table 4-10 contains a summary of these impacts.

4.20.1 Adverse Direct Impacts

Direct wetland impacts from Alternatives B, C, D, and E include conversion of wetlands within the project footprint to STAs and any temporary wetland fill necessary for

construction staging areas. Wetlands within Compartments B and C or Alternative Lands that are and are not converted to canals or uplands and that are located in the emergent vegetation and SAV cells are considered directly affected in a positive manner by flooding of the cells. The direct impacts to wetlands associated with Action Alternatives B, C, and D include 4,906 acres of freshwater marsh, 7,593 acres of atypical wetlands, and 317 acres of scrub-shrub wetlands, and the direct impacts for Action Alternative E are anticipated to be 10,137 acres of atypical wetlands.

4.20.2 Adverse Indirect Impacts

The potential indirect wetland impacts from Alternatives B, C, and D include an imbalance in the flora and fauna of wetland and aquatic communities in northern WCA 2A and WCA 3A as a result of changes in hydrology and phosphorous levels. Mitigation for the potential impacts to northern WCA 2A and WCA 3A would include requiring the SFWMD to monitor water quality, vegetative composition, and fish and wildlife usage near EAA outflow stations in conformance with the long-term plan and the permit conditions. The information would be used to evaluate the effects of the project on these regions and decide whether debits from the mitigation ledger would be appropriate.

However, the operational intent of Alternative D1 is to send more water to WCA 3A via a structure such as S-11, as an interim measure until the CERP spreader canal distributing water into WCA 3A is constructed, and to send less water to WCA 2A and eliminate the wetland impacts as a result of changes in hydrology.

4.20.3 Cultural Resources

Direct effects to cultural resources may include:

- Direct physical damage or destruction;
- Alteration of a property;
- Removal of a property from its historic location;
- Change in the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;
- Neglect of a property resulting in its deterioration; and
- Transfer, lease or sale of property out of federal ownership or control without adequate enforceable restrictions in place to ensure long-term preservation of the property's historic significance.

One site in particular that contains human remains is located immediately in the path of proposed project features and would be directly affected by construction of Alternatives B, C, and D. Implementation under Alternatives B, C, and D would result in direct effects to this NRHP-eligible archeological site. USACE therefore recommends excavation of this one NRHP-eligible site and proposes re-interment of the site's human remains within a designated burial place. SFWMD would assign a portion of its nearby property to be dedicated in perpetuity as a re-interment area. Procedures to be employed for disinterment and re-interment would be in keeping with the CERP and Acceler8 human remains policy. Once the specific re-interment property is identified, SFWMD would perform cultural resources studies necessary to evaluate project impacts that may result from re-interment.

If Alternative E is the chosen alternative, any cultural resources identified within the other lands will be coordinated with the appropriate agencies and officers in accordance with Section 106 of the National Historic Preservation Act, 1996, As Amended.

Table 4-10. Alternatives Evaluation Matrix

Assessed Resource	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C	Alternative D	Alternative E
Relative Effectiveness of Satisfying Purpose and Need					
Phosphorus reduction	Moderate	Moderate/High	Moderate/ High	Moderate/ High	Moderate/High
Operational flexibility	Moderate	Moderate/High	Moderate	Moderate/ High	Moderate
Redundancy to existing STAs	Low	Moderate/High	Moderate/ High	Moderate/ High	Moderate/High
Minimize potential for overloading existing STAs	Low	Moderate/High	Moderate	Moderate	High
Geology, Topography, and Soils					
Geology	Soil subsidence is expected to continue in these areas.	Not expected to be significantly impacted. Minor soil and caprock removal may be conducted for use in berms, roads, canals, etc.	Same as Alternative B.	Same as Alternative B.	
Topography	As a result of soil subsidence, minor lowering of topography is possible in these areas.	Not expected to be significantly impacted. The construction of berms, roads, canals may raise or lower topography in some areas.	Same as Alternative B.	Same as Alternative B.	
Soils	Soil subsidence is expected to continue in these areas.	Not expected to be significantly impacted. Minor soil and caprock disturbance may occur while constructing berms, roads, canals, etc. Project may benefit soils by reducing subsidence with the implementation of better water management practices.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.
Water Resources					
Surface Water Hydrology					
Lake Okeechobee	No change.	Increase in water released to A-1.	Slight increase in water released to A-1.	Increase in water released to A-1.	
STA 2, 3/4, 5, and 6	No change.	Minimal decrease in water inflows to each STA.	Same as Alternative B.	Same as Alternative B.	Decrease in water inflow to STA 2 and STA 5; Increase in water inflow to STA 3/4 and STA 6.

Table 4-10. Alternatives Evaluation Matrix (continued)

Assessed Resource	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C	Alternative D	Alternative E
STA 1E and 1W, and WCA 1	No change.	No change.	No change.	No change.	Decrease in water inflows to STA 1E and STA 1W.
WCA 1	No change.	No change.	No change.	No change.	Minimal decrease in water inflows.
WCA 2A	No change.	Large increase in water inflows.	Same as Alternative B.	Same as Alternative B.	Minimal decrease in water inflows.
WCA 3A	No change.	Large decrease in water inflows.	Same as Alternative B.	Same as Alternative B.	Water inflows would increase.
Northern Estuaries	No change.	Decrease in freshwater releases from Lake Okeechobee.	No change.	Decrease in freshwater releases from Lake Okeechobee with strong potential for even greater reductions.	
Rotenberger Wildlife Management Area	No change.	Decrease in water inflows.	Decrease in water inflows	Decrease in water inflows	Decrease in water inflows
Groundwater Hydrology					
Number of Aquifers Affected	2	2	2	2	2
Number of Wellhead Protection Areas Affected	0	0	0	0	0
Water Quality					
STA 2, 3/4, 5, and 6	No change.	Large decrease in phosphorus in each STA.	Same as Alternative B.	Same as Alternative B.	Decrease in phosphorus in STA 2, 5, and 6.
STA 1E and 1W, and WCA 1	No change.	No change.	No change.	No change.	Large decrease in phosphorus in each STA and WCA 1.
WCA 2A	No change.	Minimal increase in phosphorus inputs.	large increase in phosphorus inputs.	Same as Alternative C.	Minimal decrease in water inflows.
WCA 3A	No change.	Large decrease in phosphorus inputs.	Same as Alternative B.	Same as Alternative B.	Minimal decrease in water inflows.
Northern Estuaries	No change.	No change.	No change.	Potential decrease in phosphorus inputs from reduced Lake Okeechobee releases.	
Rotenberger Wildlife Management Area	No change.	Large decrease in phosphorus inputs.	Same as Alternative B.	Same as Alternative B.	Large decrease in phosphorus load.
Air Resources					
Climate	No change pre-project baseline.	Potential for minor microclimatic effects.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.

Table 4-10. Alternatives Evaluation Matrix (continued)

Assessed Resource	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C	Alternative D	Alternative E
Air Quality	No change pre-project baseline.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative B.
Noise	No change pre-project baseline.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative B.
Vegetation					
Compartments B	Conversion of 7,266 acres of wetlands (3,217 acres marsh and 4,049 acres atypical) within Compartment B footprint to active agriculture.	Conversion of 7266 acres of wetlands (3217 acres marsh and 4,049 acres atypical) within Compartment B footprint to STAs with emergent vegetation and SAV.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.
Compartments C	Conversion of 5,550 acres wetlands (1,689 acres marsh, 3,544 acres atypical, and 317 acres scrub-shrub) within Compartment C footprint to active agriculture.	Conversion of 5,550 acres wetlands (1,689 acres marsh, 3,544 acres atypical, and 317 acres scrub-shrub) to STAs with emergent vegetation and SAV.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.
Indirect Effects	Improvement in vegetation expected within the affected regions from improved timing, frequency, and quantity of water as a result of other projects.	Anticipated minor negative effects within RWMA. Potential major negative effects within WCAs 2-A and 3-A	Same as Alternative B.	Similar to Alternative B, but with the potential for additional improvements to seagrass and mangrove communities in the Northern Estuaries, and potential for enhanced dry-season deliveries of water to WCA 3A and ENP.	
Fish and Wildlife					
Compartments B	Conversion of 7,266 acres of wetlands (3,217 acres marsh and 4,049 acres atypical) within Compartment B footprint to active agriculture.	Conversion of 7,266 acres of wetlands (3,217 acres marsh and 4,049 acres atypical) to STAs with emergent vegetation and SAV.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.
Compartments C	Conversion of 5,550 acres wetlands (1,689 acres marsh, 3,544 acres atypical, and 317 acres scrub-shrub) within Compartment C footprint to active agriculture.	Conversion of 5,550 acres wetlands (1,689 acres marsh, 3,544 acres atypical, and 317 acres scrub-shrub) to STAs with emergent vegetation and SAV.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.
Indirect Effects	Improvement in habitat quality expected within the project affected regions from improved timing, frequency, and quantity of water as a result of other projects.	Potential minor benefits to fish and aquatic wildlife habitats within RWMA. Potential major negative effects on fish and wildlife habitat within WCAs 2-A and 3-A.	Same as Alternative B.	Same as Alternative B, with the potential for additional improvements to the Northern Estuaries, and potential for enhanced dry-season deliveries of water to WCA 3A and ENP.	

