

SOUTH FLORIDA WATER MANAGEMENT DISTRICT



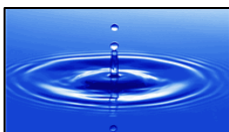
OPERATION PLAN

INTEGRATED

STORMWATER TREATMENT AREAs 5 & 6



UPDATED



August 2007

Gary Goforth, Inc.



CERTIFICATION

I hereby certify, as a Professional Engineer in the State of Florida, that the information in this Operation Plan was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by the South Florida Water Management District or others without specific verification or adaptation by the Engineer. This certification is made in accordance with the provisions of the Laws and Rules of the Florida Board of Professional Engineers under Chapter 61G15-29, Florida Administrative Code.

Gary F. Goforth, P.E. Florida P.E. # 35525

Date: _____

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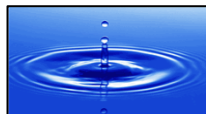
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STA-5 & STA-6 OPERATION PLAN STRUCTURE REFERENCE

Structure ID	Structure Type	Function	Design Capacity (cfs)	Emergency Back-up Power	Operation Type	Page Containing Description	Notes
S-8	Pump station	Discharges treated water from STA-3/4 and STA-5 to WCA-3A	4,160	Diesel engines	Local	23	
G-88	4 72-in CMPs	Transfer water from L-3 to L-4 canal	Subject to HW/TW	N/A	Local	24	flashboards to remain out
~~G-155~~	Structure demolished – function replaced by G-407						
G-342A-F	6 10-ft W x 6-ft H gated box culverts	STA-5 inflow structures	6 @ 300	Generator hookup receptacle; portable generator located at G-406	Local & Remote	11	
G-343A-J	10 10-ft W x 8-ft H gated box culverts	STA-5 intermediate structures	8 (A-H) @ 150; 2 (I & J) @ 300	Generator hookup receptacle; portable generator located at G-406	Local & Remote	13	
G-344A-F	6 10-ft W x 10-ft H gated box culverts	STA-5 outflow structures	6 @ 300	Generator hookup receptacle; portable generator located at G-406	Local & Remote	15	
G-345	2 48-in CMPs	Transfer between Cells 1B and 2B	2 @ 18	Not operable	Local	14	flashboards
G-348	48-in CMP	Seepage return	18	Not operable	Local	20	Flap on w. end
G-349A	Pump station	Seepage return	2 @ 22	Not available	Local & Remote	18	
G-349B	Pump station	Water supply	39	Not available	Local & Remote	22	
G-349C	Pump station	Water supply	2 @ 18-27	Not available	Local & Remote	18	

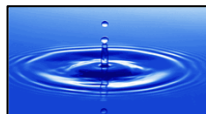




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Integrated STA-5 & 6 Operation Plan

Structure ID	Structure Type	Function	Design Capacity (cfs)	Emergency Back-up Power	Operation Type	Page Containing Description	Notes
~~G-350A~~	Decommissioned						
G-350B	Pump station	Water supply	39	Not available	Local & Remote	23	
G-351	2 open 10-ft W x 9-ft H box culverts	STA-6 Section 2 inlet from L-3	<667	Not operable	Not operable	12	Gates will be added
~~G-360A~~	Decommissioned						
G-352A-C	3 10-ft W x 10-ft H gated box culverts	STA-6 Section 2 outlet structures	3@ 223	Underground line from generator located at G-407; generator hookup receptacle on site	Local & Remote	15	
G-353A-B	2 8-ft W x 6-ft H gated box culverts	STA-6 Cell 5 inlet structures	2 @ 143	Underground line from generator located at G-407; generator hookup receptacle on site	Local & Remote	13	
G-353C	8-ft W x 6-ft H gated box culvert	STA-6 Cell 3 inlet structure	105	Underground line from generator located at G-407; generator hookup receptacle on site	Local & Remote	13	
G-354A-C	3 weir boxes, gates and CMPs	STA-6 Cell 5 outlet structures	3 @ 120	Not needed	Local	16	
G-357	2 10-ft W x 10-ft H gated box culverts	Transfer water from Miami Canal to L-4 canal	Subject to HW/TW		Local & Remote	24	
G-360B	36-in CMP	Seepage	2	Not needed	Local	19	flashboards
G-393A-C	3 weir boxes, gates and CMPs	STA-6 Cell 3 outlet structures	140	Not needed	Local	16	
G-396A-C	3 8-ft W x 8-ft H gated box culverts	STA-6 Section 2 inlet structures	3 @ 223	Underground line from generator located at G-407; generator hookup	Local & Remote	14	





UPDATED

Integrated STA-5 & 6 Operation Plan

Structure ID	Structure Type	Function	Design Capacity (cfs)	Emergency Back-up Power	Operation Type	Page Containing Description	Notes
				receptacle on site			
G-404	Pump station	Discharges STA-3/4 and STA-5 to WCA-3A	3 @ 190		Local & Remote	24	
G-406	2 10-ft W x 9-ft H gated box culverts	Diversion	>1,770 cfs depending on HW/TW	Generator hookup receptacle; generator located on site	Local & Remote	20	
G-407	2 10-ft W x 9-ft H gated box culverts	Diversion	2,000 cfs depending on HW/TW	51kW generator located on site	Local & Remote	21	
G-409	Pump station	Water supply	190	By others	By others	25	
G-507	Pump station	Water supply	67	Not available	Local	22	
G-600	Pump station	Inlet from Compartment C	150	Not available	Local & Remote	12	
G-601 & G-602	Broad crested trapezoidal weirs	STA-6 Cell 5 inflow	N/A	Not needed	Not operable	14	
G-603	Broad crested trapezoidal weir	STA-6 Cell 3 inflow	N/A	Not needed	Not operable	14	
G-604	Structure demolished						
G-607	No longer serves any function; abandoned in place						
C-139 Annex discharge facility	Pump station with supplemental gated culvert	Discharge into L-3 Borrow Canal	3 @ 150	By others	By others	21	Operated by others





1 PROJECT DESCRIPTION

1.1. BACKGROUND

The South Florida Water Management District (District), in accordance with the Everglades Forever Act (EFA), §373.4592, Fla. Stat., and an agreement with the federal government, is implementing the Everglades Construction Project (ECP) in an effort to restore the quality of the water entering the Everglades Protection Area (EPA). The ECP consists of the construction of six treatment marshes that will use natural physical, chemical and biological processes to remove excess nutrients, particularly total phosphorus (TP), from stormwater runoff and other sources prior to discharge into the EPA. Stormwater Treatment Area 5 (STA-5), located adjacent to the northwest corner of the Rotenberger Wildlife Management Area (RWMA), and STA-6, located adjacent to the southwest corner of the RWMA, are the subject of this integrated Operation Plan.

The original STA-5 consisted of 4,110 acres of effective treatment area and began operation in 2000. A 1,985-acre expansion of STA-5 was constructed and is in the Start-up Phase operations. The additional treatment area is the third flow-way of STA-5 and is operated in parallel with the existing two flow-ways. The original STA-6 consisted of 897 acres of effective treatment area and began operation in 1997. STA-6 was expanded by an additional 1,387 acres of effective treatment area. Because of the necessity to synchronize operations of STA-5 and STA-6, this integrated Operation Plan incorporates both of these expanded treatment areas.

These expansions and other treatment area expansions are described in the November 2004 revisions to the *Everglades Protection Area Tributary Basins Long-Term Plan for Achieving Water Quality Goals* (Long-Term Plan) (SFWMD 2003). As part of the adaptive implementation process envisioned by the Long-Term Plan, it was anticipated that further refinements to the recommended water quality improvement measures would be made at the earliest achievable dates as more scientific and engineering information was obtained. One of the key assumptions during the development of the Long-Term Plan was that Compartments B and C (see **Figure 1**) would be under consideration for use as part of the Everglades Agricultural Area (EAA) Storage Reservoir Project, a component of the Comprehensive Everglades Restoration Plan (CERP), through FY 2010. It was therefore assumed that these areas should not be considered for other Everglades restoration uses until FY 2011. Subsequent to completion of the Long-Term Plan, conceptual level analyses indicated that all of the EAA Storage Reservoir Project's CERP water storage goals could be achieved on Compartment A, and that Compartments B and C would not be needed to meet the storage objectives of the EAA Storage Reservoir CERP Project. In light of the availability of the land in Compartments B and C, STA-5 and STA-6 are being expanded to assist in maximizing the treatment effectiveness of the STAs in improving water quality entering the EPA (see **Figure 2**).





Figure 1. Overview of the Everglades Construction Project.

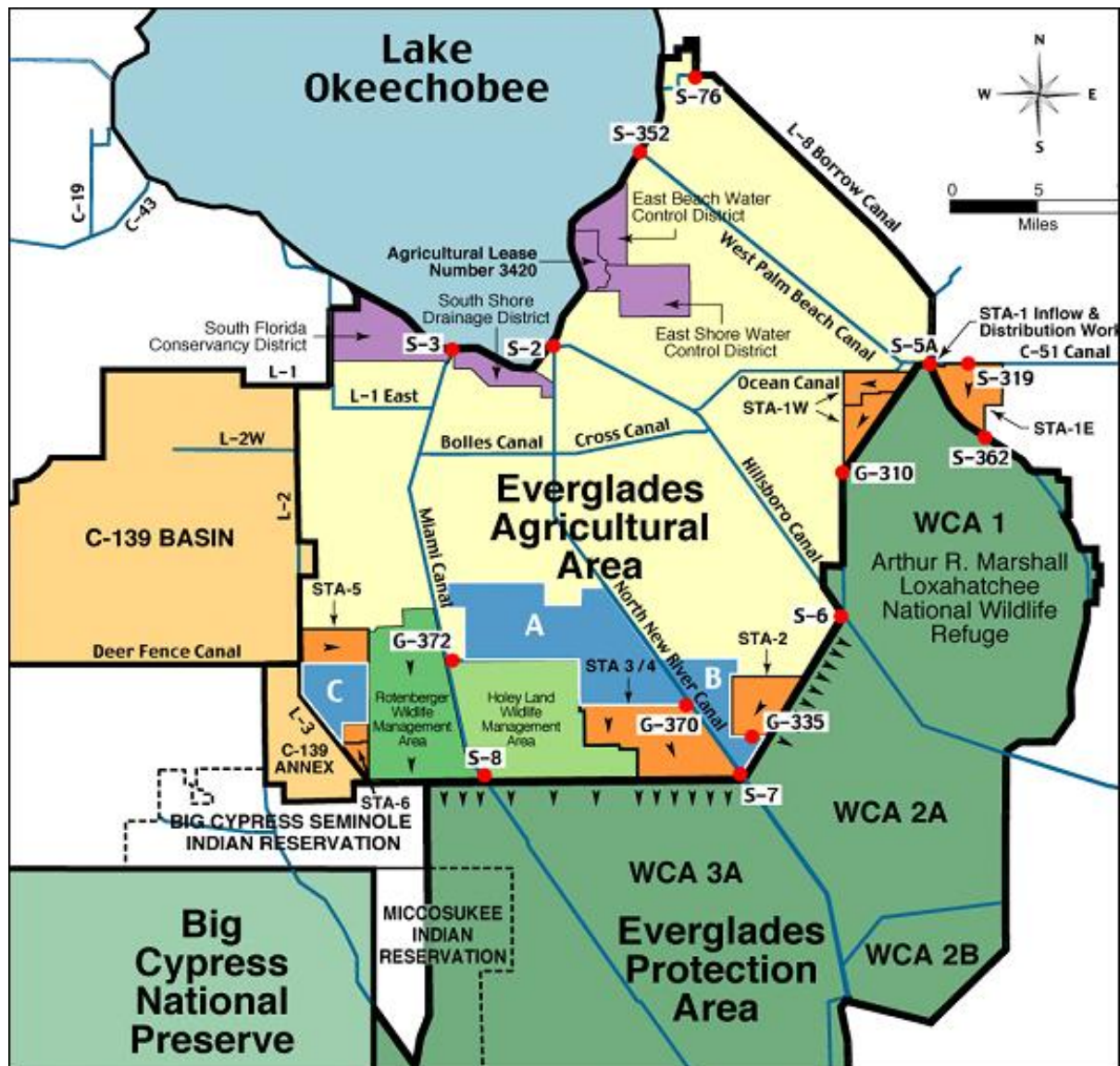
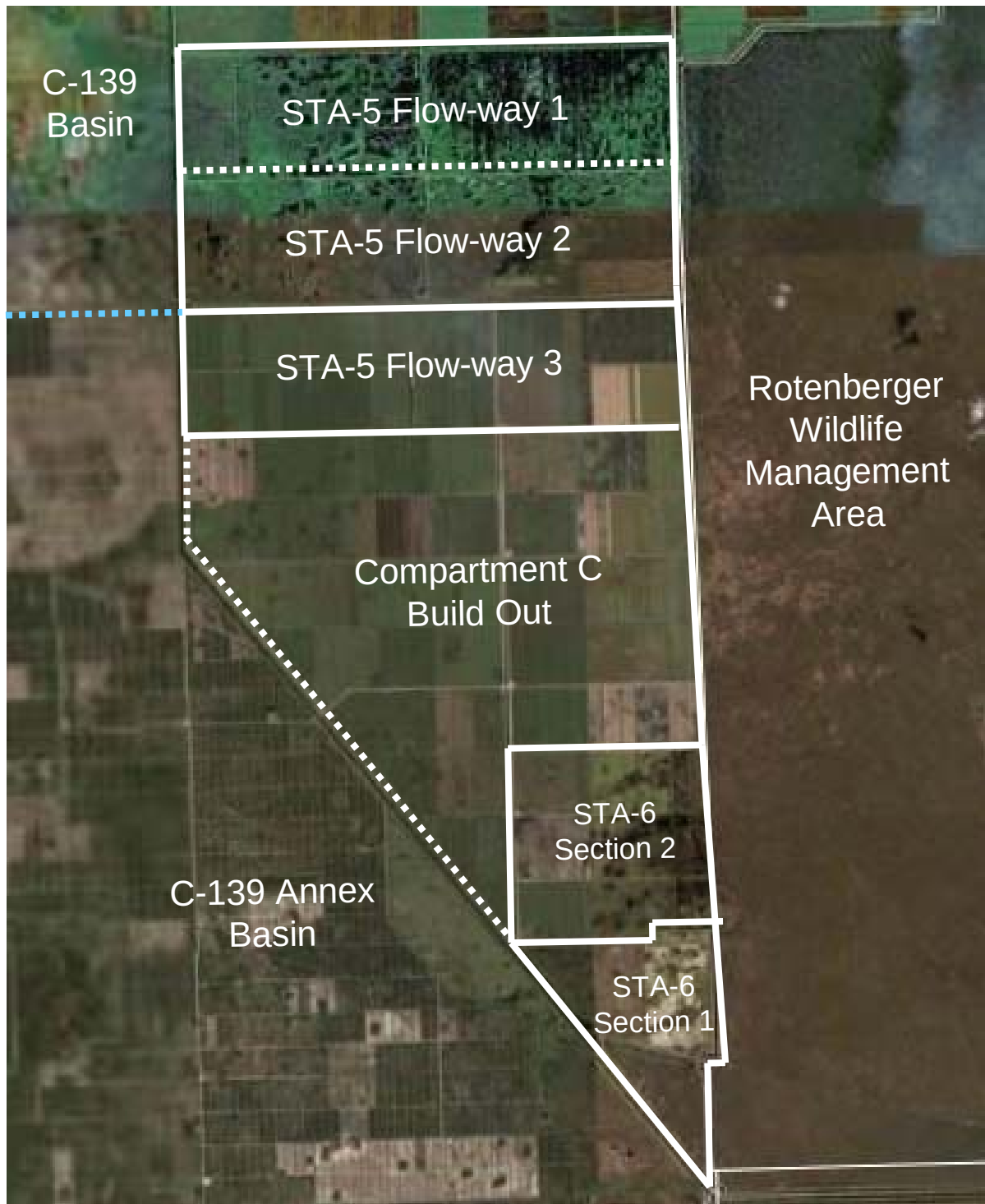




Figure 2. STA-5 and STA-6 Regional Overview.





The District is also moving forward with design and construction of additional treatment areas on the remaining acreage of Compartments B and C to further assist in maximizing the effectiveness of the STAs in improving water quality entering the EPA. A regional feasibility study was recently conducted by the District to determine the optimal configuration and operation of the additional treatment areas on the remaining acreage of Compartments B and C. The feasibility study evaluated alternatives for the optimal balance of flows and phosphorus loads to the STAs in order to optimize treatment performance, and included cost estimates, schedules and performance projections.

The full expansion of STA-5 and STA-6 will occur in two phases, with approximately 3,372 acres of additional treatment area flow-capable as of December 2006, yielding approximately 6,095 acres of effective treatment area for STA-5 and 2,284 acres of effective treatment area for STA-6. A schematic of this initial expansion is presented in **Figure 3**. An additional 6,230 +/- acres of effective treatment area is presently under design in the balance of Compartment C. This sequence of expansion necessitates an **interim phase of operation** for STA-5 and STA-6 until normal flow-through operation of the full expansion. This **interim phase of operation** is anticipated to consist of two periods:

Interim Operation Period 1. Flow through approximately 5,007 acres of existing STA-5 and STA-6, and start-up operations for STA-5 Flow-way 3 and STA-6 Sect. 2.

Interim Operation Period 2. Flow through approximately 8,379 acres of treatment area, including the initial expansion.

Upon completion of these interim periods of operation, the **long-term operations** should commence, with a total of approximately 14,600 ± acres of effective treatment area.

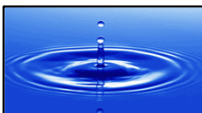
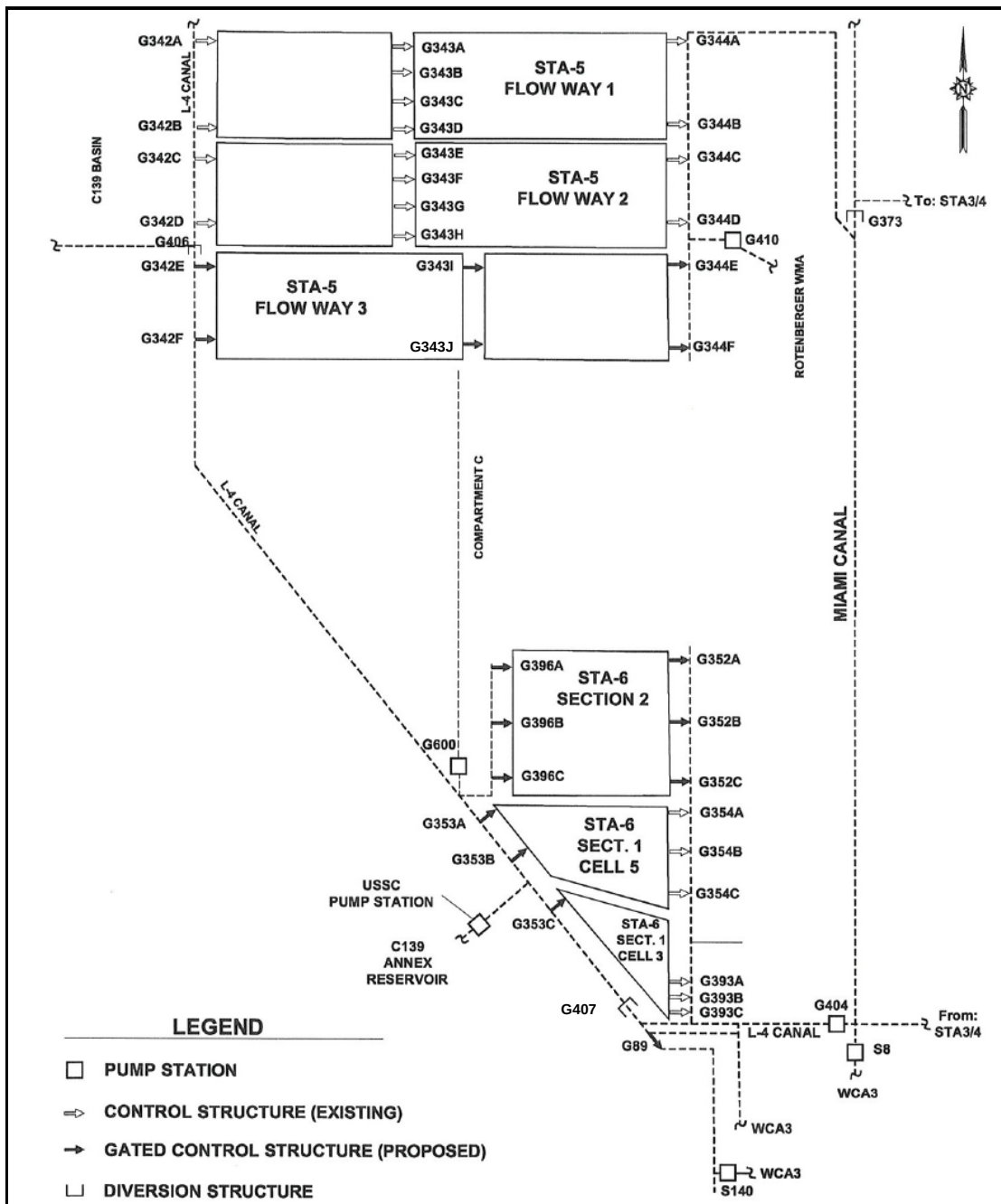




Figure 3. Schematic of Initial Expansion (Not to scale; from URS 2005).





STA-5 Operations History. The construction of the interior works for the first two flow-ways of STA-5 was completed in December 1998 at which time inundation of the cells commenced. Water quality monitoring at the inflow and outflow locations during September and October 1999 demonstrated a net improvement in total phosphorus, total mercury and methylmercury, and hence, satisfied the "start-up" requirements in the state operating permits. On October 15, 1999, FDEP granted emergency authorization to discharge from STA-5 for a 14-day period due to extreme rainfall associated with Hurricane Irene. The Everglades Forever Act operating permit for STA-5 was issued on February 29, 2000, however, the NPDES permit was challenged. The District requested interim authority to discharge, and on March 3, 2000 the request was granted; on March 20, 2000 the FDEP issued the interim order for discharge. Due to better phosphorus removal occurring in the southern flow-way, the initial operational strategy was to move water through the southern flow-way prior to moving water through the northern flow-way. By August 2000, the northern flow-way performance had improved sufficiently, and discharges were initiated through both flow-ways. During the 2004-2005 dry season, the north flow-way was taken out of service in order to upgrade the interior water control structures and remove flow obstructions in Cell 1B. Similar enhancements were completed in the southern flow-way in 2006, and included conversion of portions of the treatment vegetation from emergent to submerged aquatic vegetation (SAV). During the general design for STA-5, topography data revealed that the western 20% of the area anticipated in the 1994 Conceptual design was too high in elevation to serve as effective treatment area. This necessitated that portions of the C-139 Basin eventually be diverted into a new treatment area, STA-6 Section 2, for treatment.

STA-6 Operations History. From 1989 to 1997, the areas identified as STA-6 Cells 3 and 5 were operated as stormwater detention areas by the United States Sugar Corporation (USSC). STA-6, Section 1 was constructed and began operation in 1997. It was designed to provide a total effective treatment area of approximately 897 acres (245 acres in Treatment Cell 3 and 652 acres in Treatment Cell 5) with the goal of reducing the long-term, flow weighted mean Total Phosphorus concentration in discharge waters to 50 parts per billion (ppb). The drainage basin served by STA-6 Section 1 consisted of what is now referred to as Compartment C, and in May 2005, agricultural production was terminated in this area.

Construction of Initial Expansion. Construction of the 3rd flow-way of STA-5 and STA-6 Section 2 commenced in early 2006 and was completed such that the new treatment areas were flow-capable by December 31, 2006.

Operation Plan Modifications. In accordance with the District's practice and the operating permits for STA-5 and STA-6, this *Operation Plan* shall be reviewed periodically and revised as appropriate.

All elevations referenced in this *Operation Plan* are based on the 1929 National Geodetic Vertical Datum (NGVD).





1.2. INFLOW SOURCES

At the completion of the Start-up Phase operations for the initial expansion, STA-5 and STA-6 will provide a total effective treatment area of approximately 8,379 acres to treat water from a variety of sources, including

- Agricultural stormwater runoff from the C-139 Basin;
- Stormwater runoff from a portion of the S-8 Basin located directly north of STA-6 (referred to as Compartment C); and
- Agricultural stormwater runoff from the C-139 Annex Basin; and
- Supplemental water from Lake Okeechobee necessary to prevent dryout of STA-5 (at the present time no physical means are in place to introduce the supplemental water to STA-6)

As part of the adaptive implementation process embodied in the Long-Term Plan, the flow and phosphorus contributions from these areas are being updated (Goforth 2007). The current revised inflow projections for the interim period is presented in **Table 1**.

Table 1. Estimated Average Inflows to STA-5 and STA-6 for the Interim Period.

STA	Effective Treatment Area	Source Water	Average Volume AF/yr	Average TP Load kg/yr	Average TP Conc ppb
STA-5	6,095	C-139 Basin	176,258	51,153	235
STA-6	2,284	C-139 Basin, C-139 Annex, S-8 Basin	70,218	7,729	89
Total	8,379		246,476	58,882	194

1.3. OPERATIONAL OBJECTIVES

In accordance with the 1994 Conceptual Design for the Everglades Protection Project, the Long-Term Plan, and subsequent design documents, the primary objectives of STA-5 and STA-6 include the following:

1.3.1 Reduce Phosphorus Levels to Achieve Compliance with Water Quality Standards

In combination with the implementation of the C-139 Basin Best Management Practice Program (including the C-139 Annex), STA-5 and STA-6 are designed to reduce Total Phosphorus (TP) in discharges as necessary to achieve the water quality standard of the Everglades Protection Area.





1.3.2 Hydropattern Restoration

In accordance with the guidance of the Everglades Forever Act, STA-5 and STA-6 will be operated to the maximum extent practical to improve the quality, timing and distribution of water entering the northwest portion of WCA 3A. This will be accomplished in two phases. Initially, treated water from STA-5 and STA-6 will be directed to the northwestern portion of WCA 3A boundary through a cut in the southern L-4 levee. After long-term water quality solutions are in place, it is anticipated that the entire southern L-4 levee between S-8 and the existing cut will be degraded to allow a uniform distribution of treated water along the northwest boundary of WCA 3A (Burns & McDonnell 2003).





2 STRUCTURE AND CANAL DESCRIPTIONS

The total effective treatment area of approximately 8,379 acres within the initial expansion of STA-5 and STA-6 is distributed within six parallel treatment cells. Estimates of the effective treatment areas, anticipated design peak flow and target treatment vegetation for each cell are provided below.

Table 2. STA-5 and STA-6 Cell Characteristics – Initial Expansion. Note – the maximum cumulative peak flow through STA-5 is 1,200 cfs.

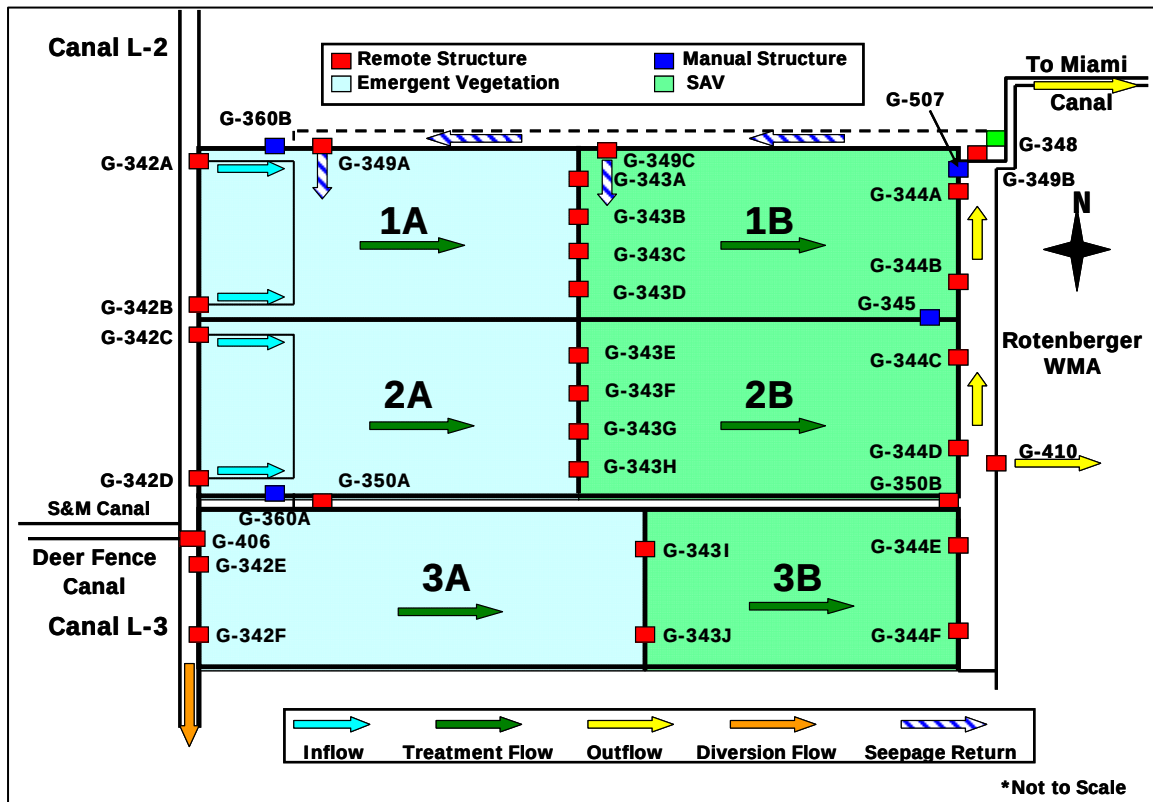
STA	Cell	Effective Treatment Area (acres)	Anticipated Normal Peak Flow (cfs)	Target Dominant Vegetation
STA-5	1A	835	600	Emergent
	1B	1,220	600	SAV
	2A	835	600	Emergent
	2B	1,220	600	SAV
	3A	1,065	600	Emergent
	3B	920	600	SAV
	Total Area	6,095	3,600	
STA-6	Cell 3	245	105	Emergent
	Cell 5	652	286	Emergent
	Section 2	1,387	667	SAV
	Total Area	2,284	1,058	

STA-5 Flow Patterns. Within STA-5, water moves through parallel flow-ways, from the L-2 and L-3 borrow canals along the west boundary to the discharge canal along the eastern boundary (see **Figure 4**). The northern two flow-ways each contain approximately 4,110 acres of effective treatment area, and the third will contain approximately 1,985 acres. Due to a significant downward slope in ground elevation from west to east, each flow-way is subdivided into two treatment cells by an internal levee to limit water depths within the flow-ways to acceptable limits. A seepage collection canal is located along the northern boundary of the project, and functions along with the G-349A and G-349C pump stations to return seepage to Cell 1A. Stages in the discharge canal are influenced by water levels in the Miami Canal, which is controlled primarily by the S-8 and G-404 pump stations. The northern three flow-ways discharge into a common discharge canal via culverts G-344A-F located on the extreme eastern side of the project. The STA-5 Discharge Canal is located along the western and northern boundaries of the Rotenberger WMA and is connected to the Miami Canal (see Figure 4). Within the STA, the vegetative communities will provide water quality treatment. In the upstream cells (Cells 1A, 2A and 3A), the vegetation management intent is to sustain an emergent macrophyte community that will likely be dominated by cattail. In the downstream cells, the intent is to maintain a submerged aquatic vegetation (SAV) community.





Figure 4. STA-5 Flow Schematic (Initial Expansion).



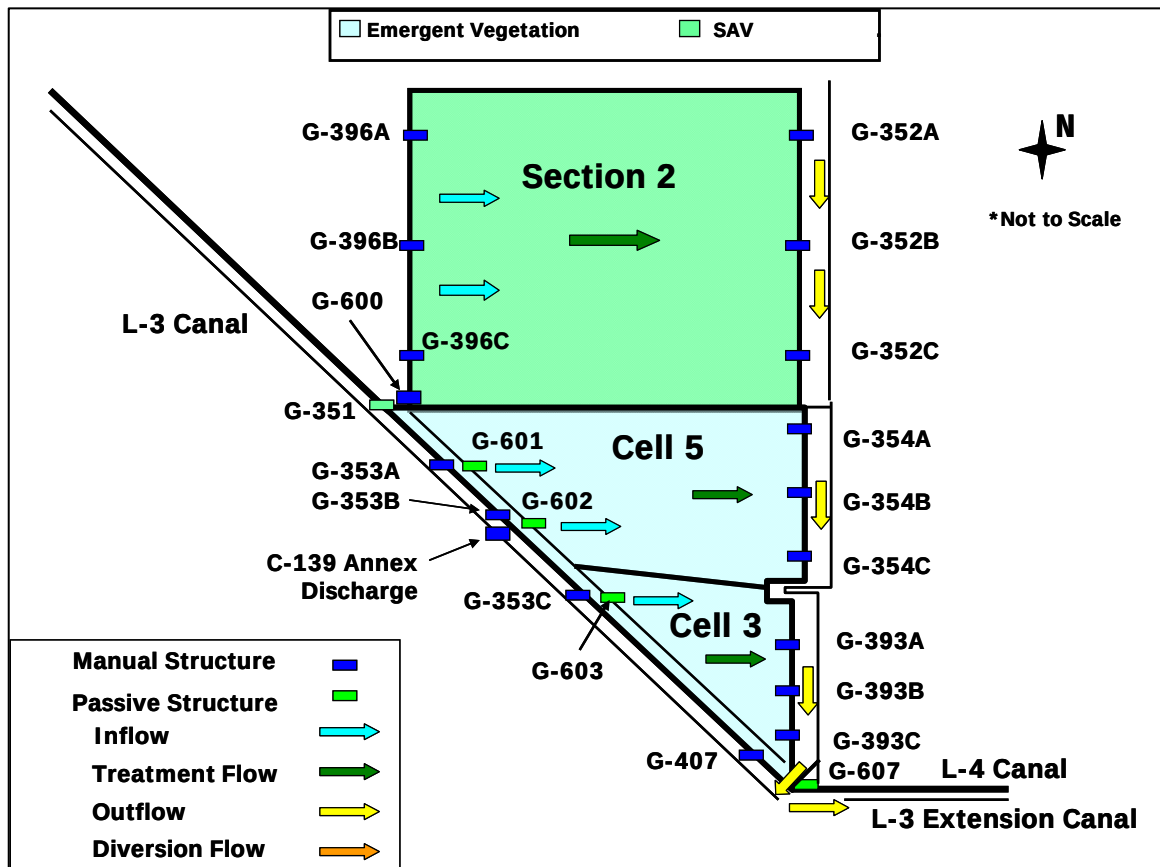
STA-6 Section 1 Flow Patterns. Inflows from the L-3 borrow canal enter the STA-6 Section 1 Supply Canal through the inflow structures (G-353A-C) to Treatment Cells 3 and 5 via inflow control weirs G-601, G-602 and G-603 (see Figure 5). Flows are subsequently dispersed in spreader canals located downstream of the Inflow Weirs within each treatment cell. Flows travel in an eastward direction through the treatment cells and are released to the STA-6 discharge canal through collection canals and a series of discharge structures. Gated culvert structure G-393A-C conveys Treatment Cell 3 discharges to the discharge canal and gated culvert structures G-354A-C convey Treatment Cell 5 discharges to the discharge canal under normal operating conditions. The discharge canal directs flow to the L-3 borrow canal just downstream of G-407. At this location, treated water can flow south in the L-3 extension canal to Water Conservation Area 3A which enhances hydropattern restoration in the area. In addition, there is the potential that when the STA is discharging water can be conveyed east in the L-4 through the G-88 structure to the location of the cut constructed between the L-4 and L-3 extension canal. There is also the potential for treated water to be taken up by the Seminole Reservation water supply pump G-409.





