DATE: **August 31, 2005**

TO: **Sue Ray, P.E.**
South Florida Water Management District

FROM: **Barry Meyer, P.E., Engineering Design Manager**
Ed Copeland, P.E., Project Director

SUBJECT: **Project Synopsis of Configuration Chronology**
C-44 Reservoir/Stormwater Treatment Area (STA)
CN040918, Work Order 03, Task 10, P507.5.1.2.3.10

PURPOSE

In accordance with Contract CN040918, Work Order No. 03, *Basis of Design Report – Project Controls and Management*, HDR Engineering, Inc. (HDR) was requested to provide a memorandum documenting the chronology of the various configurations proposed for the C-44 Reservoir/ Stormwater Treatment Area (STA) Project from November 2003 through April 2005. The configurations to be included in the synopsis are:

- Indian River Lagoon-South Project Implementation Report (IRL-S PIR) configuration per the PIR dated March 2004,
- Aquacalma configuration per CDM's Conceptual Design Report dated June 2004,
- 8,000 acre configuration that was the basis of Resolution No. 2004-1247 which was passed by the South Florida Water Management District (District) Governing Board in December 2004,
- 12,000 acre configuration that was the basis of Resolution No. 2005-546 that was passed by the Governing Board in May 2005.

This synopsis provides a brief background on the details and benefits of each configuration and background information on the parties involved and the reasons for moving from one concept to another. Since the cost estimates for each alternative was a factor in moving from one concept to another, the estimated cost for each concept including land costs is presented. The intent of this memorandum is to provide a slightly informed reader with an insight to the various issues surrounding the determination of the configuration for the Project through August 2005 when the land strategy by the District had been finalized.

IRL-S PIR configuration per the PIR dated March 2004

The Indian River Lagoon-South (IRL-South) Project Implementation Report (PIR) / Environmental Impact Statement (EIS) (March 2004) was a collaborative effort between the U.S. Army Corps of Engineers Jacksonville District and the South Florida Water Management District. This report presented the Recommended Plan for the IRL-South components that

included the C-44 Reservoir/STA Project. The PIR Section 7, Recommended Plan, specified the following major components that constitute the C-44 Project:

- C-44 Reservoir
- C-44 East STA
- C-44 West STA

The location of the C-44 Project and the configuration presented in the PIR is shown on Figure 1.0. The Project location presented in the PIR is depicted on the property primarily controlled by the Developer Aquacalma; the north-east portion of the reservoir shown on Figure 1.0 is controlled by other land owners. The PIR Recommended Plan calls for 3,000 acres for the East STA, 3,000 acres for the West STA, and 33,150 acre-feet of storage in a 10-ft deep reservoir. In order to maintain the 33,150 ac-ft storage and 10-ft water depth, a minimum of 3,315 acres would be required for the reservoir. These values are "wet areas" and do not include the additional area for levees, roads, canals, and set-backs from property lines; however, Table 7-3 in the PIR presents the required 9,315 acres as actual real estate to be acquired. In reality, about 15 to 20% additional acreage is required for the additional lands necessary to develop a Project site; the total land to be acquired would be approximately 10,700 to 11,200 acres. Figure 1.0 depicts approximately 13,000 acres for the C-44 Project.

The main purpose of the C-44 reservoir is to capture and detain C-44 Basin stormwater thereby reducing the volume and flow rate of stormwater discharging through S-80 into the St. Lucie Estuary. The C-44 Basin, C-44 Canal, and associated structures are shown on Figure 2.0 (with 12,000 acre property). The capture and attenuation of peak flows in the C-44 Canal potentially helps to reduce the number of extreme events of freshwater discharge to the estuary in conjunction with the other IRL-South components in the Recommended Plan. Analyses performed as part of the PIR indicated that 33,150 acre-ft of storage for the C-44 reservoir would be sufficient to meet the goals presented in the PIR. The additional structural components required for the C-44 Project to achieve the attenuation goals in the estuary included:

- A reservoir pump station on the C-44 Canal with a maximum capacity of 1,100 cubic feet per second (cfs),
- An emergency overflow spillway,
- A reservoir drawdown structure, and
- Pump stations and gated culverts to distribute water from the reservoir to the East and West STAs and discharge of the treated water to the C-44 Canal.

An additional C-44 component discussed in the PIR is a canal to divert up to 250 cfs of water from the C-23 Canal to the C-44 Reservoir/STA Project. The C-23 Canal is located approximately six miles north of the C-44 Project. The diversion canal connecting the C-23 Canal and C-44 Project is not currently included in the design and construction of the C-44 Project except for the required interface of the C-44 Project to the future diversion canal.

An additional benefit of the C-44 Project is to reduce phosphorus and nitrogen nutrient loads from detained C-44 Basin water. Specific nutrient load and load reduction values for phosphorus and nitrogen were not presented for the individual Project components within the main body of the PIR; however, in Appendix A of the PIR, Section A-6, Summary of Water Quality Modeling Results, a table of nutrient load reduction values is provided on page A-370.

C-44 Reservoir/STA Project Phosphorus Removal by Component

Component*	Land Conversion (kg/year)	Irrigation (kg/year)	Reservoir (kg/year)	STA (kg/year)	Total P Removal (kg/year)
C23 to C44 STA	0	0	0	13,447	13,447
C44 East STA	0	0	0	8,005	8,005
C44 Reservoir/ STA	1,057	617	655	12,450	14,779
TOTAL	1,057	617	655	33,902	36,321

* assumed these three components are same as C-44 East STA, West STA, and reservoir

C-44 Reservoir/STA Project Nitrogen Removal by Component

Component*	Land Conversion (kg/year)	Irrigation (kg/year)	Reservoir (kg/year)	STA (kg/year)	Total N Removal (kg/year)
C23 to C44 STA	0	0	0	30,931	30,931
C44 East STA	0	0	0	18,902	18,902
C44 Reservoir/ STA	6,856	7,063	3,834	40,022	57,775
TOTAL	6,856	7,063	3,834	89,855	107,608

* assumed these three components are same as C-44 East STA, West STA, and reservoir

The cost estimate for the IRL-South components is presented in Appendix D of the PIR; the cost estimate was prepared in October 2003. The total estimated cost for the C-44 Project is $244,738,000. The cost of lands is $125,879,000 and the remaining cost that includes design, construction, supervision and administration, and contingencies is $118,859,000. It appears that the PIR configuration may have required the relocation of up to 12 miles of Florida Power & Light (FP&L) high voltage electric transmission lines.

Aquacalma configuration per CDM's Conceptual Design Report dated June 2004

The District approved a cooperation agreement with the Developer Aquacalma, L.P. (Aquacalma) in December 2003 to form a public private partnership (PPP) to provide the land, complete design of the Project, and the construction of the Project. Since the PIR was completed in March 2004, it appears the PIR configuration was adjusted to fit the Aquacalma property, based on changes from earlier draft versions of the PIR and the earlier IRL – South Feasibility Study.

The Developer Aquacalma and their Project Manager, Camp, Dresser, and McKee (CDM), completed a Phase I fatal flaw analysis and conceptual design of a proposed C-44 Project and presented the results in the Conceptual Design Report dated June 2004. The Project as proposed by Aquacalma included additional storage beyond the capacity envisioned in the PIR. This additional storage capacity provided the potential ability to capture a portion of the Lake

Okeechobee regulatory releases in the C-44 Canal. A conceptual site layout for the proposed Aquacalma project is shown on Figure 3.0.