Table 4-10. Alternatives Evaluation Matrix (continued)

Assessed Resource	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C	Alternative D	Alternative E
Threatened and Endangered Species					
Birds					
Audubon crested caracara	No impact to preferred foraging or nesting habitat.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Cape Sable seaside sparrow	No impact due to distance of project from suitable habitat.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Everglade snail kite	Conversion of 5,223 acres potential foraging habitat within Compartments B and C footprint to agriculture.	Potential negative indirect impacts to habitats within the northern portions of WCA 2A and 3A. Conversion of 5,223 acres potential foraging habitat within Compartments B and C footprint to STAs with emergent vegetation and SAV.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.
Woodstork	Conversion of 5,223 acres potential foraging habitat within Compartments B and C footprint to agriculture.	Potential negative indirect impacts to habitats within the northern portions of WCA 2A and 3A. Conversion of 5,223 acres potential foraging habitat within Compartments B and C footprint to STAs with emergent vegetation and SAV.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.
Fish					
Opossum pipefish	Improvement in habitat quality and migratory ability expected from improved timing, frequency, and quantity of freshwater releases to the Northern Estuaries as a result of other projects.	Same as Alternative A.	No change in conditions from Alternative A.	Additional diversions of freshwater Lake releases to STA 3/4 afforded by the Build-out would further improve habitat in Northern Estuaries and upstream habitats.	
Smalltooth sawfish	Foraging habitat quality (seagrass and mangrove habitat) expected to improve from better timing, frequency, and quantity of freshwater releases to the Northern Estuaries resulting from other projects.	Same as Alternative A.	Same as Alternative A.	Additional diversions of freshwater Lake releases to STA 3/4 afforded by the Build-out would further improve habitat in Northern Estuaries.	
Mammals					
West Indian manatee	Improvement in foraging habitat (seagrass) quality in the Northern	Same as Alternative A.	Same as Alternative A.	Additional diversions of freshwater Lake releases to STA 3/4 afforded by the Build-	

Table 4-10. Alternatives Evaluation Matrix (continued)

Assessed Resource	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C	Alternative D	Alternative E
	Estuaries from better timing, frequency, and quantity of freshwater releases to the Northern Estuaries as a result of other projects.			out would further improve habitat in Northern Estuaries.	
Florida panther	No direct or indirect impact.	No direct impact to preferred or long-term panther habitat within the Build-out footprints. Overall conversion of potential ranging and resting habitat and 317 acres potential foraging habitat (scrub/shrub wetlands) would be off set by the preservation of 101,066 acres of land within primary and other panther zones from CERP Band 1/Accelerate projects.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.
Plants					
Johnsons seagrass	Enhanced seagrass habitat from improvements in timing, frequency, and quantity of freshwater releases to the Northern Estuaries resulting form other projects.	Same as Alternative A.	Same as Alternative A.	Additional diversions of freshwater Lake releases to STA 3/4 afforded by the Build-out would further improve habitat.	
Okeechobee gourd	Enhancement of habitat expected from hydrology improvements resulting from other projects.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Assumed to be the same as other alternatives with comparable conditions.
Reptiles					
American alligator	Conversion of 4,906 acres freshwater marsh potential foraging habitat in Compartments B and C to active agricultural lands.	Conversion of 4906 acres freshwater marsh potential foraging habitat in Compartments B and C to STAs with emergent vegetation and SAV, which would be accessible to alligators. Temporary displacement of alligators during construction.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.
Sea turtles	Foraging habitat quality (seagrass habitat) expected to improve from better timing, frequency, and quantity of freshwater releases to	Same as Alternative A.	Same as Alternative A.	Additional diversions of freshwater Lake releases to STA 3/4 afforded by the Build-out would further improve foraging habitat in Northern Estuaries.	

Table 4-10. Alternatives Evaluation Matrix (continued)

Assessed Resource	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C	Alternative D	Alternative E
	the Northern Estuaries resulting from other projects.				
Eastern Indigo snake	No direct or indirect impact.	No direct or indirect effect to preferred habitat. Loss of potential foraging habitat in Compartments B and C from conversion of 7,593 acres of atypical wetlands to STAs.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.
Essential Fish Habitat	N/A	N/A	N/A	N/A	N/A
Land Use					
Land use patterns	Conversion of wetlands and inactive agricultural lands to active agricultural lands.	Conversion of 13,740 acres of inactive agriculture lands to STAs.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.
Consistency with land use plans and policies	Inconsistent with the Framework Agreement.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Assumed to be the same as other alternatives with comparable conditions.
Recreation Resources					
Direct	No change to recreational opportunities or facilities.	Increased public access for limited recreational facilities and opportunities in Compartments B and C.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.
Indirect	No change in water management practices that influence recreational opportunities or facilities.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Assumed to be the same as other alternatives with comparable conditions.
Aesthetic Resources	Continued to have local landscape dominated by current condition.	Shift from terrestrial landscape (agricultural, dry areas) to wetland (water) landscape.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.
Cultural Resources	Potential degradation of three NRHP-eligible sites and several sites theta contain human resources due to encroaching farming activities.	Potential future erosion of two NRHP-eligible sites and several other sites that contain human remains as a result of exposure to increased water flow during extreme weather events.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.
Socioeconomics					
Population/demographics	No impact.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Assumed to be the same as other alternatives with comparable conditions.
Economic conditions	No impact.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Assumed to be the same as other alternatives with

Table 4-10. Alternatives Evaluation Matrix (continued)

Assessed Resource	Alternative A – No Action	Alternative B (Proposed Action)	Alternative C	Alternative D	Alternative E
					comparable conditions.
Disadvantaged populations	No impact.	Shot term impacts during construction.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.
Transportation, Utilities, and Public Infrastructure	No changes to regional transportation, utilities and infrastructure.	Negligible short-term impacts on roadways from construction traffic.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.
Hazardous, Toxic, and Radioactive Waste	These areas would be predominately agricultural type land use. Potential exists for the use/release of petroleum and/or agricultural chemicals.	Potential exists for the release of petroleum or other chemicals during construction activities. Inundation could pose a threat to foraging/wading avian in areas that may contain contamination.	Same as Alternative B.	Same as Alternative B.	Assumed to be the same as other alternatives with comparable conditions.

5.0 MITIGATION

As defined by the CEQ, Title 40 CFR, Section 1508.20, mitigation requirements include the following:

- Avoiding the impact altogether by not taking a certain action or parts of an action;
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating the impacts over time by preservation and maintenance operations during the life of the action; and
- Compensating for the impacts by replacing or providing substitute resources or environments.

Mitigation measures for the Action Alternatives were identified as BMPs, wetland compensatory mitigation, and cultural resource mitigation, which are discussed in the following sections.

5.1 BEST MANAGEMENT PRACTICES

Standard construction BMPs would be implemented during construction with all the Action Alternatives to avoid affecting the surrounding environments. Standard construction BMPs include, but are not limited to, installing siltation fences to prevent erosion and turbidity barriers to minimize suspended solids in the water column, watering construction sites and roads to reduce dust generation, suspending surface-disturbing activities such as grading during periods of particularly high winds, and maintaining construction equipment according to the manufacturer's specifications. Downstream turbidity would be monitored to ensure state turbidity standards (29 nephelometric turbidity units [NTUs]) are not exceeded.

5.2 AIR RESOURCES

Construction or operation of any of the Action Alternatives would not result in any significant air quality impacts that would require mitigation measures. Nevertheless, a variety of BMPs are customarily employed as standard practices to reduce air emissions, particularly in conjunction with construction. These include measures such as watering construction sites and roads to reduce dust generation, suspending surface-disturbing activities such as grading during periods of particularly high winds, and maintaining construction equipment according to the manufacturer's specifications to reduce air

emissions. The impact analysis assumes these types of measures would be applied and that they would help to minimize air quality effects from the project.

5.3 NOISE

Construction or operation of Alternatives B, C, D, or E would not result in any significant noise impacts that would require mitigation measures. Nevertheless, a variety of BMPs are customarily employed as standard practices to reduce unwanted sound, particularly in conjunction with construction. These include measures such as maintaining construction equipment according to the manufacturer's specifications to reduce noise levels, avoiding extended periods of idling equipment, and limiting construction activity to daytime hours. Seasonal or daily timing restrictions on construction activity adjacent to the Refuge, Everglades WMA or RWMA might be appropriate if it was determined that nesting activity or other sensitive wildlife values were present in those areas.