STA-6 Section 2 Flow Patterns. Following a demonstration of net improvement in phosphorus and mercury, flow-through operation of the new Section 2 will be authorized. A combination of inflow from the G-600 pump station and the L-3 borrow canal will be introduced into Section 2 through three inflow structures (G-396A-C) and flow east through the treatment cell. A collection canal and three discharge culverts (G-352A-C) will convey treated water into the common STA-6 discharge canal and into the L-3 borrow canal.

Figure 5. STA-6 Flow Schematic (Initial Expansion).



The following sections describe the associated project water control structures, canals and related features.

2.1 INFLOW CONTROL FACILITIES

2.1.1 G-342A-F (STA-5 Flow-Ways 1-3)

The G-342A-F structures consist of a series of six gated concrete box culverts that control inflow into STA-5:





- G-342A and B control inflows into treatment cell 1A;
- G-342C and D control inflows into treatment cell 2A; and
- G-342E and F control inflows into treatment cell 3A.

Structures G-342A-F are situated along the western perimeter levee adjacent to the L-2/L-3 Borrow Canal. Water is conveyed from these structures east to the upstream of each flow-way by means of an inflow canal, and distributed across the treatment area by means of a spreader canal aligned north-to-south. Each of the G-342A-D structures consists of a single 10-ft wide by 6-ft high reinforced concrete box culvert approximately 70 feet long. The invert elevation of each structure is elevation 7.25 ft NGVD. Each culvert is fitted with a 10-ft by 6-ft control gate at its upstream end (see **Figure 3**). Each of the G-342E-F structures consists of a single 10-ft wide by 6-ft high reinforced concrete box culvert approximately 45 feet long at an invert of 6.0 ft. Each structure is fitted with a single 10-ft wide by 6-ft high control gate at its upstream end. Local and remote operation of the gates are possible. Remote operation via telemetry is from the District's West Palm Beach Operations Control Center. Headwater, tailwater stage and gate position information are available to the remote operators, while headwater and tailwater staff gauges and gate position indicators are available for local operation. In the event of loss of electrical power at the site, the structures can be manually operated by means of a portable generator or truck-mounted motor. In anticipation of the loss of power, a portable generator has been installed at the G-406 structure to ensure continued operation if electrical power is lost. A 4-pole plug (3 phase conductors and neutral) with a pressure connector is available at each structure to receive the generator's power cord. The generator will remain on site to operate the structures as necessary after the storm has subsided, prior to permanent power being restored. Flow equations developed by the District and URS for these inflow structures are presented in **Appendix 1**. Structure photographs are presented in **Appendix 2**.

2.1.2 G-600 (STA-6)

Until the construction of the full expansion of Compartment C is complete, stormwater runoff and construction dewatering from the area north of STA-6 will be transferred into the STA and/or L-3 canal by pump station G-600. This facility consists of three diesel pumps with a reliable total capacity of approximately 150 cubic feet per second (cfs) (URS 2007b). The pumps are operated by contractors for the convenience of construction activities. Headwater and tailwater stage data are available via dial-up readings. Headwater and tailwater staff gauges are also available for local observation.

2.1.3 G-351 (STA-6)

Structure G-351 consists of two 10-ft wide by 9-ft high open box culverts. The structure allows transfer of water to the L-3 Borrow Canal from the G-600 pump station, and from the L-3 Borrow Canal to STA-6 Section 2. During the construction of the Compartment C build





out, gates will be installed in these culverts to add operational flexibility to STA-6. Rating curves for G-351 were developed by URS for this structure and are presented in **Appendix 1**.

2.1.4 G-353A-C (STA-6 Cells 3 and 5)

Structures G-353 A&B control flow into STA-6 Cell 5 and G-353C controls flow into STA-6 Cell 3. These structures are located along the L-3 levee. Water is distributed across the treatment area by means of a spreader canal aligned northwest-to-southeast parallel to L-3. Each of the three structures consists of a single 8-ft wide by 6-ft high reinforced concrete box culvert approximately 45 feet long. The invert elevation of each structure is elevation 6.0 ft NGVD. Each culvert is fitted with an 8-ft by 6-ft control gate at its upstream end. Local and remote operation of the G-353 gates is possible. Remote operation via telemetry is from the District's West Palm Beach Operations Control Center. Headwater, tailwater stage and gate position information are available to the remote operators, while headwater and tailwater staff gauges and gate position indicators are available for local operation. Power supply to the structures will be provided during the Interim operation phases by a 51 kW generator located at the G-407 structure. Power lines to the structures were placed underground to prevent damage from storm events. In the event of loss of electrical power at the site, the G-353 structures can be manually operated by means of a portable generator or truck-mounted motor. A 4-pole plug (3 phase conductors and neutral) with a pressure connector is available at each structure to receive the generator's power cord. Flow equations developed by URS for these inflow structures are presented in **Appendix 1**.

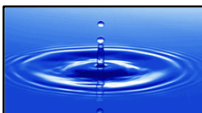
2.2 INTERIOR CONTROL FACILITIES

2.2.1 G-343A-J (STA-5)

The G-343A-J structures consist of ten concrete box culverts with upstream gates that control water levels in the western treatment cells and flow into the eastern cells:

- structures G-343A-D control stages in Cell 1A;
- structures G-343E-H control stages in Cell 2A; and
- structures G-343I-J control stages in Cell 3A.

Each of the G-343A-H structures consists of a single 10-ft wide by 8-ft high reinforced concrete box culvert approximately 60 feet long. The invert elevation of each box is 5.0 ft NGVD. Structures G-343A-H have single 10-ft high by 8-ft wide vertical lift gates. Each of the G-343I&J structures consists of a single 10-ft wide by 8-ft high reinforced concrete box culvert approximately 45 feet long. The invert elevation of each box is 4.0 ft NGVD. Structures G-343I&J have double leaf 10-ft high by 8-ft wide vertical lift gates. The G-343I&J top and bottom gates are each 10-ft wide and 4-ft high and can be opened independently from the bottom up. Local and remote operation of the G-343 gates are possible. Remote operation via telemetry is from the District's West Palm Beach Operations Control Center. Headwater, tailwater stage and gate position information are available to the remote operators, while





headwater and tailwater staff gauges and gate position indicators are available for local operation. In the event of loss of electrical power at the site, the structures can be manually operated by means of a portable generator or truck-mounted motor. A portable generator has been installed at the G-406 structure to ensure continued operation if electrical power is lost. A 4-pole plug (3 phase conductors and neutral) with a pressure connector is available at each structure to receive the generator's power cord. Flow equations developed by URS for these inflow structures are presented in **Appendix 1**.

2.2.2 G-345 (STA-5)

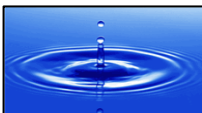
The G-345 structure consists of a two barreled culvert between STA-5 Cells 1B and 2B. Each barrel is 48-inches in diameter and approximately 92 feet long. The diameter of the riser is 48-inches, the top of the risers is set at 16.42 ft NGVD, the riser board size is 7.5 inches by 2.5 inches by 50 inches, and there are 30 boards. The flow line elevation is 7.00 ft NGVD. The G-345 culverts will be opened when there is a need to transfer water from Cell 1B to Cell 2B. The boards on the structure are manually operated. Upstream and downstream staff gauges are available at structure G-345.

2.2.3 G-396A-C (STA-6 Section 2)

The G-396A-C structures consist of a series of three gated concrete box culverts that control flow into STA-6 Section 2 from G-600 and L-3. These structures are situated along the western interior levee. Water is distributed across the treatment area by means of a spreader canal aligned north-to-south. Each of the three structures consists of a single 8-ft wide by 8-ft high reinforced concrete box culvert approximately 45 feet long. The invert elevation of each structure is elevation 4.0 ft NGVD. Each culvert is fitted with a 8-ft by 8-ft control gate at its upstream end. Local and remote operation of the G-396 gates are possible. Remote operation via telemetry will be from the District's West Palm Beach Operations Control Center. Headwater, tailwater stage and gate position information are available to the remote operators, while headwater and tailwater staff gauges and gate position indicators are available for local operation. Power supply to all STA-6 Section 2 structures will be provided during the Interim operation phases by a 51 kW generator located at the G-407 structure. Power lines to the structures were placed underground to prevent damage from storm events. In the event of loss of electrical power at the site, the structures can be manually operated by means of a portable generator or truck-mounted motor. A 4-pole plug (3 phase conductors and neutral) with a pressure connector is available at each structure to receive the generator's power cord. Flow equations developed by URS for these inflow structures are presented in **Appendix 1**.

2.2.4 G-601 and G-602 (STA-6 Cell 5)

Structures G-601 and G-602 are trapezoidal broad-crested weirs, which have 11 ft wide crests at elevation 14.0 ft NGVD with 6:1 (H:V) side slopes. The approach and exit channels have





invert elevations of 10.0 ft NGVD. No operation of these structures is required. Headwater and tailwater data are available via telemetry for G-602 only.

2.2.5 G-603 (STA-6 Cell 3)

Structure G-603 is a trapezoidal broad-crested weir with a crest elevation of 14.2 ft NGVD, a crest width of 15.0 ft NGVD with 10:1 (H:V) side slopes. The approach and exit channels have an invert elevation of 10.0 ft NGVD with 5:1 side slopes. No operation of this structure is necessary. Headwater and tailwater data are available via telemetry.

2.3 OUTFLOW CONTROL FACILITIES

2.3.1 G-344A-F (STA-5 Flow-Ways 1-3)

The G-344A-F structures consist of six gated concrete box culverts controlling outflows from STA-5 to the STA-5 Discharge Canal:

- G-344A and B controls flow from treatment cell 1B;
- G-344C and D controls flow from treatment cell 2B; and
- G-344E and F controls flow from treatment cell 3B.

Each of the G-344A-D structures consists of a single 10-ft wide by 10-ft high reinforced concrete box culvert approximately 53 feet long. The invert elevation of each structure is 0.0 ft NGVD. Each culvert is fitted with a 10-ft wide by 10-ft high control gate at its upstream end. Each of the G-344E&F structures consists of a single 10-ft wide by 10-ft high reinforced concrete box culvert approximately 45 feet long. The invert elevation of each box is 0.0 ft NGVD. Structures G-344E&F have double leaf 10-ft high by 10-ft wide vertical lift gates. The G-344E&F top and bottom gates are each 10-ft wide and 5-ft high and can be opened independently from the bottom up. Local and remote operation of the gates are possible. Remote operation via telemetry is from the District's West Palm Beach Operations Control Center. Headwater, tailwater stage and gate position information are available to the remote operators, while headwater and tailwater staff gauges and gate position indicators are available for local operation. In the event of loss of electrical power at the site, the structures can be manually operated by means of a portable generator or truck-mounted motor. In anticipation of loss of power, a portable generator is available at the G-406 structure to ensure continued operation. A 4-pole plug (3 phase conductors and neutral) with a pressure connector is available at each structure to receive the generator power cord. Flow equations developed by the District and URS for these inflow structures are presented in **Appendix 1**.





2.3.2 STA-5 Discharge Canal

The Discharge Canal is located adjacent to the east side of STA-5 and continues along the northern and northeast side of the Rotenberger Wildlife Management Area, connecting to the Miami Canal just south of the G-373 divide structure.

2.3.3 G-352A-C (STA-6 Section 2)

Treated discharges from STA-6 Section 2 is controlled by the three G-352A-C control structures. Each of the G-352 structures consists of a single 10-ft wide by 10-ft high reinforced concrete box culvert approximately 45 ft long. The invert elevation of each structure is 0.0 ft NGVD. Each culvert was fitted with a double leaf 10-ft wide by 10-ft high control gate at its upstream end. Local and remote operation of the gates are possible. Remote operation via telemetry is from the District's West Palm Beach Operations Control Center. Headwater, tailwater stage and gate position information are available to the remote operators, while headwater and tailwater staff gauges and gate position indicators are available for local operation. Power supply to all STA-6 Section 2 structures will be provided during the Interim operation phases by a 51 kW generator located at the G-407 structure. Power lines to the structures were placed underground to prevent damage from storm events. In the event of loss of electrical power at the site, the structures can be manually operated by means of a portable generator or truck-mounted motor. A 4-pole plug (3 phase conductors and neutral) with a pressure connector is available at each structure to receive the generator's power cord. Flow equations developed by URS for these outflow structures are presented in **Appendix 1**.

2.3.4 G-354A-C (STA-6 Cell 5)

Treatment Cell 5 has three control structures (G-354A-C) that have been designed to convey a total of 360 cfs under normal operations. The G-354A-C structures consist of aluminum corrugated metal pipes (cmp) with concrete weir boxes and vertical lift gates located on the upstream end of the culvert. The weir boxes utilize a fixed crest weir at 14.1 ft NGVD to limit draw-down of Treatment Cell 5 to the desired static water level of 14.1 ft NGVD under normal operations. Each control structure is equipped with a large aluminum slide gate downstream of the weir box that is used primarily as a means to eliminate the flow from the treatment cell in the event that the cells must be taken off line for maintenance or repair. G-354A-C will be maintained in the fully open position during normal operations. In general, the gates are not intended to modulate discharges from the treatment cells. Under special circumstances, the gates may be partially or fully closed to modulate the hydraulic retention time within each treatment cell. Structures G-354A & C include a small slide gate in the weir boxes that may be used to drain each treatment cell to elevation 12.0 ft NGVD in the event that maintenance or repairs are required. The gates have been designed to lower the water level in each treatment cell to 12.0 ft NGVD in approximately 7 days. The gates can only be used when tailwater stages in the discharge canal have dropped sufficiently below the desired elevation in the treatment cells. Manual operation of these structures is required when needed for the special





circumstances discussed above. Telemetry for headwater and tailwater data is available to the remote operators for G-354C only. Headwater and tailwater staff gauges are available for local operation at G-354A-C. Flow equations developed by the District for these outflow structures are presented in **Appendix 1**.

2.3.5 G-393A-C (STA-6 Cell 3)

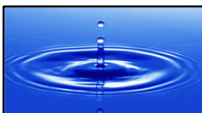
Treatment Cell 3 has three control structures (G-393A-C). The structures consist of aluminum corrugated metal pipes (cmp) with concrete weir boxes located on the upstream end of each culvert. The weir boxes utilize a fixed crest weir at 14.0 ft NGVD to limit draw-down of Treatment Cell 3 the desired static water level of 14.0 ft NGVD under normal operations. Each control structure is equipped with a large aluminum slide gate downstream of the weir box that is used primarily as a means to eliminate the flow from the treatment cell in the event that the cells must be taken off line for maintenance or repair. G-393A-C will be maintained in a fully open position during normal operations. In general, the gates are not intended to modulate discharges from the treatment cells. Under special circumstances, the gates may be partially or fully closed to modulate the hydraulic retention time within each treatment cell. Structure G-393B includes a small slide gate in the weir boxes that may be used to drain each treatment cell to elevation 12.0 ft NGVD in the event that maintenance or repairs are required. The gate has been designed to lower the water level in the treatment cell to 12.0 ft NGVD in approximately 7 days. The gate can only be used when tailwater stage in the discharge canal has dropped sufficiently below the desired elevation in the treatment cells. Manual operation of these structures is required when needed for the special circumstances discussed above. Telemetry for headwater and tailwater data is available to the remote operators for G-393B only. Headwater/tailwater staff gauges are available for local operation at G-393B only. Flow equations developed by the District for these outflow structures are presented in **Appendix 1**.

2.3.6 STA-6 Discharge Canal

The STA-6 Discharge Canal currently has a bottom width of 34 ft at 0.0 ft NGVD and side slopes of 2.5:1 (H:V). As part of the initial expansion construction, the discharge canal was expanded to a 40-ft bottom width at elevation -2.0 and routed west to the L-3 Borrow Canal. A aerial photograph of the configuration of canals and structures is presented in **Figure 6**.

2.3.7 G-607 (STA-6)

Until the discharge canal was routed to L-3 as part of the initial expansion construction, STA-6 discharges were conveyed to the L-4 Borrow Canal via structure G-607. Structure G-607 consists of four 66" diameter x 70 ft long culverts and two 84" diameter x 70 ft long culvert and is located at the confluence of the old Discharge Canal and the L-4 Borrow Canal. These structures are fully opened under all circumstances and require no manipulation. With the construction of the new STA-6 discharge canal and levee, G-607 serves no hydraulic function.





2.4 SEEPAGE CONTROL FACILITIES

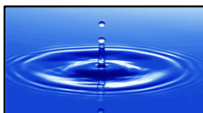
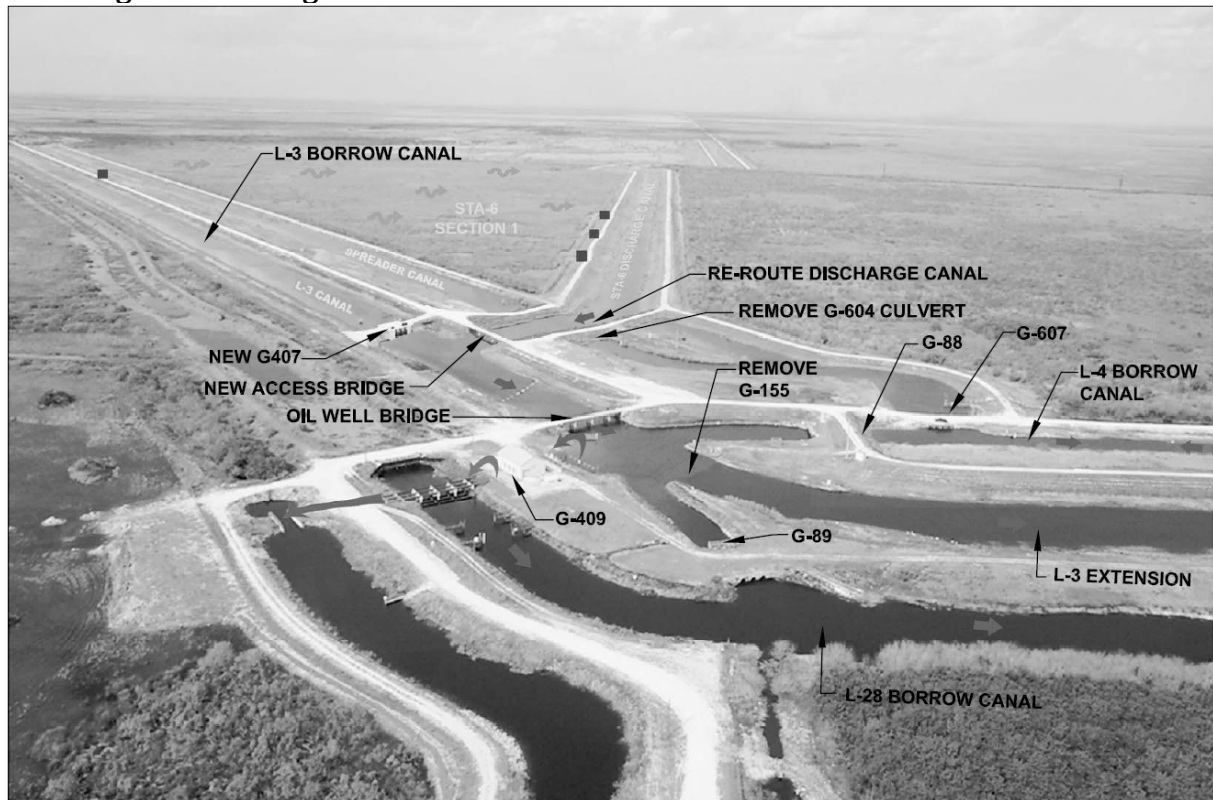
The numerous features constructed to control seepage from STA-5 are described below. STA-6 has no seepage control facilities.

2.4.1 STA-5 North Seepage Collection Canal

A seepage collection canal is located along the northern boundary of the STA, and returns seepage to Cell 1A. The seepage collection canal is located between the perimeter levee and the adjacent private property, and extends from the L-2 borrow canal to the STA-5 discharge canal. The seepage canal extends 8 to 14 feet below ground elevation into underlying layers of relatively porous limestone and sand.

Due to the variation in ground topography from west to east, the seepage canal is divided into two separate operational sections. The ground elevation in the western 0.5-mile section ranges from 14.5 ft in the west to about 13.0 ft on the east. Control structure G-360B (described below) controls water levels within this western section. The approximate ground elevation along the eastern 3.5-mile section of the seepage canals ranges from 13.0 ft NGVD in the west to about 11.5 ft NGVD at the east end of the canal.

Figure 6. Configuration of STA-6 canals and structures - Confusion Corner.





2.4.2 G-349A & G-349C (STA-5)

Seepage return pump stations G-349A and G-349C maintain water levels in the north seepage collection canals. These structures are located on the perimeter levee, with G-349A at approximately 0.5 mile east of the L-2 borrow canal, just east of structures G-360B, and G-349C located at the northwest corner of Cell 1B. The purpose of these stations is to return seepage from the seepage collection canals to the treatment cells. In addition, working in conjunction with pump stations G-349B (described below) they can also be utilized in time of drought for the purpose of providing supplemental water to the treatment cells when desired to prevent dryout.

Each station has two (2) 20-inch diameter axial flow pumps with 60-Hp electric powered engines, and each pump has a discharge capacity of 18-27 cfs depending on headwater and tailwater stages, for a combined capacity at each station of 36-54 cfs. The factory test report, including performance curves, for these pumps are contained in the project files.

Pump Station Description:

Discharge capacity (each pump):	17.8 cfs at maximum static head of 8.25 ft 26.9 cfs at minimum static head of 4.0 ft (G-349C) 22 cfs at 16.1 ft total dynamic head
Design headwater elevation:	9.0 ft
Design low water (headwater) elevation:	8.0 ft (assumes 1-foot head loss across trash rack)
Design tailwater elevation:	16.25 ft
Nominal pump operating speed:	740 rpm
Normal “on elevation” (based on operating experience):	When Seepage Canal (pump HW elevation) is 10.5 ft NGVD
Normal “off elevation” (based on operating experience):	When Seepage Canal (pump HW elevation) is 9.5 ft NGVD
Motor speed:	1700 rpm

Both manual and remote operation of these pump stations are possible. Remote operation is from the SFWMD’s operations control center in West Palm Beach. Telemetry control for remote operation and real-time status of each pump is available. Headwater and tailwater data are also available to the remote operators, while headwater and tailwater staff gauges are available for manual/local operation.

2.4.3 G-360B (STA-5)

Structure G-360B is located in the North Seepage Canal approximately one half mile east of the L-2 Borrow canal and limits drawdown in the western sections of the seepage canal to an elevation of 11.0 ft NGVD. The structure consists of a 55-ft long 3-ft diameter corrugated aluminum pipe with a 3-ft wide by 6-ft high flashboard riser. A weir plate is attached to the riser and the plate has a crest elevation of 10.5 ft NGVD. A single flashboard is installed





above the weir crest to maintain the water level upstream (west end) of each structure at 11.0 ft NGVD. The invert elevation is 7.5 ft NGVD. The culvert has a nominal flow capacity of 2 cfs. No operation is required of this structure; it is however anticipated that flashboards can be added or taken out to alter the weir crest height if desired. Headwater/tailwater staff gauges are available for local observation.

2.4.4 STA-5 Discharge Canal Seepage Collection Canal

The STA-5 discharge canal seepage collection canal is north of and adjacent to the discharge canal and extends approximately 3.3 miles from the northeast corner of STA-5 to just south of the Manley Canal. The discharge canal seepage collection canal is located between the discharge canal and adjacent farm fields. Seepage from the discharge canal is intercepted by the discharge canal seepage canal and returned to the STA via culvert G-348, subsequently returning to the treatment cells via pump station G-349A and G-349C.

Control of stages in the discharge canal seepage canal is provided by G-349C, which has a current operating range of 9.5 - 10.5 ft; hence, stages in the discharge canal seepage canal will be slightly higher than 9.5 - 10.5 ft. Under Design Discharge Conditions, maximum conservative estimated seepage losses to the discharge canal seepage canal are approximately 12 cfs.

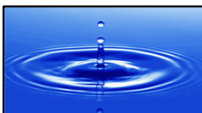
2.4.5 G-348 (STA-5)

G-348 is a single culvert located near the northeast corner of STA-5 and serves to transfer seepage flows from the discharge canal seepage canal to the north seepage canal. The G-348 structure has a diameter of 48 inches and length of approximately 80 feet. A flap gate on the west end of the culvert prevents unintended increases in stages east of G-348 during delivery of supplemental water to STA-5 (via G-349B to North Seepage Canal). G-348 has a maximum flow capacity of 18 cfs. No operation is required. Headwater and tailwater data are available via telemetry, while headwater/tailwater staff gauges are available for local observation of stages.

2.5 DIVERSION FACILITIES

2.5.1 G-406

Prior to the flow-through operations of STA-5 3rd flow-way, G-406 serves as the diversion control structure for STA-5. Closing the G-406 gates will force runoff from the C-139 Basin into the STA-5 northern and central flow-ways. Opening the gates will allow C-139 Basin runoff to divert south to STA-6 and when G-407 is open, to WCA-3A. With the flow-through operation of STA-5 3rd flow-way, G-406 will normally remain fully open, and will no longer serve any function during normal operations; G-407 will become the new diversion structure for C-139 Basin runoff.

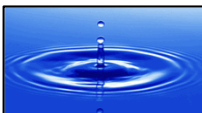




The structure is located east of and adjacent to the L-2 borrow canal, immediately south of the confluence with the Deer Fence Canal. Structure G-406 consists of two 10-ft wide by 9-ft high reinforced concrete box culverts approximately 50 feet long. The invert elevation of the culvert barrels is 6.0 feet NGVD, slightly above the minimum existing L-2 borrow canal invert elevation of approximately 5.0 feet NGVD. Each culvert barrel is fitted with a 10-ft wide by 9-ft high control gate at its upstream (north) end. During construction of the initial expansion, the entire crest of the earthen plug across the L-3 borrow canal adjacent to G-406 was lowered by about 4.25 ft from elevation 21.75 to 17.5 ft NGVD, and armored to prevent erosion during periods of overtopping. Both manual and remote operation of this structure are possible. Remote operation is from the SFWMD's operations control center in West Palm Beach. In the event of loss of electrical power at the site, the G-406 structure can be manually operated by means of a portable generator or truck-mounted motor. In anticipation of the loss of power, a portable generator is available at the G-406 structure to ensure continued operation. A 4-pole plug (3 phase conductors and neutral) with a pressure connector is available to receive the generator's power cord. The generator will remain on site to operate other STA-5 structures as necessary after the storm has subsided, prior to permanent power being restored. Telemetry control is available for remote operation and real-time status of the gates. Headwater and tailwater data are also available to the remote operators, while headwater/tailwater staff gauges are available for local/manual operation. Flow equations developed by URS for this diversion structure are presented in **Appendix 1**.

2.5.2 G-407

When G-406 is closed prior to the flow-through operation of STA-5 3rd flow-way, G-407 serves as a diversion structure for C-139 Annex runoff discharged to the L-3 Borrow Canal. With the flow-through operation of STA-5 3rd flow-way, structure G-407 serves as a diversion control structure for the integrated STA-5 and STA-6 system. Under most circumstances, G-407 is closed, and directs runoff from the C-139 Basin, C-139 Annex basins, and Compartment C to STA-5 and STA-6 for treatment. When opened, G-407 will route runoff to the northwest corner of WCA-3A. The structure is located just east of the center line of the L-3 borrow canal west of STA-6 Cell 3 and immediately north of the Oil Well bridge. Structure G-407 consists of two 10-ft wide by 9-ft high reinforced concrete box culverts approximately 40 feet long. The invert elevation of the culvert barrels is 3.0 feet NGVD. Each culvert barrel is fitted with a 10-ft wide by 9-ft high control gate at its upstream (north) end. Both manual and remote operation of this structure are possible. Remote operation is from the SFWMD's Operations Control Center in West Palm Beach. Power supply to G-407 and the STA-6 inlet structures and the STA-6 Section 2 outlet structures will be provided during the Interim Operation phases by a 51 kW generator located at the G-407 structure. A 4-pole plug (3 phase conductors and neutral) with a pressure connector is available to receive the generator's power cord. Power lines from G-407 to the STA-6 structure were placed underground to prevent damage from storm events. Telemetry control is available for remote operation and real-time status of the gates. Headwater and tailwater data are also available to the remote operators, while





headwater/tailwater staff gauges are available for local/manual operation. Flow equations developed by URS for this structure are presented in **Appendix 1**.

2.6 RELATED FACILITIES

2.6.1 C-139 Annex Discharge Facility

The C-139 Annex is a 17,950-acre agricultural area owned and managed by U. S. Sugar Corporation (USSC). Historically the discharge from the stormwater detention facility for the C-139 Annex flowed into the L-28 Borrow Canal, ultimately entering the Everglades Protection Area through the S-140 pump station. The Everglades Forever Act (s. 373.4592, F.S.) and the District's Long-Term Plan contemplated the re-direction of this untreated discharge into the drainage system of the C-139 Basin for treatment in the STA-5/STA-6 system. A discharge facility was constructed to effect this re-direction. The facility contains 3 pumps, each rated at 150 cfs. The facility also includes the ability to discharge by gravity through gate operation when headwater and tailwater conditions allow. Based on information contained in the November 2005 construction permit (permit number 26-00094-S), one pump will turn on when the headwater rises to 12.89 ft NGVD; a second unit will turn on as the stage rises to 13.14 ft NGVD; the third will turn on if the stage rises to 13.39 ft NGVD, for a total discharge capacity of 450 cfs. All pumps will turn off once the headwater stage recedes to 11.5 ft NGVD. Pump flow will be monitored via telemetry, a data logger and manual logs. Water quality samples will be collected by autosamplers. As of August 2007, USSC had not provided operational or monitoring information about the gravity discharge culvert, and the facility had not obtained an operation permit.

2.6.2 STA-5 Supplemental Water Supply Pump Stations G-349B, G-350B, and G-507

G-349B. Pump station G-349B is located on the northeast side of STA-5, at the point that the discharge canal bends to the east. The purpose of this pump stations is to provide supplemental water to the STA by moving water from the STA-5 discharge canal into the north seepage collection canals during periods of drought. In this mode, pump station G-349A (described above) will be activated along with G-349B and G-349C to pump the water from the seepage collection canals into their respective treatment cells.

G-349B has a single 24-inch diameter axial flow pump with a 125-Hp electric powered engine, and each pump has a discharge capacity of 39 cfs at a maximum static head of 11 ft. The factory test report, including performance curves, for these pumps are contained in the project files.

Pump Station Description:

Design low water (headwater) elevation:	7.0 ft
Design tailwater elevation:	9.0 ft
Nominal pump operating speed:	735 rpm
Normal "on elevation":	Subject to drought conditions





Normal “off elevation”: Subject to drought conditions
Motor speed: 1780 rpm

Local and remote operation of this pump station is available. The station has telemetry equipment to allow for remote operation, which is from the SFWMD’s operations control center in West Palm Beach. Telemetry control for remote operation and real-time status of the pump station is available. Headwater and tailwater data are also available to the remote operators, while headwater/tailwater staff gauges are available for local operation.

G-507. Pump station G-507 is located on the east side of STA-5, at the point that the discharge canal bends to the east. The purpose of this pump station is to provide supplemental water to the STA by moving water from the STA-5 discharge canal into Cell 1B during periods of drought. Supplemental water entering STA-5 Cell 1B may be passed into Cell 2B via the G-345 Structure. The station has a single 36-inch diameter pump with a 125-Hp diesel powered engine, has a discharge capacity of 51.3 cfs; the invert of discharge pipe is 14.3 ft NGVD.

Pump Station Description:

Normal “on & off elevations”: Subject to drought conditions
Motor speed: 1800 rpm

The pump can only be started manually on site as requested by the SFWMD’s operations control center in West Palm Beach. Headwater and tailwater data are obtained from station G-344A approximately 100 yards south of G-507. A rating curve for G-507 is presented in **Appendix 1.**

G-350B. Pump station G-350B is located at the southeast corner of STA-5 at the confluence of the South Seepage Canal and the STA-5 Discharge Canal. The purpose of this pump station originally was to provide supplemental water to Flow-way 2 by moving water from the STA-5 discharge canal into the south seepage collection canals during periods of drought. The pump station has a single 24-inch diameter axial flow pump with a 125-Hp electric powered engine, and has a discharge capacity of 39 cfs at a maximum static head of 11 ft. The factory test report, including performance curves, for these pumps are contained in the project files. Telemetry control for remote operation and real-time status of the pump station is available. Headwater and tailwater data are also available to the remote operators, while headwater/tailwater staff gauges are available for local operation. G-350B is available for supplemental water supply to STA-5 Flow-way 3 via portable pumps.