The conceptual design of the Project as proposed by Aquacalma included approximately 7,400 acres of reservoir and 3,400 acres of STAs located on an approximately 12,000 acre site that Aquacalma either owned or held an option to acquire the land. The conceptual design was for a reservoir that would hold a maximum of 10 feet of water with 20 foot high embankments capped with soil cement to protect the side slopes from erosion. The STAs were divided into 20 cells around the perimeter of the reservoir. The design also included a clayey sand core and a toe drain system.

The Aquacalma conceptual design included the following additional components:

- Four 500 cfs electric pumps/engines for a total capacity of 2,000 cfs,
- Control structures to distribute water from the reservoir to the 20 STA cells,
- Control structures to discharge water from the 20 STA cells to the perimeter seepage canal, and
- Control structures to discharge water from the seepage canal to the C-44 Canal.

Additionally, the water could bypass the STAs entirely and exit through a control structure in the reservoir to the seepage canal and back into the C-44 Canal. Except for the inflow pumped into the reservoir, all water was to be gravity drained; therefore a substantial amount of cut was required to establish the STA bottom elevation to allow gravity drainage. The location of the reservoir would require the relocation of approximately 12 miles of FP&L high voltage transmission lines.

It was stated in the CDM report that the 3,400 acres of STA could meet the nutrient load reduction goals presented in the PIR.

The total cost for the Aquacalma C-44 Project was $523 million. This amount included land, design, construction management, and construction costs. Since the District was not provided with a detailed breakdown in the costs it is not known what portion of the costs was attributed to each of the above items; however assuming a land cost of $12,000 per acre, the estimated cost of all activities excluding land cost would be approximately $377 million. The proposed Project costs also included the costs for relocating approximately 12 miles of FP&L high voltage transmission lines. However, subsequent discussions with FP&L indicate that the amount for the relocation contained in the proposed Project costs may have been $10 million lower than FP&L's estimate. Indications were that there may have been a separate agreement between FP&L and Aquacalma relative to relocation and power supply costs.

The District had an independent cost analysis performed for the Aquacalma project and found that the total project cost excluding land was estimated to be $318.5 million; this includes a 25% contingency on construction costs. For this as well as other reasons, the District decided that the Project would not be designed through a PPP, and determined that the conventional design, bid, build (DBB) contracting method would be followed.

Even though the District decided not to proceed with the PPP with Aquacalma, the District was still interested in purchasing part of the Aquacalma property. The District decided that they

would proceed with the design of the Project using one of the General Engineering Service (GES) engineering consultants. HDR was selected to complete the Basis of Design Report (BODR) and the 30% design. Land acquisition was to be negotiated separately with Aquacalma.

8,000 Acre Configuration Approved by the Governing Board in December 2004

In December 2004, Resolution No. 2004-1247 was passed by the District Governing Board authorizing the purchase of a minimum of 7,000 acres (of the original 12,000 acres) of land from Aquacalma. The resolution states that the land would be purchased on April 1, 2007 and Aquacalma would be paid $12,000 per acre with an appreciation rate of 1 and 1/8% or 1 and 1/3% per month. The District also planned to purchase an additional 1,000 acres of land owned by others. The Project location is shown on Figure 4.0 and the land ownership is shown on Figure 5.0.

The reservoir and STA configuration is shown on Figure 6.0. A total of 3,035 acres are available for the reservoir and 3,853 acres are available for the STAs. As shown, this configuration is smaller than the PIR configuration and the reservoir is set back about 3-1/2 miles from the C-44 Canal. Water will be pumped into the reservoir from the C-44 Canal via an intake/discharge canal.

The components of this configuration are similar to the PIR. Water will be pumped into the reservoir from the C-44 Canal via the intake canal. Water from the reservoir will be delivered to the STAs through a discharge structure by either gravity or pumped depending on the water level in the reservoir. The treated water will discharge from the STAs to the perimeter canal through gated structures and routed to one or more discharge canals to the C-44 Canal.

The reservoir footprint or surface area is less than the PIR value for this configuration; however, the water depth would be increased to 11 ft to achieve the required minimum storage capacity.

A number of Dynamic Model for Stormwater Treatment Areas (DMSTA) simulations were performed to determine if 3,853 acres is sufficient to meet the PIR phosphorus removal goals. Based on these analyses, it was determined that there is sufficient treatment area if submerged aquatic vegetation (SAV) is used in conjunction with traditional emergent vegetation. SAV is more difficult to establish and maintain, and is less drought tolerant than emergent vegetation. However, this system may not be capable of effectively treating water from the C-23 Canal with current elevated nutrient levels. Evaluation of data collected in the last 5 years indicates the phosphorus concentrations in the C-23 Canal could be 50 to 75% higher than phosphorus concentrations reported in the PIR.

Preliminary cost estimates indicate the 8,000 acre Project could be constructed, not including land costs within the Acceler8 budget of $318.5 million. Also, this configuration would not require major relocation of FP&L transmission lines.

12,000 Acre Configuration Approved by Governing Board in May, 2005

In April 2005, the District decided to acquire the Aquacalma property now rather than wait until the beginning of construction in 2007. To finalize the land acquisition, it was negotiated to

acquire 12,000 acres of Aquacalma represented property at the current appraised land price of $14,000 per acre with no appreciation rate. The land acquisition, as with the other configurations, would require acquisition of land owned by the Troup-Indiantown Water Control District (TIWCD).

The Project location is shown on Figure 7.0 and the land ownership is shown on Figure 8.0. The Project will consist of a 3,259 acre reservoir with 36,000 to 39,000 acre-feet of storage and 6,100 acres of STA. The reservoir and STA configuration is shown on Figure 9.0.