5.4 ENDANGERED SPECIES

For those actions that may potentially directly or indirectly impact threatened or endangered species, mitigative measures would be developed with the appropriate agency and implemented as special conditions of a permit to ensure the project would not adversely affect threatened or endangered species. The USACE is currently engaged in information consultation with the USFWS for potential impacts to federally listed species as a result of the Proposed Action. Any mitigation measures will be identified and included in the Final EIS.

5.5 TRANSPORTATION AND UTILITIES

Railways that exist in the EAA to transport sugar cane and the mainline railroad, SCFE, are not anticipated to be affected by Action Alternatives B, C, and D based on their distance from Compartments B and C. Construction equipment would be stored on site in designated areas. Excavated material would be kept on site and used for wetland construction. Guards and the contractor's traffic control personnel would be stationed at the site to control access to the project area. There would be no blasting within 500 feet of the Conservation Corbett or Levee Midway lines within Compartment B.

A levee along the southeast perimeter would be constructed to protect FPL land in Compartment B, and STAs are being designed to accommodate the lines running through the SBO. SFWMD would coordinate with FPL to institute a coordination plan for construction and operation practices. Mitigation measures may be required if additional wetlands are impacted or if relocation of utility lines are needed. Formal coordination efforts with FPL would be established once the design process is complete.

5.6 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

Under the No Action Alternative, the land use would remain primarily agricultural; however, it would become active. There is the potential for release of petroleum or agricultural chemicals in these areas with active agricultural land use.

Under Alternatives B, C, and D, current areas of known soil or groundwater contamination need to be addressed before the STAs are constructed and operated. Therefore, mitigative measures would be required.

5.7 WETLANDS

Section 404 of the Clean Water Act (CWA) requires compensatory mitigation to replace aquatic resource functions unavoidably lost or adversely affected by authorized activities. In accordance with the CWA Section 404(b)(1) Guidelines, wetland impacts are first avoided, and if unavoidable are minimized to the maximum extent practicable. The following sections discuss the project's direct and indirect impacts to wetlands and the compensatory mitigation proposed.

5.7.1 Alternatives B, C, and D

The USACE completed wetland jurisdictional determinations for Compartments B and C in June 2007. The SBO of Compartment B contains 3,217 acres of freshwater herbaceous wetland dominated by cattail interspersed with several isolated open-water ponds. The NBO of Compartment B contains 4,049 acres of atypical wetlands, consisting of active and fallow sugar cane, sod farms, open lands, and Brazilian pepper. Compartment C contains 317 acres of scrub-shrub wetlands, 1,689 acres of freshwater marshes with a mix of native and exotic vegetation, and 3,544 acres of atypical wetlands consisting of fallow sugar cane with positive indicators of wetland hydrology and hydric soils. Although a majority of Compartments B and C lands are considered jurisdictional Waters of the United States, much of the existing lands are highly disturbed due to agricultural practices. As a result, wetland functions and values have been severely reduced. The Compartments B and C Build-outs would include construction of STA features including levees, canals, an inflow pump station, and an outflow pump station. The internal cells within the system would be flooded to promote the growth of emergent and submerged aquatic vegetation for water treatment. Compensatory mitigation requirements would be the same for Alternatives B, C, and D.

5.7.2 Alternative E

A wetland jurisdictional determination has not been completed for the 10,137 acres of land considered with Alternative E; however, based on aerial interpretation the land is primarily farmland, which most likely includes atypical wetlands similar to the fallow and active sugar cane fields described in the Compartment B NBO. It is anticipated that the construction of

the STA 1W build-out would include similar features and the internal cells within the STA flooded to promote the growth of emergent and submerged aquatic vegetation for water treatment.

Acme B Basin – Section 24 was identified as potential alternative water treatment lands as STAs, due to its proximity to STA 1E. However, as stated in previous chapters of this document, at the time this Draft EIS was prepared it was not known that a permit application was being submitted by the Village of Wellington to construct an impoundment (STA and recreational area) on this land. A permit application was submitted May 9, 2008 by the Village of Wellington and is currently being reviewed by the USACE. Based on the Jurisdictional Determination, Section 24 includes approximately 114 acres of wetland habitat with nearly 100 percent of herbaceous and shrub vegetation cover. The quality of the wetland is reported in the jurisdictional determination to be degraded, low quality with moderate exotic infestation.

5.7.3 Direct Impacts

5.7.3.1 Alternative A

Under the No Action Alternative there would be impacts to 4,906 acres of marsh wetlands and 317 acres of scrub shrub due to Compartments B and C lands being reverted back to agricultural use. Wetlands would revert back to agricultural land with clearing of vegetation and active pumping and draining.

5.7.3.2 Alternatives B, C, D, and E

Direct wetland impacts from Alternatives B, C, D, and E include re-grading of wetlands, dredging wetlands, placement of fill material into wetlands and any temporary wetland fill necessary for construction staging areas within the project footprint. Wetlands within Compartments B and C, or Alternative E Lands, which are not converted to canals or uplands and that are located in the planned emergent and submerged aquatic vegetation cells would be directly affected by flooding of the cells. The direct impacts to wetlands associated with Action Alternatives B, C, and D include 4,906 acres of freshwater marsh, 7,593 acres of atypical wetlands, and 317 acres of scrub-shrub wetlands, and the direct impacts for Action Alternative E is assumed to be up to 10,137 acres of atypical wetlands.

The Uniform Mitigation Assessment Method (UMAM), Chapter 62-345 FAC, was used to assess the function and value of the Compartment B and C wetlands. UMAM will be used as the functional assessment methodology for determining the compensatory mitigation requirements. This methodology was a result of a legislative mandate to develop a statewide mitigation assessment methodology. UMAM calculates the ecological loss of the impact area, the ecological value of the mitigation area, the amount of time needed for the mitigation

to reach maturity (time-lag), and the risks that might affect the success of the mitigation to estimate the amount of mitigation necessary for the impacts.

Implementation of Alternatives B, C, or D would result in a loss of approximately 7,266 acres for the construction of Compartment B and 5,549 acres for the construction of Compartment C. Based on the UMAM scores this loss equates to 4,386.4 Functional Capacity Units (FCUs). Compensatory wetland mitigation necessary to offset this loss would be required. This mitigation requirement is based on a Future With-Project UMAM score or Functional Capacity Index (FCI) of zero. Some of the jurisdictional areas within the Compartments B and C footprints would be filled for the construction of levees, embankments, pump stations, and other associated features; however, the majority of lands would be flooded and managed to promote the growth of emergent and submerged aquatic vegetation for water treatment. Although STAs are considered wetlands, they are operated to provide water treatment and as such it is not appropriate to give mitigation credit for areas designed as treatment systems that would be managed and operated for treatment purposes rather than for managed and maintained for wetland ecological function and value.

Implementation of Alternative E may result in the loss of approximately 10,137 acres. If Alternative E were selected, a UMAM assessment would be conducted for specific plots of lands identified as jurisdictional wetlands for the STA. Alternative E would have similar features as proposed for Compartments B and C. The jurisdictional areas would be impacted due to the placement of fill for levees, embankments, pump stations, and the like. Jurisdictional areas internal to the treatment cells would be flooded and managed to promote the growth of emergent and submerged aquatic vegetation for water treatment.

5.7.4 Mitigation for Direct Wetland Impacts

Current USACE mitigation guidance focuses on a watershed approach, requiring wetland mitigation to meet the ecological needs of the watershed, use of a functional assessment methodology to offset environmental losses, and protection of wetlands and other aquatic resources that are established as mitigation. Compensatory wetland mitigation options for unavoidable impacts associated with all of the Action Alternatives (Alternatives B, C, D, and E) include the following:

- The Acceler8 system-side mitigation;
- Excess mitigation credits remaining from the original ECP;
- Ecological improvements to downstream wetlands; and
- Vegetation and structural habitat improvements within the footprint of the STAs, including replacement of sugar cane fields with native vegetation and removal of invasive exotic species.