2.6.3 Miami Canal

The STA-5 discharge canal conveys treated water from STA-5 into the Miami Canal downstream of the STA-3/4 divide structure (G-373). The Miami Canal extends from Lake Okeechobee (at Pump Station S-3) through Pump Station S-8 into Water Conservation Area 3A, and southeast to Miami-Dade County. The Miami Canal is the primary drainage feature of





the S-3 and S-8 basins in the Everglades Agricultural Area. The elevation of the Miami Canal bottom varies from 4.0 ft NGVD to -13.0 ft NGVD, with greater depths situated near the S-8 pump station. Top levee elevations on both the east and west sides of the canal vary from 19.5 ft NGVD to 26.0 ft NGVD.

2.6.4 S-8 Pump Station

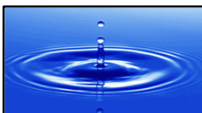
By maintaining water levels in the Miami Canal, pump station S-8 provides the hydraulic gradient for STA-5 Flow-ways 1-3 and also for STA-3/4. This pumping station is located in the alignment of the Miami Canal at the north boundary of WCA-3A, about 30 miles southwest of the town of Belle Glade and 15 miles west of U.S. Highway 27. The pumping station is equipped with four (4) Fairbanks Morse 152-inch diameter horizontal pumps rated for 1,040 cfs each, for a total capacity of 4,160 cfs. The station also has an adjacent gated spillway that allows water to enter the WCA-3A without use of the pumps. In addition to moving treated water from STA-5, S-8 conveys treated water from STA-3/4 into WCA-3A. S-8 is operated as needed to convey treated water to WCA-3A, unless the water level in the conservation area is low enough to permit gravity discharge at a satisfactory rate through the adjacent spillway gate.

2.6.5 G-88

Structure G-88 is located immediately south of STA-6 in the L-3/L-4 pool area commonly referred to as "Confusion Corner." The structure consists of four (4) 72-inch corrugated metal pipes with risers. Operation of G-88 facilitates movement of water between the L-3 and L-4 canals, subject to the operations of G-404 and G-409. Normal operation is with all flashboards removed.

2.6.6 G-357

The G-357 structure is located on the Miami Canal at the confluence with the L-4 borrow canal. This structure is located adjacent to G-404 pump station, just north of the S-8 pump station, and adjacent to the southeastern corner of the Rotenberger Wildlife Management Area. The structure consists of two (2) 10-ft high by 10-ft wide concrete box culverts fitted with motorized lift gates. The northern culvert has an invert in the Miami Canal at elevation 3.66 ft, and an invert in the L-4 borrow canal at 2.84 ft. The southern culvert has an invert in the Miami Canal at elevation 2.85 ft, and an invert in the L-4 borrow canal at 2.76 ft. The structure has historically been used to facilitate movement of water from the L-4 borrow canal to the Miami Canal or to pass irrigation flows to L-4 from the Miami Canal. When the gates are closed, G-357 will prevent back flow from the L-4 Borrow canal to the Miami Canal when G-404 is pumping. Under water supply conditions, if the Miami Canal stage is higher than the L-4 borrow canal, G-357 may be opened to allow gravity flow to the L-4.





2.6.7 G-404 Pump Station

Pumping station G-404 is located in Broward County on the Miami Canal at the confluence with the L-4 borrow canal. The station is located adjacent to structure G-357, just north of the S-8 pump station, and adjacent to the southeastern corner of the Rotenberger Wildlife Management Area. There are two operational objectives for G-404:

1. To supply northwest WCA-3A with treated discharges from STA-5 and STA-3/4, and
2. To provide irrigation water supply to the Big Cypress Seminole Indian Reservation.

The pump station has three (3) 60-inch diameter vertical axial flow pumps with diesel engines and each pump has a discharge capacity of 190 cfs at a total dynamic head of 10.3 ft. The factory test report, including performance curves, for these pumps are contained in the project files.

Pump Station Description:

Number of pumps: 3

The following characteristics are for each pump:

Start-up capacity:	190 cfs at a total developed head of 10.3 ft, and a static head of 8.0 ft (HW=8.0 ft; pipe crest elevation = 16.0 ft)
Flood condition capacity:	207 cfs at 5.5 ft static head (HW=11.0 ft; TW=16.5 ft)
Siphon-assisted capacity:	209 cfs at 4.45 ft static head (HW=8.0 ft; TW=12.45 ft)
Design headwater elevation:	9.0 ft
Design low water shut off elevation:	8.0 ft
Design flood headwater:	12.0 ft
Design tailwater elevation (estimate):	12.45 ft
Design maximum tailwater elevation:	16.5 ft
Design head loss across trash rack:	1.0 ft
Nominal pump operating speed:	275 rpm
Normal "on elevation":	Subject to STA-5 operations and Miami Canal conditions
Normal "off elevation":	Subject to STA-5 operations and Miami Canal conditions
Motor size:	375 Hp

2.6.7 L-4 Borrow Canal

The L-4 Borrow Canal is located directly south of the Rotenberger WMA between the Miami Canal and the L3 Borrow Canal. As part of the initial construction of STA-5, a 100-foot gap was cut in the south L-4 levee at a location directly adjacent to the point that the L-3 Extension Canal bends to the south. A short connector canal was excavated between the L-4 canal and the L-3 Extension Canal at this point. The cut has a bottom width of 150 ft. at elevation 3.0 ft. NGVD. Treated flows from STA-5 (and STA-3/4) can move west through the L-4 borrow canal from the G-404 pump station to this location. Treated water from STA-6 can move east to this same location. Treated flows are then directed south in the L-3 extension canal to Water





Conservation Area 3A which enhance hydropattern restoration in the area. Complete degradation of the southern L-4 levee is anticipated to occur in accordance with the Everglades Forever Act after 2010.

2.6.8 G-409 (Seminole Indian Reservation Water Supply Pump Station)

This pump station is located on the west L-3 levee just south of the Oil Well Bridge. Water supply releases from Lake Okeechobee or treated water from STA-3/4, STA-5 and/or STA-6 can be delivered to the intake of this pump station to satisfy water supply demand of the Big Cypress Seminole Indian Reservation.





3 OPERATION

Described below are the anticipated operations of the STA-5 and STA-6 treatment system during the initial expansion start-up operations, normal conditions, and operations during the construction of Compartment C Build out. A schematic showing the design and extreme flow conditions associated with the initial configuration is presented in **Figure 8**. Throughout this *Operation Plan*, an operational range of +/- 0.20 ft is applied to all the target stages, unless otherwise stated. For example, if the plan calls for a target stage of 13.0 ft NGVD, then the operational range is 12.8 – 13.2 ft NGVD.

The full expansion of STA-5 and STA-6 is presently under design, with construction of the full Compartment C build-out scheduled to be sufficiently complete to be capable of flow-through operations by August 2013. This sequence of expansion necessitates an **interim phase of operation** for STA-5 and STA-6 until normal flow-through operation of the full build out. This **interim phase of operation** is anticipated to consist of two periods:

Interim Period 1. Flow through operations of approximately 5,007 acres of existing STA-5 and STA-6, and start-up operations (i.e., no flow through) for the initial expansion (STA-5 Flow-way 3 and STA-6 Section 2).

Interim Period 2. Flow through operations of approximately 8,379 acres of treatment area, including the initial expansion.

Upon completion of these interim periods of operation, the **long-term operations** should commence, with a total of approximately 14,609± acres of effective treatment area in the integrated STA-5 and STA-6 system.

3.1 INITIAL EXPANSION START-UP OPERATION

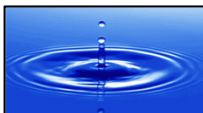
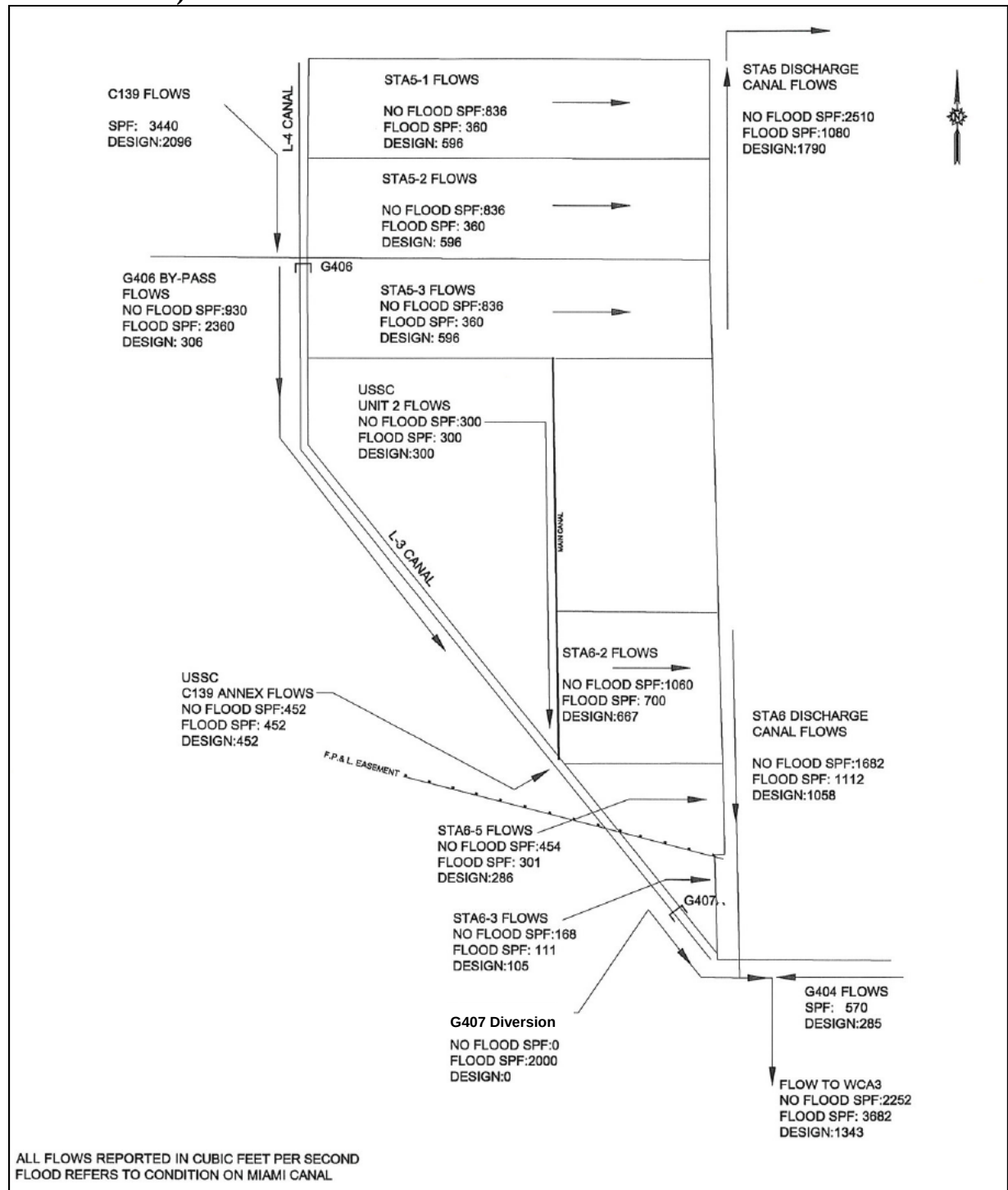
The target vegetation in the new STA-5 treatment Cell 3A is emergent vegetation and in Cell 3B is Submerged Aquatic Vegetation (SAV). The target vegetation in STA-6 Section 2 is SAV. Start-up operations in STA-5 3rd flow-way and STA-6 Section 2 began during construction of the initial expansion. This start-up period is anticipated to last from 6-18 months, subject to vegetation grow-in and other factors outside the control of the District. The operational goal during start-up operations is to regulate water levels within the STA treatment cells to encourage establishment of the desired treatment vegetation and to prevent discharge until net improvement in phosphorus and mercury are demonstrated. Until flow-through operations are authorized in STA-5 Flow-way 3, the existing two STA-5 flow-ways will be operated to capture and treat approximately the same STA-5 inflows as presently occur. Until net improvement is demonstrated in STA-6 Section 2, the two existing STA-6 treatment cell will be operated to capture and treat STA-6 inflows, which will consist of runoff and





construction dewatering from the fallow agricultural land to the north and, if capacity is available, runoff from the C-139 Annex.

Figure 7. Design and Extreme Flow Conditions for Initial Configuration (not to scale; from URS 2005).





Vegetation Development. During start-up operations, water levels will be managed in the western portion of the STA-5 Flow-way 3 (Cell 3A) to encourage the growth of emergent vegetation. Water levels will be managed in the eastern portion of the STA-5 flow-way (Cell 3B) and in STA-6 Section 2 to encourage the growth of SAV.

Water quality within the new treatment cells will be assessed to demonstrate a net reduction in phosphorus and mercury species prior to allowing discharge. Net reduction for phosphorus will be demonstrated once the 4-week geometric mean total water column phosphorus concentrations from samples collected upstream of the outlet structures is less than the 4-week geometric mean total water column phosphorus concentration from samples collected at the inflow structures. Net improvement in total mercury and methylmercury will be demonstrated once the total mercury and methylmercury concentrations at the midpoint locations are not significantly greater than the corresponding species at the inflow locations. District staff will be responsible for the Start-Up Water Quality sampling program required to demonstrate net improvement in phosphorus and mercury.

3.2 NORMAL OPERATION

Proposed structure operations developed and presented herein represent an initial estimate of those operations necessary to achieve the various operational goals of STA-5 and STA-6. Temporal and spatial variations in the distribution of inflows, as well as in the hydraulic response of the treatment areas as vegetative communities mature, will require periodic review and refinement as needed in structure operations to develop and maintain balanced flow distributions. Short-term deviations from the operations described in this Section are anticipated, as District personnel will exercise their best professional judgment based upon existing regional and on-site conditions and data available at the time. Water levels in the STA will be adjusted through operation of the inflow structures and adjustment of the gates on the interior and outlet structures. Initial operating guidelines are provided below, however, as the STA vegetation matures or as may be warranted for STA performance purposes, the target water levels and gate openings may need to be refined.

3.2.1 Normal Flow Conditions

Normal Operations are defined as those operations for inflows up to and including the Design Flow Condition. The design flow condition will change as flow-through operation begins on the additional treatment area, however, the target depths will not. A summary of the anticipated discharges for STA-5 and STA-6 are presented in **Table 3** for the two interim operation periods.





Table 3. Summary of Design Flow Conditions for STA-5 and STA-6.

Operation Period	STA	Effective Treatment Area (acres)	Inflow Structures	Anticipated Peak Inflow (cfs)	Outflow Structures	Anticipated Peak Outflow (cfs)
Interim Period 1	STA-5	4,110	G-342A-D	<1,200	G-344A-D	<1,200
Interim Period 1	STA-6	897	G-353A-C	500	G354A-C, G393B	500
Interim Period 2	STA-5	6,095	G-342A-F	<1,200	G-344A-F	<1,200
Interim Period 2	STA-6	2,284	G-396A-C & G-353A-C	1,058	G-352A-C, G354A-C & G-393A-C	1,058

Note: For the period 7/00 – 4/07, the peak inflow to STA-5 was 944 cfs and approximately 20% of the southern C-139 Basin runoff was diverted through G-406. Outflow from STA-5 is limited by the capacity at the S-8 pump station.

For the **Interim Operation Period 1**, the anticipated flows and stages in STA-5 and STA-6 are anticipated to be represented by the original design values, as the treatment area in operation is identical. A summary of STA-5 peak stages under normal and extreme flow conditions for interim period 1 is presented in **Table 4** (Burns & McDonnell 1999) and a summary of STA-6 design flow condition is presented in **Table 5** (Burns & McDonnell 1996). During **Interim Operation Period 1**, operation of the existing treatment cells of STA-5 and STA-6 Section 1 are anticipated to continue as before their construction.

Table 4. STA-5 Interim Period 1 Peak Stages Under Design Flow Condition.

Flow Condition	G-342 A-D			G-343 A-H			G-344 A-D			G-406		
	HW Ft	TW ft	Flow per struct cfs	HW ft	TW ft	Flow per struct cfs	HW ft	TW ft	Flow per struct cfs	HW ft	TW Ft	Flow per struct cfs
Design Flow – 1,750 cfs												
STA Inflow = 1,200 cfs	17	16.3	300	15.63	14.87	150	14.34	14.13	300	17	16.3	550





Table 5. STA-6 Interim Period 1 Design Flow Condition.

INFLOW WEIRS	DESIGN MAX INFLOW (@500 cfs)	HEADWATER (HW) (Low Tailwater Condition) No L3 to L4 Flow (500 cfs Discharge)	TAILWATER (TW) (Low TW Condition)	HEADWATER (HW) 250 cfs L3 to L4 Flows (500 cfs Discharge)	TAILWATER (TW) (High TW Condition)
G-601 & G-602:	180 cfs	16.34 ft NGVD	15.45 ft NGVD	16.32 ft NGVD	15.95 ft NGVD
G-603:	140 cfs	16.09 ft NGVD	15.47 ft NGVD	16.20 ft NGVD	16.07 ft NGVD

STA-6 SECTION 1 TREATMENT CELLS	STATIC WATER SURFACE ELEVATION (No Discharge)	LOW WATER CONDITION IN CELL (No L3 to L4 Flows) (500 cfs STA Discharge)	HIGH WATER CONDITION IN CELL (250 cfs L3 to L4 Flows) (500 cfs STA Discharge)
CELL 3: (Only one structure G-393B used)	14.0 ft NGVD	15.35 ft NGVD	16.0 ft NGVD
CELL 5: (All three structures G-354A-C used)	14.1 ft NGVD	15.25 ft NGVD	15.85 ft NGVD

TREATMENT CELL DISCHARGE STRUCTURES	MAX HW (@500 cfs Discharge)	MAX TW (500 cfs STA Discharge)
CELL 3: (Only one structure G-393B used)	16.0 ft NGVD	15.15 ft NGVD (140 cfs)
CELL 5: (All three structures G-354A-C used)	15.85 ft NGVD	15.16 ft NGVD (120 cfs per structure)

3.2.2 General Operation of the Treatment Cells

Note: Short-term deviations from the operations described in this Section are anticipated, as District personnel will exercise their best professional judgment based upon existing regional and on-site conditions and data available at the time.

Operating Depth Ranges. In general, STA treatment cells are operated to encourage colonization by and continued viability of wetland plants and optimize uptake of phosphorus from the stormwater passing through the cells.





- **Minimum Depth.** To the maximum extent practicable, a minimum static water level of 0.5 feet above the reference ground elevation¹ of the treatment cells will be maintained to avoid dryout of the treatment cells, subject to available water from the upstream watershed.
- **Maximum Depth.** To the maximum extent practicable, a maximum static water level of 4.0 feet above the reference ground elevation of the treatment cells will be observed to avoid damage to the levees and marsh vegetation.

Target depths between storm events. Recommended target depths for the different treatment vegetation communities have varied over the years as operating and performance experience has been gained. In general, emergent cells will be maintained at approximately 1.25 ft above the reference ground level, while SAV cells will be maintained at approximately 2 ft above reference ground level. The table below identifies the reference ground elevation, target vegetation community, target depth and associated target stage between storm events for each treatment cell. The reference ground elevations for STA-5 flow-way 3 and STA-6 Section 2 were set equal to the average ground elevation from topography data used by URS during hydraulic modeling of the cells (URS 2005). As additional operating experience is gained, or as refined topographic data become available, or as other conditions warrant, these reference ground elevations and target stages will be revised.

Table 6. Target Stages for Normal Operations.

STA	Cell	Effective Treatment Area (acres)	Reference Ground Elevation (ft NGVD)	Target Dominant Vegetation	Target Depth (ft)	Target Stage Between Storm Events (ft NGVD)	Minimum Stage (ft NGVD)	Maximum Stage (ft NGVD)	Structure Measured for Targets (HW)
STA-5	1A	835	12.75	Emergent	1.25	14.00	13.25	16.75	G-343A-D
	1B	1,220	11.50	SAV	2.00	13.50	12.00	15.50	G-344A&B
	2A	835	12.75	Emergent	1.25	14.00	13.25	16.75	G-343E-H
	2B	1,220	11.50	SAV	2.00	13.50	12.00	15.50	G-344C&D
	3A	1,065	14.00	Emergent	1.25	15.25	14.50	18.00	G-343I&J
	3B	920	12.50	SAV	2.00	14.50	13.00	16.50	G-344E&F
	Total	6,095							
STA-6	Cell 3	245	13.07	Emergent	0.93	14.00	13.57	16.85	G-393A-C
	Cell 5	652	12.94	Emergent	1.16	14.10	13.44	16.85	G-354A-C
	Section 2	1,387	12.50	SAV	1.60	14.10	13.00	16.50	G-352A-C
	Total	2,284							

Note: As additional operating experience is gained, or as refined topographic data become available, or as other conditions warrant, these reference ground elevations and target stages will be revised.

Balance phosphorus loading rate among flow-ways. To optimize STA phosphorus removal performance, the inflow phosphorus loading rates (mass P per unit area per year) should be

¹ For operations and permitting purposes, the reference ground elevation is assumed to be equal to the average ground elevation.





balanced among the flow-ways to the extent practical. If the inflow TP concentration to all the cells were equivalent, balancing the loading rate to each flow-way would be achieved by balancing the areal hydraulic loading in proportion to each flow-ways treatment area, as shown in **Table 7**. However, there has been a strong concentration gradient in the L-2 and L-3 Borrow Canals, with inflows averaging 199 ppb for the northern flow-way of STA-5, and 284 ppb for the central flow-way for the period 10/1999 – 4/2007. Assuming these concentrations remain the same, for conditions up to stages requiring opening of the diversion structures, the northern flow-way should receive approximately 43% more flow than the central and southern flow-ways in order to balance the phosphorus loading rate among the flow-ways². Achieving this balance will require differential modulation of the inlet gate openings, and operating the intermediate (G-343s) and outlet gates (G-344s) to maintain similar stages in the downstream cells. Based on the equations for the rating curves derived by the District for the G-342 A-D structures (see Appendix 1), **Table 8** provides initial guidance for gate openings to balance the phosphorus loading rate among the three STA-5 flow-ways. Full gate openings at G-342A&B and gate openings of 3.4 ft at G-342C-F should achieve the balanced phosphorus loading rate. Temporal and spatial variations in the distribution of inflows, as well as in the hydraulic response of the treatment areas as vegetative communities mature, will require periodic review and refinement as needed in structure operations to develop and maintain balanced flow distributions.

Table 7. STA-5/STA-6 Flow-way Spatial Characteristics

STA	Flow-way	Effective Treatment Area (acres)	Proportion of Total Treatment Area	Inflow Structures
STA-5	1A/1B	2,055	24.5%	G-342A&B
	2A/2B	2,055	24.5%	G-342C&D
	3A/3B	1,985	23.7%	G-342E&F
STA-6	Cell 3	245	2.9%	G-353C
	Cell 5	652	7.8%	G-353A&B
	Section 2	1,387	16.6%	G-396A-C

² 284 ppb / 199 ppb = 1.43



**Table 8. Initial STA-5 gate Openings Designed to Achieve Balanced TP Loading Rate**

G-406 HW Stage ft NGVD	Estimated Flow cfs	Target Flow in Northern Flow-way, cfs	G-342A&B Head loss ft	Target Flow in Central Flow-way, cfs	G-342C&D Gate Opening ft	Target Flow in Southern Flow-way, cfs	G-342E&F Gate Opening ft
15.5	850	353	0.216	249	3.4	249	3.4
15.6	900	374	0.242	263	3.4	263	3.4
15.7	950	394	0.270	278	3.4	278	3.4
15.8	1000	415	0.299	292	3.4	292	3.4
15.9	1050	436	0.330	307	3.4	307	3.4
16.0	1100	457	0.362	322	3.4	322	3.4
16.1	1139	473	0.388	333	3.4	333	3.4
16.2	1178	489	0.415	344	3.4	344	3.4
16.3	1217	505	0.443	356	3.4	356	3.4
16.4	1256	521	0.472	367	3.4	367	3.4
16.5	1294	537	0.502	378	3.4	378	3.4
16.6	1333	554	0.532	390	3.4	390	3.4
16.7	1372	570	0.564	401	3.4	401	3.4
16.8	1411	586	0.596	413	3.4	413	3.4
16.9	1450	602	0.629	424	3.4	424	3.4

Assumes the goal is to direct 43% more flow into the Northern Flow-way than the other two.

Algorithm to determine initial gate opening to achieve balanced TP loading rate

- Step 1. For a given G-406 HW stage (<16.9 ft), determine the target flow from the table above
- Step 2. For this target flow, determine the head loss for the G-342A-B structures with fully open gates, using the flow equation for the G-342 structures in **Appendix 4**.
- Step 3. For the desired flow rate for the G-342C-F structures from the table above, determine the gate opening that yields the head loss from Step 2.

On a weekly basis, the District's STA Management Division summarizes STA-5 flow and phosphorus loading data and compares it to the operational envelopes (see section 3.2.3 below). This information is used to develop guidance for future operations. It is anticipated that adjustments to the STA-5 inlet gates in **Table 8** may be necessary to balance the loading rates to the treatment cells.

Inlet gate operations necessary to achieve an optimal phosphorus loading rate to STA-6 will vary depending on the following factors:

1. the quantity and quality of flows from the C-139 basin passing south of STA-5,
2. the quantity and quality of flows from the C-139 Annex,
3. the quantity and quality of flows from the Compartment C area, and
4. the prior loading to the STA.

Because of the variability in these factors, it is infeasible to generate initial gate openings in this *Operation Plan*. On a weekly basis, the District's STA Management Division evaluates





STA-6 loading and performance against the operational envelopes (see section 3.2.3 below), and establishes guidance for future allocations. It is anticipated that weekly adjustments to the STA-6 inlet gates will be necessary to avoid overloading the treatment cells.

All gates should be fully open prior to opening the diversion structure, which will occur at a G-406 headwater stage of 16.9 ft NGVD.

Depth-duration after storm events. To a certain extent, the operation of the inflow and outflow structures can be modulated to minimize damage to the treatment vegetation caused by prolonged durations of high water levels; this will optimize long-term treatment performance of the STA. Previously, the operating guidance (and permit condition) for the STAs had been to ensure that water levels are at the maximum depth of 4.5 ft for no more than 10 days, however, concerns have been raised that 10 days at 4.5 ft is too long to maintain viable treatment vegetation. To minimize impacts to treatment vegetation and associated treatment performance, the following depth-duration thresholds are proposed during non-flood conditions:

- avoid 4.0 ft for more than 3 consecutive days
- avoid 3.5 ft for more than 7 consecutive days
- avoid 3.0 ft for more than 10 consecutive days

G-600. URS recommended the following operations at G-600 during the Interim Conditions, assuming 150-cfs pumping capacity (URS 2007b):

1. Temporary impoundment of stormwater within Compartment C Build out area is recommended to reduce the peak flows through STA-6. When severe storms are not anticipated for at least 6 days, Compartment C may be used as a temporary reservoir, allow stages to rise to no more than 14.5 ft NGVD, provided that it does not impact proposed construction operations for the Compartment C Build out. The stored stormwater may be discharged to the L-3 Canal at an appropriate rate when the flow-way depths have dropped under recommended limits. The full pumping capacity should be used to lower the Compartment C stage if severe storms are expected within 6 days.
2. For storm events with anticipated rainfall of 8 inches or less, the Compartment C stage should be drawn down to 13.6 feet NGVD or lower.
3. When more than 8 inches of rainfall is anticipated, Compartment C build-out area should be drawn down to 12.5 ft NGVD or lower.
4. During the construction of the Compartment C build out, the construction contractor will be responsible for all surface water management means and methods, including operation of G-600. The construction contract will need to require that the construction contractor prevent untreated surface water discharges to either the Rotenberger tract or the STA-6 Discharge Canal, anticipated to occur at stages above 14.5 ft NGVD. The construction contractor will most likely need to provide supplemental pumping capacity in excess of 150 cfs to prevent these discharges.





Seepage Pump Stations. The northern seepage collection canal will be maintained at levels to prevent seepage from STA-5 from adversely impacting adjacent lands. The estimated control elevation during design was 9.0 ft NGVD for the eastern section, based on the assumption that stages in the seepage canal needed to be 2.5 – 4.0 ft below adjacent ground elevation. Similarly, the control elevation estimated during design was 11.0 ft NGVD for the western section. In practice, the stage in the eastern section is being maintained between 9.5 ft and 10.5 ft NGVD, measured at the headwater of the G-349A pump station. A new seepage return pump station (G-349C) was constructed at the northwest corner of Cell 1B to assist in maintaining desired stages.

3.2.3 Operational Envelopes

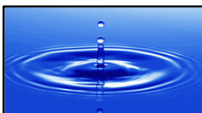
The *Everglades Protection Area Tributary Basins Long Term Plan for Achieving Water Quality Goals* recommends structural, vegetative and operational enhancements for each STA, and provides a predicted range of long-term average outflow phosphorus concentrations once the enhancements are completed. The basin data sets, operational envelopes and outflow performance projections are currently being updated. The operational envelopes presented in **Appendix 4** are based on the latest estimates of average inflows covering the period May 1, 1994 through April 30, 2007 (Goforth, 2007). Adaptive refinement of the operational strategies for the STAs will be required to optimize the phosphorus removal performance of the STAs and to ensure that the STAs are not subject to overload from inflow volume or phosphorus. The information in Appendix 4 can be updated as estimates of STA inflow are updated through the permit process.

On a weekly basis, the District's STA Management Division summarizes STA-5 and STA-6 flow and phosphorus loading data and compares it to the operational envelopes. This information is used to develop guidance for future operations. It is anticipated that adjustments to the STA inlet gates may be necessary to balance the loading rates to the treatment cells.

3.2.4 Diversion During Interim Operation Period 1

During start-up of STA-5 3rd flow-way and STA-6 Section 2, operation of the G-406 structure is anticipated to continue as before their construction.

STA-5. Stormwater runoff from the C-139 Basin will continue to enter STA-5 through the G-342A-D structures up to the hydraulic capacity of the STA, with the balance being diverted through G-406. In general, during storm events the inflow structures G-342A-B will be fully opened and structures G-342C&D opened 3.4 ft when stages in the L-2/L-3 borrow canals are above stages within STA-5. Under normal operations, the STA structures will be operated up to the anticipated peak flow of just under 1,000 cfs. These structures should be fully opened prior to opening G-406, which during the **Interim Operation Period 1**, will serve as a divide structure for C-139 basin runoff to discharge south.



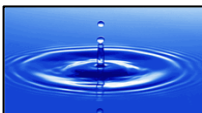


G-406 Interim Operation Period 1. During **Interim Operation Period 1**, G-406 will be operated as it is presently. Under normal operating conditions, G-406 will be closed until the stage at the headwater of the structure rises to elevation 16.0 ft NGVD, which will force tributary basin stormwater runoff through STA-5. Above elevation 16.0 ft NGVD, it will be necessary to open G-406 to provide flood protection for the upstream basin, in accordance with the following proposed operations.

1. When the L-3 stage reaches 16.0 ft NGVD, G-406 will be opened gradually in an attempt to maintain 16.0' until the G-406 flow rate is approximately 400 cfs.
2. If the L-3 stage continues to rise above 16.0 ft NGVD, flow through G-406 will be allowed to increase from approximately 400 cfs to approximately 500 cfs, while the stage rises to 17.0 NGVD.
3. When the L-3 stage reaches 17.0 ft NGVD, the gate opening at G-406 will be progressively increased until it is fully open in an effort to maintain a stage of 17.0'.
4. At stages above 17.0 ft NGVD, G-406 will remain fully opened. If higher flows were to occur, the stage in the canal would rise based on the ability of the STA to accept flow and the ability of G-406 to divert flow.
5. Following the storm peak flows/stages, operation of G-406 will follow the above strategy in reverse. If the stages rebound in response to the gate closing, G-406 will be operated according to the rising schedule until stages recede.
6. The STA 5 outlet structures (G-344s) will not be closed or partially closed if the G-406 diversion structure is open, regardless of the stage in the Miami Canal, except under emergency conditions where life or property is threatened.

If the sum of STA-5 total discharge and the STA-3/4 treated discharge volume in the L-5 borrow canal exceeds the combined capacity of the S-8 pump station and the G-404 pump station, then G-406 will be opened to divert the difference in flows. Elevations at the G-342 inflow structures will be monitored closely for a critical elevation of 16 ft NGVD that will trigger opening of G-406. G-406 will be modulated in accordance with the interim G-406 operating schedule. G-406 will remain open until system operations demonstrate that the closing of G-406 will not result in a reduction in flood protection.

STA-6. Pump station G-600 and the C-139 Annex discharge facility, along with any diversion through G-406, will control the stage in the L-3 borrow canal adjacent to the STA-6 inflow structures. Depending on these inflows and the hydraulic and treatment capacity of STA-6, the G-407 headwater stage may rise sufficiently high to warrant opening for diversion of untreated water to WCA-3A.