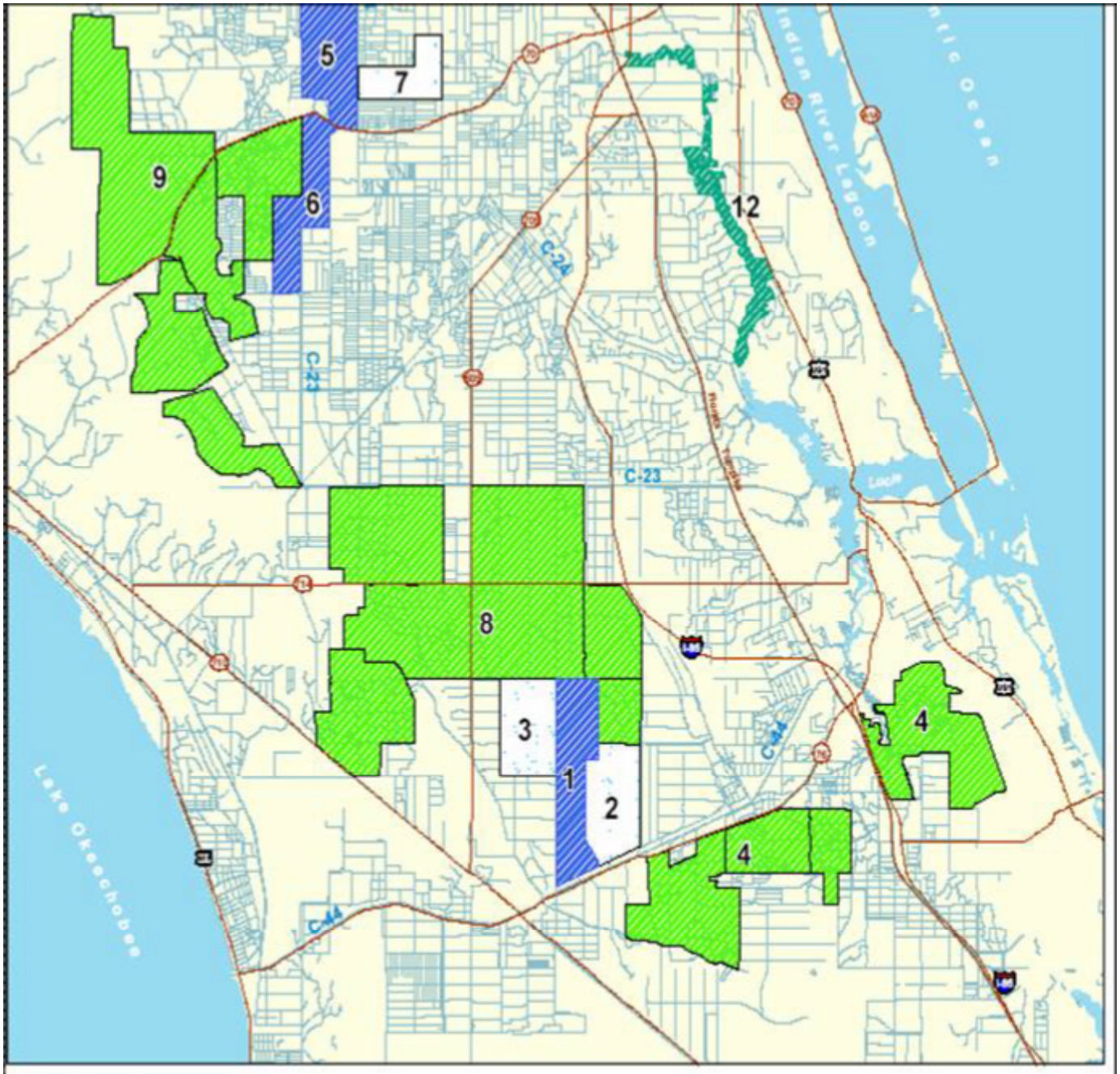
This configuration provides the minimum reservoir storage capacity and the STA acreage identified in the PIR. Water will be pumped into the reservoir from the C-44 Canal via an intake canal. Water from the reservoir will be delivered to the STAs through a discharge structure by either gravity or pumped depending on the water level in the reservoir. The treated water will discharge to the perimeter canal through gated culverts and routed to one or more discharge canals to the C-44 Canal. The three PIR components of the C-44 Project for this configuration are shown on Figure 10.0.

DMSTA simulations were performed to determine if 6,100 acres of STA area is sufficient to meet the PIR phosphorus removal goals. Based on these analyses, it was determined that there is sufficient treatment area with traditional emergent vegetation; SAV is not required. Also, this system would be capable of treating water from the C-23 Canal with current elevated nutrient levels.

Preliminary cost estimates indicate the 12,000 acre Project could be constructed (not including land costs) within the current Acceler8 budget of $329.1 million which includes an estimated $10.6 million for the design, construction, and operation of a test cell program. A detailed Project cost estimate will be provided in the Basis of Design Report (BODR).

HDR is currently proceeding with completion of the BODR followed by 30% level plans and specifications for the 12,000 acre Project. The BODR will be completed in February 2006 and the 30% plans and specifications by July 2006.

Figures



Indian River Lagoon South Recommended Plan

C-44 Basin Components

1 C-44 - Reservoir
2 C-44 - Stormwater Treatment Area
3 C-23/C-44 - Stormwater Treatment Area
4 Palmar Complex - Natural Storage and Water Quality Area

- Natural Floodplain Restoration
- Natural Storage and Water Quality Area
- Reservoir
- Stormwater Treatment Area

Reference: Indian River Lagoon-South Project Implementation Report (IRL-S PIR) dated March 2004

Figure File Name: 03_05._10_Fig 1_KES_090205.grf

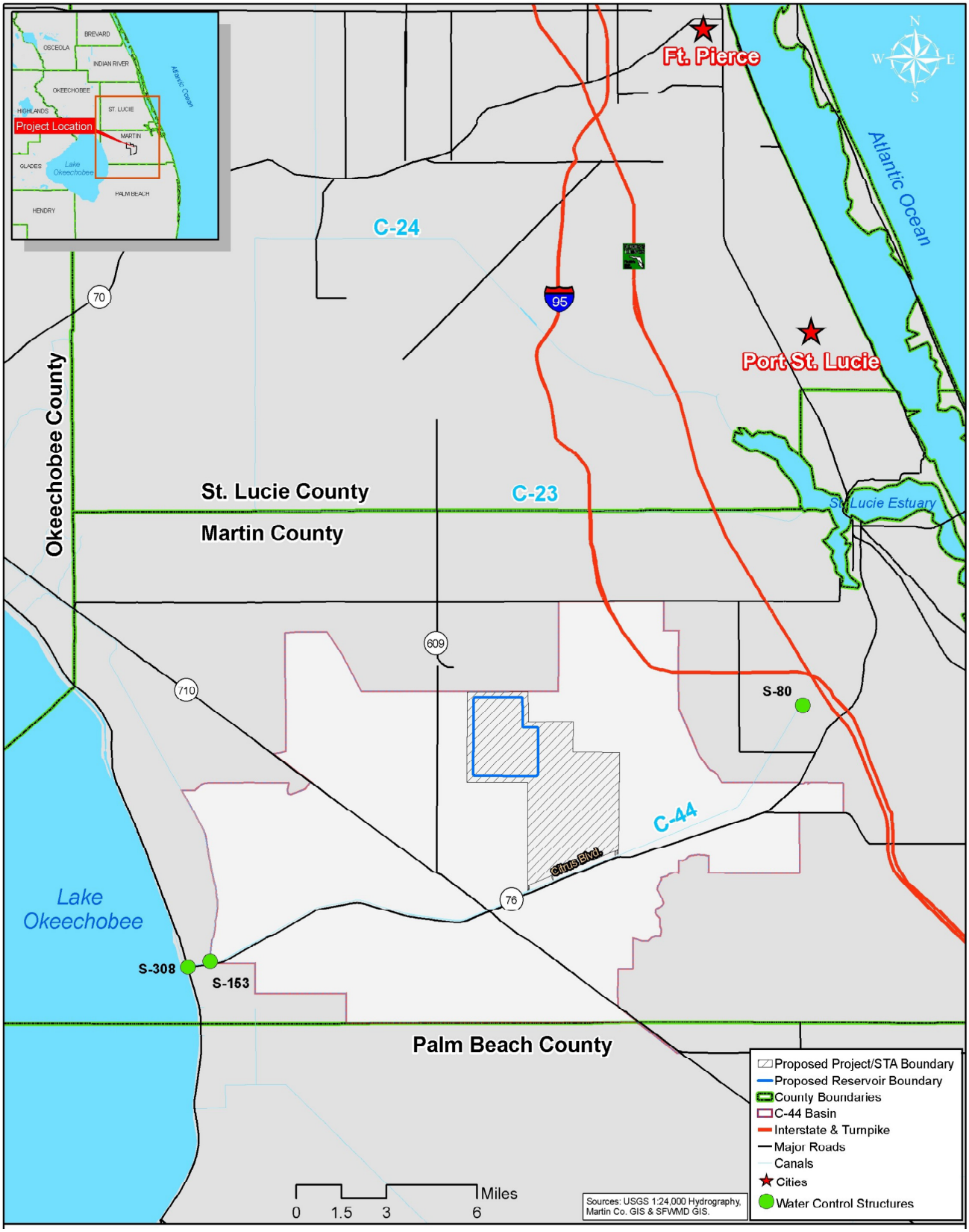
Acceler8
South Florida Water Management District
2301 CenterPark West Drive, Suite #150
West Palm Beach, FL 33406
Tel # (561) 242-5520