5.7.4.1 Acceler8 System-Wide Mitigation Option

The SFWMD has originally requested the USACE consider the Acceler8 system-wide mitigation evaluation as compensatory mitigation for wetland impacts associated with Compartment B NBO and SBO, and the Compartment C buildout. This is the mitigation plan that was developed for the SFWMD's Acceler8 projects and used in 1) evaluation of DA permits for three Acceler8 permits, 2) EAA A-1 Reservoir, 3) C-44 Reservoir and STA, and 4) C-43 West Storage Reservoir. The Acceler8 system-wide mitigation plan includes accounting for the system-wide interdependencies and watershed benefits of the Acceler8 projects for compensating for wetland impacts as a result of individual Acceler8 projects. The Acceler8 projects are widespread throughout south Florida and will provide ecological benefits to the watershed consistent with the goals and objectives of CERP. The Acceler8 system-wide mitigation evaluation defines the watershed as the south Florida ecosystem. Consistent with CERP, the system is defined as pertaining to the C&SF Project or the south Florida ecosystem as described in Water Resources Development Act of 2000. Implementation of some of the Acceler8 projects will affect overlapping areas throughout the south Florida ecosystem. As such, benefits attributable to individual projects may not be distinguishable once multiple projects are online. For this reason, the USACE agreed to account for the system-wide interdependencies and watershed benefits of the Acceler8 projects operated together as a system rather than rely on individual project benefits.

With the Acceler8 system-wide mitigation evaluation, functional losses associated with individual Acceler8 projects will be offset by the environmental lift to aquatic resources within the south Florida ecosystem. A draft preliminary mitigation ledger was developed based on current project-specific information at that time, Acceler8 system-wide model runs, and analysis by an interagency team consisting of the USACE, SFWMD, USFWS, and USEPA. The Acceler8 mitigation ledger, compensatory mitigation plan, and model runs are described in detail in the Final EIS for the SFWMD's proposed Acceler8 EAA Reservoir A-1 project dated May 19, 2006, and incorporated herein by reference. The Interagency Modeling Center performed model simulations using the SFWMM at the 2010 planning horizon with authorized non-CERP features (e.g., Modified Water Deliveries Project to be constructed by 2010) without and with Acceler8 projects (see Annex D of the EAA A-1 Final EIS). Target areas of the model simulations showing hydrologic effects included Lake Okeechobee, the Northern Estuaries (i.e., the Caloosahatchee and St. Lucie Estuaries), and the Greater Everglades including ENP, WCAs, and Picayune Strand. 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.

DA permits were issued for the EAA A-1 Reservoir, C-44 Reservoir and Stormwater Treatment Area (RSTA), and C-43 West Storage Reservoir (WSR) in July 2006, September 2007, and May 2008, respectively. These projects cumulatively resulted in a loss of 6,436.19 FCUs. A copy of the current Acceler8 system-wide mitigation ledger as updated in January 2008 for the C-43 WSR evaluation is shown in Table 5-1 below.

The January 2008 Acceler8 system-wide mitigation ledger indicates that approximately 6,890 FCUs will be provided to the nearshore habitat of Lake Okeechobee and the St. Lucie and Caloosahatchee Estuaries through implementation of the EAA A-1 Reservoir, the C-44 RSTA, and the C-43 WSR. These credits were sufficient to offset the combined loss of 6,436 FCUs as a result of aquatic resources within the footprints of the EAA A-1 Reservoir, C-44 RSTA, and C-43 WSR. To date, the USACE has not released mitigation credits from the EPA (i.e., the WCAs and ENP) since the operation plan for the EAA A-1 Reservoir has not been approved. Also, some of the Acceler8 projects anticipated to benefit the EPA as described in the EAA A-1 Final EIS are not currently planned for construction by the SFWMD.

Table 5-1. Acceler8 Project Impacts and System-Wide Benefits – January 2008 Draft Mitigation Ledger

Impacts						Benefits									
Acceler8 Project	HUC	Habitat	FCI	Acres	Debits	Acceler8 System-wide Benefits	HUC	Existing FCI	Adjusted FCI	With-Project FCI	Δ	Temporal Lag	Risk Factor	Estimated Acres	Ledger Credits
EAA A-1 Reservoir	3E+06	Atypical Wetalands	0.37	15467.48	5,722.97	Lake Okeechobee Nearshore Habitat	3090202	0.23	0.30	0.43	0.13	1.28	3.00	50,000.00	1,692.71
		Canals	0.57	149.83	85.40	St. Lucie Estuary	3090202	0.33	0.33	0.53	0.20	1.28	2.00	5,120.00	400.00
		Wetlands	0.43	187.63	80.68	Upper Caloosahatchee Estuary	3090205	0.33	0.33	0.60	0.27	1.28	2.00	4,130.00	435.59
C-44 RSTA	3E+06	Canals	0.30	572.20	171.66	Mid/Lower Caloosahatchee Estuary	3090205	0.33	0.33	0.47	0.14	1.28	2.00	12,170.00	4,361.73
		Wetlands	0.30	44.00	13.20										
		Wetlands	0.50	1.22	0.61										
C-43 Reservoir	######	Canals	0.33	908.60	299.84										
		Wetlands		120.29	51.98										
C-43 Test Cells	3E+06	Canals		24.50	8.09										
		Wetlands		4.49	1.76										-
					-										-
					-										-
					-										-
															-
															-
					-										-
					-										-
				Total	6,436.19									Total	6,890.02
		Net Gain / Loss			453.83										

The EAA A-1 Final EIS originally anticipated that all of the Acceler8 projects would be on line by 2010 with full benefits of the projects by 2020. Some of the projects have been delayed and will not be online by 2010. Other projects such as Broward County Water Preserve Areas, Site 1 impoundment, and Acme Section 24 are anticipated to be constructed by the USACE or other parties (Acme Section 24 to be constructed by the Village of Wellington) rather than the SFWMD. As such, the Acceler8 system-wide mitigation simulation does not reflect those projects anticipated to be implemented by the SFWMD by 2010.

Additionally, the interagency mitigation team's assessment was based on the EAA A-1 reservoir being operated as a priority to receive Lake Okeechobee discharges that would normally be released to the estuaries. Whether EAA A-1 receives Lake Okeechobee regulatory releases or EAA runoff as a priority, the NNRC and Miami Canal send water to EAA A-1 first; therefore, EAA runoff has the first opportunity to reach EAA A-1. This is true in the EAA A-1 Final EIS runs and in the Compartments B and C EIS runs. To date, a final operations plan for the EAA A-1 Reservoir has not been approved, so flows to the south into the Greater Everglades are based on model simulations and assumptions.

Additionally, the EAA A-1 Final EIS Acceler8 simulation shows that the Cape Sable seaside sparrow, 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. Environmental effects to federally listed species as a

result of the 2010 Acceler8 system-wide model simulation were not evaluated because an operations plan for EAA A-1 had not been developed.

Due to model assumptions, delays in construction, lack of an operations plan for EAA A-1 Reservoir, lack of evaluation of effects to federally listed species, and differences in operations of Compartment B associated with implementation of Alternatives B, C, and D, use of the Acceler8 system-wide mitigation for offsetting impacts to aquatic resources within the footprints of Compartment B NBO, Compartment B SBO, and Compartment C would require a new evaluation. The current Acceler8 system-wide mitigation ledger does not reflect changes in conditions that have come about since completion of the EAA A-1 Final EIS.

5.7.4.2 Excess ECP Mitigation

In accordance with the EFA (Chapter 373.4592 (4) Florida Statutes), the SFWMD was required to purchase inholding land, private parcels surrounded by publicly owned land, in the RWMA and other lands to achieve a 2:1 mitigation ratio for 1) the use of Brown's Farm WMA, 2) STA 1 Inflow Works within WCA, and 3) other similar lands. In response, the SFWMD's purchased 29,000 acres of inholdings for the RWMA and 32,039 continuous acres in Hendry and Collier Counties known as the Okaloaccoochee Slough State Forest (OSSF). These areas are actively managed as natural areas. The RWMA was an extensive sawgrass marsh, where the native plant community and soil properties were experiencing marked changes due to increased drainage, decreased hydroperiod, drought, and fire. In accordance with the EFA, the SFWMD initiated a hydropattern restoration project within RWMA, and conducted annual interagency progress valuations to assess the progress of the improvements from these measures. The OSSF is being managed through a cooperative agreement between the FDEP, the Division of Forestry of the Florida Department of Community Services, the FFWCC, and the SFWMD. The objective of the OSSF management plan is to maintain high-quality diversified natural vegetative communities, including freshwater marshes and swamps, depressional marshes, dome swamps, and hydric hammocks.

The SFWMD's purchase of the 61,039 acres of land mentioned above provided a 15:1 mitigation ratio, which exceeded the 2:1 mitigation ratio required under the EFA. The SFWMD is proposing to utilize the appropriate amount of this excess mitigation as required by UMAM for the Compartments B and C Build-out Project.