G-407 Interim Period 1 Operations. This new divide structure will normally be closed, however, the gates can be opened to divert untreated runoff should the L-3 stage rise above 16.9 ft NGVD. Dynamic hydraulic modeling of the L-3 Canal and STA 5/6 systems performed by URS confirmed that operation of the G-407 Structure, based on the G-406 headwater stage, was effective for maintaining the existing flood protection level of service (URS 2007b). Modeling conducted by URS established the G-407 gate operations in **Table 9** that should be sufficient to maintain the existing flood protection level of service while reducing diversions to WCA3A (URS 2007b). G-406 headwater stages and G-407 diversion quantities for various storm events modeled by URS are presented in **Table 10** (URS 2007b). **Figure 8** shows the flood protection level of service calculated for the C-139 Basin from prior to STA construction, the existing phase, and the proposed interim phase (URS 2007b). After the storm passes, the gate opening at G-407 will be reduced in reverse sequence, using the same criteria in **Table 9**. **In the event that G-406 is closed and the headwater stage at G-407 rises to 16.9 ft, G-407 should be operated as in Table 9, using the headwater stage at G-407.**

Table 9. G-407 Interim Phase Gate Operation Recommendations

G-406 HW Stage (ft NGVD)	G-407 Flow Rate (cfs)
<16.9	0
16.9 to 18.1	500
>18.1	1,400

Table 10. Existing and Proposed Flood Control Level of Service (URS 2007b)

Storm Event	Existing		Proposed	
	Peak G-406 Headwater Stage (ft NGVD)	Diversion Volume to WCA3A (ac-ft) ¹	Peak G-406 Headwater Stage (ft NGVD)	Diversion Volume to WCA3A (ac-ft) ¹
5-yr, 3-day	17.1	18,600	17.1	1,600
10-yr, 3-day	17.7	20,400	17.7	3,200
25-yr, 3-day	18.3	22,400	18.1	5,400
SPF, 3-day	20.4	29,500	19.6	8,100

¹Estimated diversion volume for first 11 days of storm event



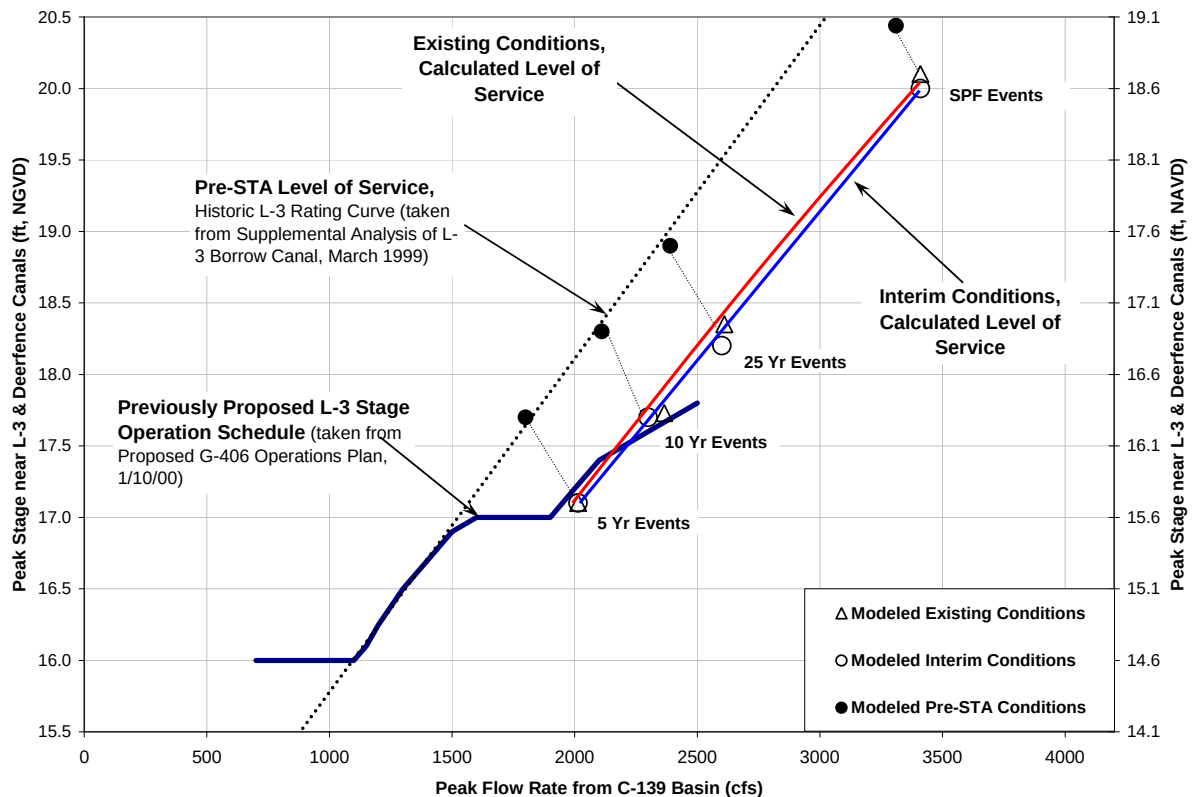


Figure 8. C-139 Basin Flood Protection Level of Service (Source: URS 2007b)

3.2.5 Diversion During Interim Operation Period 2

After flow-through operations commence in the STA-5 Flow-way 3 and STA-6 Section 2, and prior to flow-through operations commence for the full build-out, a second **interim period of operations** will occur. General operations are described below. Additional modeling of the STA-5/STA-6 system is recommended to assist Operations staff modulate the STA-5/STA-6 inflow structures to balance the hydraulic and phosphorus loading rates among the flow-ways.

STA-5. With the 3rd Flow-way in flow-through operation, STA-5 will continue to capture C-139 Basin runoff, and the resulting hydraulic and nutrient loading rates to the STA-5 flow-ways, i.e., on a unit area basis, should therefore be reduced.

STA-6. With STA-6 Section 2 in flow-through operation, STA-6 will continue to capture stormwater runoff from the balance of Compartment C, the C-139 Annex and, to the extent capacity is available, a portion of the C-139 Basin runoff that is diverted from STA-5. With 60% additional treatment area on line, the hydraulic and nutrient load to the two existing treatment cells should decrease considerably. Inflows to Section 2 will be controlled by the G-396A-C structures.





G-406 Operations. G-406 will remain open during **Interim Operation Period 2**. Operations personnel may exercise the discretion to close G-406 if no rain is anticipated in the C-139 basin should they desire to prevent intermingling of discharges from the C-139 Annex with water from the C-139 basin.

G-407 Operations. The operations for G-407 during **Interim Operation Period 2** are identical to operations for **Interim Operation Period 1**.

3.2.6 G-404 Operations

Storm events. During periods when STA-5 is treating water from the C-139 basin, G-404 shall operate to supply STA-5 discharges to the northwest corner of WCA-3A. Although specific operating criteria may be refined, the following are initial guidelines:

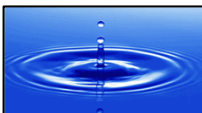
1. When STA-5 discharges treated storm flows through the G-344 structures, G-404 should be operated for a sufficient capacity and duration to deliver a similar volume to the northwest portion of WCA-3A. If G-404 alone cannot handle the discharges from STA-5, additional pump stations on the Miami Canal should be activated (S-8 and G-200A as needed).
2. Unless concurrent releases are being made from STA-3/4, G-404 should be operated prior to S-8 for the purpose of sending treated water from STA-5 into WCA-3A.
3. If concurrent releases are being made from STA-3/4 and STA-5, additional pump stations on the Miami Canal (S-8 and G-200A³) may be activated sooner than G-404 depending on specific conditions.

STA-3/4 Discharges. If releases from STA-3/4 are being made and no discharges are being made from STA-5, G-404 may be used to supplement the capacity of S-8 and G-200A as needed to convey the treated water from STA-3/4.

Water supply operations. At the request of the Big Cypress Seminole Indian Reservation, G-404 will be operated to supply water to the west along the L-4 borrow canal in concert with the 190-cfs G-409 pump station to supply water to the Reservation.

Miami Canal storm operations. Although not an explicit project objective, an ancillary benefit of G-404 is to supplement the ability of S-8 and G-200A to convey treated discharges from STA-3/4 to WCA-3A.

³ G-200A was damaged during the 2004 hurricanes and is presently inoperable.





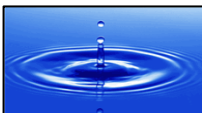
3.2.7 Normal Flow Operations Summary

- **STA-5**

- The G-342 inlet gates will be modulated to try to balance the phosphorus loading rate among the flow-ways. Initial guidance for gate openings is provided in **Table 8**. Revisions to these initial gate openings are anticipated as operational experience is gained and as STA performance necessitates.
- There may be periods when storm events occur concurrently in the C-139 Basin and the Miami Canal Basin necessitating concurrent releases of STA-5 and STA-3/4, and diversion at G-406 and G-407 may be unavoidable. As an attempt to balance these, the following guidelines were developed:
 1. If the following conditions occur:
 - a. the Miami Canal pump stations (S-8, G-404 and G-200A) are operating at their available capacity, and
 - b. the G-406 gate is closed (during Interim Operation Phase 1),
 - c. the G-407 gate is closedthen the STA-5 outlet structures can be partially closed to take advantage of available storage capacity within the treatment area, subject to the maximum operating depths within the treatment cells, depth-duration restrictions and forecast of minimal storm and wind events in the STA-5 area.
 2. During Interim Operation Phase 1, if the stage at G-406 approaches the opening threshold of 16.0 ft NGVD, the STA-5 outlet structures will be opened subject to a maximum HW/TW differential of one foot across the structure within the range of 12.3 – 12.7 ft NGVD at the G-344 HW. If the stage at G-406 passes the opening threshold of 16.0 ft NGVD, then G-406 will be operated in accordance with the guidelines in Section 3.3.4 above.
 3. During Interim Operation Phase 2, if the stage at G-406 approaches the opening threshold for G-407, the STA-5 outlet structures will be opened subject to a maximum HW/TW differential of one foot across the structure within the range of 12.3 – 12.7 ft NGVD at the G-344 HW. If the stage at G-406 passes the opening threshold for G-407, then G-407 will be operated in accordance with the guidelines in Section 3.2.5 above.
 4. The Miami Canal pump stations (S-8, S-404 and G-200A) will be operated in accordance with their operating guidelines.
- The interior and outflow structures will be modulated depending on flow and tailwater conditions to maintain target stages in all STA-5 treatment cells.

- **STA-6**

- Interim Operation Phase 1: G-600 will introduce a peak inflow rate of approximately 150 cfs into the L-3 Canal via G-351. The C-139 Annex discharge facility will discharge up to 450 cfs to the L-3 canal. G-406 will pass C-139 Basin runoff in excess of the capacity of STA-5. The G-353 inlet gates will control flow into STA-6





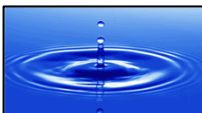
- Cells 3 and 5 up to 500 cfs. The G-354A-C and G-393B will control outflow from the STA.
- Interim Operation Phase 2: G-600 will introduce a peak inflow rate of approximately 150 cfs into the STA-6 Section 2 inflow canal and/or L-3 Canal. The C-139 Annex discharge facility will discharge up to 450 cfs to the L-3 canal. G-406 will pass C-139 Basin runoff in excess of the capacity of STA-5. The G-353 inlet gates will control flow into STA-6 Cells 3 and 5. The G-396 inlet gates will control flow into STA-6 Section 2. The G-352A-C, G-354C and G-393B will control outflow from the STA and the stages within the STA.
 - **G-406 Operation.** During Interim Operation Period 1, G-406 will be operated as it is presently (section 3.2.4). During Interim Operation Period 2, G-406 will remain open.
 - **G-407 Operations.** The gates will be opened according to the stages as described in **Table 9**.
 - When discharges are made from STA-5, the G-404 pump station should be operated for a sufficient capacity and duration to deliver a similar volume to the northwest portion of WCA-3A, in accordance with the guidance in Section 3.2.6. above.

3.3 PRE-STORM OPERATION

The intent of a pre-storm drawdown is to provide storage in STA-5 and STA-6 prior to a heavy rainfall event. Pre-storm drawdown operations may be based upon the District's rainfall forecast. If storage in STA-5 and STA-6 can be created by discharging water prior to the storm event, pre-storm drawdown may be initiated. If a major storm is predicted, outflow structures that do not have emergency back-up power should be opened in anticipation that power will be lost during the storm event, such that the water levels in the treatment cells are reduced to, or below, the target stages in Table 6. Pre-storm operations are therefore accompanied by some risk that a drawdown may be implemented and the actual amount of rainfall does not match the predicted amount, with the result that after the storm passes, the target stages are not met. The biological consequences of this operation could be potential damage to the vegetation if a source of water is not available after such a pre-storm drawdown and related less-than-predicted rainfall. Such an occurrence in the dry season could result in even higher risk of damage to the vegetation if a source of water can not be found for an extended period of time.

3.4 WATER SUPPLY OPERATION

It is not anticipated that water supply deliveries to the EPA or other areas will be made through STA-5 or STA-6, other than for delivery to Big Cypress Seminole Reservation (described above) and hydropattern restoration purposes (described below).





3.5 EXTREME FLOW OPERATION

3.5.1 Interim Operation Period 1

For the Interim Operation Period 1 (prior to flow-through of STA-5 3rd flow-way and STA-6 Section 2), the operation of STA-5 and STA-6 will be the same as it is before the initial expansion.

3.5.1.1 STA-5 Extreme Event Operation During Interim Period 1

The Standard Project Flood (SPF) was estimated for STA-5 as 1.25 times the 100-year flood peak discharge for discharges originating from the C-139 basin to the L-2 Borrow canal for period water years 1978 to 1995. The computed SPF discharge from the C-139 basin is 3,440 cfs (Burns & McDonnell 1996). When the Miami Canal basin is not in flood mode (which would restrict flows through STA-5), STA-5 inflows will be limited to 2,510 cfs during the SPF event. The difference in flows, 930 cfs, will be diverted via diversion structure G-406.

Table 11. STA-5 Standard Project Flood Expected Flows and Stages.

Structure	Headwater ft NGVD	Tailwater ft NGVD	Flow cfs	Total Flows cfs
Through STA-5:				
G-342A-D	21.22	18.53	627.5	2,510
G-343A-H	18.13	17.41	313.75	2,510
G-344A-D	17.10	16.12	627.5	2,510
G-406 (diversion)	21.22	17.12	930	930
Total flow				3,440

Note: actual G-406 design HW for 930 cfs flow is lower than G-342 design HW for STA inflow.

It is possible that when STA-5 is experiencing an SPF event, the Miami Canal will be experiencing the historic maximum runoff from the S-8 basin (3,660 cfs) with flows going into STA-3/4. With a potential STA-5 discharge rate of 2,510 cfs, the combined flow in the Miami canal would be 6,170 cfs (3,660 cfs + 2,510 cfs = 6,170 cfs). This exceeds the S-8 and G-404 pumping capacity (S-8 pump station + G-404 pump station = 4,740 cfs) by 2,360 cfs. Hence, 2,360 cfs must be diverted away from the Miami Canal through the diversion structure G-406, as shown in the table below.



**Table 12. STA-5 Standard Project Flood Expected Flows and Stages, with Maximum S-8 Basin Runoff.**

Structure	Headwater ft NGVD	Tailwater ft NGVD	Flow cfs	Total Flows cfs
Through STA-5:				
G-342A-D	22.69	16.16	270	1,080
G-343A-H	15.50	14.69	135	1,080
G-344A-D	13.80	13.60	270	1,080
G-406 (diversion)	22.69	20.36	2,360	2,360
Total flow				3,440

Elevations at the G-342 inflow structure will be monitored closely for a critical elevation of 16.0 ft NGVD which will trigger opening of G-406. Maximum design elevation at G-342 for the SPF event is 21.22 ft NGVD, so it is expected that with the opening of G-406 and the continuation of the extreme precipitation/runoff event, elevations at G-342 will continue to rise. G-406 will be operated to maintain elevations at G-342 less than SPF design maximum of 21.22 ft NGVD.

It should be noted that with the top elevation and width of the G-406 access embankment established at elevation 17.5 ft NGVD and 28 ft respectively, diversion flows of 2,360 cfs across G-406 with HW elevation of 22.69 ft NGVD will result in flows overtopping the access embankment. Of the 2,360 cfs crossing the G-406 structure 1,772 cfs will pass through the structure culverts and 588 cfs will be conveyed across the top of the access embankment.

The two scenarios described above represent extreme conditions. Diversion rates falling between these two scenarios are possible and structure G-406 will be modulated accordingly to supplement the Miami Canal capacity (capacity of S-8 pump station and G-404 pump station).

Standard Project Flood (SPF) Condition Operation Procedure Summary Actions:

- The Standard Project Flood (SPF) Condition is defined as 1.25 times the 100-year flood peak discharge for discharges originating from the C-139 basin to the L-2 Borrow canal for period water years 1978 to 1995. The computed SPF discharge from the C-139 Basin is 3,440 cfs (Burns & McDonnell 1996). STA-5 inflows will be limited to 2,510 cfs during the SPF event. STA Inflow events greater than 2,510 cfs will automatically require diversion operations. Inflow events less than 2,510 cfs will trigger diversion operations dependent on the pumping capacity of S-8 pump station and G-404 pump station.
- Inflow structures G-342 A-D are fully opened.
- Interior structures G-343 A-H gates fully opened.





- Outflow structures G-344 A-D are opened subject to a maximum HW/TW differential of one foot across the structure within the range of 12.3 – 12.7 ft NGVD at the G-344 HW.
- Diversion structure G-406 opened at headwater elevation of 16.0 ft NGVD.
- Maximum design elevation at G-342 for the SPF event is 21.22 ft NGVD, so it is expected that with the opening of G-406 and the continuation of the extreme precipitation/runoff event, elevations at G-342 will continue to rise. G-406 will be operated to the extent possible to maintain elevations at G-342 less than SPF design maximum of 21.22 ft NGVD.
- For volumes up to 930 cfs diverted across G-406, design flow HW elevations are lower than G-342 design HW elevations. *Modulation of G-406 gates will be required to limit diversion to required flow rates.* For the largest estimated flow across G-406, 2,360 cfs, G-406 culverts will be wide open. For the 2,360 cfs diversion event, it is estimated that 1,772 cfs will pass through the G-406 culverts and 588 cfs will flow overtop the levee.

3.5.1.2 STA-6 Extreme Event Operation During Interim Period 1

The Standard Project Storm (SPS) was estimated for STA-6 as 21.6 inches of rain over a 24-hour period (Burns & McDonnell, July 1996)⁴. The stages associated with the SPS are based on the assumption that initial water levels at the beginning of the storm are equivalent to maximum design operational stages and that 500 cfs are introduced to Cells 3 and 5 throughout the storm event. Outflow structures for Cell 3 and Cell 5 (G-393A-C and G-354A-C, respectively) will operate at maximum capacity to discharge flows from the STA. *Note that Structures G-393A and C, which are normally closed under normal operating conditions, will have to be opened to their maximum position.* Under the SPS condition, the maximum discharge from the STA was estimated to be 712 cfs and the maximum stage at the inlet of each cell was estimated to be approximately 18 ft NGVD. The maximum stage within the treatment cells was estimated to be 17.6 ft NGVD. The maximum stage within the STA-6 discharge canal was estimated to be 16.4 ft NGVD. Levee elevations are 20.5 ft NGVD for the Supply Canal and 19.5 ft NGVD for the Discharge Canal.

Table 13. STA-6 Estimated Stages During Standard Project Storm.

	Cell 3 and 5 Inlet HW	Cell 3 and 5 Inlet TW	Discharge Canal
Stage (ft NGVD)	18.0	17.6	16.4

⁴ The modeling conducted by Burns & McDonnell simulated conditions for the original STA-6 configuration, and not the current configuration. As such, these values should be used only as estimates.





G-407 Emergency Operation – Prior to flow-through operation of STA-5 3rd flow-way. Diversion of waters from through the G-407 structure shall be allowed in accordance with the permit. The District shall notify DEP within 48 hours of diversion through G-407. Such notification shall contain information regarding the circumstances related to the discharge, as well as a projection of the anticipated duration of the discharge. In the event any such discharge extends beyond the period specified in the original notification, the District shall notify DEP within 48 hours of the continuation of the discharge, and such notice shall contain additional information regarding the circumstances causing the need for the discharge.

3.5.2 Interim Operation Period 2

As part of the design of the initial expansion, URS simulated the anticipated water levels within STA-5 and STA-6 under normal conditions and the Standard Project Flood for both the initial expansion and the full expansion. A flow schematic was presented in Figure 8 above. Water surface profiles for each treatment cell in the STA-5/STA-6 system are presented in the table below (URS 2007c).

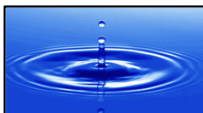
Table 14. Simulated Peak Stages for SPF (URS 2007c)

STA Treatment Cell	Upstream Stage (ft NGVD)	Downstream Stage (ft NGVD)
STA-5 Cell 1A	15.7	14.7
STA-5 Cell 1B	14.6	14.5
STA-5 Cell 2A	15.9	14.8
STA-5 Cell 2B	14.7	14.5
STA-5 Cell 3A	16.7	15.6
STA-5 Cell 3B	15.4	15.2
STA-6 Cell 3	15.9	15.5
STA-6 Cell 5	15.7	15.7
STA-6 Section 2	15.9	15.7

During construction of the initial expansion, the entire crest of the earthen plug adjacent to G-406 was lowered by about 4.25 ft from elevation 21.75 to 17.5 ft NGVD. This will lower the SPF stage at the headwater of G-406 to 19.21 ft NGVD from 21.22 ft NGVD. In addition, the G-406 overflow weir was armored to prevent erosion.

Standard Project Flood (SPF) Condition Operation Procedure Summary Actions:

- The computed SPF discharge from the C-139 Basin is 3,440 cfs. Inflow events less than 1,672 cfs will trigger diversion operations dependent on the pumping capacity of S-8 pump station and G-404 pump station.
- Inflow structures to STA-5 and STA-6 are fully opened.





- Interior structures of STA-5 and STA-6 are gates fully opened.
- Outflow structures G-344 A-F are opened subject to a maximum HW/TW differential of one foot across the structure within the range of 12.3 – 12.7 ft NGVD at the G-344 HW.
- STA-6 outflow structures are fully opened.
- Diversion structure G-406 remains fully opened.
- Maximum design elevation at G-342C&D for the SPF event is 18.7 ft NGVD, so it is expected that with the continuation of the extreme precipitation/runoff event, elevations at G-342 will continue to rise.
- As described above, STA-5 discharges by gravity into the project's discharge canal and then are conveyed to the Miami Canal. Analyses conducted by Burns & McDonnell in the December 1999 *Assessment of STA-5 Operational Impacts* indicate that under all but the most extreme conditions, adequate downstream pumping capacity exists within the Miami Canal Basin and no additional bypasses are required. However, if an extreme situation requires a reduction of discharges from STA-5 to maintain flood protection in the Miami Canal Basin, G-407 may be operated beyond its normal range in order to preserve the flood protection in the C-139 Basin as well.
- **G-407 Emergency Operation.** According to analyses conducted by URS during the design of the initial expansion, the combined hydraulic capacity of the expanded STA-5 and the expanded STA-6 should be sufficient to capture the SPF from the C-139 Basin and the maximum contribution of 452 cfs from the C-139 Annex (URS 2005), as long as the Miami Canal is not simultaneously in flood mode. However, **diversion structure G-407** was designed to convey 2,000 cfs during the SPF should insufficient capacity exist in the expanded treatment areas. Diversion structure G-407 will begin to be opened if the L-3 stage at the headwater of G-406 reaches 16.9 ft NGVD. If this occurs, the gates will be modulated to in accordance with the guidelines in **Table 9**, and notification of DEP will be necessary.

3.6 DROUGHT OPERATION

Subject to water availability, the District shall maintain a minimum water depth in STA-5 and STA-6 at an average of 0.5 ft above the reference ground elevations in Table 6 to the greatest extent practicable. The ability to maintain this minimum water elevation is determined primarily by the availability of water from rainfall and in the case of STA-5, the Miami Canal. At the present time, only STA-5 has facilities to enable delivery of supplemental water to the STA. If water depths drop below 0.5 ft, and if supplemental water is available, water can be drawn from the Miami Canal (opening G-373 if STA-3/4 is not discharging) through the





discharge canal by one or more of the STA-5 supplemental water pumps, e.g., G-507, G-349B & G-350B. These pumps can directly hydrate the eastern cells of the new flow-ways that contain the SAV, which is more susceptible to drought than emergent vegetation. Structure G-345 can be opened to allow Cell 2B to receive water from Cell 1B. Subject to water availability, the western cells can be hydrated by opening the interior G-343 structures.

During severe drought condition, the minimum stages may be revised as follows: SAV cells shall still be maintained at 0.5 ft above reference ground elevation to greatest extent practicable (with same above potential optional water sources). Emergent cells will be maintained at or above 0.5 ft below reference ground elevation. The supplemental water supply pumping stations (G-349B, G-350B and G-507) may be turned on to supply water from the Miami Canal through the STA-5 discharge canal.

In the extreme case that there is no water available from the upstream watershed, other sources and/or from rain, the treatment cells may dry out. After an extended dryout, there is a potential that the water quality improvement performance of subsequent discharges of water from treatment cells may be adversely affected. The severity and duration of the dry conditions that may lead to reduced project performance is currently unknown, as is the magnitude and duration of the potential depression of project performance. Analysis of the monthly compliance monitoring data collected at the project outflow monitoring station will be useful in making these determinations.

It is possible to supply the STA-6 cells with supplemental water by means of temporary pumps lifting water from the discharge canal into the treatment cells. The target vegetation in STA-6 Section 2 is SAV, and this vegetation is likely to require supplemental water before the emergent vegetation in Cells 3 and 5.

Pump station G-404 will be operated at the request of the Big Cypress Seminole Indian Reservation. If operated, G-404 will send, to the fullest extent practicable, supply water to the west along the L-4 Borrow Canal. G-404 will be operated in conjunction with G-409 to supply water to the Reservation.

3.7 TREATMENT CELL OUT OF SERVICE OPERATION

During maintenance operations, it may be necessary or desirable to remove a treatment flow-way from the treatment system, the general procedure is to close the inflow and outflow structures associated with the flow-way of interest.

STA-5. To remove the STA-5 flow-ways from service, the appropriate inflow structures (G-342) and associated flow-way outflow structures (G-344) will be closed. In the event that one or more treatment flow-ways are taken off-line, the diversion control structure G-407 may need to be opened sufficiently to pass the remaining flow volumes to assure flood protection for the upstream basin.





STA-6. To remove Treatment Cell 5 from service, the inflow gates G-353A&B will be closed. Structures G-393 A and C, which are normally closed, will be opened to accommodate the additional flows into and out of Treatment Cell 3. A flow capacity of 440 cfs is achievable. To remove Treatment Cell 3 from service, the inflow gates G-353C will be closed. A flow capacity of 440 cfs through Treatment Cell 5 is achievable. To remove STA-6 Section 2 from service, the G-396 structures will be closed.

In the event that one or more treatment flow-ways are taken off-line, the diversion control structure, G-407, may need to be opened sufficiently to pass the remaining flow volumes to assure flood protection for the upstream basin.

3.8 NUTRIENT REMOVAL PERFORMANCE OPTIMIZATION

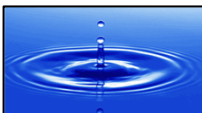
3.8.1 STA-5 Enhancements

The primary enhancement to STA-5 consisted of the conversion of Cell 2B from emergent macrophyte vegetation to submerged aquatic vegetation (SAV); that work was completed in WY2007. In addition, the interior G-343 structures were modified to improve operational flexibility through the addition of operable gates, removal of the upstream weir controls, addition of telemetric control to the structures, coupled with the addition of stilling wells for water level data acquisition in the upper ends of Cells 1B and 2B. Also, several flow obstructions were removed in Cells 1B and 2B. Finally, an analysis of seepage was conducted during the conduct of the *Evaluation of Alternatives for the ECP Basins*, and concluded that a secondary source of inflow to STA-5 exists. That secondary source of inflow logically consists of inflows induced from the adjacent lands (which are in the S-8 Basin) by the operation of the seepage collection and return system. That operation by necessity maintains seepage collection canal stages below normal depths (measured from ground surface) in the higher lands west of Cells 1B and 2B, in order to adequately control stages adjacent to Cells 1B and 2B. In order to minimize the induced loading on STA-5, an additional seepage return pumping station was constructed near the northwest corner of Cell 1B with a nominal capacity of 45 cfs each. The south seepage return pump station, G-350A has been abandoned with the termination of agricultural production on the south adjacent lands.

3.8.2 STA-6 Enhancements

The Long-Term Plan identifies structural and vegetation enhancements for STA-6 (SFWMD 2004), including

- Subdividing Cell 5 and STA-6 Section 2
- Converting the downstream cell 5B from emergent to SAV
- Installation of a water supply pump for STA-6





As part of the design of the initial expansion, URS compared the modeled performance of the divided Section 2 and Cell 5 with undivided treatment cells and concluded that the performance benefits were not warranted (URS 2005), and the Long-Term Plan was subsequently amended. The Long-Term Plan suggested the earliest time frame for conversion to SAV in Cell 5 would be FY07-08.

3.9 COMPARTMENT C BUILD OUT CONSTRUCTION TRANSITION

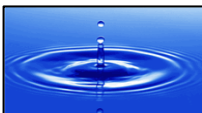
Construction of STA-5 Flow-ways 4 and 5 and the upstream cell of STA-6 Section 2 will occur after 2008, according to the schedules in the Long-Term Plan (Burns & McDonnell 2003, as subsequently amended). The target vegetation in the new treatment Cells 4A, 5A and STA-6 is emergent vegetation and in Cells 4B and 5B is Submerged Aquatic Vegetation (SAV). During construction, the contractor will be responsible for manipulation and documentation of water levels on-site as appropriate for establishment of the target vegetation. The contractor's responsibility for manipulation and documentation of water control structures and water levels will continue through completion of construction. Contract specifications describing the water management responsibilities during construction are summarized in **Appendix 3**.

3.10 HYDROPATTERN RESTORATION

Discharges from STA-5 will enter the Miami Canal and be conveyed south and west to Water Conservation Area 3A (WCA-3A) and the Big Cypress Seminole Reservation (BCR) via pump stations S-8, G-404 and G-409. STA-5 discharges will also be conveyed to the Rotenberger Wildlife Management Area via pump station G-410. The maximum pumping capacity of G-410 is 240 cfs. This discharge capacity corresponds to the required flow rate to produce a flow depth of 1 ft in the Rotenberger Wildlife Management Area. Corresponding discharges from Rotenberger WMA will be conveyed to the Miami Canal by four 54-inch diameter gated culverts (G-402A-D) installed in the existing L-23 west levee. These culverts are spaced throughout the full length of Rotenberger WMA (approximately 10 miles) in order to maximize the flow width and conveyance capacity of the Tract. A separate operating plan has been developed for the Rotenberger WMA inflow pump G-410. STA-6 discharges will be conveyed to the northwest corner of WCA-3A to assist in its hydroperiod restoration.

3.11 ADDITIONAL FLOWS/BMP REPLACEMENT WATER

Neither STA-5 nor STA-6 is intended to be used to treat additional Lake Okeechobee regulatory discharges or BMP replacement water deliveries. These operations are addressed in the operational plans developed for those STAs that will receive additional Lake Okeechobee regulatory discharges or BMP makeup water.





3.12 DEVIATIONS FROM THE OPERATION PLAN

This *Operation Plan* is meant to be updated regularly based on field observations of stage-flow relationships, structure flow calibrations, STA performance and other factors. Best professional judgment on the part of the District's Operations staff shall be used in the operation of the STA structures to deviate from these guidelines to account for flood protection, excess precipitation, site specific conditions, and upstream and downstream conditions. It is anticipated that after the first year of flow-through operation of the initial expansion, and annually thereafter, this *Operation Plan* will be reviewed to identify any needed revisions.

4 OPERATING PERMITS

4.1 EVERGLADES FOREVER ACT PERMIT

The FDEP issued operating permits for STA-5 and STA-6 required by the Everglades Forever Act (Section 373.4592(10), Florida Statutes). Relevant provisions of the EFA permits are included in Appendix 7.

4.2 NPDES PERMIT

The FDEP issued National Pollutant Discharge Elimination System (NPDES) permits for STA-5 and STA-6, and relevant provisions are presented in Appendix 7.

5 COORDINATION WITH OTHER PLANS

As modifications to the Central and Southern Florida Project are analyzed through the Lower East Coast Regional Water Supply Plan (LECRWSP), Lake Okeechobee Regulation Schedule Study (LORSS), and Comprehensive Everglades Restoration Plan (CERP), and in consideration of the "Seminole Entitlement Study", the hydraulic and treatment capacities of the current STA designs will be evaluated if appropriate. In addition, the Long-Term Plan may be modified to incorporate additional treatment enhancements for these STAs. If it is deemed necessary to do so, these studies will recommend additional treatment facilities. The operational plans for the STAs will be reviewed by SFWMD staff involved with the aforementioned studies and, if necessary, will be modified for consistency with said studies.





6 REFERENCES

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- URS 2007a. Hydrologic and Hydraulic Analysis of Compartment C Build-out for the STA-5 and STA-6 System (Draft), June 2007.
- URS 2007b. Operational Plan Update Technical Memorandum, July 27, 2007.
- URS 2007c. Personal communication from Martin Brungard, e-mail dated August 9, 2007.





APPENDIX 1: STRUCTURE RATING CURVES AND PUMP CURVES

STA-5 Inflow Culverts G-342 A-D and G-344 A-D (from Nashi 2006)

Inflow Culverts (G-342A-D)

Size:	10-ft wide by 6-ft high
Invert Elevation:	7.25 ft NGVD
Number of Barrel and Gate:	1
Length of the barrel:	68 feet
Gate Dimensions:	10-ft wide by 6-ft high

Outflow Culverts (G-344A-D)

Size:	10-ft wide by 10-ft high
Invert Elevation:	0.0 ft NGVD
Number of Barrel and Gate:	1
Length of the barrel:	53 feet
Gate Dimensions:	10-ft wide by 10-ft high

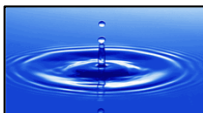
Since the inflow culverts G-342A-D are identical in their hydraulic characteristics, the rating developed herein applies to all of them. Along the same lines, one rating was developed for the outflow culverts G-344A-D.

Flow through uncontrolled or gated culvert structures, is classified into three major types: full-pipe flow, orifice flow and open channel flow. Full-pipe flow occurs when both the inlet and outlet of the culvert are submerged. Orifice flow occurs when the inlet is submerged and the outlet is unsubmerged. Open channel flow occurs when there is a free surface throughout the culvert, and is further classified into three subtypes depending on whether critical flow occurs at the inlet, or at the outlet, or whether the depth of flow throughout the culvert is sub-critical. Since the flow conditions at the inflow and outflow culverts are predominantly pipe flow, the flow ratings developed in this study were addressed only for this flow condition.