HDR ENGINEERING, INC.
2202 N. WEST SHORE BLVD.
SUITE 250
TAMPA, FL 33607
CA 4213

Reccommended Plan from PIR
Synopsis of Configuration Chronology
C-44 Reservoir/STA Project
Contract# CN040918-WO03

DATE
08/31/2005

FIGURE
1.0



Source: E:\Data2\C44_IRLS\map_docs\working\arcmap\map_a_p_location_map_fig1_no_border.mxd

Figure File Name: 03_05._10_Fig 2_KES_090205.grf

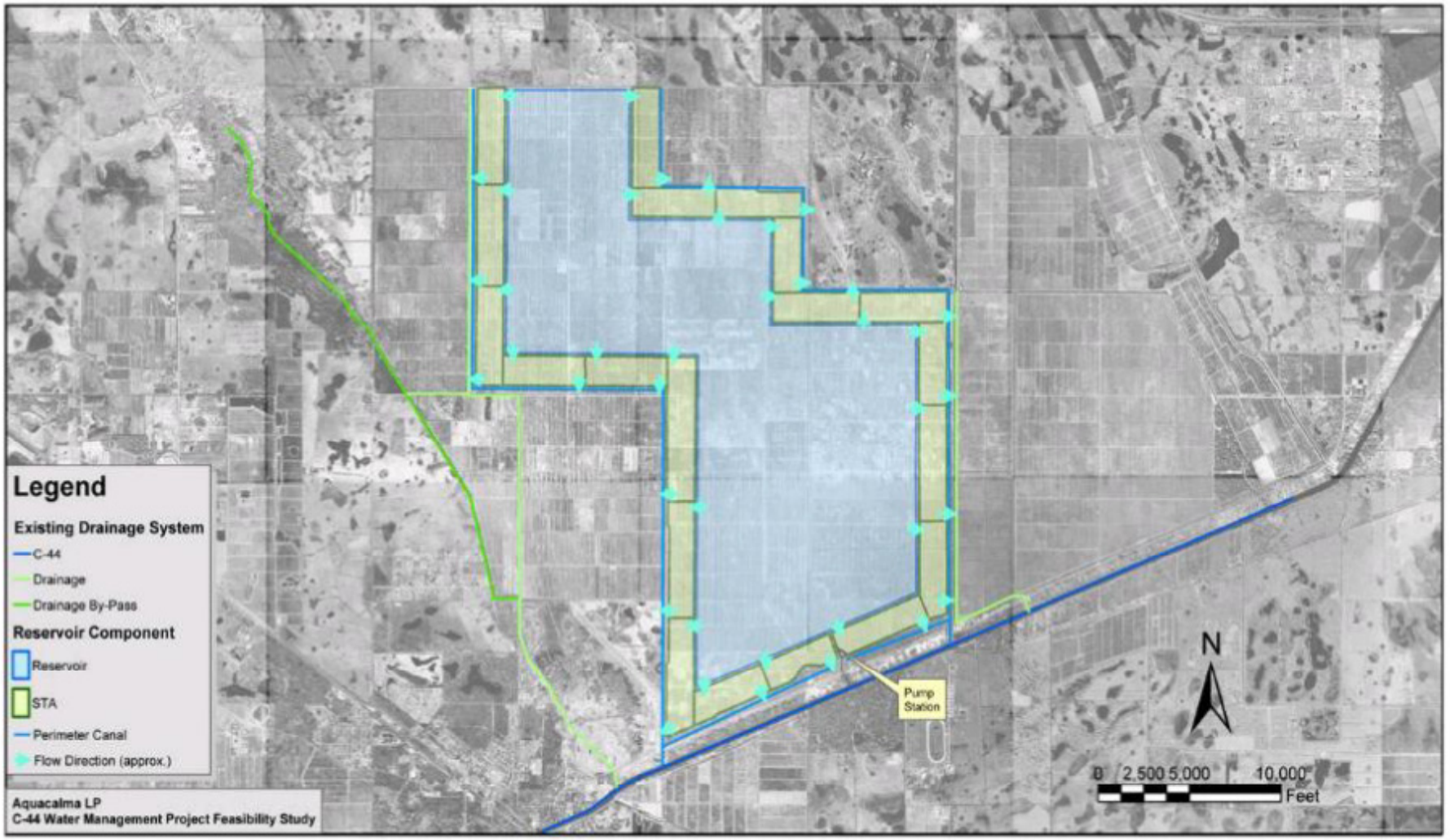
Acceler8
South Florida Water Management District
2301 CenterPark West Drive, Suite #150
West Palm Beach, FL 33406
Tel # (561) 242-5520

HDR ENGINEERING, INC.
2202 N. WEST SHORE BLVD.
SUITE 250
TAMPA, FL 33607
CA 4213

Reservoir/STA Project Location
Synopsis of Configuration Chronology
C-44 Reservoir/STA Project
Contract# CN040918-WO03

DATE
08/31/2005

FIGURE
2.0



Reference: Indian River Lagoon-South Project Implementation Report (IRL-S PIR) dated March 2004

Figure File Name: 03_05._10_Fig 3_KES_090205.grf

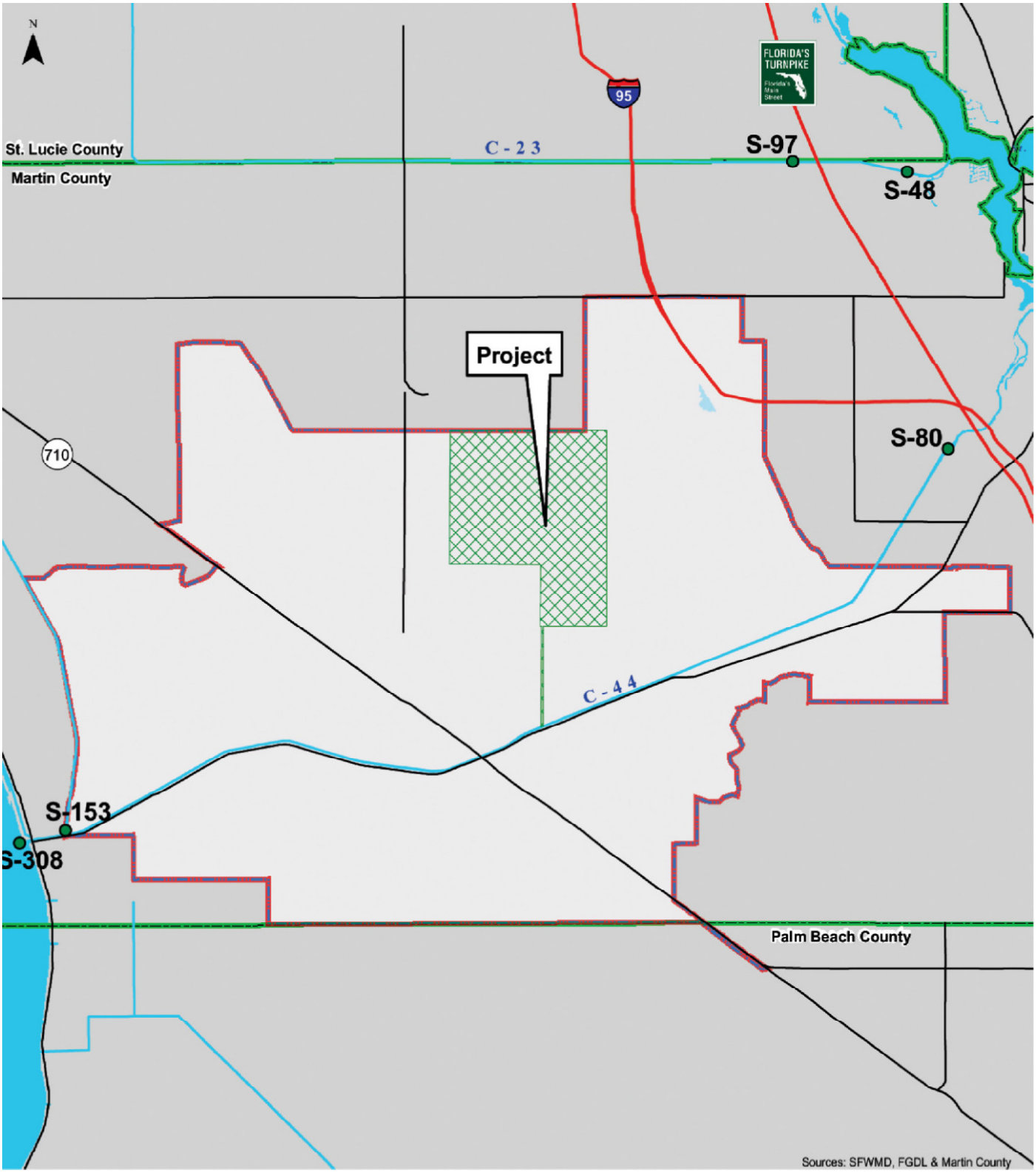
Acceler8
South Florida Water Management District
2301 CenterPark West Drive, Suite #150
West Palm Beach, FL 33406
Tel # (561) 242-5520