The original DA permit for the ECP included direct construction impacts (excluding STA-3/4) totaling 1,081 acres consisting of: 141 acres within the northern edges of the WCAs, 698 acres of remnant Everglades within STA-2 (Brown's Farm) and RWMA, 664 acres of agricultural land, and 11 acres of canal littoral zone. In addition, the works authorized

resulted in the flooding, of depths up to 4 feet, of an additional 4,460 acres of remnant Everglades and 42,164 acres of agricultural lands. Partial mitigation credit was given for hydropattern improvement in the WCAs and the permit required acquisition and management of 9,320 acres of lands in the region as partial mitigation to provide functional replacement for remnant wetland areas at a ration of 2:1 consistent with the EFA mitigation requirements. The USACE issued DA permits in August 2005 and December 2005 for the expansion of the ECP through construction of STA-2 Cell-4 and STA-5 Flowway-3, respectively. As mitigation for impacts associated with the STA expansions, the USACE required a 1:1 acreage replacement for the total acreage of lands impacted. This amounted to 4,547 acres provided through the previous mitigation efforts at RWMA and OSSF.

USACE regulatory practices include evaluation of potential offsite mitigation areas for offsetting future impacts, at the time of establishment of the mitigation area, not after the restoration work has been done. Additionally, the USACE regulatory program has traditionally used acres as the standard measure for determining impacts and the amount of required mitigation for wetlands and other aquatic resources as was done in the original ECP DA permit evaluation. Current USACE regulatory guidance encourages the use of functional assessments such as UMAM to consider the ecological functions of an impact site fully and to ensure a minimum one-to-one functional replacement as compensatory mitigation. Since the restoration work at RWMA was completed without a functional assessment of the baseline and restored condition, there is no established ecological lift for the restoration activities. Although the ecological lift in the impacted portion of RWMA was moderate, there has been a high time lag from completion of the restoration. The ecological lift in OSSF is relatively low due to mitigation primarily being in the form of preservation. At this time, the number of ecological credits remaining in RWMA and OSSF, if any, can not be determined and a UMAM analysis including ecological lift or credits generated at RWMA, OSSF and ecological loss as a result of the ECP, the STA expansions, and the proposed project would be needed.

5.7.4.3 Ecological Improvements to Downstream Wetlands

Stepping down from the Acceler8 System-wide mitigation evaluation, the SFWMD has suggested the USACE consider the environmental benefits associated with implementation of STAs on Compartments B and C as mitigation to offset the wetland and aquatic resource losses associated with construction. This basic concept of “self-mitigation” is not unusual in the context of environmental restoration activities. Self-mitigation occurs when a project possesses environmental benefits that outweigh and override any adverse consequences of the project. Where the positive effects equal or exceed the adverse impact, additional mitigation should not be required.

Environmental benefits are expected to result from the construction and operation of STAs on Compartments B and C (Alternatives B, C, and D) and construction of STAs on other lands in the EAA and Acme Basin B – Section 24 (Alternative E). These additional proposed STAs are anticipated to improve watershed functions and provide environmental benefits to the downstream wetlands within the south Florida ecosystem. These environmental benefits include reducing extreme high and low water level events, restoring sheet flow, and controlling seepage. Furthermore, there would be improvements in water quality as a result of water diversions and storage in stormwater treatment areas prior to discharging into the natural system. Specifically, wetland impacts as a result of the construction of the STAs are proposed to be offset by the ecological lift gained by improving the timing, distribution, quantity and quality of water delivered to WCA 2A, WCA 3A, and/or RWMA for Alternatives B, C, and D, and to the Refuge for Alternative E.

For Alternatives B, C, and D, the Compartment B Build-out Project has two components: the NBO and the SBO. The NBO contains five treatment cells (emergent and SAV) and would be operated in series with existing STA 2, Cell 4. The SBO is a triangular-shaped parcel containing two cells (emergent and SAV) located directly south of the existing STA 2, Cell 4. Treated water from the NBO and the SBO would sheetflow into wetlands in WCA-2A via a common 1,600 cfs capacity outflow pump station over 10,400 feet of L-6 Canal east levee that would be brought to natural grade. This 10,400-foot levee degradation would be an expansion of the existing 3,400-foot section of degraded lower L-6 Canal east levee. For Alternatives B, C, and D, the amount of water entering WCA 2A would be similar. The total volume delivered to the WCA 2A under Alternatives B, C, and D could increase by 20 percent or more. For Alternative D1, water would be delivered from Compartment B directly to WCA 3A via the S-11 Structure.

For Alternatives B, C, and D, including Alternative D1, the Compartment C Build-out is an expansion of the existing STAs 5 and 6. Compartment C Build-out consists of emergent and SAV cells that would treat stormwater runoff from C-139 and C-139 Annex Basins. Compartment C include a 1,630 cfs inflow pump station and discharge structures that would ultimately supply treated water into WCA 3A and RWMA.

For Alternative E, the project considered lands located to the west of STA 1W and within the EAA. Alternative E also assumed use of lands located east of STA 1E known as Acme Basin B Section 24. With implementation of Alternative E, water would stay in the basin and be treated rather than being sent to tide or to another basin for treatment (Alternative B). This water would then be available to the Refuge on an as-needed basis.

For Alternatives B, C, D, and E, environmental benefits include restoring the natural hydroperiod and hydropattern in the downstream wetlands, which improves the ecological

function throughout the wetland systems in the WCA 2A, WCA 3A, RWMA, and/or the Refuge. The increased hydroperiod benefits the downstream wetlands by decreasing soil loss due to oxidation, reducing water column total phosphorous, and improving habitat for many aquatic species. The ecological functionality is improved by providing a higher quality and quantity of water to the receiving downstream wetland systems. This improves the diversity and abundance of fish and wildlife and ultimately increases the fish and wildlife usage. In addition, the increase in water quantity within the downstream wetlands facilitates detrital transport and providing a contiguous buffer of additional foraging habitat for wading birds. Because Alternative A would continue the agricultural operations on the project site, no change in downstream environmental conditions is expected in this alternative.

Alternatives B, C, D, and E would be implemented using similar management and operational strategies, which are currently in place for existing STAs. The EFA, Section 404, and NPDES permits require the SFWMD to implement a monitoring and assessment program to evaluate ecological changes associated with the existing STAs discharges to downstream WCAs and RWMA. The monitoring and assessment program is designed to evaluate baseline (pre-discharge) and current (post-discharge) ecological conditions in these areas. This monitoring program is expected to provide decision makers with sound ecological data to aid in environmental management decisions for Everglades restoration.

Mitigation credits for water quality improvements are generally not provided unless state water quality standards are met. In that case, the USACE may recognize water quality improvements above and beyond what is required and consider the improvements to be restoration benefits. The opportunities for mitigation credits to be afforded to the SFWMD for hydropattern improvements would be made possible by Compartment B and Compartment C as well as Alternative E. These opportunities are not necessarily a product of the existence of the additional proposed STAs, but rather the hydropattern improvements are largely a function of system operations that have not been evaluated, finalized, or approved. At this time, the USACE has not conducted a NEPA evaluation of the planned operations for the EAA A-1 Reservoir including its functional relationships with existing and additional/proposed STAs; other water management system infrastructure, features, and constraints; nor has full consideration been given to downstream effects of operations on restoration goals, the natural environment, and federally listed species.

Vegetation and structural habitat improvements within the footprint of the STAs include replacement of sugar cane fields with native vegetation and removal of invasive exotic species.

The presence, abundance, health, condition, appropriateness, and distribution of plant communities in surface waters, wetlands, and uplands can be used as indicators to determine

the degree to which the functions of the community type identified are provided. As compared to the current communities in Compartments B & C Build-out areas, Alternative E Lands, and Acme Basin B – Section 24, vegetative and structural habitat improvements within the footprint of the STAs would provide ecological lift to the area. Currently, a majority of the area consists of monotypic sugar cane fields with large areas of invasive exotic vegetation such as Brazilian pepper. The high cover of sugar cane and invasive exotic species provides little habitat value or wetland function due to the alteration of the natural structure of the wetland system. The lack of an appropriate complex wetland community structure further limits the functionality of the system.

With Alternatives B, C, D, and E, the STAs would consist of wetland and aquatic refuge with emergent and submerged aquatic vegetation, which would provide more ecologically valuable habitat for wading birds (foraging habitat), aquatic invertebrates, aquatic reptiles, and amphibians. Existing agricultural canals and ponds would be filled to prevent short-circuiting of the system, but deeper canals (conveyance and collector canals) would continuously provide deeper-water fish habitat. Cells with emergent aquatic vegetation would provide fish bedding and spawning habitat during peak water levels. Aquatic fish and wildlife similar to the species that currently use the EAA are anticipated with all of these alternatives. The Action Alternatives are overall improvements to foraging and nesting habitat for prey birds and other avian species as a result of improved vegetative communities and fish and wildlife with reductions in total phosphorous loads and concentrations entering the WCAs. Vegetation is the base of the food web in any community and provides many additional structural habitat benefits to fish and wildlife. The monotypic and dense growth patterns of sugar cane as well as the areas of invasive exotic vegetation do not afford the same habitat diversity.