The expression for Q is given by

$$Q = CA_0 \left[\frac{2g(HWE - TWE)}{\left[\left(\frac{A_0}{A_G} \right)^2 + 2C^2 \left(1 - \frac{A_0}{A_G} + \frac{gn^2 L}{(1.49)^2 R_0^{4/3}} \right) \right]} \right]^{1/2} \quad (1)$$

where





C is the coefficient of discharge,

Q = discharge in cfs

A_0 = area of the culvert flowing full (ft^2);

g = acceleration due to gravity (32.2 ft/s^2)

HWE = headwater elevation (ft, NGVD)

TWE = tailwater elevation (ft, NGVD)

A_g = flow area under the gate (ft^2);

n = Manning's friction loss coefficient (= 0.12)

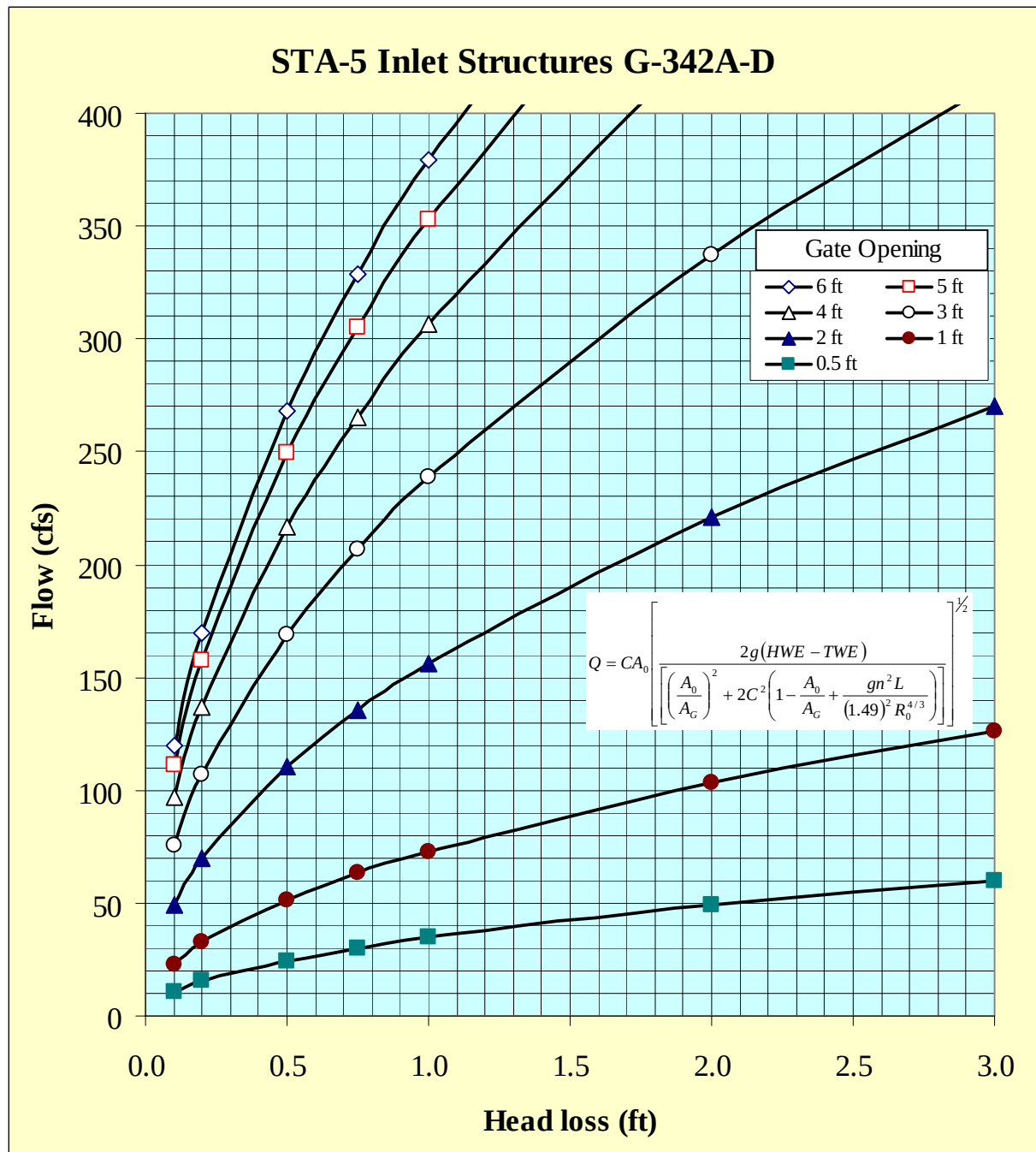
L = Length of the barrel (ft)

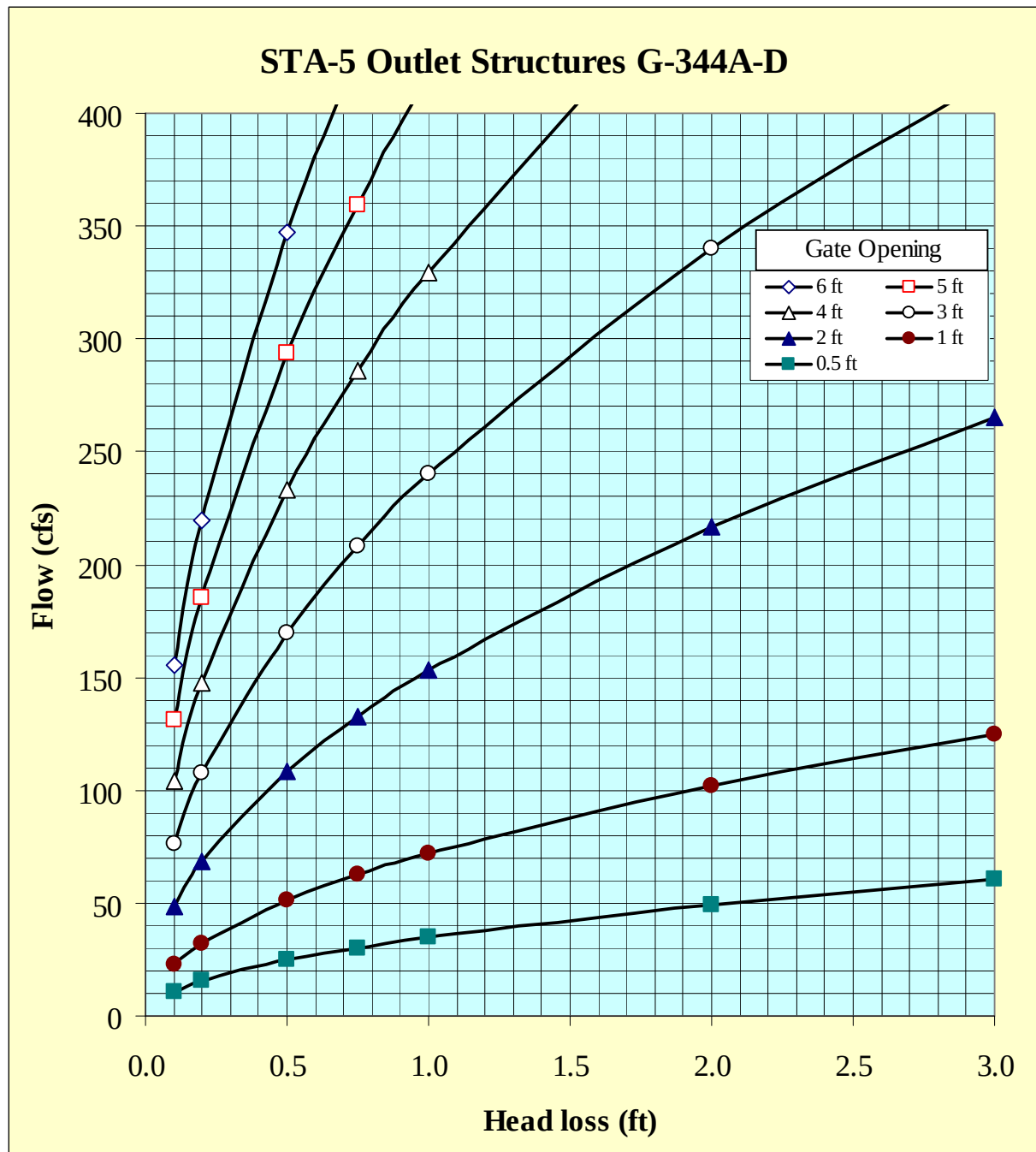
R_0 = hydraulic radius of the full pipe (ft)

The flow ratings for the inflow culverts, G-342A-D, were calibrated from 32 stream flow measurements collected using an Acoustic Doppler Current Profiler (ADCP), mounted on a boat. The flow measurements were all made at the inlet of the culverts, under full pipe-flow conditions, while the culvert gate openings varied from 0.5 to 5.5 feet. With a coefficient of discharge equal to 0.82, the overall mean absolute error for this new rating is around 5%, with the maximum error for a single measurement around 11%.

The outflow culverts, G-344A-D, were calibrated from 43 stream flow measurements collected using an Acoustic Doppler Flow Meter (ADFM). The flow measurements were collected under pipe flow conditions, at the outlet of the culverts, with the instrument mounted on the crown of the culvert, looking down into the water. The data was collected at the northern culvert G-344A and the southern culvert G-344D for cell B, and the gate openings at the culvert varied from 0.5 to 5.5 feet. Using equation (1), there was a marked improvement in the rating. The overall mean absolute error for the new rating improved to 4%, and the largest error for a single measurement is now reduced to 10%. The value of the discharge coefficient used in equation (1), for which the overall mean absolute error was the minimum, was 0.84 for the outflow culverts.

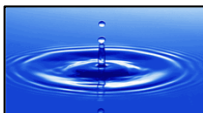
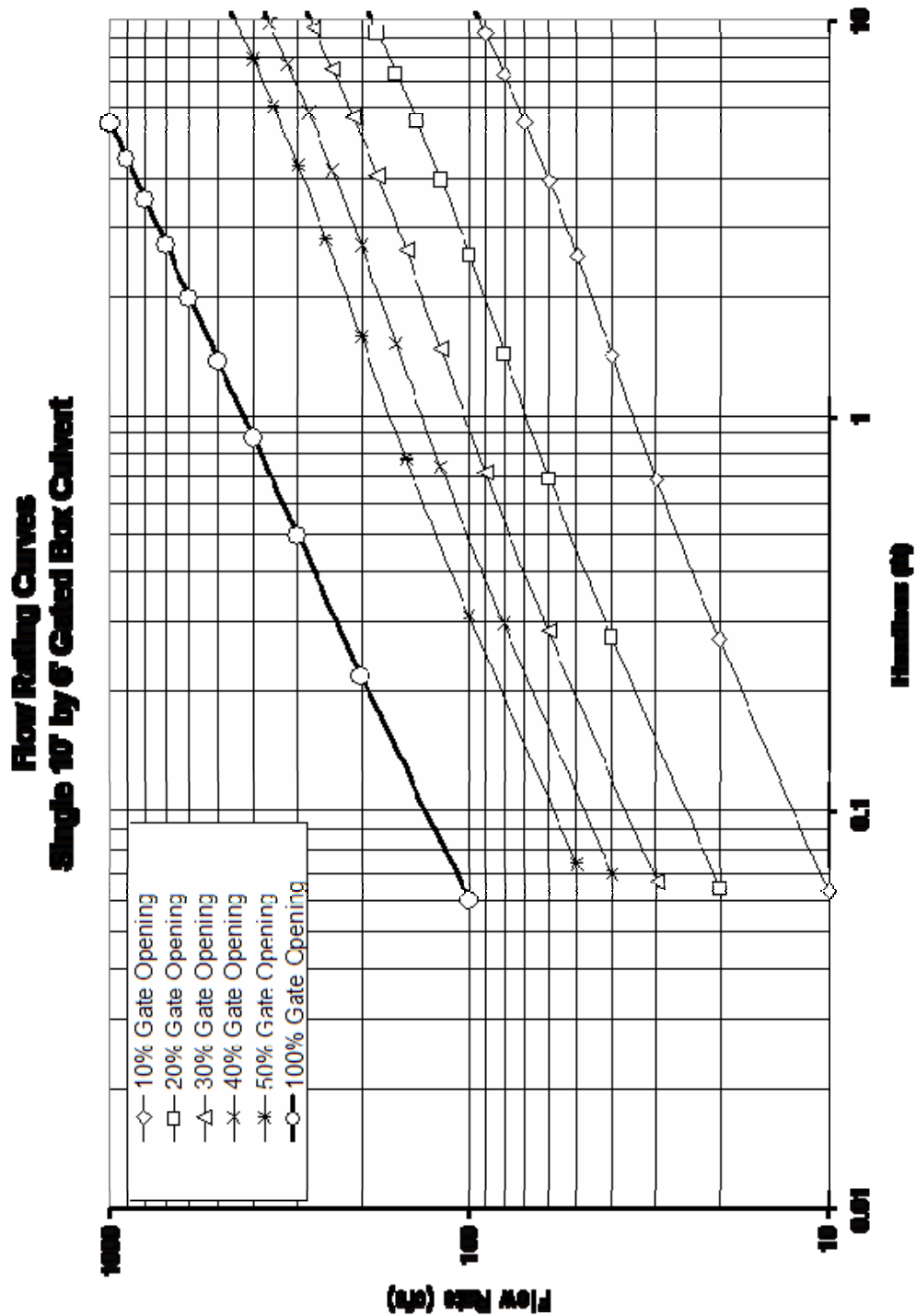






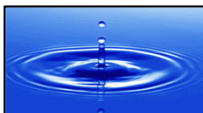
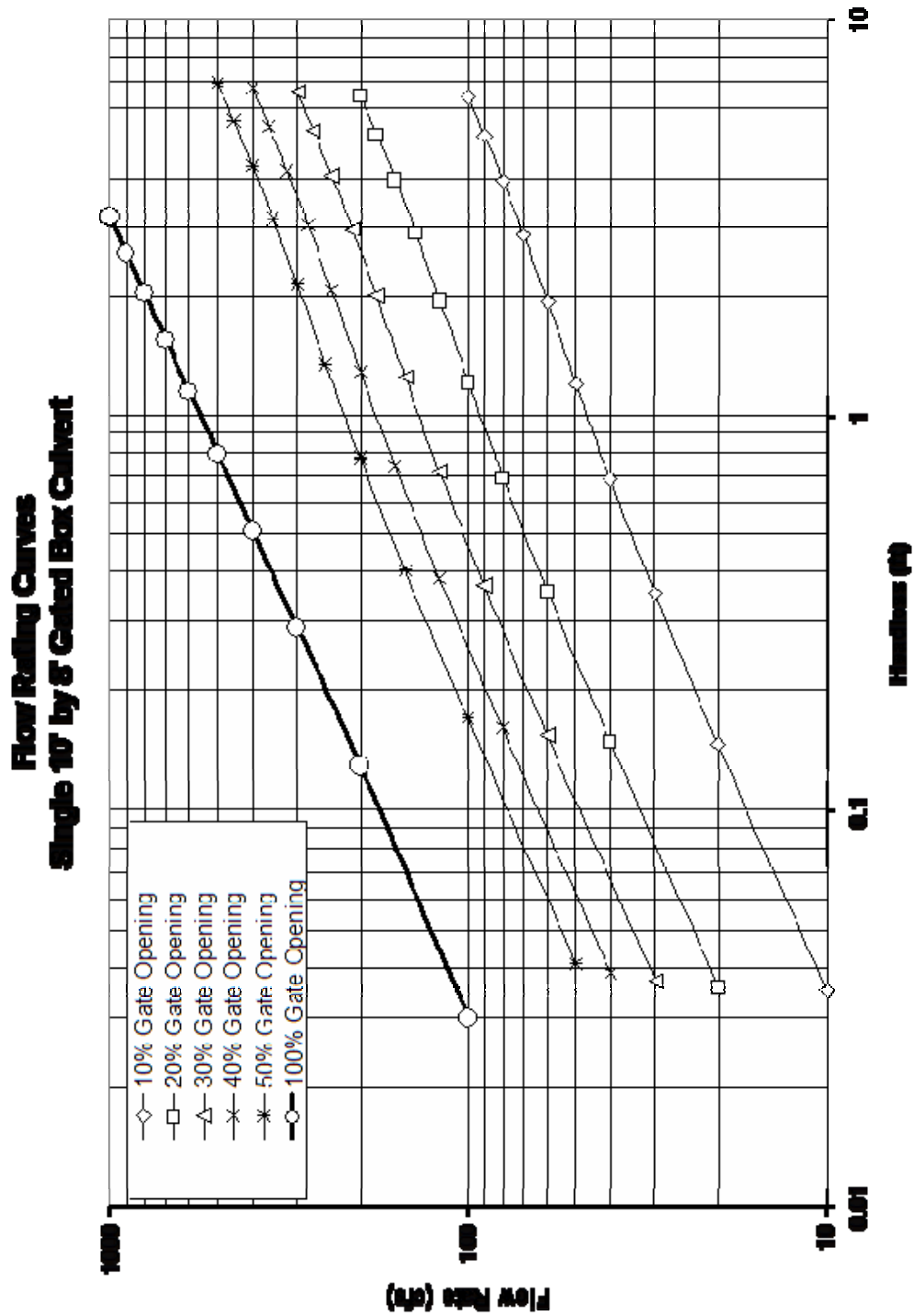


G-342 E-F Structure Rating Curves (URS, 2007a)



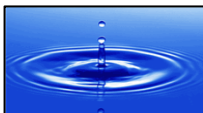
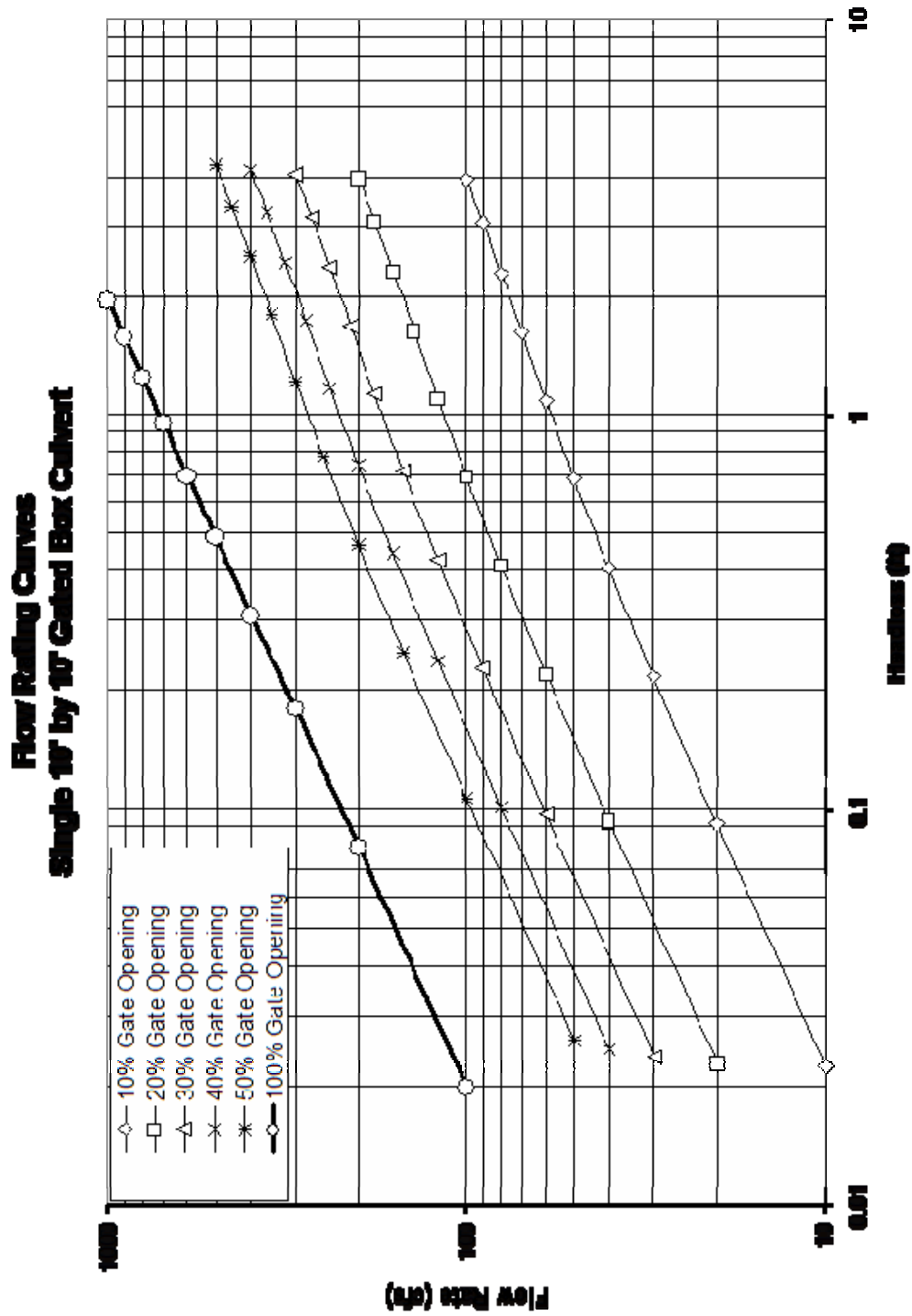


G-343 E-F Structure Rating Curves (URS, 2007a)





G-344 E-K and G-352 A-C Structure Rating Curves (URS, 2007a)





Variable-speed Pumps at G600

The variable-speed pumps at G600 are in Case 6. In this case the flow is computed as a function of pump speed and head, and is given by:

$$Q = 0.00223 \cdot C_2 \cdot \frac{N}{C_0} \cdot \left\{ C_1 - \frac{\left[\left(\frac{C_0}{N} \right)^2 \cdot H - C_3 \right]}{\left[\left(\frac{C_0}{N} \right)^2 \cdot H - C_3 \right]} \left[\left(\frac{C_0}{N} \right)^2 \cdot H - C_3 \right]^{1/3} \right\}$$

where, Q is the discharge in cfs; C_0 through C_3 are regression coefficients; H is the head difference between upstream and downstream stages in ft; and N is the pump speed in rpm. Flow coefficients for pumps at G600 are listed in Table 1.

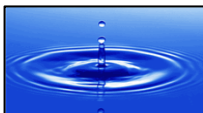
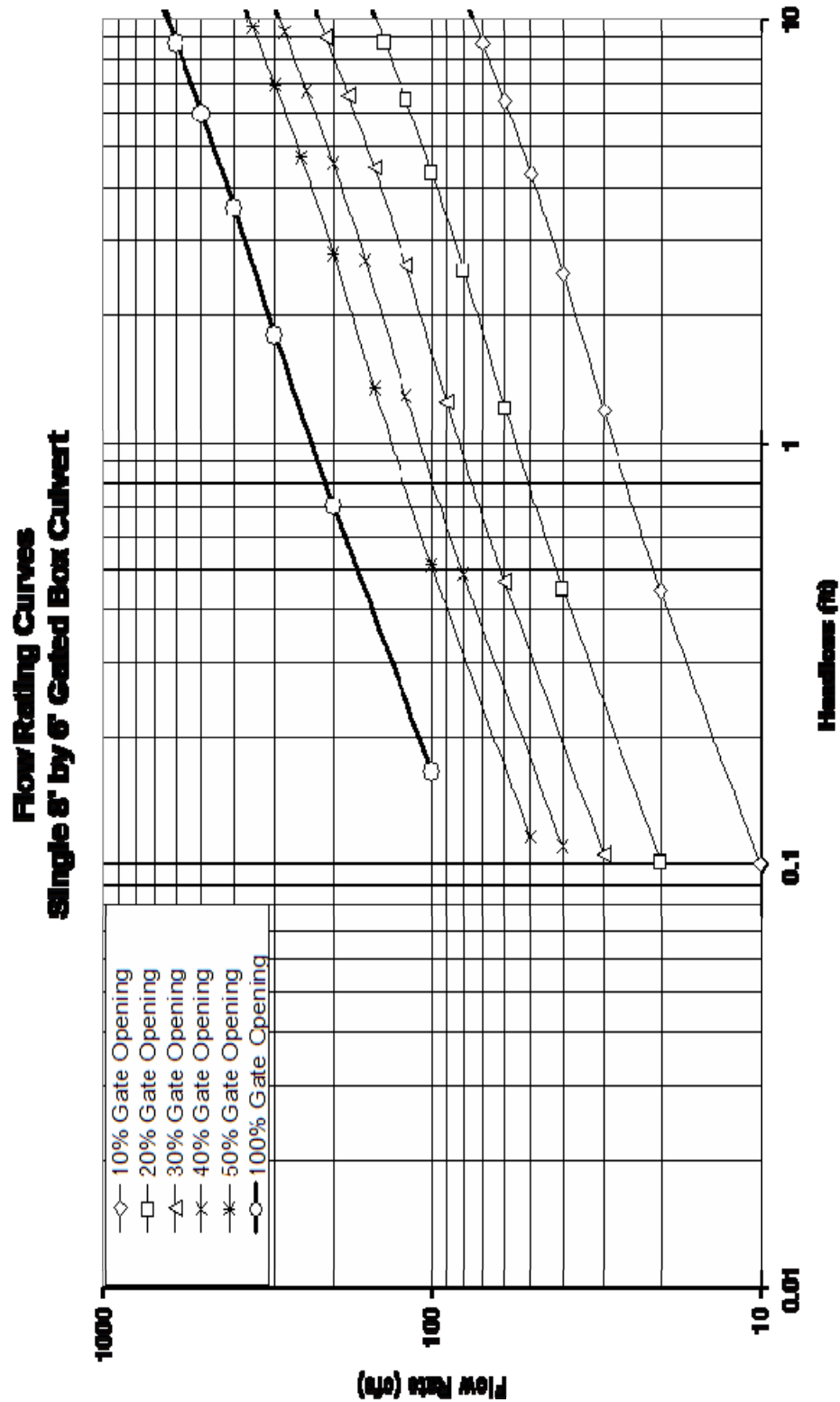
Table 1. Flow coefficients for pumps At G600

Station	Case No.	Unit No.	C_0	C_1	C_2	C_3
G600_P	6	1	1800	-1.1	29250	21
		2	1800	-1.1	29000	19
		3	1800	-1.1	32000	20
		4	1800	-1.1	36000	19





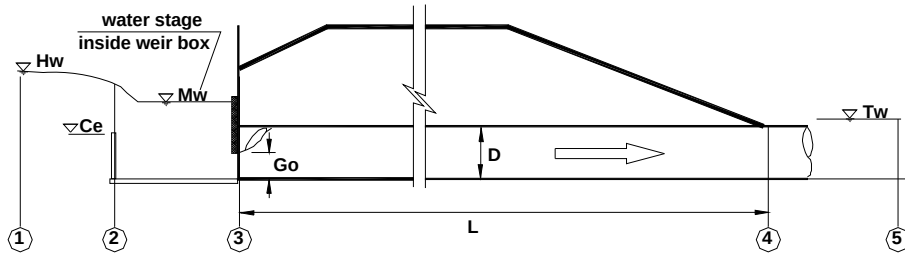
G-353 A-C Structure Rating Curves (URS, 2007a)





Flow Rating Equations for Culverts at G-354 and G-393

The structures G-354 and G-393 are compound culverts with a weir box at the inlet and a gate at the upstream end of the 75-ft long 7-ft diameter culverts. The design maximum flow for the G-354 structures is 152 cfs each for the SPF (no flood mode at S-8). The design maximum flow for the G-393 structures is 56 cfs each for the SPF (no flood mode at S-8).



Flow rating equations include free weir flow and submerged weir flow for these structures, as well as culvert flow. For free weir flow, the flow equation is given by

$$Q_{free} = C_d L_e H^{1.5}$$

For submerged weir flow, the flow equation is given by

$$Q_{submerged} = \left(C_d L_e H^{1.5} \right) \left[1 - \left(\frac{h}{H} \right)^{1.5} \right]^{0.385}$$

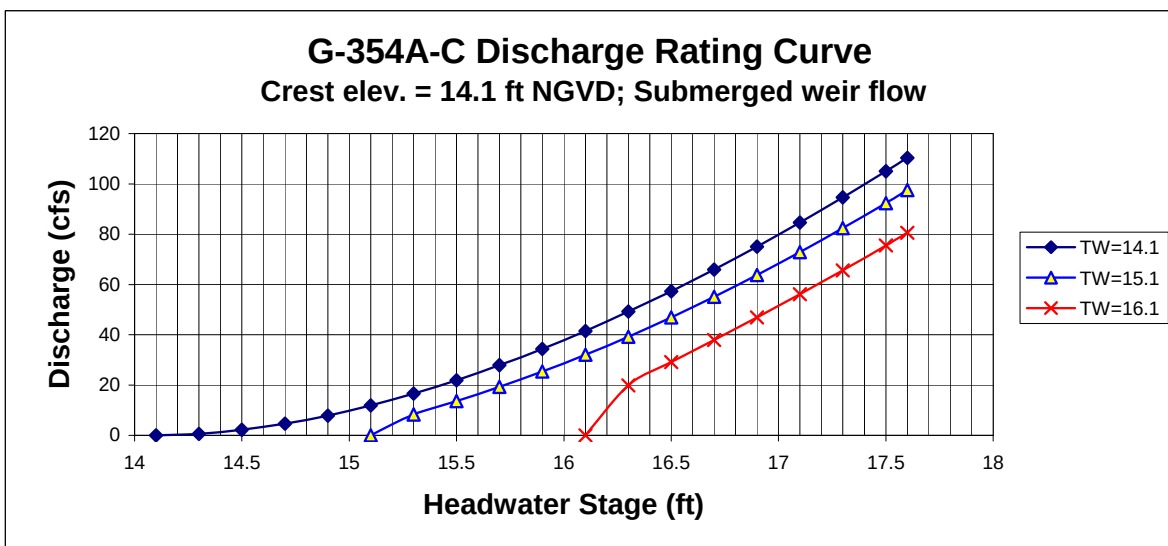
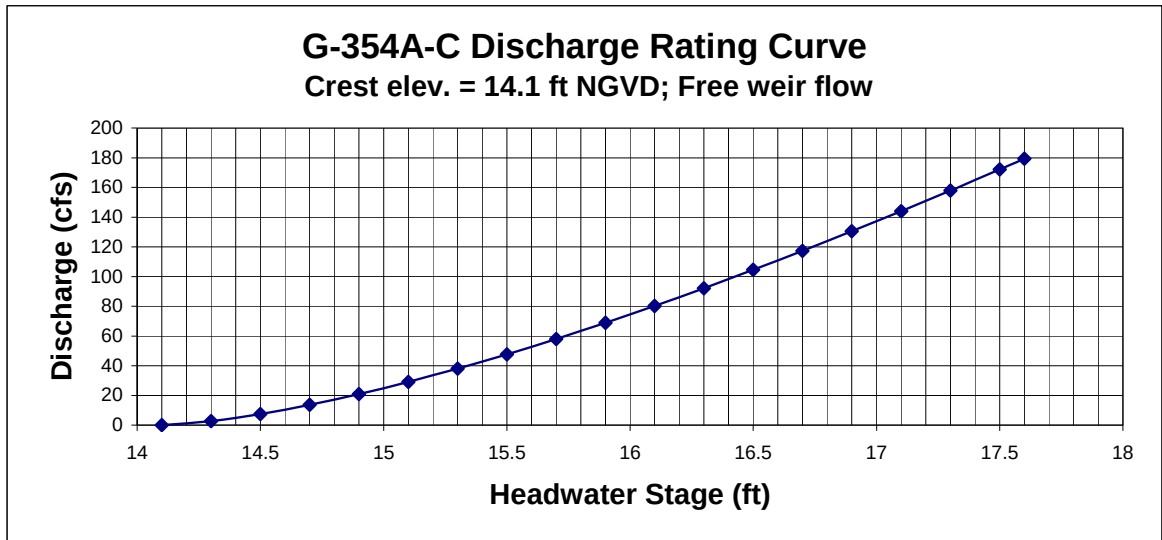
where C_d is the discharge coefficient, L_e is the effective crest length and $L_e = L - 0.2 \cdot H$, h and H is the downstream and upstream head respectively. The flow parameters used in flow estimation for culverts at G-354 and G-393 were summarized in the table below.