HDR ENGINEERING, INC.
2202 N. WEST SHORE BLVD.
SUITE 250
TAMPA, FL 33607
CA 4213

Aquacalma Conceptual Site Layout with 12,000 Acres
Synopsis of Configuration Chronology
C-44 Reservoir/STA Project
Contract# CN040918-WO03

DATE
08/31/2005

FIGURE
3.0



Source: Figure 04.jpg

Figure File Name: 03_05._10_Fig 4_KES_090205.grf

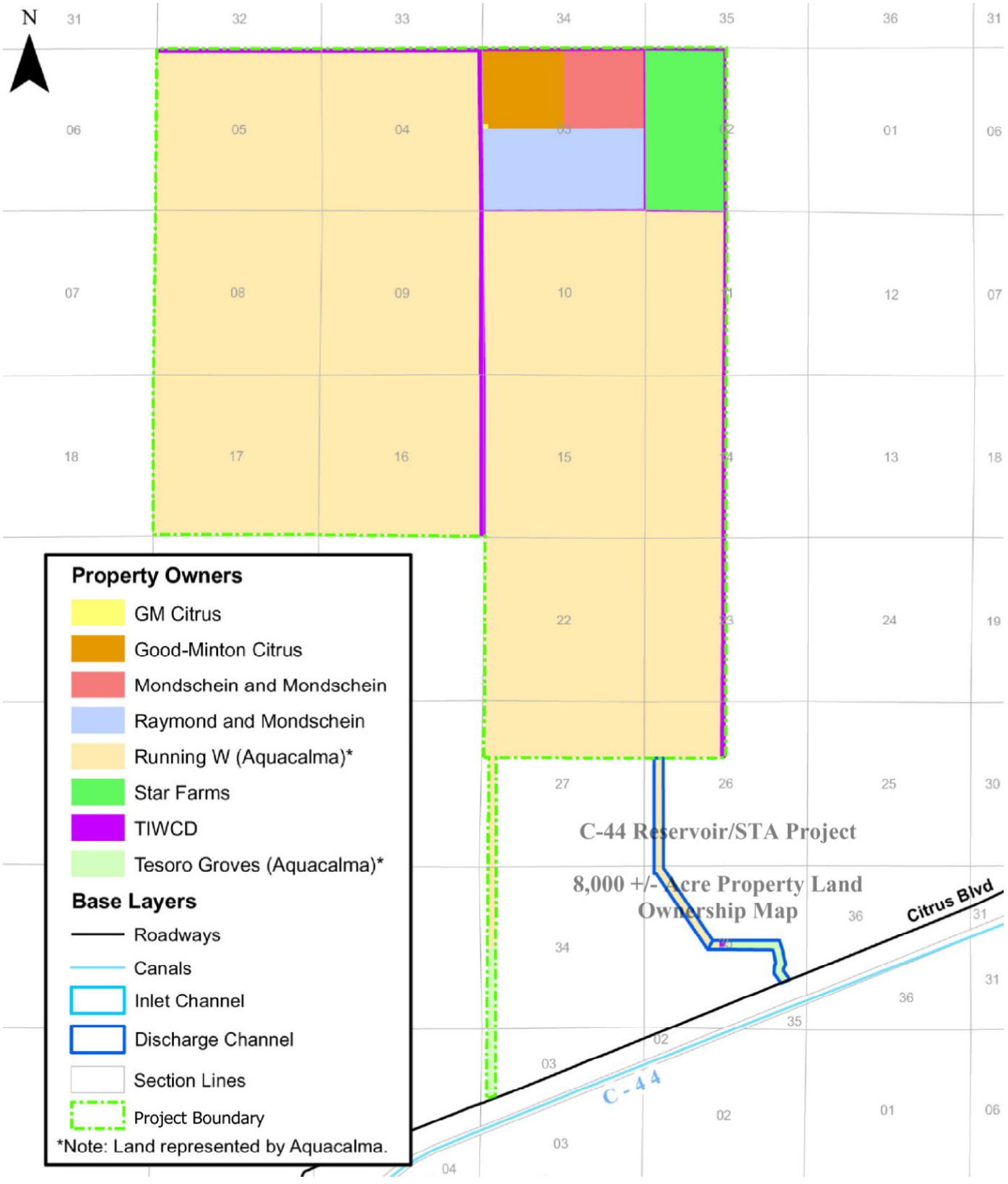
Acceler8
South Florida Water Management District
2301 CenterPark West Drive, Suite #150
West Palm Beach, FL 33406
Tel # (561) 242-5520

HDR ENGINEERING, INC.
2202 N. WEST SHORE BLVD.
SUITE 250
TAMPA, FL 33607
CA 4213

8,000 Acre Property Location
(dated December 2004)
Synopsis of Configuration Chronology
C-44 Reservoir/STA Project
Contract# CN040918-WO03