The vegetative community structure that would be created as a result of the Action Alternatives includes the creation emergent and submerged aquatic vegetation cells, which would include native plant species such as sawgrass, bulrush , pickerel weed, duck potato, etc. Presence of these species along with other natural recruitment would increase the functionality of these wetlands and provide ecological lift. The wetlands created as STAs would be protected from further development and would provide improved functionality for the system. These wetlands, however, would be part of a manipulated system that would be managed for treatment, not for wetland function and value. As such, routine maintenance is anticipated by the SFWMD, including removal of vegetation and drawdown of the STA cells.

5.7.5 Mitigation for Indirect Impacts

5.7.5.1 Cultural Resources

Alternative A will allow the site to revert to farmland. With this alternative, no mitigative measures are proposed to protect site areas. No archeological resources were identified as a result of surveys within Compartment B. Therefore, no cultural resource mitigation measures for Compartment B would be needed. Three archeological sites within Compartment C have been determined potentially eligible to the NRHP; these and two additional archeological sites contain human remains. Therefore, mitigative measures would be needed for Construction of Compartment C. Further coordination with the SHPO would be needed to determine the specific detail of the mitigation measures.

6.0 COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

Coordination with and evaluation of required compliance with specific federal acts, executive orders, and other policies for the various alternatives was achieved, in part, by coordinating this document with appropriate agencies and the public. This section documents compliance with all applicable federal statutes, executive orders, and policies.

6.1 CLEAN AIR ACT OF 1970, AS AMENDED

The initial Clean Air Act was enacted in 1970 and was dramatically revised and expanded in 1990, giving USEPA broader authority to implement and enforce regulations that reduce acid rain, urban air pollution, and toxic air emissions. As described in Chapter 8, air quality permits may be required for pump stations. SFWMD will apply for these permits, which FDEP and USEPA will review, if necessary. The Proposed Action complies with this statute.

6.2 CLEAN WATER ACT OF 1972, AS AMENDED

The Federal Water Pollution Control Act Amendments of 1972 became commonly known as the Clean Water Act with its amendment in 1977. The act established the basic structure for regulating discharges of pollutants into the waters of the United States.

The Proposed Action would assist existing STAs in making progress towards achieving water quality goals for total phosphorus in the EPA. As described in Chapter 8, the build-out of Compartments B and C would require a Clean Water Act, Section 404 Dredge and Fill Permit issued by USACE. A permit application has been submitted to USACE. In addition, a NPDES Operational permit would be required before the project can be operated. SFWMD would be responsible for obtaining an NPDES permit. The Proposed Action complies with the CWA of 1972, as amended.

6.3 COASTAL ZONE MANAGEMENT ACT OF 1972

The Coastal Zone Management Act of 1972, as amended, provides the national policy to preserve, protect, develop, and restore the nation's coastal zones and was established to encourage states to better manage their coastal resource. The statute assists coastal states in developing state coastal management programs and achieving a balance between competing uses of coastal resources. The statute requires that federal actions that may affect any land or water use of the coastal zone be "consistent" with the enforceable policies of a coastal state's or territory's federally approved coastal management program. The Proposed Action is

consistent with the Florida Coastal Management Program. No comments on the NOI for this EIS have been submitted by the Florida State Clearinghouse.

6.4 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

The purpose of NEPA is "To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality;" Sec. 2 (42 USC Section 4321). It encourages public participation and comment, and it ensures that all branches of government consider environmental consequences of federal projects.

NEPA requires environmental impacts be considered within the federal decision-making process. CEQ established regulations for implementing NEPA (under Title 40 CFR Section 1500). USACE has its own supplemental regulations for complying with NEPA (33 CFR 320) for its Civil Works Program. These regulations call for the preparation of an EIS for authorization of any major federal project that could have significant effects on the environment. The USACE Jacksonville District Commander is the responsible official for NEPA actions within the district. Ultimately, the decision whether to implement the Proposed Action, one of the other Action Alternatives, or the No Action Alternative will be made at USACE Headquarters in Washington DC.

As stated above, NEPA requires environmental impacts be considered within the federal decision-making process. The decision to grant an approval for a change in land use under the Grant Agreement is a federal decision as contemplated by NEPA.

NEPA requires agencies to cooperate with other federal agencies and state and local governments and to involve public stakeholders or citizens. Chapter 8 and Appendix F documents the public involvement process completed as part of this EIS.

6.5 FISH AND WILDLIFE COORDINATION ACT OF 1958

The Fish and Wildlife Coordination Act (FWCA) requires that fish and wildlife receive equal consideration as other project components for proposed water resource development projects and that appropriate mitigation for impacts be provided. This statute is implemented through consultation with the USFWS.

As described in Chapter 7, USFWS is a cooperating agency in developing this EIS. An ongoing consultation process between USACE and USFWS has involved regular communication and exchange of input between the agencies through monthly interagency

coordination meetings, public scoping meetings, and correspondence. A final record of the USFWS determination will be included in the Final EIS.

6.6 MIGRATORY BIRD TREATY ACT OF 1918, AS AMENDED, AND THE MIGRATORY BIRD CONSERVATION ACT

The Migratory Bird Treaty Act (MBTA) of 1918, as amended, prohibits pursuing, hunting, taking, capturing, killing, or selling migratory birds, as identified in the act, through international conventions between the United States and Great Britain, Mexico, Japan, Canada, and Russia. The Migratory Bird Conservation Act establishes a Migratory Bird Conservation Commission that makes decisions acquiring lands or water bodies identified by the Secretary of the Interior as necessary for the conservation of migratory birds.

Many wading birds, including the wood stork, use the Compartments B and C Build-out area for foraging. Wading birds were observed feeding in the footprint of the proposed project, but no nesting activity was observed during the surveys for the 2007 wildlife evaluation report. Foraging habitat within the proposed STA build-out area is marginal at best because of past land-use practices and encroachment by exotic plant species. It is anticipated that the Compartments B and C Build-out Project would improve foraging habitat within the STA expansion. The project complies with these acts.

Burrowing owls are also on the MBTA list of migratory birds. Suitable habitat was not identified within Compartment B in the 2007 wildlife reports (URS 2007a,b). However, burrowing owls were observed by URS field personnel within Compartment B during other studies, and reported to SFWMD (SFWMD 2008b). Burrowing owls have historically used Compartment C. A 2004 map produced by U.S. Sugar Corporation (URS 2007a,b) identifies several burrows within Compartment C, but it is unclear if these were active burrows at that time. During the surveys for the 2007 wildlife evaluation report in the Compartment C build-out footprint, it was concluded that the locations of burrowing owl nests shown on the map were no longer suitable habitat because tall vegetation was present. In addition, no burrowing owls were found during field inspections of existing burrowing owl habitats within Compartment C.

No migratory birds will be adversely affected by the Proposed Action. This action complies with these statutes.

6.7 ENDANGERED SPECIES ACT OF 1973

The Endangered Species Act of 1973 replaced the Endangered Species Conservation Act of 1969 and provides protections for species that are threatened or endangered throughout all or a significant portion of their geographic range and the habitats that those species use. In the ESA, “endangered” species are defined as in danger of extinction throughout all or a

significant portion of its range, "threatened" species are likely to become endangered within the foreseeable future throughout all or a significant portion of its range, and "species of special concern" might need concentrated conservation actions.

Coordination for threatened and endangered species was initiated with USFWS on July 5, 2007. Per agreement between USACE and USFWS, the biological assessment for Compartments B and C will be based on biological evaluations in the EIS, and a letter determination has been sent to the USFWS for concurrence. A biological opinion will be obtained from USFWS before USACE issues the record of decision (ROD) and makes a decision on the Section 404 permit application.

A threatened and endangered species biological survey for the Compartments B and C Build-out Project was completed by URS, Inc. and submitted to SFWMD on September 13, 2007 and January 10, 2008. Data from these reports were used to assess the effects to threatened and endangered species for the species identified. In addition to species identified in the URS report, the EIS assesses effects to all federal and state listed species that are expected to occur in the project-affected area, described in Chapter 3.

6.8 MAGNUSON-STEVENS FISHERY CONSERVATION ACT

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) mandated NMFS and the Fisheries Management Council include the identification and protection of essential fish habitat (EFH) in all federal fishery management plans. NMFS implements and enforces the MSFCMA through consultation with federal agencies required for any federally funded, permitted, or proposed work that may affect EFH.