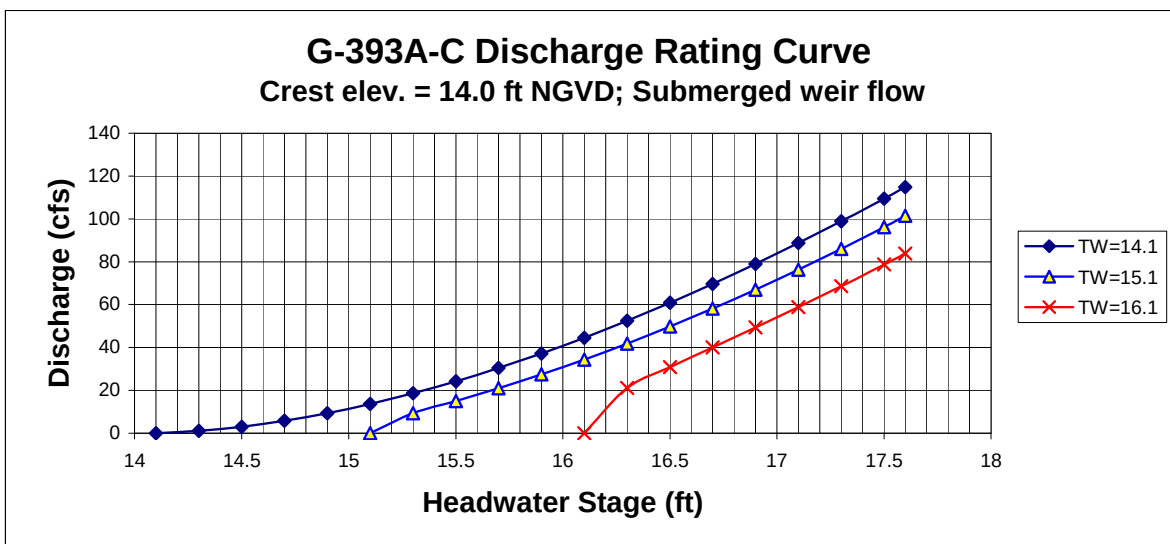
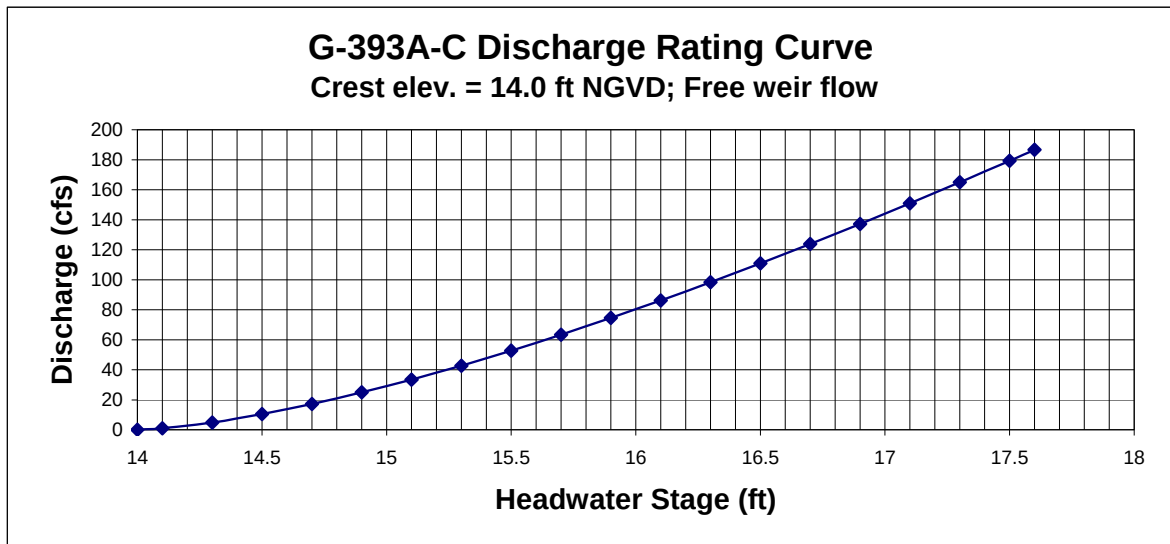
Flow parameters for culverts G354 and G393

Station	Crest elevation (ft)	Crest length L (ft)	C_d
G354	14.1	9	3.3
G393	14.0	9.6	3.3

Rating curves for the weir flow equations are presented below. URS determined that weir flow controls below 325 cfs, and since the design maximum flow is less than this, no culvert flow curves are presented here (URS 2006).

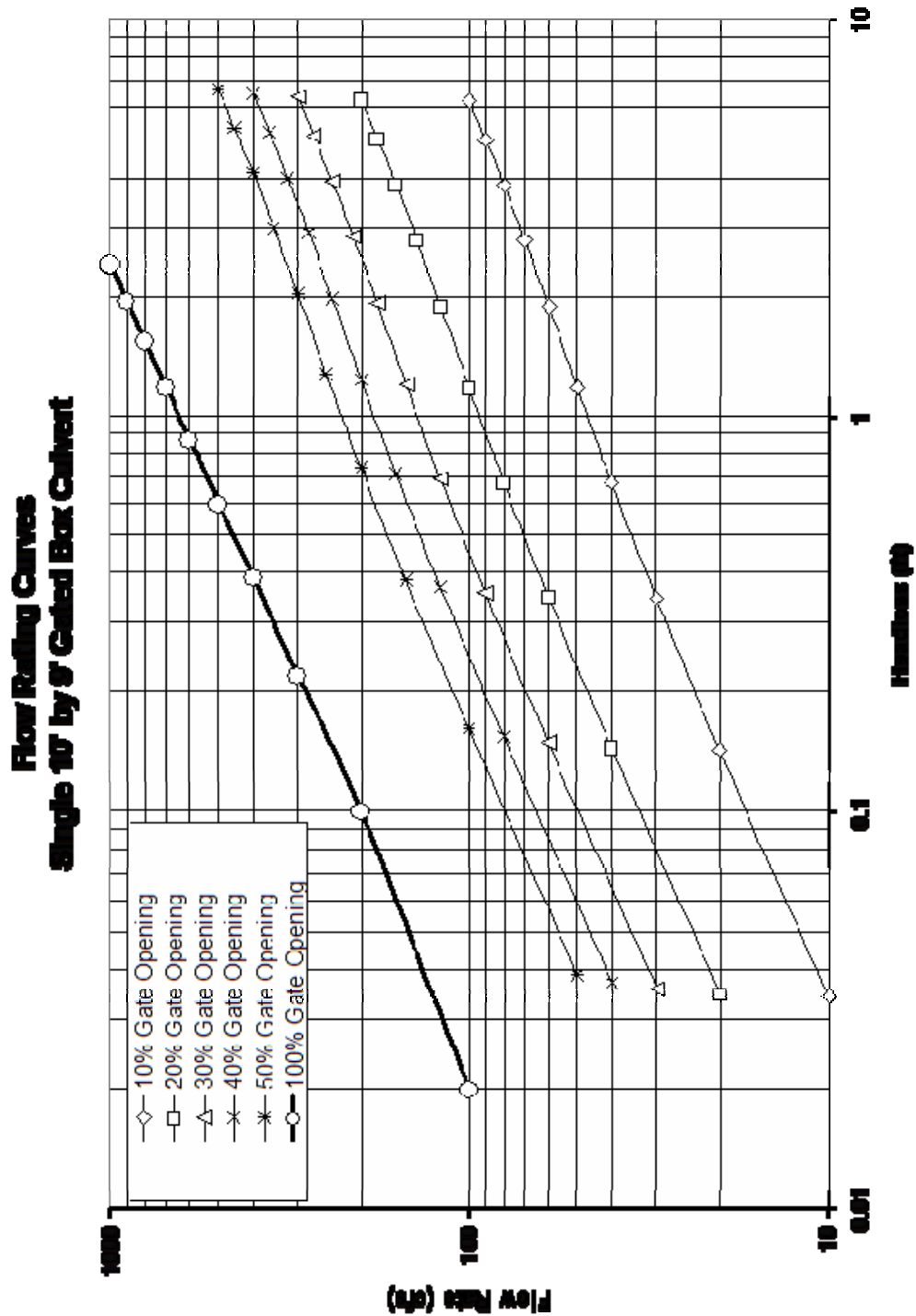






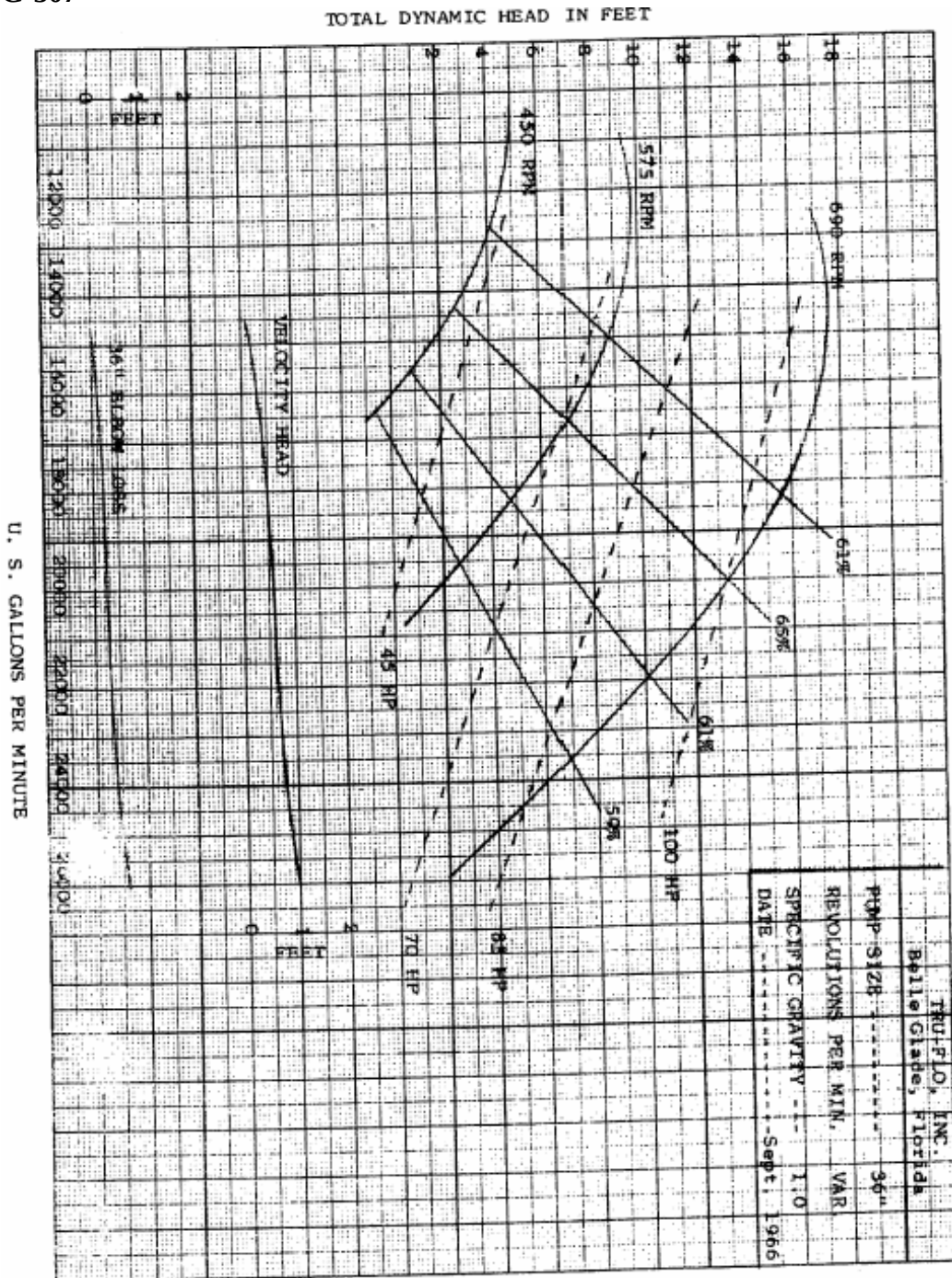


G-406 and G-407 Rating Curve (URS, 2007a)





G-507





APPENDIX 2. STRUCTURE PHOTOGRAPHS

G-342 D



G-342F





G-343B (AFTER MODIFICATION)



G-344 A





G-410



G-349B

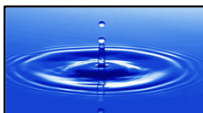




G-406



G-600





G-351 (lower center of photo) and G-600 (upper center of photo)

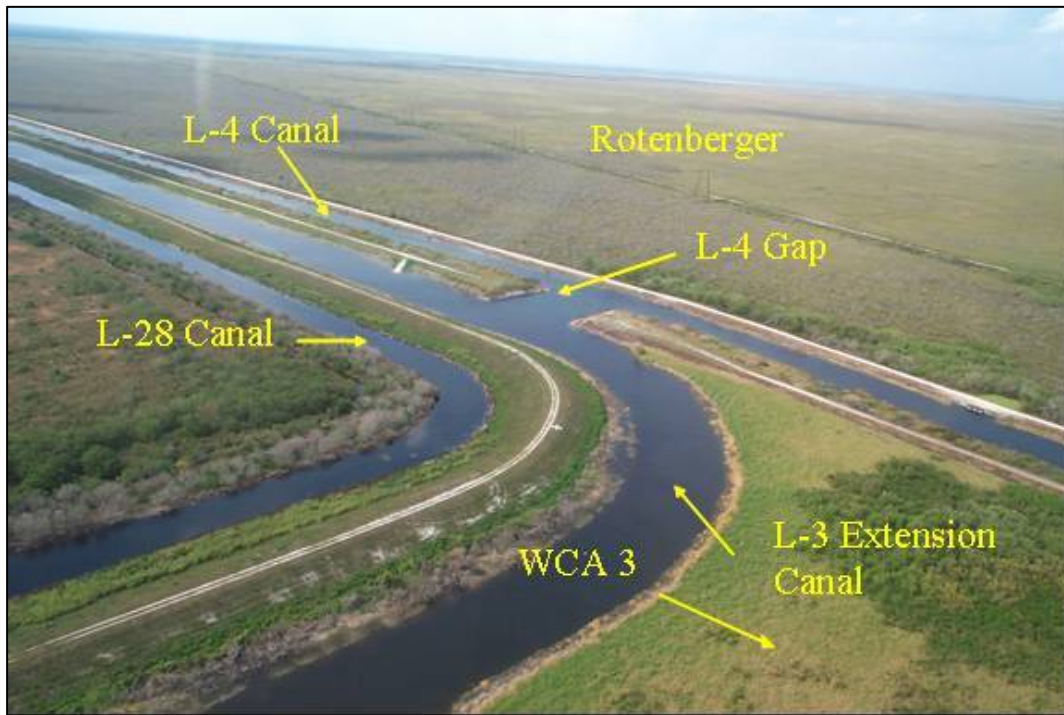


G-354B





L-4 GAP AREA



Weir G-602





STA-6 Cell 5



G-393 B





S-8 and Associated Facilities

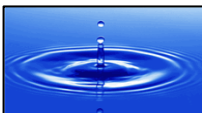




APPENDIX 3. COORDINATION DURING CONSTRUCTION OF BUILD OUT

STA-5

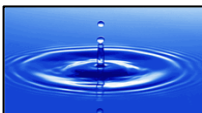
1. As soon as the controlled burning by the District is complete, as determined by the **DISTRICT**, the **CONTRACTOR** shall begin to inundate the Cells 4A and 5A to an average of 6-12 inches and inundate Cells 4B and 5B to an average depth of not less than 2 feet or more than 3 feet of water. The **CONTRACTOR** shall ensure the target cell depths are achieved within 14 calendar days after the controlled burning by the **DISTRICT** is complete.
2. Beginning when the **CONTRACTOR** begins inundating STA-5 Cells 4A or 3B, and continuing until Final Completion is certified, the **CONTRACTOR** shall be responsible for monitoring, maintaining and documenting the water levels in the cells and at each water control structure on a daily basis. Water levels, in feet NGVD, and structure gate openings, in feet, shall be reported daily on a District-approved data sheet.
3. The **CONTRACTOR** shall maintain Cells 4A and 5A's water depth between 6-12 inches and maintain Cells 4B and 5B's water depth between 2 and 3 feet deep, for at least thirty (30) calendar days, and will require only minimal manual operation as may be necessary to sustain the desired level. At the direction of the **DISTRICT**, thirty (30) to sixty (60) calendar days after initial inundation, the **CONTRACTOR** will raise the water depth in Cells 4A and 5A to 6-18 inches and shall lower the water depth in STA-5 Cells 4B and 5B to an average of approximately 6-12 inches within seven calendar days.
4. The **CONTRACTOR** shall make daily manual structure operations as needed to sustain the desired water level in the cell, as determined by the **DISTRICT**, and based on daily communications between the **CONTRACTOR** and **DISTRICT**.
5. At the **DISTRICT's** direction, the **CONTRACTOR** shall operate the cell's control structures to provide flow-through operation and maintenance of target water levels until Final Completion is certified.





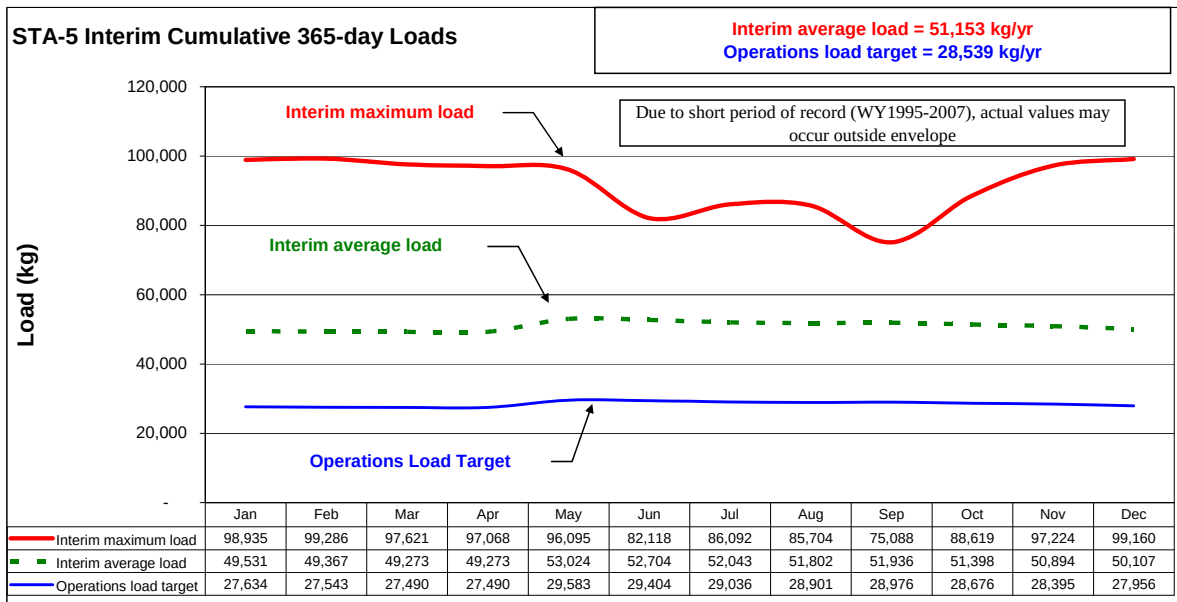
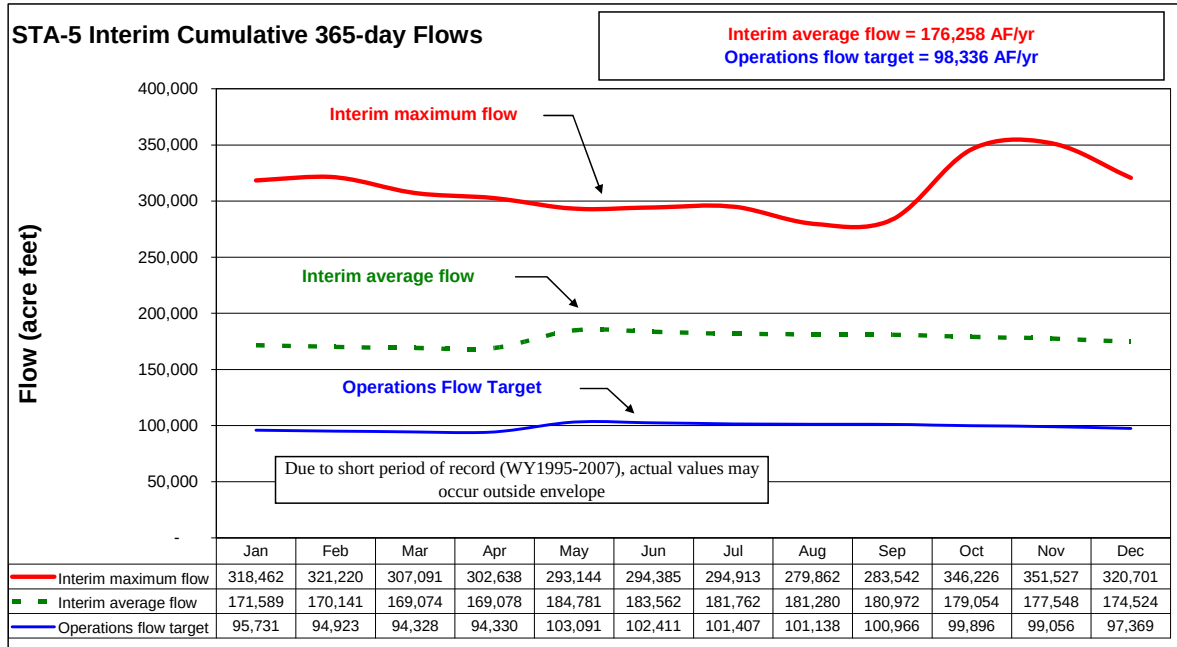
STA-6 New Cell

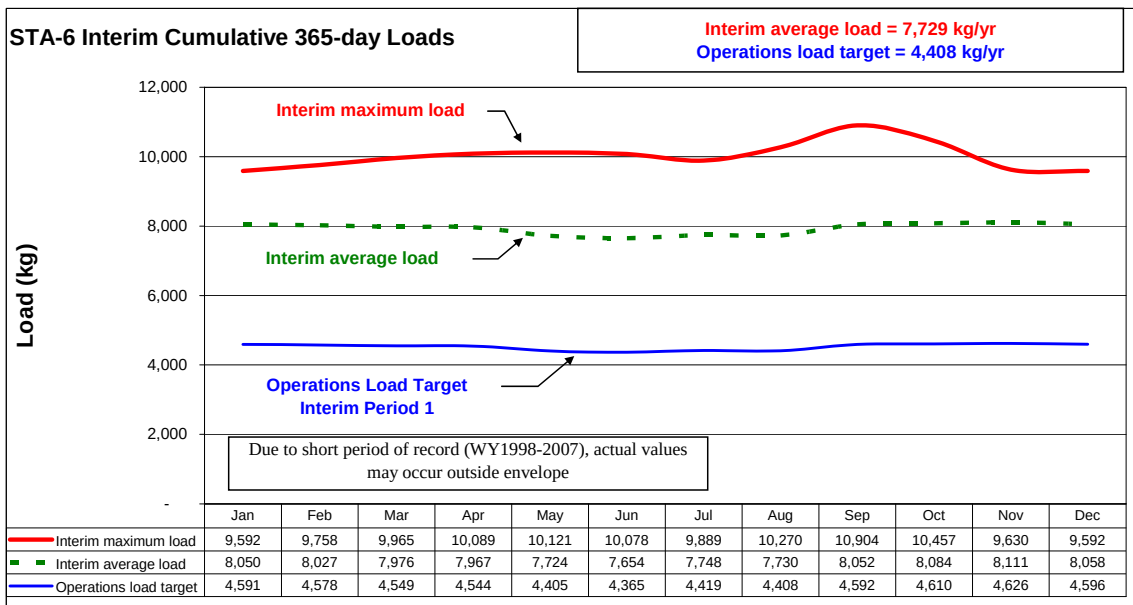
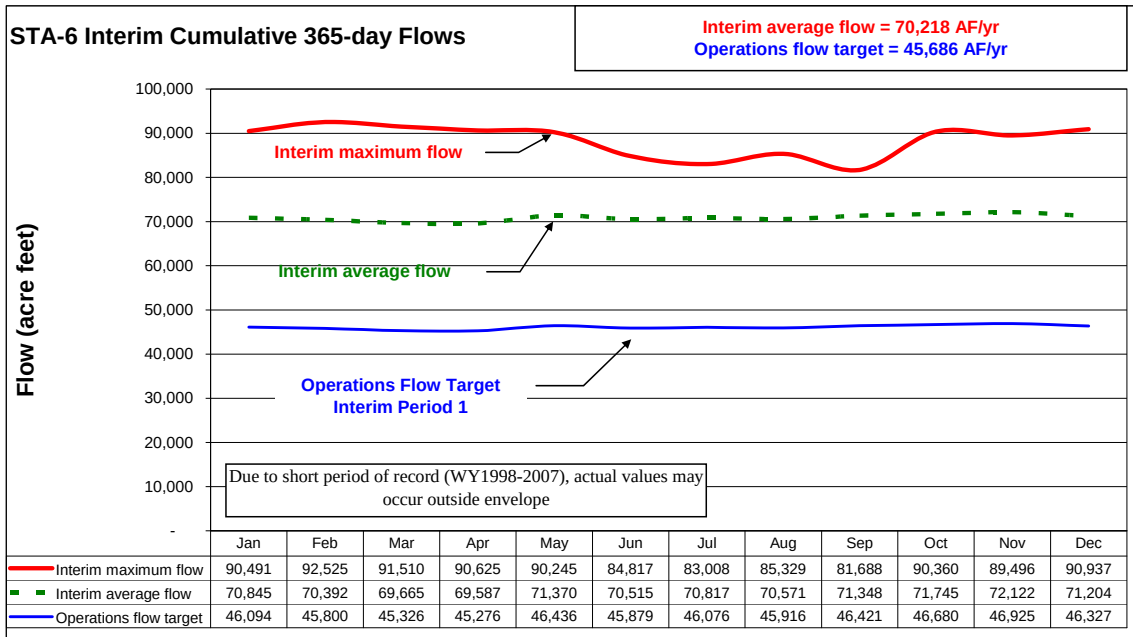
1. As soon as the controlled burning by the District is complete, as determined by the **DISTRICT**, the **CONTRACTOR** shall begin to inundate the cell to an average depth of 6-12 inches of water. The **CONTRACTOR** shall ensure the target cell depth is achieved within 14 calendar days after the controlled burning by the **DISTRICT** is complete.
2. Beginning when the **CONTRACTOR** begins inundating the new cell and continuing until Final Completion is certified, the **CONTRACTOR** will be responsible for monitoring, maintaining and documenting the water levels in the cell and at each water control structure on a daily basis. Water levels, in feet NGVD, and structure gate openings, in feet, shall be reported daily on a District-approved data sheet.
3. The **CONTRACTOR** shall maintain the cell's water depth between 6-12 inches for at least thirty (30) calendar days, and will require only minimal manual operation as may be necessary to sustain the desired level. At the direction of the **DISTRICT**, thirty (30) to sixty (60) calendar days after initial inundation, the **CONTRACTOR** will raise the water depth in the cell to 6-18 inches within seven calendar days.
4. The **CONTRACTOR** shall make daily manual structure operations as needed to sustain the desired water level in the cell, as determined by the **DISTRICT**, and based on daily communications between the **CONTRACTOR** and **DISTRICT**.
5. At the **DISTRICT's** direction, the **CONTRACTOR** shall operate the cell's control structures to provide flow-through operation and maintenance of target water levels until Final Completion is certified.





APPENDIX 4. OPERATIONAL ENVELOPES







APPENDIX 5. STA-5 STAGE-VOLUME & STAGE-AREA RELATIONSHIPS

FLOW-WAYS 1 & 2

The STA-5 stage-volume stage-area relationships were developed using topographic data that was obtained from a topographic survey conducted by Wantman Group on 2005. Any substantial changes in the topographic data will require revision of the stage-volume and stage-area relationships for this STA (SFWMD, May 2007).

*Science and Technology Service (STS)
Contract No. ST060589-WO01*

South Florida Water Management District

June 20, 2006



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Prepared for:

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1. Introduction

As stated in the Long-term Plan for Achieving Water Quality goals (Burn & McDonnell, 2003), accurate stage-volume/stage-area relationships need to be developed for every cell of each STA [Bc82(4)]:

- *“A stage-volume relationship for each cell of each STA. A principal use of the new survey data described in section 5.2.1 is to develop the water storage potential in those systems. This aids directly in management of water volumes and indirectly in the correct determination of hydraulic detention times in the STAs. Additionally, the wetted fraction of area may be developed, and used to forecast the loss of effectiveness at low stages (see section 5.2.1). An accurate stage-volume relationship becomes more critical as shallower depth operations come under consideration, because issues of short-circuiting and areal water coverage become more important at low stages.”*

This technical note summarizes the development of stage-volume and stage-area relationships of STA-5 as specified in Task 1.3 of Contract No. ST060589-WO01.

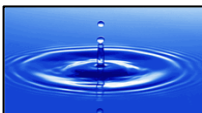
2. Topographic Data

The STA-5 topographical data from a new topographic survey (Wantman Group, 2005) provided the ground surface elevations for each cell of STA-5. These survey data were used for the STA-5 stage-volume and stage-area relationships.

3. Methodology

The survey data were linearly interpolated to a finite element mesh of STA-5. The Surface Water Modeling System (SMS 8.1) calculation tool was used to obtain the storage volume under a specified static water level (SWL) (Figure 1). This is repeated to obtain the relationships for a series of SWL values ranging from minimum to maximum surveyed ground surface elevations. Similarly, the wetted portion of surface area under a certain static water level was determined from the contour lines of specific ground surface elevations.

By assuming that the effect of the slope of the perimeter levees on storage is negligible, when the static water level reaches or exceeds the maximum surveyed ground surface elevations, the wetted surface area is a constant value and the stage-volume relationship becomes linear.



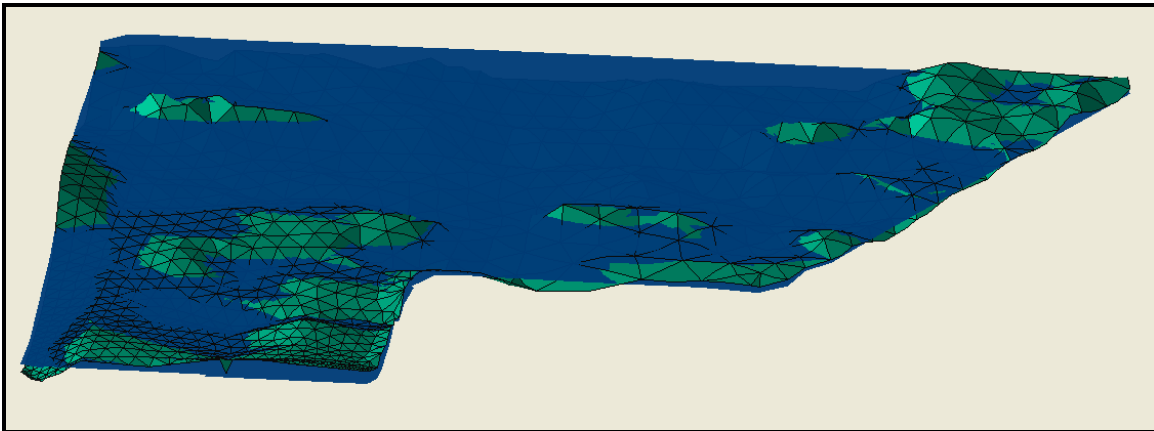


Figure 1. 3-D View of Storage Volume and Wetted Surface Area at a specific Static Water Level

Stage-volume and stage-area relationships are provided in the forms of look-up tables, curve plots for convenient future use.

3. Stage-Volume and Stage-Area Relationships for each Cell of STA-5

Local topographic features, such as remnant farm ditches and spreader/collection canals were not considered. Figure 2 is a schematic of STA-5.

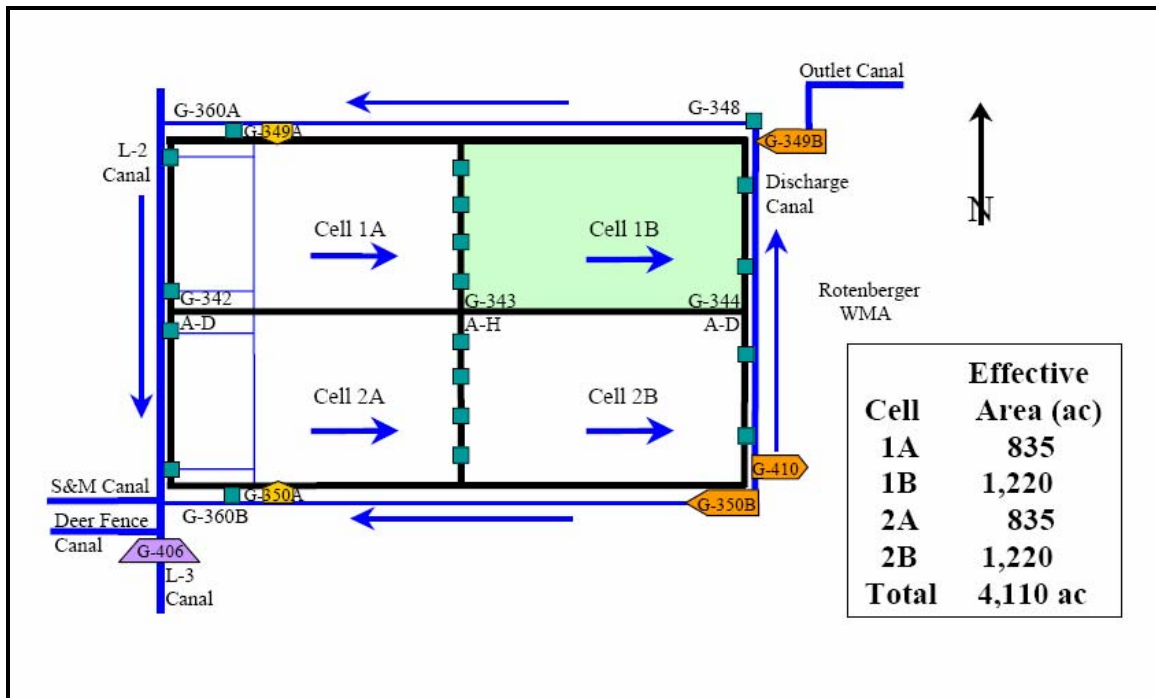
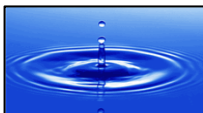


Figure 2. Schematic of STA-5





3.1 Cell 1A:

The surveyed ground elevations in Cell 1A marsh area range from 11.0 ft NGVD to 16.0 ft NGVD. The spatially averaged ground surface elevation is 13.73 ft NGVD. Storage volume and wetted surface area were sampled at various water levels in an increment of 0.20 ft. The results are summarized in Table 1 and Figure 3. These storage volume and area data were directly obtained from SMS volume/area estimation.