DATE
08/31/2005

FIGURE
4.0



Source: Figure 05.jpg

Figure File Name: 03_05._10_Fig 5_KES_090205.grf

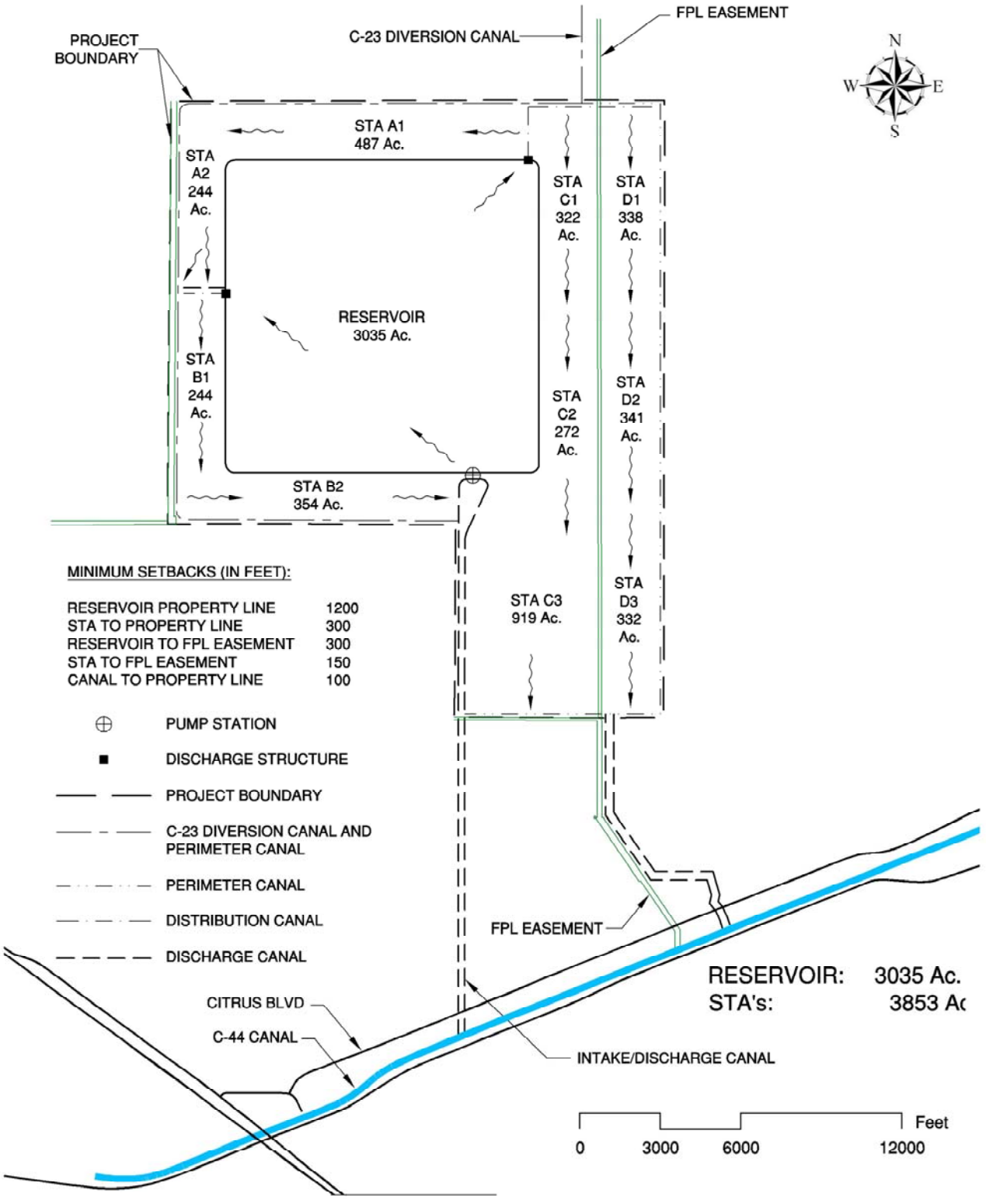
Acceler8
South Florida Water Management District
2301 CenterPark West Drive, Suite #150
West Palm Beach, FL 33406
Tel # (561) 242-5520

HDR ENGINEERING, INC.
2202 N. WEST SHORE BLVD.
SUITE 250
TAMPA, FL 33607
CA 4213

8,000 Acre Property Land Ownership
Synopsis of Configuration Chronology
C-44 Reservoir/STA Project
Contract# CN040918-WO03

DATE
08/31/2005

FIGURE
5.0



Source: WO3-REV02-PPO1.dwg

Figure File Name: 03_05._10_Fig 6_KES_090205.grf

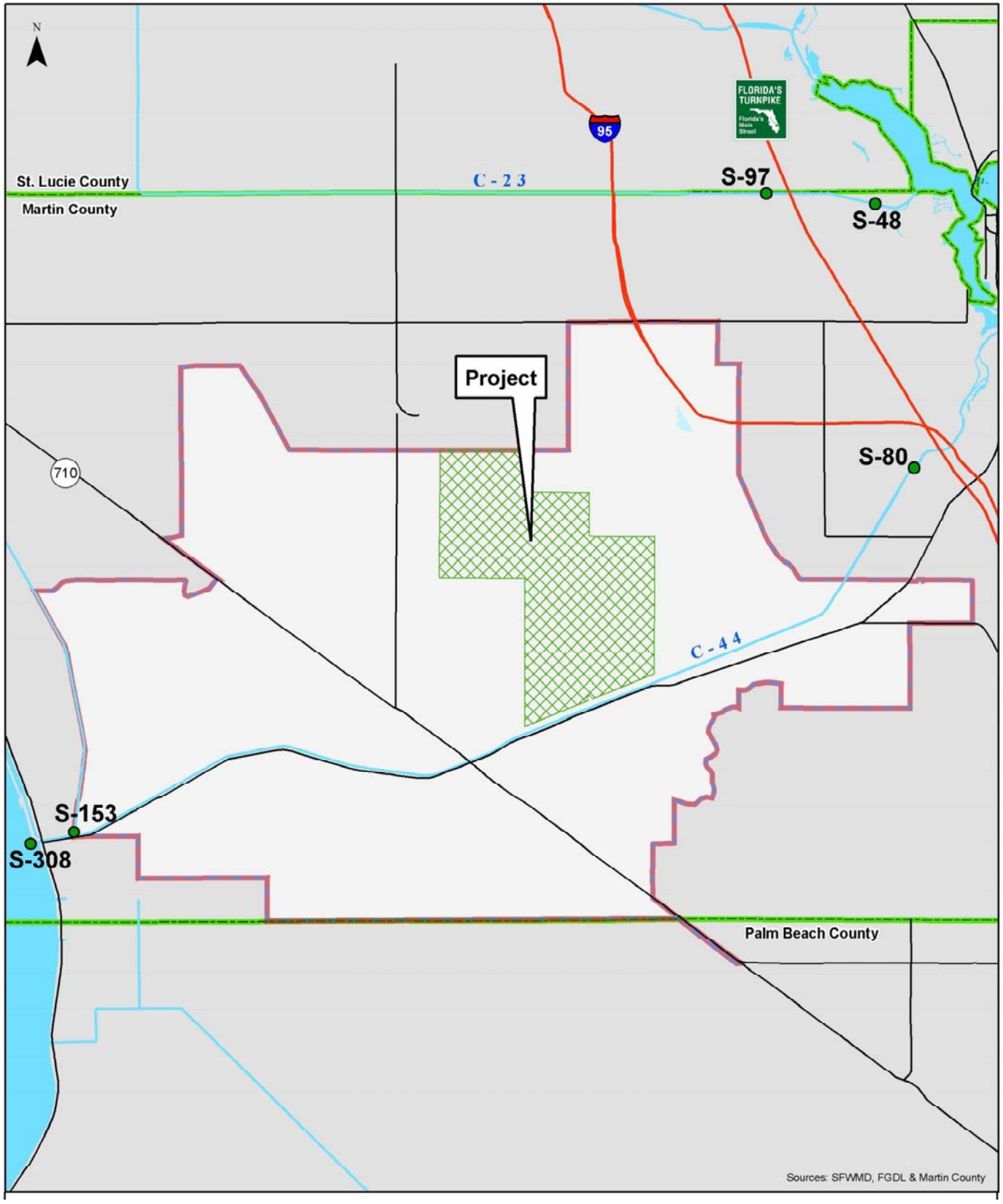
Acceler8
South Florida Water Management District
2301 CenterPark West Drive, Suite #150
West Palm Beach, FL 33406
Tel # (561) 242-5520