As documented in Chapter 3, no EFH exists within the footprint of the project or within an extended distance of the proposed project. As a result, consultation with NMFS was not initiated. The Proposed Action complies with this statute.

6.9 MARINE MAMMAL PROTECTION ACT OF 1972, AS AMENDED

The Marine Mammal Protection Act prohibits the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas and also prohibits importation of marine mammals and marine mammal products into the United States. The only marine mammal known to enter waterways within the EAA is the West Indian manatee. The CERP Interagency Manatee Task Force showed that manatees navigated through the Okeechobee Waterway and accessed the EAA canals through the gates at the S-351, S-352 and S-354 structures (CERP 2004). (The task force is made up of representatives from USFWS, FWC, USACE, USGS, the National Park Service, the Miami-Dade Department of Environmental Resources Management, and private researchers.) Subsequently, manatee barriers have been installed at

these control structures; therefore, manatees are not expected within canals adjacent to the project. The Proposed Action complies with the Marine Mammal Protection Act.

6.10 ESTUARY PROTECTION ACT OF 1968

The Estuary Protection Act emphasizes the values of estuaries and the need to conserve these natural resources. The act authorized an inventory and studies of U.S. estuaries to determine whether these areas should be acquired by the federal government for protection, and authorized cost-sharing between the federal and state governments for management of estuary resources.

Water management in Lake Okeechobee periodically involves releasing large quantities of water into these estuaries, resulting in changes in salinity and in dissolved oxygen content, increased turbidity, and nutrification within the estuaries. Alternative D would reduce freshwater releases from Lake Okeechobee to the Northern Estuaries, which include the St. Lucie and Caloosahatchee River Estuaries and the Indian River Lagoon. Other alternatives would not change the frequency, duration, or timing of lake releases. The alternatives would not adversely affect estuaries and comply with this statute.

6.11 NATIONAL HISTORIC PRESERVATION ACT OF 1966, AS AMENDED

The National Historic Preservation Act (NHPA) was enacted to provide adequate protection for historic resources, including archaeological sites. The National Register of Historic Places (NRHP), National Historic Landmarks, and the posts of State Historic Preservation Officers (SHPOs) were established under this act. NHPA requires a Section 106 review for all government-funded construction projects that evaluates impacts to historic resources.

Consultation with the Florida Department of State Division of Historical Resources was initiated in 2003. A Phase 1 cultural resources survey report was prepared for the Compartment B Build-out Project (referred to at that time as Component B). The SHPO found the report complete and sufficient in accordance with Chapter 1A-46, FAC. Based on the report recommendations, SHPO concluded that the proposed Compartment B Build-out Project would have no effect on any historic properties eligible for listing on the NRHP or otherwise of historical or archaeological value.

Consultation was reinitiated in 2005, and through a series of communications that continued through 2007, USACE provided the SHPO with sufficient information to support a finding related to the Compartment C Build-out Project. The cultural resource assessment survey of the Compartment C Build-out project area specified mitigation to minimize effects to three sites eligible for listing on the NRHP and to avoid five sites based on the findings of cultural surveys (Janus Research 2007). The SHPO found the report complete and sufficient in

accordance with Chapter 1A-46, FAC. Based on the report recommendations, SHPO concluded that the proposed Compartment C Build-out Project would have no adverse effect on cultural resources listed or eligible for listing on the NRHP. Because of constraints, however, the USACE has changed the approach from avoidance to relocation for one of the affected sites. USACE will continue to consult with SHPO on this proposed change in mitigation.

USACE also provided the final cultural survey reports to the Seminole Nation of Oklahoma, the Poarch Band of Creek Indians, and the Seminole Tribe of Florida as part of the determination of avoidance and no adverse effect with the federally recognized Native American Tribes.

6.12 RESOURCE CONSERVATION AND RECOVERY ACT OF 1976, AS AMENDED

The Resource Conservation and Recovery Act (RCRA) provides guidance for hazardous waste disposal and gives USEPA the authority to establish waste management laws and regulations. RCRA's primary goals are to protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner.

Chapter 3 discloses the results of investigations of hazardous waste disposals in the project footprint. The proposed project would comply with this statute.

6.13 FARMLAND PROTECTION POLICY ACT OF 1981

The purpose of the Farmland Protection Policy Act (FPPA) is to "minimize the extent to which Federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses..." This project has been coordinated with the Natural Resources Conservation Service (NRCS) and complies with this statute.

6.14 EXECUTIVE ORDER 11988, FLOODPLAIN MANAGEMENT

Executive Order 11988 requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with occupancy and modification of flood plains. It further directs federal agencies to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. The project is in the base floodplain (100-year flood) and has been evaluated in accordance with this executive order. The action is in compliance.

6.15 EXECUTIVE ORDER 11990, PROTECTION OF WETLANDS

Executive Order 11990 requires federal agencies to avoid, to the extent possible, the adverse impacts associated with destruction or modification of wetlands. The action complies with the goals of this executive order.

6.16 EXECUTIVE ORDER 12898, ENVIRONMENTAL JUSTICE

Executive Order 12898 requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. As described in Chapter 4, the effects of the Proposed Action would not be disproportionate toward any minority or low-income populations.

6.17 EXECUTIVE ORDER 13112, INVASIVE SPECIES

Executive Order 13112 requires federal agencies to, among other tasks, prevent the introduction of invasive species, monitor invasive species populations, restore native species and habitat where invasions have occurred, and promote public education. The Proposed Action would reduce total phosphorus loading, which could reduce the proliferation of invasive cattails in the EPA. This action complies with this executive order.

7.0 CONSULTATION AND COORDINATION

Under NEPA, all agencies are required to consider all environmental impacts for federal projects and federal rules. It also requires agencies to cooperate with other federal agencies, and with state and local governments, and to involve public stakeholders or citizens. All persons and organizations that have a potential interest in the Proposed Action are urged to participate in the NEPA environmental analysis process. These persons and organizations may include federal, state, and local agencies; federally recognized Indian tribes; interested stakeholders; and minority, low-income, or disadvantaged populations. Throughout this process, the public may obtain information on the status and progress of the EIS by contacting:

Ms. Tori White
U.S. Army Corps of Engineers, Jacksonville District
1400 Centrepark Boulevard, Suite 750
West Palm Beach, Florida 33401
Telephone (561) 472-8888
E-mail at tori.white@usace.army.mil
Or by fax at (561) 683-2418.

7.1 PUBLIC INVOLVEMENT

The public scoping process was initiated when the NOI to prepare an EIS for the proposed Build-out of Compartments B and C for STAs was published on July 11, 2007 [(72 FR, No. 132, page 37733-37735)(Appendix E)]. The NOI provided information on the purpose and need for the Proposed Action, background, the alternatives to be evaluated, and the geographic locations of the project sites. The NOI further provided dates, times, and locations for the scoping meetings and the point of contact information at USACE to submit comments and receive additional information.

USACE conducted two scoping meetings—one in West Palm Beach, Florida (Palm Beach County) on July 25, 2007, and one in Belle Glade, Florida (Hendry County) on July 26, 2007—in an effort to help identify significant issues and data gaps and to assist in evaluating the alternatives, identifying other alternatives, and analyzing the potential impacts. The locations were selected on the basis of accessibility for the public throughout the primary regions affected by the Proposed Action. Public stakeholders, representatives of federal, state, and local agencies, and federally recognized Indian tribes were contacted through mail as part of the scoping process. The mailing list was prepared using several lists of interested parties from an existing electronic mailing list provided by SFWMD and USACE. Notification was sent out to more than 2,500 people on the Corporate Communications "CERPPROJECTSPROGRAM@evergladesplan.org" e-notification list. This list includes

interested parties who have signed up to receive notifications on the www.evergladesplan.org Web site or at previous USACE public meetings. List members include a broad spectrum of interested parties encompassing private individuals; local, county, state, and federal government and agencies; businesses; educational institutions; elected officials at all levels; and special interest groups. Additionally, the public scoping meetings and request for comments were announced on the USACE Jacksonville District Web site at http://www.saj.usace.army.mil/pao/hotTopics/compartmentB-C_EIS.htm.

As other interested parties are identified, they will be added to the mailing list, which will be updated continuously throughout development and finalization of the EIS. Anyone who requested information on the EIS was added to the mailing list. Persons who attended the public scoping meetings or other meetings also have been added to the list. USACE considered the results of the scoping process to develop a range of alternative actions, including the No Action Alternative, to implement the Proposed Action.