Table 1: STA-5 Cell 1A Stage-Volume and Stage-Area Relationship

Stage (ft NGVD)	Volume (acre-ft)	Area (acre)
11.00	0.00	0.00
11.30	4.94	22.64
11.50	10.73	31.63
11.60	14.00	38.62
11.80	25.10	59.09
11.90	30.39	69.91
12.10	49.83	108.55
12.20	60.08	129.62
12.40	92.24	168.07
12.50	107.78	192.15
12.70	155.01	241.05
12.80	177.17	261.53
13.00	237.11	304.20
13.10	265.51	326.65
13.30	339.62	374.99
13.40	374.48	401.48
13.60	465.62	470.81
13.70	510.40	511.16
13.90	624.81	601.28
14.00	684.03	666.73
14.20	830.94	761.51
14.30	906.01	802.71
14.50	1077.07	902.91
14.60	1171.46	989.50
14.80	1378.82	1063.59
14.90	1484.89	1097.06
15.10	1710.00	1136.39
15.20	1822.98	1143.75
15.40	2053.35	1155.70
15.50	2168.54	1159.82
15.70	2400.85	1162.24
15.80	2516.99	1163.16
16.00	2749.85	1166.38





UPDATED

Integrated STA-5 & 6 Operation Plan

16.30	3099.77	1166.38
16.60	3449.68	1166.38
16.90	3799.60	1166.38
17.20	4149.51	1166.38
17.50	4499.43	1166.38
17.80	4849.34	1166.38
18.10	5199.25	1166.38
18.40	5549.17	1166.38
18.70	5899.08	1166.38
19.00	6249.00	1166.38
19.30	6598.91	1166.38
19.60	6948.83	1166.38
19.90	7298.74	1166.38
20.20	7648.65	1166.38
20.50	7998.57	1166.38
20.80	8348.48	1166.38
21.10	8698.40	1166.38
21.40	9048.31	1166.38
21.70	9398.23	1166.38
22.00	9748.14	1166.38
22.30	10098.05	1166.38
22.60	10447.97	1166.38
22.90	10797.88	1166.38
23.20	11147.80	1166.38
23.50	11497.71	1166.38



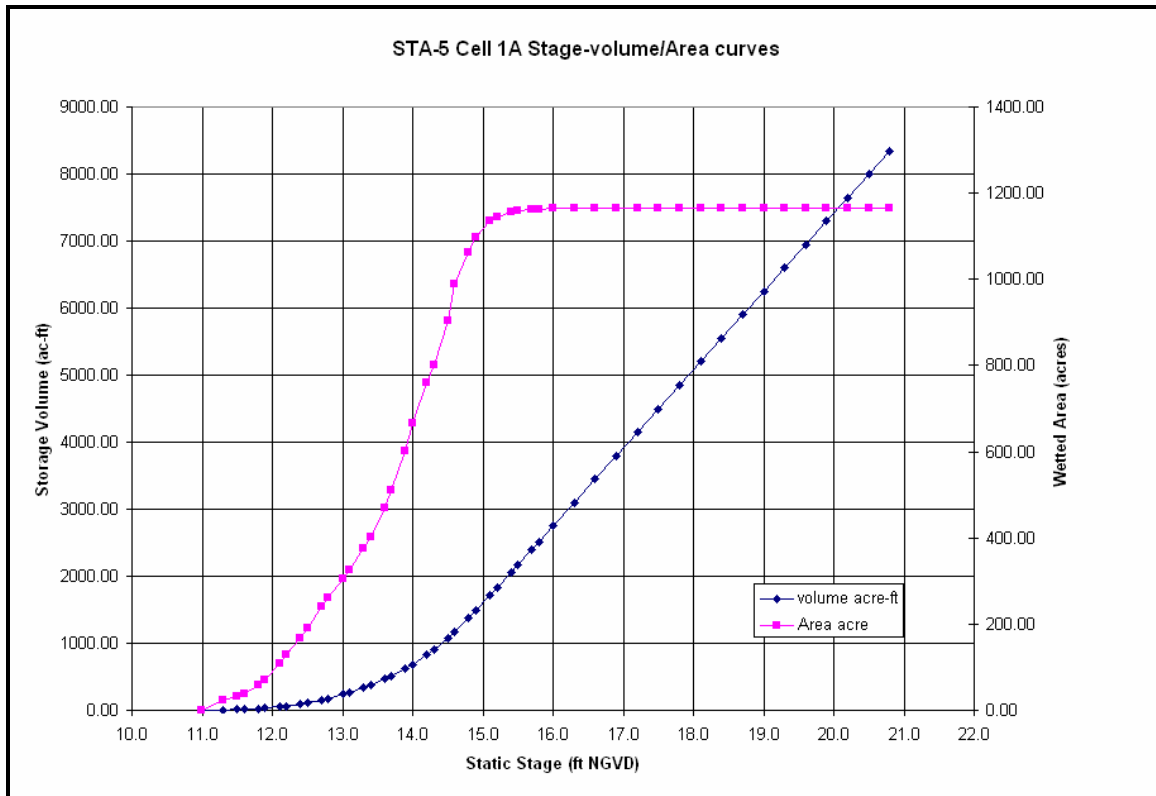


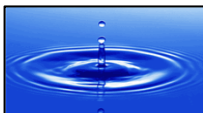
Figure 3. STA-5 Cell 1A Stage – Volume and Stage – Area curves

3.2 Cell 1B:

The surveyed ground elevations in Cell 1B marsh area range from 10.26 ft NGVD to 13.80 ft NGVD. The spatially averaged ground surface elevation is 11.92 ft NGVD. Storage volume and wetted surface area were sampled at various water levels in an increment of 0.10 ft. The results are summarized in Table 2 and Figure 4. These storage volume and area data were directly obtained from SMS volume/area estimation.

Table 2: STA-5 Cell 1B Stage-Volume and Stage-Area Relationship

Stage (ft NGVD)	Volume (acre-ft)	Area (acre)
10.26	0.00	0.00
10.40	0.02	0.33
10.50	0.11	1.23
10.60	1.28	16.20
10.70	3.39	25.20
10.80	6.92	35.95
10.90	10.69	48.20

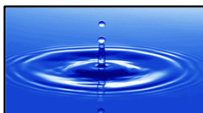




UPDATED

Integrated STA-5 & 6 Operation Plan

11.00	16.42	82.03
11.10	42.40	283.52
11.20	72.42	344.37
11.30	109.68	401.03
11.40	154.64	462.80
11.50	152.81	607.75
11.60	265.33	637.42
11.70	331.03	655.25
11.80	396.30	670.00
11.90	463.90	682.93
12.00	533.62	695.40
12.10	602.94	706.94
12.20	674.22	719.34
12.30	747.67	732.51
12.40	820.74	746.89
12.50	896.17	769.80
12.60	976.19	825.30
12.70	1061.85	896.87
12.80	1156.03	994.35
12.90	1262.33	1117.72
13.00	1377.42	1189.38
13.10	1497.26	1199.45
13.20	1617.30	1201.28
13.30	1737.51	1203.03
13.40	1857.90	1204.74
13.50	1978.44	1206.41
13.60	2099.17	1208.04
13.70	2220.05	1209.41
13.80	2341.00	1209.91
13.90	2461.99	1209.91
14.00	2582.98	1209.91
14.50	3187.94	1209.91
15.00	3792.89	1209.91
15.50	4397.85	1209.91
16.00	5002.81	1209.91
16.50	5607.76	1209.91
17.00	6212.72	1209.91
17.50	6817.67	1209.91
18.00	7422.63	1209.91
18.50	8027.59	1209.91
19.00	8632.54	1209.91
19.50	9237.50	1209.91
20.00	9842.46	1209.91
20.50	10447.41	1209.91
21.00	11052.37	1209.91





21.50	11657.33	1209.91
22.00	12262.28	1209.91
22.50	12867.24	1209.91
23.00	13472.19	1209.91
23.50	14077.15	1209.91
24.00	14682.11	1209.91

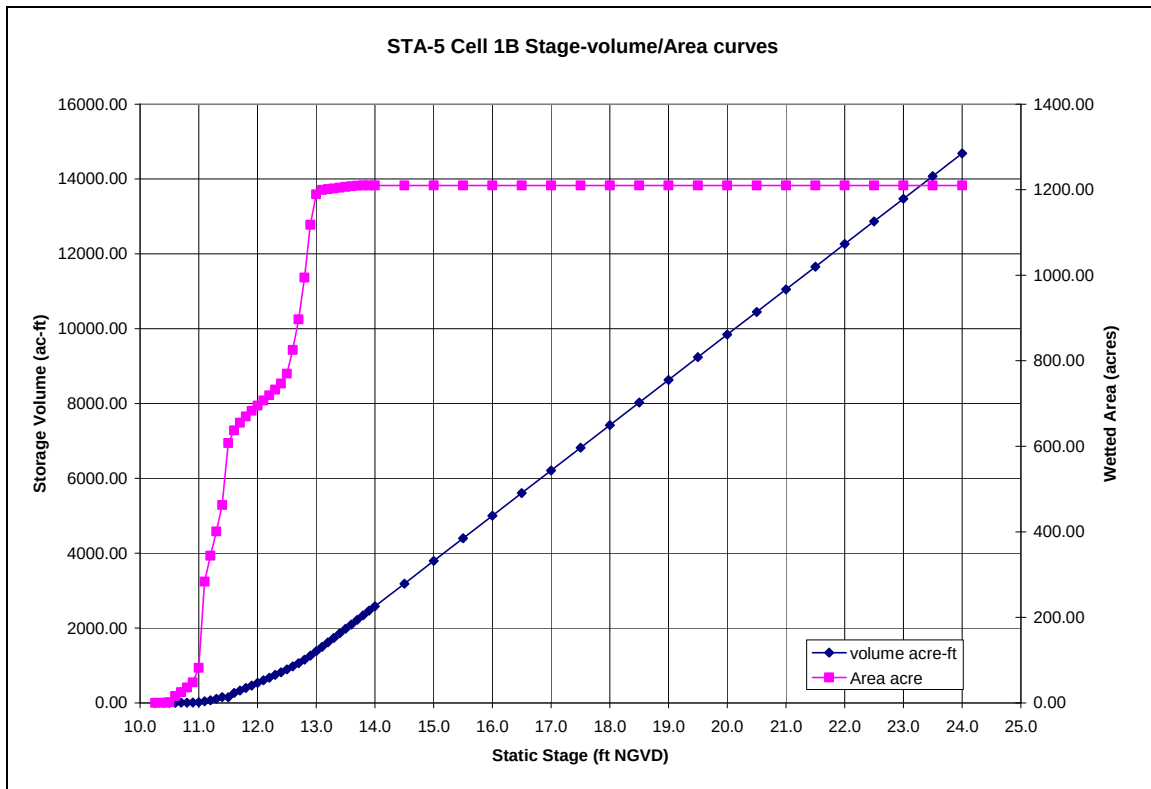


Figure 4. STA-5 Cell 1B Stage – Volume and Stage – Area curves

3.3 Cell 2A:

The surveyed ground elevations in Cell 2A marsh area range from 10.50 ft NGVD to 15.33 ft NGVD. The spatially averaged ground surface elevation is 13.32 ft NGVD. Storage volume and wetted surface area were sampled at various water levels in an increment of 0.10 ft. The results are summarized in Table 3 and Figure 5. These storage volume and area data were directly obtained from SMS volume/area estimation.

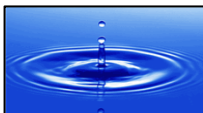


**Table 3: STA-5 Cell 2A Stage-Volume and Stage-Area Relationship**

Stage (ft NGVD)	Volume (acre-ft)	Area (acre)
10.50	0.00	0.00
10.80	0.18	1.34
10.90	0.34	1.90
11.10	0.90	4.01
11.20	1.39	5.41
11.40	2.82	8.64
11.50	3.82	11.26
11.70	8.36	32.44
11.80	12.37	45.98
12.00	24.96	81.39
12.10	35.27	116.25
12.30	65.39	186.94
12.40	86.37	233.32
12.60	151.70	411.10
12.70	194.55	445.33
12.90	290.04	511.76
13.00	343.09	554.56
13.20	459.78	605.80
13.30	521.33	627.17
13.50	651.12	678.83
13.60	720.76	709.80
13.80	867.97	761.94
13.90	945.54	789.23
14.10	1115.88	922.74
14.20	1210.31	965.60
14.40	1411.42	1048.98
14.50	1518.63	1117.67
14.70	1747.90	1156.43
14.80	1863.84	1163.75
15.00	2097.68	1180.16
15.10	2215.92	1183.75
15.30	2452.91	1186.05
15.40	2571.52	1186.07
15.80	3045.95	1186.07
16.20	3520.37	1186.07
16.60	3994.80	1186.07
17.00	4469.23	1186.07
17.40	4943.66	1186.07
17.80	5418.09	1186.07
18.20	5892.52	1186.07
18.60	6366.95	1186.07





19.00	6841.38	1186.07
19.40	7315.81	1186.07
19.80	7790.24	1186.07
20.20	8264.66	1186.07
20.60	8739.09	1186.07
21.00	9213.52	1186.07
21.40	9687.95	1186.07
21.80	10162.38	1186.07
22.20	10636.81	1186.07
22.60	11111.24	1186.07
23.00	11585.67	1186.07
23.40	12060.10	1186.07

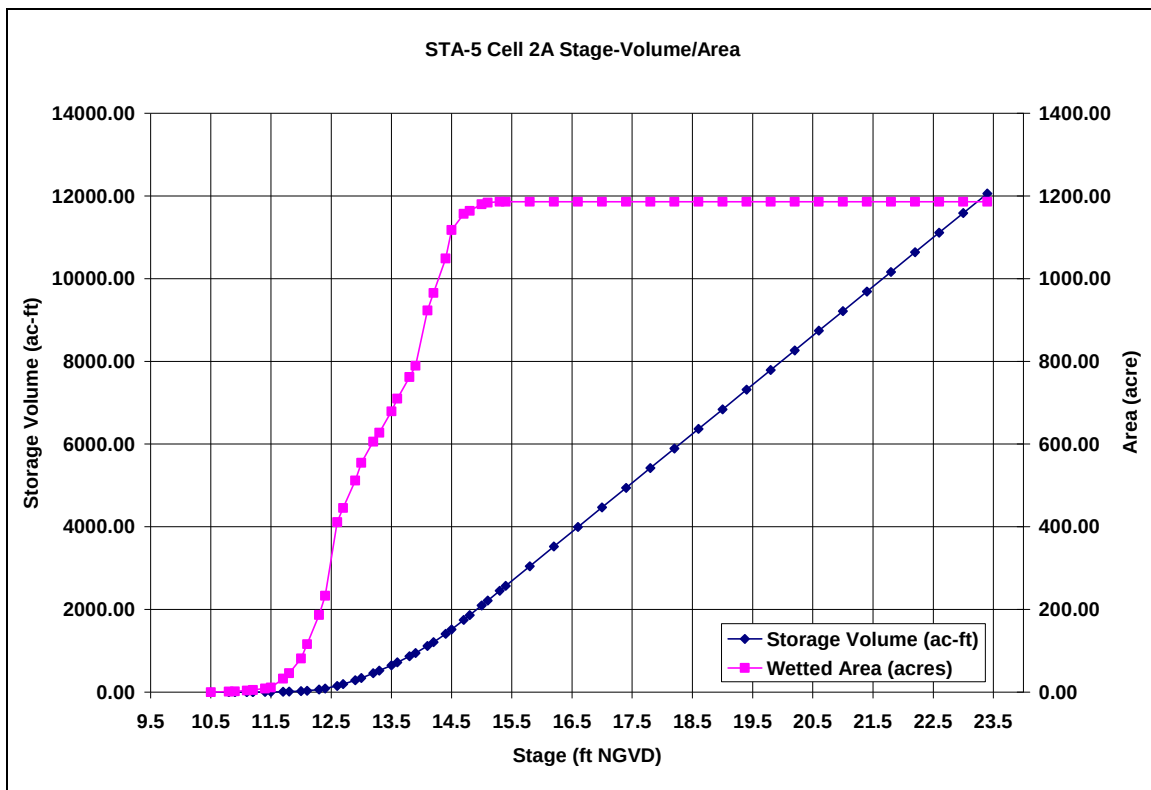


Figure 5. STA-5 Cell 2A Stage – Volume and Stage – Area curves

3.4 Cell 2B:

The surveyed ground elevations in Cell 4N marsh area range from 10.06 ft NGVD to 16.65 ft NGVD. The spatially averaged ground surface elevation is 12.07 ft NGVD. Storage volume

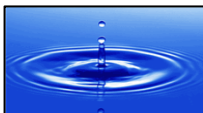




and wetted surface area were sampled at various water levels in an increment of 0.20 ft. The results are summarized in Table 4 and Figure 6. These storage volume and area data were directly obtained from SMS volume/area estimation.

Table 4: STA-5 Cell 2B Stage-Volume and Stage-Area Relationship

Stage (ft NGVD)	Volume (acre-ft)	Area (acre)
10.06	0.00	0.00
10.10	0.01	0.08
10.30	0.24	2.79
10.50	1.26	7.98
10.70	11.46	76.08
10.90	31.45	122.94
11.10	67.48	250.71
11.30	127.14	343.99
11.50	206.33	460.54
11.70	313.36	586.68
11.90	439.79	675.58
12.10	585.35	777.35
12.30	748.01	847.22
12.50	924.17	920.02
12.70	1116.82	989.04
12.90	1318.84	1031.99
13.10	1529.53	1073.22
13.30	1747.45	1105.93
13.50	1971.39	1135.08
13.70	2200.28	1155.06
13.90	2432.98	1173.36
14.10	2668.85	1186.23
14.30	2906.95	1195.10
14.50	3146.62	1202.13
14.70	3387.61	1208.61
14.90	3629.77	1213.44
15.10	3872.87	1217.81
15.30	4116.84	1222.13
15.50	4361.63	1226.64
15.70	4607.30	1230.26
15.90	4853.51	1232.47
16.10	5100.08	1233.25
16.30	5346.74	1233.62
16.50	5593.46	1233.82
16.70	5840.22	1233.87
16.90	6086.99	1233.87
17.40	6703.92	1233.87





17.90	7320.86	1233.87
18.40	7937.79	1233.87
18.90	8554.73	1233.87
19.40	9171.66	1233.87
19.90	9788.60	1233.87
20.40	10405.53	1233.87
20.90	11022.46	1233.87
21.40	11639.40	1233.87
21.90	12256.33	1233.87
22.40	12873.27	1233.87
22.90	13490.20	1233.87
23.40	14107.14	1233.87
24.00	14847.46	1233.87

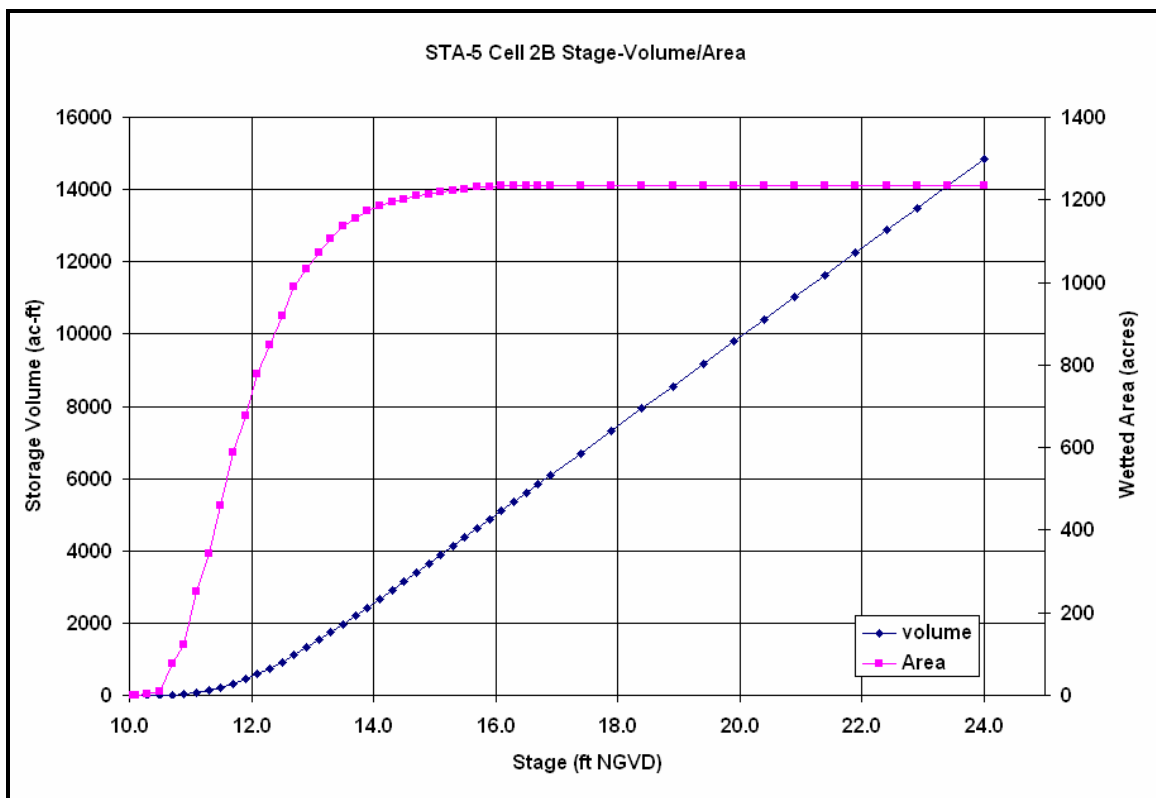


Figure 6. STA-5 Cell 2B Stage – Volume and Stage – Area curves

4. Summary

The stage-volume and stage-area relationships were derived for each cell of STA-5. These data were reported in tables and plots.

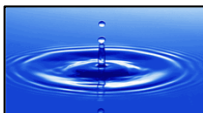




References

Burns & McDonnell, 2003. Long Term Plan for Achieving Water Quality Goals. October 27, 2003.

Wantman Group, 2005. STA-5 topographic survey. West Palm Beach, Florida.





APPENDIX 6. STA-6 STAGE-VOLUME & STAGE-AREA RELATIONSHIPS

CELLS 3 AND 5

The STA-6 stage-volume stage-area relationships were developed using topographic data that was obtained from a topographic survey conducted by Betsy Lindsay, Inc., on 2004. Any substantial changes in the topographic data will require revision of the stage-volume and stage-area relationships for this STA (SFWMD, May 2007).

***Science and Engineering Support Service (SESS)
Contract No. C-15988-WO04-05***

South Florida Water Management District

December 16, 2005



Prepared by:

Sutron Corporation
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South Florida Water Management District
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1. Introduction

As stated in the Long-term Plan for Achieving Water Quality goals (Burn & McDonnell, 2003), accurate stage-volume/stage-area relationships need to be developed for every cell of each STA [Bc82(4)]:

- *“A stage-volume relationship for each cell of each STA. A principal use of the new survey data described in section 5.2.1 is to develop the water storage potential in those systems. This aids directly in management of water volumes and indirectly in the correct determination of hydraulic detention times in the STAs. Additionally, the wetted fraction of area may be developed, and used to forecast the loss of effectiveness at low stages (see section 5.2.1). An accurate stage-volume relationship becomes more critical as shallower depth operations come under consideration, because issues of short-circuiting and areal water coverage become more important at low stages.”*

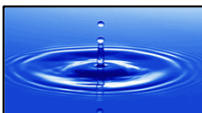
This technical note summarizes the development of stage-volume and stage-area relationships of STA-6 Section 1 as specified in Task 2.4 of this SESS contract.

2. Topographic Data

The STA-6 new topographical surveys (Betsy Lindsay, Inc., 2004) provided the ground surface elevations for each cell of STA-6. These survey data were used for the STA-6 stage-volume and stage-area relationships.

3. Methodology

The survey data were linearly interpolated to a finite element mesh of STA-6. The Surface Water Modeling System (SMS 8.1) calculation tool was used to obtain the storage volume under a specified static water level (SWL) (Figure 1). This is repeated to obtain the relationships for a series of SWL values ranging from minimum to maximum surveyed ground surface elevations. Similarly, the wetted portion of surface area under a certain static water level was determined from the contour lines of specific ground surface elevations.



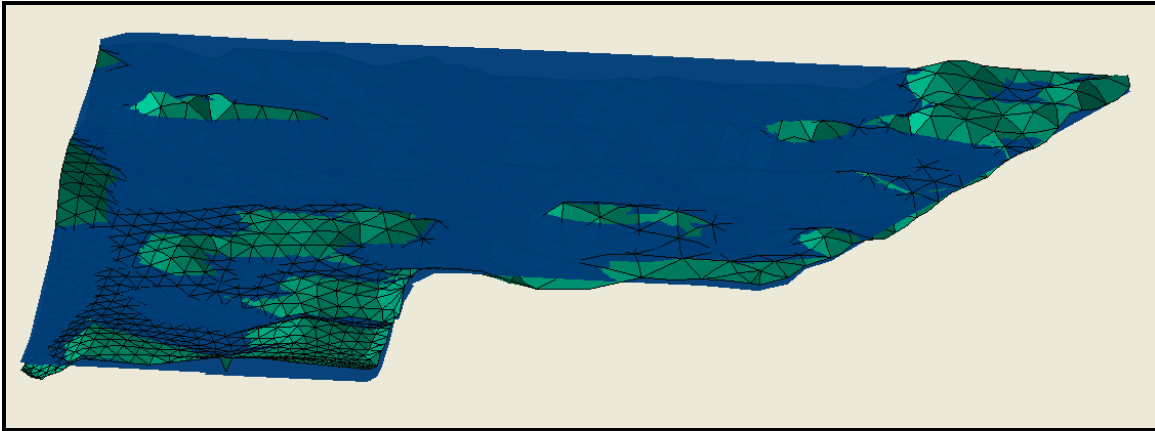


Figure 1: 3-D View of Storage Volume and Wetted Surface Area as a specific Static Water Level

Stage-volume and stage-area relationships are provided in the forms of look-up tables, curve plots for convenient future use.

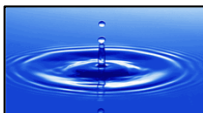
3. Stage-Volume and Stage-Area Relationships for each Cell of STA-6

3.1 Cell 3:

The surveyed ground elevations in Cell 3 marsh area range from 5.94 ft NGVD to 18.2 ft NGVD. The spatially averaged ground surface elevation is 13.07 ft NGVD. Storage volume and wetted surface area were sampled at various water levels in an increment of 0.50 ft. The results are summarized in Table 1 and Figure 2. **These storage volume and area data were directly obtained from SMS volume/area estimation.**

Table 1: STA-6 Cell 3 Stage-Volume and Stage-Area Relationship

Stage (ft NGVD)	Volume (acre-ft)	Area (acre)
5.94	0.00	0.00
7.00	0.17	0.11
7.50	0.33	0.23
8.00	0.52	0.40
8.50	0.86	0.64
9.00	1.31	0.95
9.50	1.92	1.34
10.00	2.72	1.94
10.50	4.83	6.54
11.00	9.93	13.22
11.50	18.53	20.25
12.00	31.02	29.70
12.50	53.97	76.38





13.00	119.67	171.35
13.50	212.41	194.83
14.00	313.31	208.69
14.50	420.30	219.71
15.00	531.81	228.54
15.50	647.37	236.39
16.00	765.58	240.86
16.50	885.83	241.12
17.00	1006.20	241.12
17.50	1126.70	241.12
18.00	1247.23	241.12
18.50	1367.79	241.12
19.00	1488.36	241.12
19.50	1608.92	241.12
20.00	1729.48	241.12
20.50	1850.04	241.12
21.00	1970.60	241.12
21.50	2091.16	241.12
22.00	2211.73	241.12
22.50	2332.29	241.12

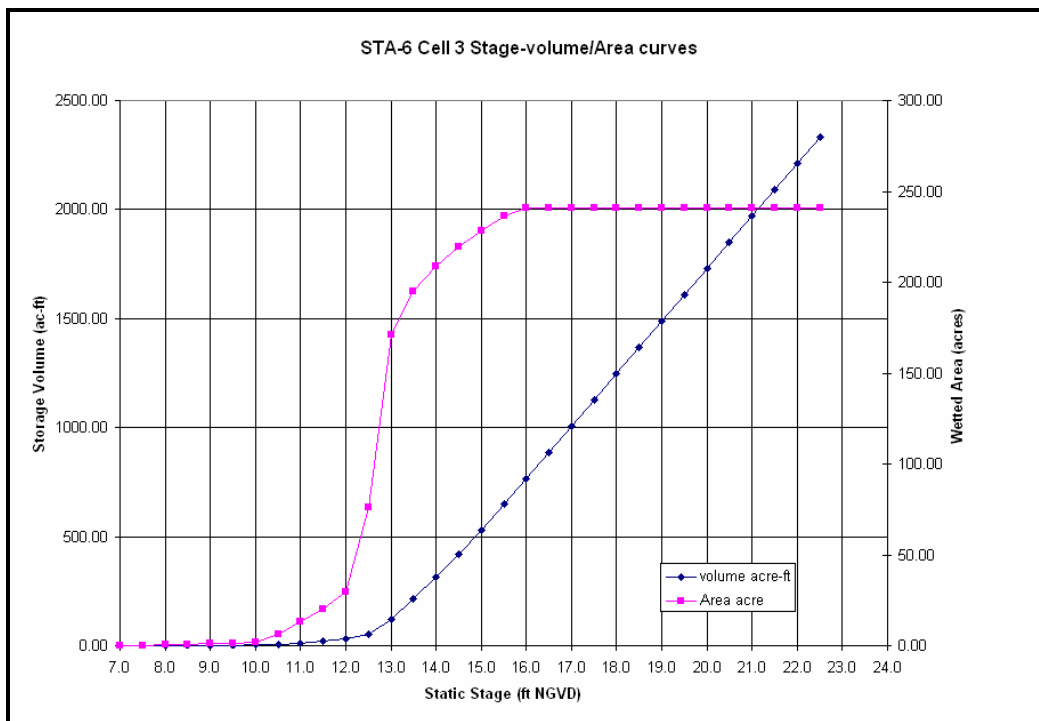


Figure 2: STA-6 Cell 3 Stage-Volume and Stage-Area Curves





3.2 Cell 5:

Surveyed land surface elevations in marsh area range from 4.28 to 17.0 ft NGVD. The spatially averaged ground surface elevation is 12.94 ft NGVD. The stage-volume/area results are summarized in Table 2 and Figure 3. **These storage volume and area data were directly obtained from SMS volume/area estimation.**

Table 2: STA-6 Cell 5 Stage-Volume and Stage-Area Relationship

Stage (ft NGVD)	Volume (acre-ft)	Area (acre)
4.28	0.00	0.00
6.00	2.37	2.62
6.50	4.16	3.75
7.00	6.46	5.08
7.50	9.53	6.32
8.00	13.17	7.66
8.50	17.48	9.12
9.00	22.56	10.74
9.50	28.48	12.58
10.00	35.33	14.69
10.50	43.31	17.14
11.00	53.10	20.85
11.50	65.73	30.68
12.00	92.25	89.48
12.50	170.95	230.01
13.00	332.02	406.82
13.50	567.86	531.45
14.00	850.48	580.57
14.50	1144.03	594.55
15.00	1443.70	605.35
15.50	1748.36	613.35
16.00	2055.05	616.02
16.50	2362.88	618.92
17.00	2671.07	618.92
17.50	2980.53	618.92
18.00	3289.99	618.92
18.50	3599.45	618.92
19.00	3908.91	618.92
19.50	4218.37	618.92
20.00	4527.83	618.92
20.50	4837.29	618.92
21.00	5146.75	618.92
21.50	5456.21	618.92
22.00	5765.67	618.92
22.50	6075.13	618.92



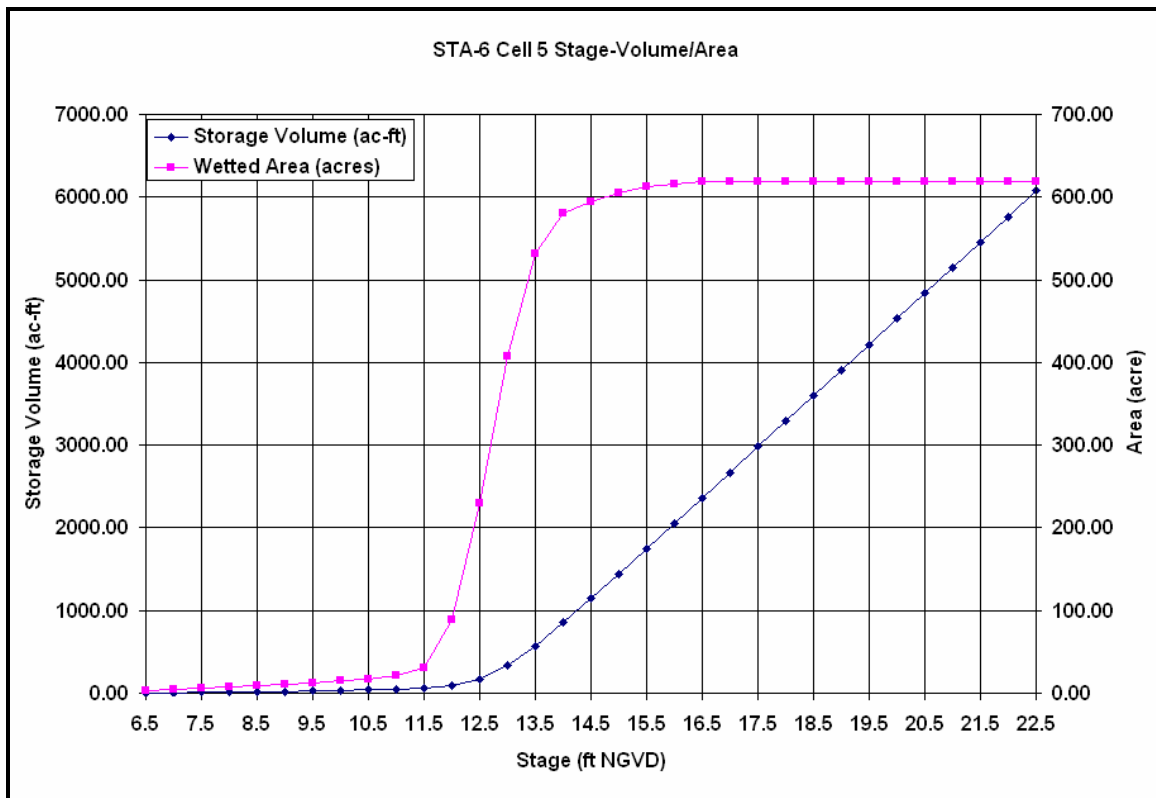


Figure 3: STA-6 Cell 5 Stage –Volume and Stage – Area Curves

4. Summary

The stage-volume and stage-area relationships were derived for each cell of STA-6 Section 1. These data were reported in tables and plots.

References

- [1] Burns & McDonnell, 2003. Long Term Plan for Achieving Water Quality Goals. October 27, 2003.
- [2] South Florida Water Management District, 2000. Everglades Consolidated Report: Chapter 6 Status of STAs. West Palm Beach, Florida.
- [3] Betsy Lindsay, Inc., February 3, 2003. Stormwater Treatment Area No. 6 Topographic Survey.