HDR ENGINEERING, INC.
2202 N. WEST SHORE BLVD.
SUITE 250
TAMPA, FL 33607
CA 4213

8,000 Acre Reservoir/STA Configuration
Synopsis of Configuration Chronology
C-44 Reservoir/STA Project
Contract# CN040918-WO03

DATE
08/31/2005

FIGURE
6.0



Source: E:\Data2\tampa\C44_IRLS\map_docs\working\arcmap\map_a_p_PPO2.mxd

Figure File Name: 03_05._10_Fig 7_KES_090205.grf

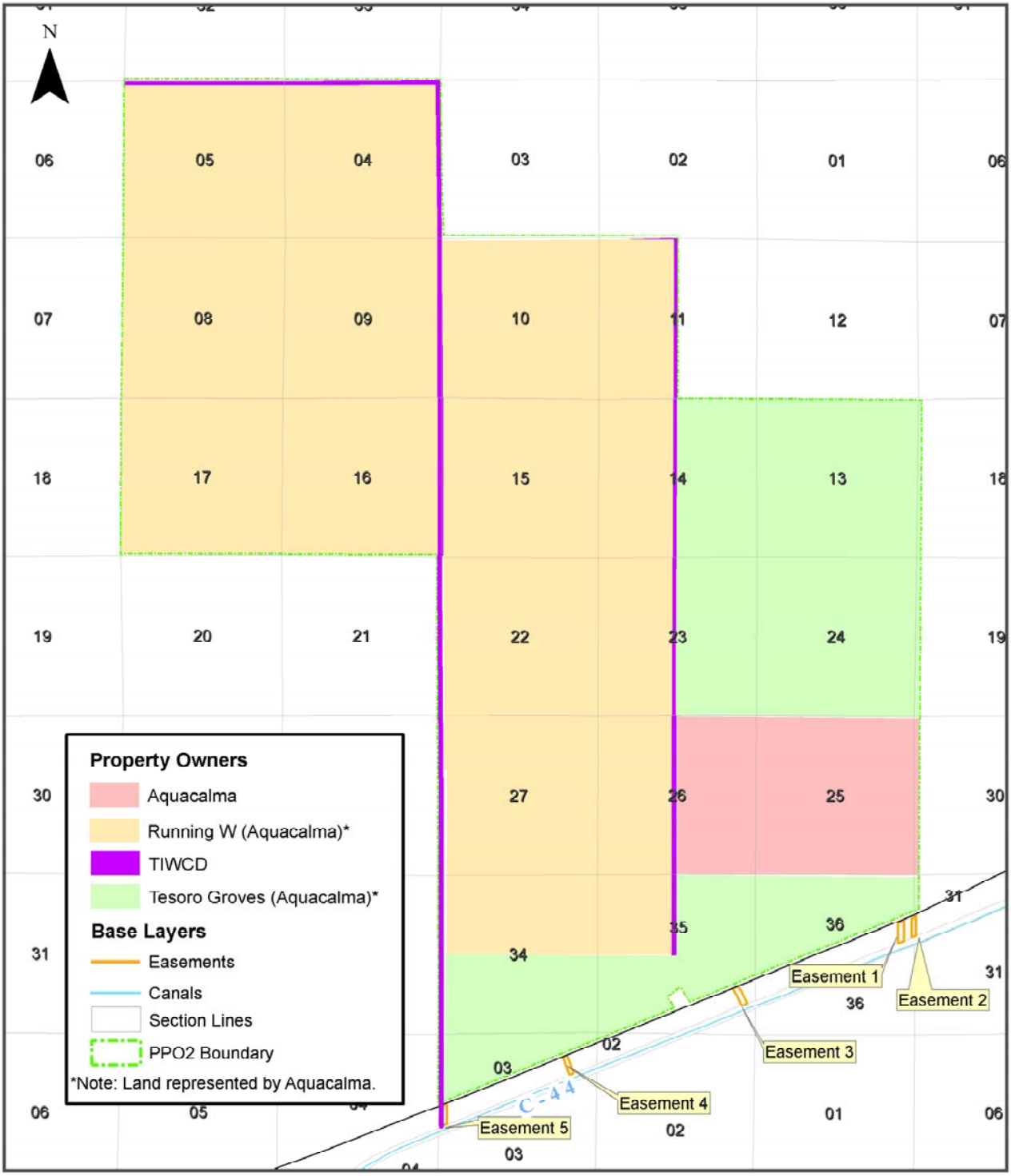
Acceler8
South Florida Water Management District
2301 CenterPark West Drive, Suite #150
West Palm Beach, FL 33406
Tel # (561) 242-5520

HDR ENGINEERING, INC.
2202 N. WEST SHORE BLVD.
SUITE 250
TAMPA, FL 33607
CA 4213

12,000 Acre Property Location (dated May 2005)
Synopsis of Configuration Chronology
C-44 Reservoir/STA Project
Contract# CN040918-WO03

DATE
08/31/2005

FIGURE
7.0



Source: E:\Data2\tampa\C44_IRLS\map_docs\working\arcmap\map_a_p_PPO2_prop_ownership.mxd