The overall scoping process consisted of the following elements:

- Developing a public participation plan, in accordance with NEPA, as guidance for conducting outreach to the public (Appendix F);
- Publishing and announcing public scoping meetings in the *Federal Register;*
- Distributing a public notice announcing public scoping meetings and locations to newspapers; federal, state, and local agencies and officials; stakeholders; and other interested parties (Appendix F);
- Distributing a press release to media outlets and newspapers (Tables 7-1 and 7-2, and Appendix F);
- Sending agency and tribal consultation letters by mail (Appendix F and Appendix D);
- Holding two public scoping meetings to inform the public about the Proposed Action and to solicit oral and written comments on the issues that should be addressed in the EIS; and
- Reviewing and categorizing oral and written comments to be evaluated in the draft EIS (Appendix F).

Table 7-1. Information on Public Notices Published in Newspapers

Date of Publication	Publication	Location
July 12 and 19, 2007	*Sun-Sentinel*	Broward County, Florida
July 11 and 18, 2007	*Palm Beach Post*	Palm Beach County, Florida
July 12 and 19, 2007	*The Sun*	Hendry County, Florida
July 12 and 19, 2007	*The Clewiston News*	Hendry County, Florida
July 12 and 19, 2007	*Glades County Democrat*	Hendry County, Florida

Table 7-2. Media Outlets that Received Press Release

Name	County
WPTV – 5	Palm Beach, Florida
WPEC – 12	Palm Beach, Florida
WFLX – 29	Palm Beach, Florida
Okeechobee News	Okeechobee, Florida
Sun Sentinel	Broward, Florida
Palm Beach Post	Palm Beach, Florida

7.2 AGENCY AND PUBLIC COMMENTS

Seven stakeholders attended the scoping meeting in West Palm Beach and six stakeholders attended the meeting in Belle Glade. Appendix B contains the scoping report, which includes all the comments received by U.S. mail, e-mail, comment cards, and oral comments given to a court reporter at the scoping meetings. The scoping process resulted in submittal of 12 comments by individuals and one by a government agency. The 12 comments were broken out by issue areas, which are described in Table 7-3 below.

Table 7-3. Issues Identified during Scoping Process

Issue	Number received
Water Resources/Water Supply	10
Biological and Natural Resources	6
Cultural and Archeological Resources	1
Socioeconomics (including Recreation)	5
Other (includes Land Use/Acquisition)	5

7.3 AGENCY COORDINATION

7.3.1 U.S. Fish and Wildlife Service

USACE mailed a consultation letter to the USFWS, on July 5, 2007 (Appendix G). In the letter, USACE invited DOI to become a cooperating agency on the EIS. By letter dated July 26, 2007, DOI accepted cooperating agency status (Appendix G). A separate interagency scoping meeting was deemed not necessary and instead was combined with the public scoping meetings as a result of the early agency involvement via an EIS kickoff meeting in February 2007. Agencies were notified of the public scoping meetings through the public notification process described in Sections 7.1 and 7.2, as well as through e-mail and in person at monthly interagency coordination meetings by USACE (Ms. Tori White).

7.4 OTHER AGENCY AND PUBLIC COORDINATION FOR THE PROPOSED BUILD-OUT OF COMPARTMENTS B AND C

The following meetings and presentations were held to present and discuss the basis of design reports for Compartments B and C:

- Compartment B Critical Criteria Meeting – December 14 and 15, 2006
- Compartment C Critical Criteria Meeting – August 21 and 22, 2007

Such meetings and presentations will continue to be held as appropriate throughout the design phase process.

8.0 PERMITS, LICENSES, AND CONSULTATION

This section summarizes the federal permits, licenses, and consultation that will be required for the build-out of Compartments B and C. SFWMD is responsible for obtaining the required regulatory documents. Chapter 6 described compliance with environmental requirements, which includes many of the same agencies and regulatory requirements.

8.1 CLEAN WATER ACT, SECTION 404 DREDGE AND FILL PERMIT

The build-out of Compartments B and C will require a Clean Water Act Section 404 Dredge and Fill Permit issued by USACE. Under Section 404 of the Clean Water Act, discharge of dredged or fill material into waters of the United States is subject to Section 404 regulation. This EIS has been prepared in accordance with NEPA and CEQ regulations and will serve as the primary document to aid the USACE in its decision to issue, issue with special conditions, or deny the Section 404 Permit for the proposed project. A permit application has been submitted to USACE. Once a ROD has been finalized for the EIS and all NEPA requirements completed, final agency action for the DA 404 permit will be made.

8.2 COASTAL ZONE MANAGEMENT ACT

The National Oceanic and Atmospheric Administration has the authority to administer the federal Coastal Zone Management Program (CZMP) under the Coastal Zone Management Act (CZMA). The purpose of the CZMP is to protect, preserve, develop, restore, or enhance the coastal environment. States are required to develop coastal management programs to protect and manage uses in the coastal zone. The FDEP will determine CZMP consistency for Compartments B and C.

8.3 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The Secretary of Commerce and Fishery Management Council have authority under Public Law 104-208 to protect EFH. Federal agencies are required to consult with the NMFS for activities that are funded, permitted, or carried out that may adversely affect EFH.

8.4 SECTION 7 ENDANGERED SPECIES ACT CONSULTATION

Under Section 7 of ESA, federal agencies are required to consult with the USFWS and/or NMFS for activities that are funded, permitted, or carried out that may affect federally listed species including designated critical habitat.

8.5 CLEAN AIR ACT

Pump stations will be required for the build-out of Compartments B and C, which may require a permit under the CAA. Final compartment pump station designs will control the requirement. SFWMD will apply for these permits during the construction phases of the Compartments B and C build-out, which FDEP and USEPA will review for compliance with the requirements of the CAA.

8.6 EVERGLADES FOREVER ACT PERMIT/SECTION 401 CERTIFICATION

Prior to issuance of a DA 404 permit, State Water Quality Certification (WQC) must be provided. The FDEP will issue the WQC in the form of an EFA permit. Pursuant to Florida Statutes, Chapter 373.4592, Florida Legislature authorizes FDEP to issue EFA permits to SFWMD for projects that are part of the long-term plan. EFA permits required for construction, operation, and maintenance of the STAs on Compartments B and C are issued for 5-year terms and renewed as appropriate. Currently, EFA permits are issued under the ECP for STA 2 (Cells 1 through 4) (FDEP Permit No. 0126704-005) and STAs 5 and 6 (FDEP Permit Nos. 0131842-006 and 0236905-001). SFWMD has submitted applications to modify the existing EFA permits to include Compartments B and C and to implement new permit-related compliance for monitoring.

8.7 NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMIT FOR OPERATIONS

The NPDES permitting program regulates point sources that discharge pollutants in waters of the United States. FDEP administers Florida's NPDES permits under Sections 403.088 and 403.0885 of Florida Statute, from authority granted by USEPA. A decision will be made to either modify existing permits under the ECP or require SFWMD to apply for new permits for operational authorization of Compartments B and C.

8.8 NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM PERMIT FOR CONSTRUCTION

An NPDES permit for construction under FAC Rule 62-621.300(4) will be required for the Compartments B and C build-out. The selected contractor will apply for the NPDES permit from FDEP and must provide a stormwater pollution prevention plan prior to start of construction.

8.9 CLEAN AIR ACT (TITLE V) PERMIT

FDEP is responsible for Title V air permits, which regulate both major and minor facilities based on emissions. In order to determine the applicable air permit for the facility, there are three permitting thresholds to consider:

- Exempt from permitting: Station will consume less than 32,000 gallons per rolling year. This is a self implementing exemption.
- State General Permit: Station will consume less than 250,000 gallons per rolling year. GP can be obtained at least 30 days prior to operation and permit is valid for 5 years.
- Title V Operation Permit: Station has the potential to emit more than 100 tons per year of NO_x. Title V Air Construction Permit must be issued prior to construction. Need about 6 to 8 months lead time to get permit and permit is valid for 5 years.

Final compartment pump station designs will control the requirement. SFWMD will apply for the appropriate permit during the construction phases of the Compartments B and C build-out, which FDEP and USEPA will review for compliance with the requirements of the CAA.

8.10 FEDERAL REQUIREMENTS UNDER 1996 FARM BILL, SECTION 390

The build-out of Compartments B and C will require the approval of the DOI. Under Section 390 of the 1996 Farm Bill (Public Law 104-127, 110 Statue 1022, April 1996), funds were provided to the Secretary of the Interior to fund or conduct restoration activities in the Everglades ecosystem. Under Section 390, the Secretary of the Interior has the responsibility to ensure that Section 390 funds are used for restoration purposes. The Compartment B and C lands were purchased with Section 390 funds and title was transferred to the SFWMD pursuant to a Grant Agreement. Pursuant to the terms of the terms of the Framework Agreement and Grant Agreement referenced in earlier chapters of this EIS, the SFWMD must request and receive approval of the DOI for any change in land use. This EIS serves as the NEPA analysis for the decision on interim land use change for construction.

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