Figure File Name: 03_05._10_Fig 8_KES_090205.grf

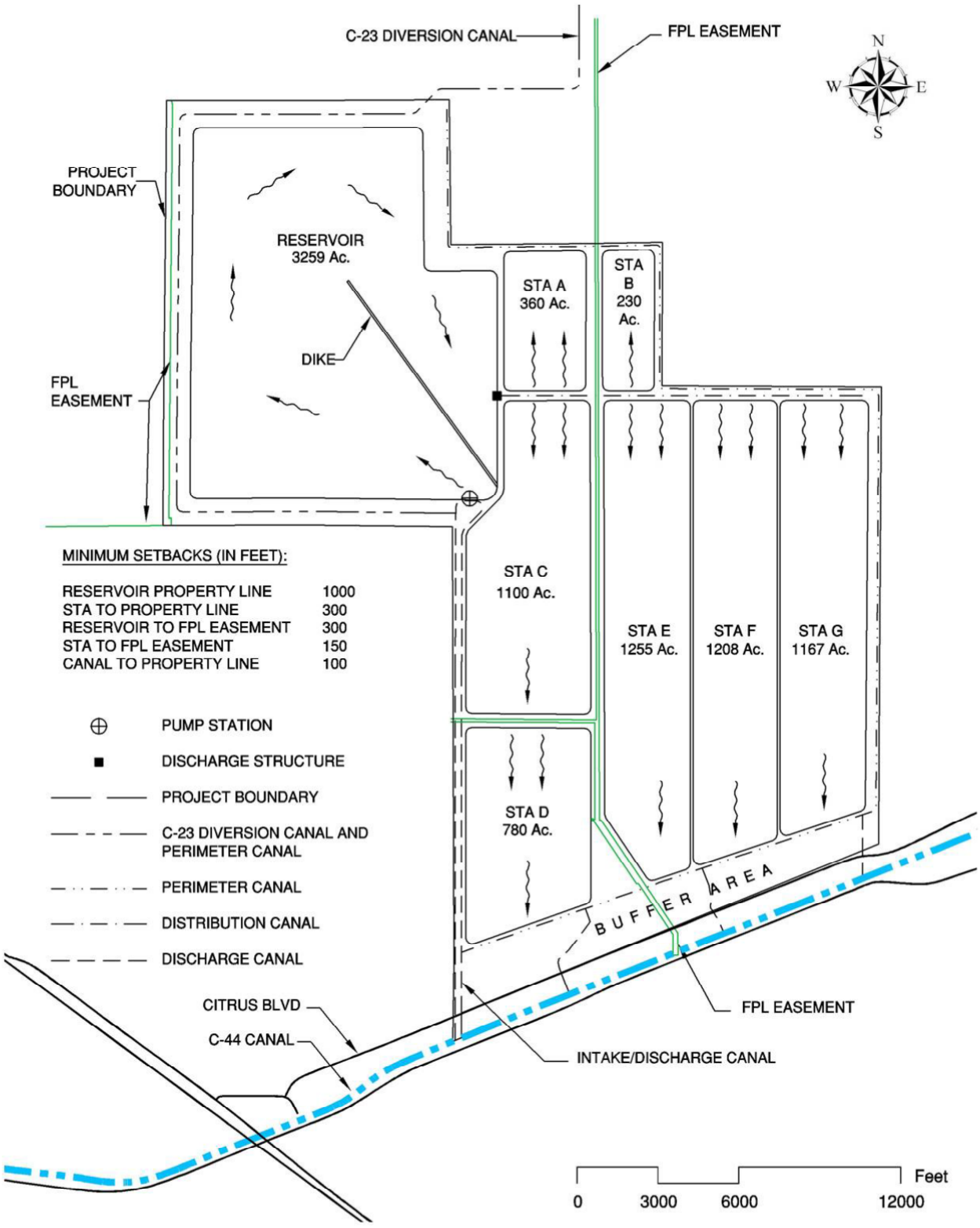
Acceler8
South Florida Water Management District
2301 CenterPark West Drive, Suite #150
West Palm Beach, FL 33406
Tel # (561) 242-5520

HDR ENGINEERING, INC.
2202 N. WEST SHORE BLVD.
SUITE 250
TAMPA, FL 33607
CA 4213

12,000 Acre Property Land Ownership
Synopsis of Configuration Chronology
C-44 Reservoir/STA Project
Contract# CN040918-WO03

DATE
08/31/2005

FIGURE
8.0



Source: WO3-REV02-PPO2.dwg

Figure File Name: 03_05._10_Fig 9_KES_092005.grf

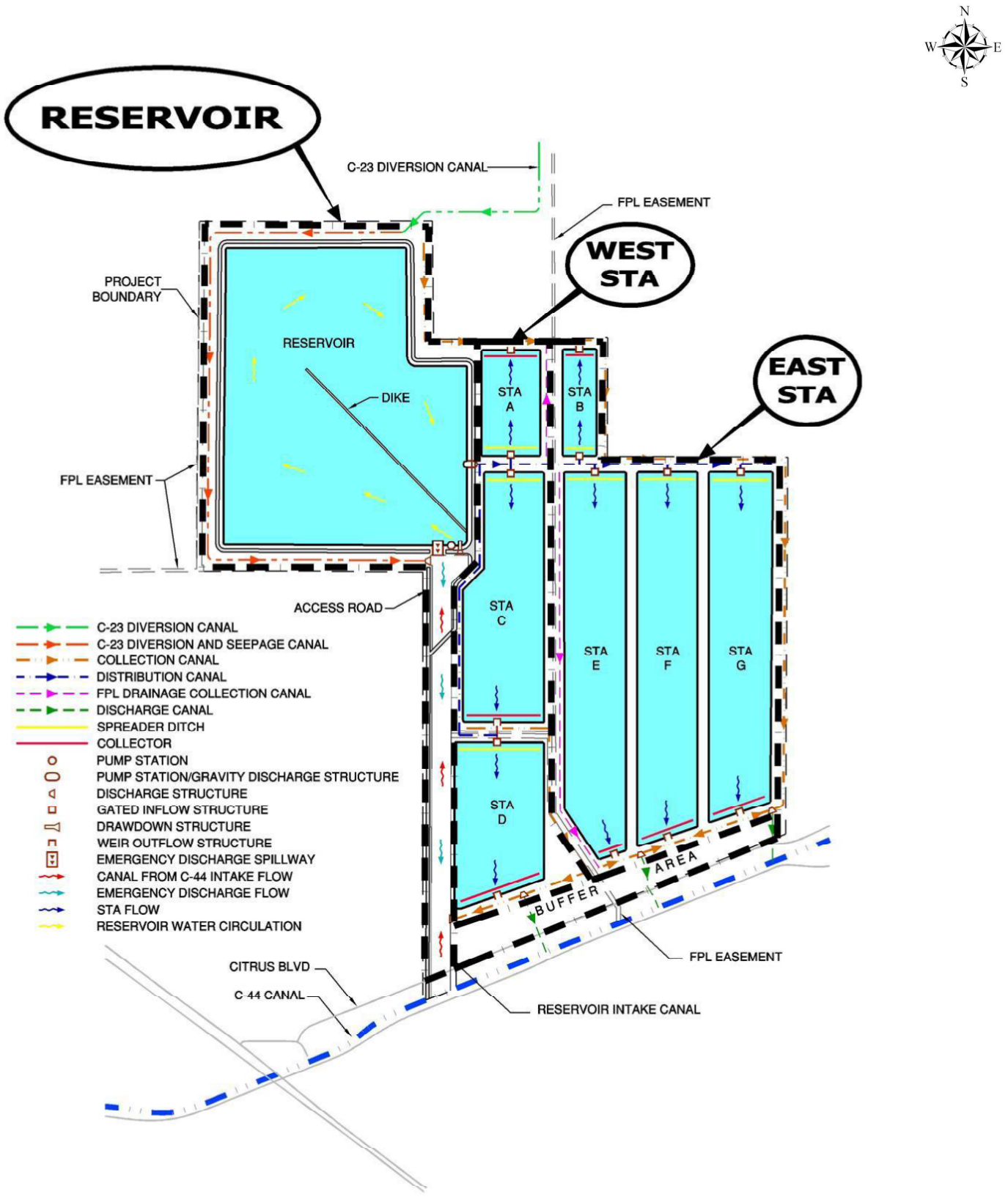
Acceler8
South Florida Water Management District
2301 CenterPark West Drive, Suite #150
West Palm Beach, FL 33406
Tel # (561) 242-5520

HDR ENGINEERING, INC.
2202 N. WEST SHORE BLVD.
SUITE 250
TAMPA, FL 33607
CA 4213

12,000 Acre Reservoir/STA Configuration
Synopsis of Configuration Chronology
C-44 Reservoir/STA Project
Contract# CN040918-WO03

DATE
08/31/2005

FIGURE
9.0



Source: 00C_13.dwg

Figure File Name: 03_05._10_Fig 10_KES_092005.grf

Acceler8
South Florida Water Management District
2301 CenterPark West Drive, Suite #150
West Palm Beach, FL 33406
Tel # (561) 242-5520

HDR ENGINEERING, INC.
2202 N. WEST SHORE BLVD.
SUITE 250
TAMPA, FL 33607
CA 4213

12,000 Acre Reservoir/STA Configuration with PIR Componenets
Synopsis of Configuration Chronology
C-44 Reservoir/STA Project
Contract# CN040918-WO03

DATE
08/31/2005

FIGURE
10.0