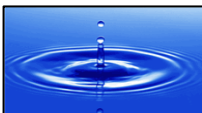
APPENDIX 7. RELEVANT PROVISIONS FROM THE STA OPERATING PERMITS

Relevant Provisions from the STA-5 and STA-6 EFA permits

STA-5. In August 2007 the Florida Department of Environmental Protection (FDEP) issued an Everglades Forever Act (EFA) permit No. 0131842-006-GL to the District for construction, operation and maintenance of STA-5 and associated works. Relevant provisions are identified below, and the full text of the permit is contained on the attached DVD.

GENERAL CONDITIONS:

- 1. Enforcement.** The terms, conditions, requirements, limitations and restrictions set forth in this permit, are "permit conditions" and are binding and enforceable pursuant to Sections 373.129, 403.141, 403.727, 403.859 through 403.861 F.S. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.
- 2. Scope of permit.** This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.
- 6. Operation and maintenance responsibilities.** The permittee shall properly operate and maintain the STA and systems of treatment and control (and related appurtenances) that are installed and used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.
- 8. Noncompliance.** If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:
 - A. A description of and cause of noncompliance; and
 - B. The period of noncompliance, including dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance. The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.



**SPECIFIC CONDITIONS:**

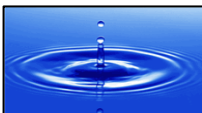
5. Project Operation and Maintenance. The permittee shall operate and maintain STA-5 consistent with the design documents, as may be modified and reflected on the record drawings, operations criteria, and operation plan required by Specific Condition 9.

7. Operational Improvements and Enhancements. Structural, operational and vegetation improvements and enhancements are presently under way in accordance with the Long-Term Plan. These improvements and enhancements are designed to optimize performance as needed to achieve the phosphorus water quality standard. The District shall complete the construction of improvements and enhancements for STA-5 that are identified in the currently approved Long-Term Plan, prior to December 2012. The schedules, strategies, and timelines for these improvements and enhancements, along with any additional schedules, strategies, and timelines for regional water management projects, are detailed in Paragraph 19 of the accompanying Administrative Order (AO-011-EV). The District shall submit proposals for additional phosphorus reduction and operational improvements and enhancements, including the schedules and strategies, and timelines associated with these improvements and enhancements, for STA-5 as part of the adaptive implementation process identified in the Long-Term Plan. Revisions to the Long-Term Plan are available on the District's webpage for the Long-Term Plan: <http://www.sfwmd.gov/sta>. Any approved changes to the Long-Term Plan will be reviewed to determine whether a permit revision is required.

8. Pump Station Maintenance. Maintenance requirements for the pump stations include operation of the pumps for approximately 2 to 4 hours per month, as necessary, to maintain their mechanical integrity. Therefore, temporary operation of the pump stations for maintenance purposes is allowed and is not subject to the discharge criteria of the specific conditions of this permit. However, the permittee shall document all such temporary maintenance operations, and shall include all such discharge flows and loads as a part of the monitoring requirements of this permit.

9. STA Operation Plan and Modifications. Upon completion of the scheduled Long-Term Plan improvements and enhancements, and within 90 days of the completion of any additional Long-Term Plan improvements and enhancements, the permittee shall submit to the Department, at the addresses listed in Specific Condition 1, an updated Operation Plan for STA-5. Until an updated Operation Plan is submitted by the permittee and approved by the Department, the previously existing Operating Plan shall remain in effect, subject to modification under the conditions set forth below.

If at any time changes to the STA-5 Operations Plan are warranted to optimize facility operation, and upon verification of data to be supplied by the permittee that justifies the need for such modification, the Operations Plan may be modified as mutually agreed upon by the Department and the permittee. The Operations Plan shall also include the information described in A-H, below.





Under emergency conditions that threaten the safety of life, property, or the STA-5 facility, the permittee may modify the operations of STA-5 and immediately employ any remedial means to protect life and property in accordance with the emergency provisions of Chapter 373, F.S. The permittee shall notify the Department within 48 hours of such occurrence and shall provide data justifying the need to employ the emergency modifications to operations of STA-5.

A. Minimum Water Level Targets to Avoid Dryout. In accordance with the relevant design documents, the permittee shall, to the maximum extent practicable, maintain a minimum static water level of 0.5 feet above the average ground elevation of the treatment cells to avoid dryout of the treatment cells, subject to available water from the upstream watershed.

B. Responding to Dryout Conditions. The permittee shall evaluate and correct potential adverse dryout effects on the water quality performance of STA-5. If the compliance requirements in this permit are not met due to dryout conditions, then the permittee shall propose modifications to the Operations Plan as appropriate and submit the revised plan to the Department for review and approval.

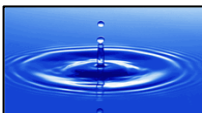
C. Maximum Water Level Targets. The permittee shall ensure, to the maximum extent practicable, that maximum water depths of 4.0 feet above the average ground elevation of the treatment cells will not be exceeded in order to avoid long-term damage to the treatment vegetation and protection of project levees.

D. Operational Envelope. The permittee shall ensure to the maximum extent practicable that operation of the facility does not exceed the operational envelope for STA-5, as set forth in the STA-5 Operations Plan.

E. Phosphorus Uptake Optimization. Operations shall be conducted to distribute the flows and water levels within STA-5 to optimize the phosphorus reduction performance and shall be updated as necessary to include the results of the permittee's Process Development and Engineering (PDE) program being implemented as a part of the Long-Term Plan.

G. Operations Plan Modifications. The STA-5 Operations Plan should be reviewed and may be revised as appropriate based on operational experience, research results, downstream monitoring and upstream levels of service.

H. Hydropattern Restoration. STA-5 shall be operated in such a manner as to be consistent with the activities proposed to restore the hydropattern of the Everglades Protection Area, as described in Specific Condition 10 below.





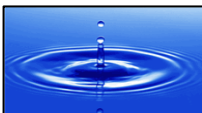
10. Hydropattern Restoration. In accordance with Subsection 373.4592(4)(b), F.S., the permittee shall operate the STAs in order to improve and restore the Everglades water supply and hydroperiod. The permittee shall operate the ECP to provide additional increased flow to the Everglades Protection Area through the modification of historical operational practices for regulatory releases from Lake Okeechobee and the Water Conservation Areas. The STAs shall be operated to achieve the goal of providing additional flows to the Everglades Protection Area and shall, to the maximum extent practicable, be coordinated with and consistent with the Lower East Coast Water Supply Plan, the Lake Okeechobee and Water Conservation Area Regulation Schedules, Comprehensive Everglades Restoration Plan (CERP), and the entitlement of the Seminole Tribe of Florida to surface water withdrawals under the Water Rights Compact (P.L. 100-228).

14. Water Quantity and Flooding Impacts. The permittee shall be responsible for ensuring that STA-5 is operated so as not to adversely affect adjacent lands with regards to flooding impacts and water supply needs of the region. The permittee shall hold and save the Department harmless for any and all damages, claims, or liabilities, which may arise from water quantity and/or flooding impacts resulting from the construction and operation of STA-5.

As treatment cells are constructed and managed to optimize performance, they will undergo three operational phases, each with different levels of performance:

16. Start-Up Phase. During the initial Start-Up Phase of a new cell or new flow-way, the permittee shall monitor phosphorus concentrations within the facility to demonstrate that the project is achieving a net reduction in phosphorus. Portions of STA-2 may operate independently of each other. Under those circumstances, Start-Up Phase operation and monitoring within the treatment area shall be performed as follows:

- i. Establishment of Marsh Vegetation.** The permittee shall manage water depths in the treatment cells to facilitate the recruitment of marsh vegetation in accordance with the Operations Plan, which may include recirculating waters within the STA.
- ii. Start-Up Monitoring.** On a weekly basis, the permittee shall monitor total phosphorus at the upstream side of inflow structure(s). Total phosphorus shall also be monitored on a weekly basis on the upstream side of the outflow structures.
- iii. Phosphorus Start-Up Test.** The Phosphorus Start-Up Test for an individual flow-way or cell is based on when the above samples demonstrate, over a four-week period, a net reduction in phosphorus occurs. This net reduction shall be deemed to occur when the 4-week geometric mean total phosphorus water column concentration from samples collected at the applicable outflow structures is less than the 4-week geometric mean total phosphorus water column concentration collected at the applicable inflow structure(s).





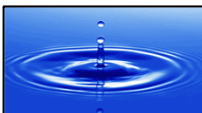
iv. Discharge Operations. Discharge operations, from an individual flow-way or cell that has passed the Phosphorus Start-Up Test described above, may commence once Initial Start-Up Phase documentation and all supporting data and analyses are submitted to the Department via regular or electronic mail. For flow-ways that have not met these tests within six months after issuance of the permit, the permittee shall submit status updates regarding progress toward and identifying strategies and timelines to achieve this test.

v. Initiation of Individual Flow-way (Stabilization and Routine Operation) Discharges and Monitoring. Once flow-through discharges from a flow-way begin, the permittee shall initiate routine water quality monitoring for that flow-way consistent with the monitoring program described in this permit.

17. Stabilization Phase (Flow-through Operations)– An STA enters the Stabilization Phase after each of three antecedent conditions: (1) once flow-through operations begin following the initial start-up of a new treatment cell; (2) when a treatment cell is taken off-line for implementation of Long-Term Plan enhancements that may have adverse impacts on STA performance, or (3) when a treatment cell is taken off-line for recovery activities associated with a major event that compromises the structural integrity or performance of the STA. During the Stabilization Phase the treatment vegetation will be maturing and the STA performance will generally be improving toward achieving the TBEL. However, the overall performance of the STA is extremely difficult to evaluate and predict. It is anticipated that the treatment vegetation will require one to three years after flow-through operations begin for the affected cells to achieve optimal performance. During the stabilization phase the TBEL shall apply. Once the facility achieves the TBEL it shall enter the Routine Operations Phase. During the Stabilization Phase, exceedance of the TBEL is anticipated; however, the STA shall be deemed in compliance as long as the actions described Paragraphs 19 and 22 of the accompanying Order are being taken, in conjunction with all other applicable permit conditions not modified by the Order.

18. Routine Operations Phase - During the Routine Operations Phase, discharges from the STA shall achieve compliance with the TBEL as described in Paragraph 19 of the accompanying Order.

20. Operational Envelope. As a part of the annual reporting requirements in Specific Condition 29, the District shall provide an annual assessment as to whether the facility is operating within or outside the operational envelope. The assessment shall be based on annual inflow volumes and phosphorus loads and shall compare flows and loads to the corresponding average values contained in the operational envelope described in Exhibit B (Goforth et al, 2007). If the annual inflow volumes or phosphorus loads exceed the corresponding average values of the operational envelope during an annual compliance period, the District shall conduct a review of potential causes and include this review in the annual report. Departmental concurrence shall be obtained prior to initiating Lake Okeechobee regulatory or water supply

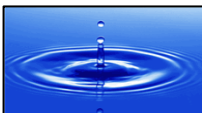




releases that would result in an exceedance of the maximum levels of flow or phosphorus load contained in the operational envelope.

27. Diversion. A new diversion structure G-407 was constructed as part of the STA expansion work. G-407 is located near the southwest corner of STA-6, on the L-3 borrow canal just upstream of WCA-3A. This structure consists of 2-10' wide by 9' high reinforced concrete box culverts. The primary purpose of this structure (G-407) is to operate in conjunction with G-406 to maintain the stage in the L-2 and L-3 Borrow Canals at sufficient levels to direct stormwater into STA-5 and STA-6. Under normal operations G-407 will be closed, however the structure also provides an option for diversion of water downstream during larger storm events in order to maintain flood protection in the upstream basin. In addition, G-407 may be operated to avoid hydrological and nutrient overloading of STA-5 and STA-6, or when water conditions within the STAs may damage existing marsh vegetation.

The District shall notify the Department within 48 hours of any unanticipated diversions of flow through the G-407 gated structure. Notifications of diversions through this structure shall be made pursuant to the requirements of the STA-6 permits.





STA-6. In August 2007 the Florida Department of Environmental Protection (FDEP) issued an Everglades Forever Act (EFA) permit No. 0236905-001 to the District for construction, operation and maintenance of STA-6 and associated works. Relevant provisions are identified below, and the full text of the permit is contained on the attached DVD.

GENERAL CONDITIONS:

- 1. Enforcement.** The terms, conditions, requirements, limitations and restrictions set forth in this permit, are "permit conditions" and are binding and enforceable pursuant to Sections 373.129, 403.141, 403.727, 403.859 through 403.861 F.S. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.
- 2. Scope of permit.** This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.
- 6. Operation and maintenance responsibilities.** The permittee shall properly operate and maintain the STA and systems of treatment and control (and related appurtenances) that are installed and used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.
- 8. Noncompliance.** If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:
 - A. A description of and cause of noncompliance; and
 - B. The period of noncompliance, including dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance. The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

SPECIFIC CONDITIONS:

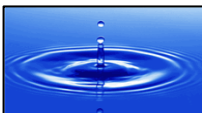
- 5. Project Operation and Maintenance.** The permittee shall operate and maintain STA-6 consistent with the design documents, as may be modified and reflected on the record drawings, operations criteria, and operation plan required by Specific Condition 9.





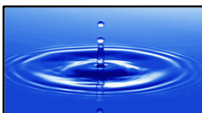
- 7. Operational Improvements and Enhancements.** Structural, operational and vegetation improvements and enhancements are presently under way in accordance with the Long-Term Plan. These improvements and enhancements are designed to optimize performance as needed to achieve the phosphorus water quality standard. The District shall complete the construction of improvements and enhancements for STA-6 that are identified in the currently approved Long-Term Plan, prior to December 2012. The schedules, strategies, and timelines for these improvements and enhancements, along with any additional schedules, strategies, and timelines for regional water management projects, are detailed in Paragraph 19 of the accompanying Administrative Order (AO-012-EV). The District shall submit proposals for additional phosphorus reduction and operational improvements and enhancements, including the schedules and strategies, and timelines associated with these improvements and enhancements, for STA-6 as part of the adaptive implementation process identified in the Long-Term Plan. Revisions to the Long-Term Plan are available on the District's webpage for the Long-Term Plan: <http://www.sfwmd.gov/sta>. Any approved changes to the Long-Term Plan will be reviewed to determine whether a permit revision is required.
- 8. Pump Station Maintenance.** Maintenance requirements for the pump stations include operation of the pumps for approximately 2 to 4 hours per month, as necessary, to maintain their mechanical integrity. Therefore, temporary operation of the pump stations for maintenance purposes is allowed and is not subject to the discharge criteria of the specific conditions of this permit. However, the permittee shall document all such temporary maintenance operations, and shall include all such discharge flows and loads as a part of the monitoring requirements of this permit.
- 9. STA Operation Plan and Modifications.** Upon completion of the scheduled Long-Term Plan improvements and enhancements, and within 90 days of the completion of any additional Long-Term Plan improvements and enhancements, the permittee shall submit to the Department, at the addresses listed in Specific Condition 1, an updated Operation Plan for STA-6. Until an updated Operation Plan is submitted by the permittee and approved by the Department, the previously existing Operation Plan shall remain in effect, subject to modification under the conditions set forth below. If at any time changes to the STA-6 Operation Plan are warranted to optimize facility operation, and upon verification of data to be supplied by the permittee that justifies the need for such modification, the Operation Plan may be modified as mutually agreed upon by the Department and the permittee. The Operation Plan shall also include the information described in A-F, below.

Under emergency conditions that threaten the safety of life, property, or the STA-6 facility, the permittee may modify the operations of STA-6 and immediately employ any remedial means to protect life and property in accordance with the emergency provisions of Chapter 373, F.S. The permittee shall notify the Department within 48 hours of such occurrence and shall provide data justifying the need to employ the emergency modifications to operations of STA-6.





- A. Minimum Water Level Targets to Avoid Dry out.** In accordance with the relevant design documents, the permittee shall, to the maximum extent practicable, maintain a minimum static water level of 0.5 feet above the average ground elevation of the treatment cells to avoid dryout of the treatment cells, subject to available water from the upstream watershed.
- B. Responding to Dryout Conditions.** The permittee shall evaluate and correct potential adverse dryout effects on the water quality performance of STA-2. If the compliance requirements in this permit are not met due to dryout conditions, then the permittee shall propose modifications to the Operations Plan as appropriate and submit the revised plan to the Department for review and approval.
- C. Maximum Water Level Targets.** The permittee shall ensure, to the maximum extent practicable, that maximum water depths of 4.0 feet above the average ground elevation of the treatment cells will not be exceeded in order to avoid long-term damage to the treatment vegetation and protection of project levees.
- D. Operational Envelope.** The permittee shall ensure to the maximum extent practicable that operation of the facility does not exceed the operational envelope for STA-6, as set forth in the STA-6 Operation Plan.
- E. Phosphorus Uptake Optimization.** Operations shall be conducted to distribute the flows and water levels within STA-6 to optimize the phosphorus reduction performance and shall be updated as necessary to include the results of the permittee's Process Development and Engineering (PDE) program being implemented as a part of the Long-Term Plan.
- F. Operations Plan Modifications.** The STA-6 Operation Plan should be reviewed and may be revised as appropriate based on operational experience, research results, downstream monitoring and upstream levels of service.
- G. Hydropattern Restoration.** STA-6 shall be operated in such a manner as to be consistent with the activities proposed to restore the hydropattern of the Everglades Protection Area, as described in Specific Condition 10 below.
- 10. Hydropattern Restoration.** In accordance with Subsection 373.4592(4)(b) F.S., the permittee shall operate the STAs in order to improve and restore the Everglades water supply and hydroperiod. The permittee shall operate the ECP to provide additional increased flow to the Everglades Protection Area through the modification of historical operational practices for regulatory releases from Lake Okeechobee and the Water Conservation Areas. The STAs shall be operated to achieve the goal of providing additional flows to the Everglades Protection Area and shall, to the maximum extent



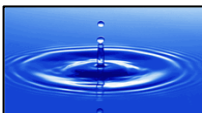


practicable, be coordinated with and consistent with the Lower East Coast Water Supply Plan, the Lake Okeechobee and Water Conservation Area Regulation Schedules, the Comprehensive Everglades Restoration Plan (CERP), and the entitlement of the Seminole Tribe of Florida to surface water withdrawals under the Water Rights Compact (P.L. 100-228).

- 13. Water Quantity and Flooding Impacts.** The permittee shall be responsible for ensuring that STA-6 is operated so as not to adversely affect adjacent lands with regards to flooding impacts and water supply needs of the region. The permittee shall hold and save the Department harmless for any and all damages, claims, or liabilities, which may arise from water quantity and/or flooding impacts resulting from the construction and operation of STA-6.

As treatment cells are constructed and managed to optimize performance, they will undergo three operational phases, each with different levels of performance:

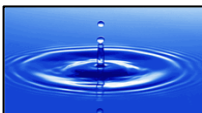
- 15. Start-Up Phase.** During the initial Start-Up Phase of a new cell or new flow-way, the permittee shall monitor phosphorus concentrations within the facility to demonstrate that the facility, cell, or flow-way is achieving a net reduction in phosphorus. Portions of STA-6 may operate independently of each other. Under those circumstances, Start-Up Phase operation and monitoring within the treatment area shall be performed as follows:
- i. Establishment of Marsh Vegetation.** The permittee shall manage water depths in the treatment cells to facilitate the recruitment of marsh vegetation in accordance with the Operations Plan, which may include recirculating waters within the STA.
 - ii. Start-Up Monitoring.** On a weekly basis, the permittee shall monitor total phosphorus at the upstream side of inflow structure(s). Total phosphorus shall also be monitored on a weekly basis on the upstream side of the outflow structures.
 - iii. Phosphorus Start-Up Test.** The Phosphorus Start-Up Test for an individual flow-way or cell is based on when the above samples demonstrate, over a four-week period, a net reduction in phosphorus occurs. This net reduction shall be deemed to occur when the 4-week geometric mean total phosphorus water column concentration from samples collected at the applicable outflow structures is less than the 4-week geometric mean total phosphorus water column concentration collected at the applicable inflow structure(s).
 - iv. Discharge Operations.** Discharge operations, from an individual flow-way or cell that has passed the Phosphorus Start-Up Test described above, may commence once Initial Start-Up Phase documentation and all supporting data and analyses are submitted to the Department via regular or electronic mail. For flow-ways that have not met these tests within six months after issuance of the permit, the permittee shall submit status updates regarding progress toward and identifying strategies and timelines to achieve this test.
 - v. Initiation of Individual Flow-way (Stabilization and Routine Operation) Discharges and Monitoring.** Once flow-through discharges from a flow-way begin, the permittee shall





initiate routine water quality monitoring for that flow-way consistent with the monitoring program described in this permit.

- 16. Stabilization Phase** (Flow-through Operations)– An STA enters the Stabilization Phase after each of three antecedent conditions: (1) once flow-through operations begin following the initial start-up of a new treatment cell; (2) when a treatment cell is taken off-line for implementation of Long-Term Plan enhancements that may have adverse impacts on STA performance, or (3) when a treatment cell is taken off-line for recovery activities associated with a major event that compromises the structural integrity or performance of the STA. During the Stabilization Phase the treatment vegetation will be maturing and the STA performance will generally be improving toward achieving the TBEL. However, the overall performance of the STA is extremely difficult to evaluate and predict. It is anticipated that the treatment vegetation will require one to three years after flow-through operations begin for the affected cells to achieve optimal performance. During the stabilization phase the TBEL shall apply. Once the facility achieves the TBEL it shall enter the Routine Operations Phase. During the Stabilization Phase, exceedance of the TBEL is anticipated; however, the STA shall be deemed in compliance as long as the actions described Paragraphs 19 and 27 of the accompanying Order are being taken, in conjunction with all other applicable permit conditions not modified by the Order
- 17. Routine Operations Phase** - During the Routine Operations Phase, discharges from the STA shall achieve compliance with the TBEL as described in Paragraph 19 of the accompanying Order.
- 19. Operational Envelope.** As a part of the annual reporting requirements in Specific Condition 28, the District shall provide an annual assessment as to whether the facility is operating within or outside the operational envelope. The assessment shall be based on annual inflow volumes and phosphorus loads and shall compare flows and loads to the corresponding average values contained in the operational envelope described in Exhibit B (Goforth et al, 2007). If the annual inflow volumes or phosphorus loads exceed the corresponding average values of the operational envelope during an annual compliance period, the District shall conduct a review of potential causes and include this review in the annual report. Departmental concurrence shall be obtained prior to initiating Lake Okeechobee regulatory or water supply releases that would result in an exceedance of the maximum levels of flow or phosphorus load contained in the operational envelope.
- 25. Diversions.** The District shall notify the Department within 48 hours of any unanticipated diversions of flow through the G-407 gated structure. The District shall notify the Department as soon as practicable in advance of anticipated diversions, with the exception of routine maintenance activities. The submitted notification shall include a description of the circumstances related to the diversion and a projection of the anticipated duration of the diversion. All diversions occurring through the G-407 structure shall be monitored for the





parameters Total Phosphorus and Calculated Flow listed in the Table 1 below. As soon as practicable after cessation of all diversions, the District shall submit a summary of the data collected from the table below, and identify the duration of the diversions.



**Relevant Provisions from the STA-5 and STA-6 NPDES permits**

STA-5. In August 2007 the Florida Department of Environmental Protection (FDEP) issued an **NPDES Permit No. FL0177954** to the District for construction, operation and maintenance of STA-5 and associated works. Relevant provisions are identified below, and the full text of the permit is contained on the attached DVD.

I. Effluent Limitations and Monitoring Requirements**E. Other Limitations and Monitoring and Reporting Requirements**

4. The District shall notify the Department within 24 hours of any unanticipated diversions of flow through the G-407 gated structure. Notifications of diversions through this structure shall be made pursuant to the requirements of the STA-6 NPDES permit.

V. Operation and Maintenance Requirements**A. Operation of Treatment Facilities**

1. The permittee shall ensure that the operation of this facility is as described in the application and supporting documents.

2. The operation of the pollution control facilities described in this permit shall be under the supervision of a person who is qualified by formal training and/or practical experience in the field of water pollution control.

3. Activities such as ongoing maintenance may have adverse impacts on STA performance. In addition, major events may compromise the structural integrity or performance of the STA or section(s) of the STA. Such activities or events will be subject to the planned changes, bypass, and/or upset provisions set forth in Section VIII Paragraphs 17, 22, and 23.

B. Record Keeping Requirements:

1. The permittee shall maintain the following records at the South Florida Water Management District's (District) headquarters and make them available for inspection:

f. Copies of the logs and schedules showing plant operations and equipment maintenance for three years from the date on the logs or schedule.

VI. Schedules

2. A revised Pollution Prevention Plan (PPP) shall be prepared and implemented in accordance with the following schedule:

Action Item		Scheduled Completion Date
1	Develop and Implement revised Pollution	Completion of scheduled Long-Term Plan





	Prevention Plan	enhancements to STA-5
2.	Submittal of revised Pollution Prevention Plan if additional enhancements are implemented	Changes that warrant modifications to the current PPP + 90 days

D. Specific Conditions Related to the Pollution Prevention Plan

1. A revised PPP shall be prepared, submitted to the Department for review and approval, and implemented in accordance with the schedule set forth in Section VI.2.
2. The STA-5 Project shall be operated in accordance with the existing PPP (Exhibit C) until such time as a revised PPP is approved by the Department. If the permitted facilities are demonstrated not to be achieving compliance with the requirements of this permit, the permittee shall submit a modified PPP for Department review and approval as appropriate.

VIII. General Conditions

1. The terms, conditions, requirements, limitations and restrictions set forth in this permit are binding and enforceable pursuant to Chapter 403, F.S. Any permit noncompliance constitutes a violation of Chapter 403, F.S., and is grounds for enforcement action, permit termination, permit revocation and reissuance, or permit revision. [62-620.610(1), F.A.C.]
2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications or conditions of this permit constitutes grounds for revocation and enforcement action by the Department. [62-620.610(2), F.A.C.]
5. This permit does not relieve the permittee from liability and penalties for harm or injury to human health or welfare, animal or plant life, or property caused by the construction or operation of this permitted source; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department. The permittee shall take all reasonable steps to minimize or prevent any discharge, reuse of reclaimed water, or residuals use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. [62-620.610(5), F.A.C.]





7. The permittee shall at all times properly operate and maintain the facility and systems of treatment and control, and related appurtenances, that are installed and used by the permittee to achieve compliance with the conditions of this permit. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to maintain or achieve compliance with the conditions of the permit. [62-620.610(7), F.A.C.]

17. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. The permittee shall be responsible for any and all damages which may result from the changes and may be subject to enforcement action by the Department for penalties or revocation of this permit. The notice shall include the following information:

- a. A description of the anticipated noncompliance;
- b. The period of the anticipated noncompliance, including dates and times; and
- c. Steps being taken to prevent future occurrence of the noncompliance. [62-620.610(17), F.A.C.]

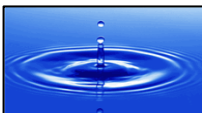
20. The permittee shall report to the Department's Tallahassee Office and the Southeast District Office any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within five days of the time the permittee becomes aware of the circumstances. The written submission shall contain: a description of the noncompliance and its cause; the period of noncompliance including exact dates and time, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

a. The following shall be included as information which must be reported within 24 hours under this condition:

- (1) Any unanticipated bypass which causes any reclaimed water or effluent to exceed any permit limitation or results in an unpermitted discharge,
- (2) Any upset which causes any reclaimed water or the effluent to exceed any limitation in the permit,
- (3) Violation of a maximum daily discharge limitation for any of the pollutants specifically listed in the permit for such notice, and
- (4) Any unauthorized discharge to surface or ground waters.

b. Oral reports as required by this subsection shall be provided as follows:

- (1) For unauthorized releases or spills of untreated or treated wastewater reported pursuant to subparagraph a.(4) that are in excess of 1,000 gallons per incident, or where information indicates that public health or the environment will be endangered, oral reports shall be provided to the Department by calling the STATE





WARNING POINT TOLL FREE NUMBER (800) 320-0519, as soon as practical, but no later than 24 hours from the time the permittee becomes aware of the discharge. The permittee, to the extent known, shall provide the following information to the State Warning Point:

- (a) Name, address, and telephone number of person reporting;
- (b) Name, address, and telephone number of permittee or responsible person for the discharge;
- (c) Date and time of the discharge and status of discharge (ongoing or ceased);
- (d) Characteristics of the wastewater spilled or released (untreated or treated, industrial or domestic wastewater);
- (e) Estimated amount of the discharge;
- (f) Location or address of the discharge;
- (g) Source and cause of the discharge;
- (h) Whether the discharge was contained on-site, and cleanup actions taken to date;
- (i) Description of area affected by the discharge, including name of water body affected, if any; and
- (j) Other persons or agencies contacted.

- (2) Oral reports, not otherwise required to be provided pursuant to subparagraph b.(1) above, shall be provided to Department's Southeast District Office within 24 hours from the time the permittee becomes aware of the circumstances.

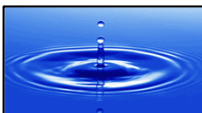
c. If the oral report has been received within 24 hours, the noncompliance has been corrected, and the noncompliance did not endanger health or the environment, the Department's Southeast District Office shall waive the written report. [62-620.610(20), F.A.C.]

21. The permittee shall report all instances of noncompliance not reported under Conditions VIII.17, 18, 19, and 20 of this permit at the time monitoring reports are submitted. This report shall contain the same information required by Condition VIII.20. of this permit. [62-620.610(21), F.A.C.]

22. Bypass Provisions.

a. Bypass is prohibited, and the Department may take enforcement action against a permittee for bypass, unless the permittee affirmatively demonstrates that:

- (1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage; and
- (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and
- (3) The permittee submitted notices as required under Condition VIII.22.b. of this permit.





b. If the permittee knows in advance of the need for a bypass, it shall submit prior notice to the Department, if possible at least 10 days before the date of the bypass. The permittee shall submit notice of an unanticipated bypass within 24 hours of learning about the bypass as required in Condition VIII.20. of this permit. A notice shall include a description of the bypass and its cause; the period of the bypass, including exact dates and times; if the bypass has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent recurrence of the bypass.

c. The Department shall approve an anticipated bypass, after considering its adverse effect, if the permittee demonstrates that it will meet the three conditions listed in Condition VIII.22 a.(1) through (3) of this permit.

d. A permittee may allow any bypass to occur which does not cause reclaimed water or effluent limitations to be exceeded if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provision of Condition VIII.22.a. through c. of this permit.

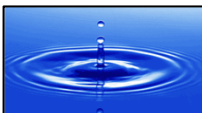
23. Upset Provisions

a. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed contemporaneous operating logs, or other relevant evidence that:

- (1) An upset occurred and that the permittee can identify the cause(s) of the upset;
- (2) The permitted facility was at the time being properly operated;
- (3) The permittee submitted notice of the upset as required in Condition VIII.20. of this permit; and
- (4) The permittee complied with any remedial measures required under Condition VIII.5. of this permit.

b. In any enforcement proceeding, the burden of proof for establishing the occurrence of an upset rests with the permittee.

c. Before an enforcement proceeding is instituted, no representation made during the Department review of a claim that noncompliance was caused by an upset is final agency action subject to judicial review.





STA-6. In August 2007 the Florida Department of Environmental Protection (FDEP) issued an **NPDES Permit No.** FL0473804-001 to the District for construction, operation and maintenance of STA-6 and associated works. Relevant provisions are identified below, and the full text of the permit is contained on the attached DVD.

I. Effluent Limitations and Monitoring Requirements

E. Other Limitations and Monitoring and Reporting Requirements

4. The District shall notify the Department within 24 hours of any unanticipated diversions of flow through the G-407 Diversion Structure. The District shall notify the Department as soon as practicable in advance of anticipated diversions, with the exception of routine maintenance. The submitted notification shall include a description of the circumstances related to the diversion and a projection of the anticipated duration of the diversion. All diversions occurring through the G-407 structure shall be monitored for the parameters listed in the table below. As soon as practicable after cessation of all diversions, the District shall submit a summary of the data collected from the table below, and identify the duration of the diversions.

Parameter	Units	Sample Type	Frequency
Total Phosphorus	mg/l	Grab	Weekly
Flow	CFS	Calculated	Daily Average

V. Operation and Maintenance Requirements

A. Operation of Treatment Facilities

1. The permittee shall ensure that the operation of this facility is as described in the application and supporting documents.
2. The operation of the pollution control facilities described in this permit shall be under the supervision of a person who is qualified by formal training and/or practical experience in the field of water pollution control.
3. Activities such as ongoing maintenance may have adverse impacts on STA performance. In addition, major events may compromise the structural integrity or performance of the STA or section(s) of the STA. Such activities or events shall be subject to the planned changes, bypass, and/or upset provisions set forth in Section VIII Paragraphs 17, 22 and 23.

VI. Schedules

1. The Annual Report shall be received by the Department no later than March 1 of each year following the date of issuance of this permit. Each Annual Report shall present the information for the previous water year, from May 1 to April 30. Upon approval by the Department, the District may modify the Annual Report submission date to coincide with multiple reporting requirements and time periods needed for data acquisition and analysis.





2. A revised Pollution Prevention Plan (PPP) shall be prepared and implemented in accordance with the following schedule:

Action Item		Scheduled Completion Date
1	Develop and implement revised Pollution Prevention Plan	Completion of scheduled Long-Term Plan enhancements to STA-6
2.	Submittal of revised Pollution Prevention Plan if additional enhancements are implemented	Changes that warrant modifications to the current PPP + 90 days

VII. Other Specific Conditions

D. Specific Conditions Related to the Pollution Prevention Plan

1. A revised Pollution Prevention Plan (PPP) shall be prepared, submitted to the Department for review and approval, and implemented in accordance with the schedule set forth in Section VI.2.
2. The STA-6 Project shall be operated in accordance with the existing PPP (Exhibit C) until such time as a revised PPP is approved by the Department. If the permitted facilities are demonstrated not to be achieving compliance with the requirements of this permit, the permittee shall submit a modified PPP for Department review and approval as appropriate.

VIII. General Conditions

1. The terms, conditions, requirements, limitations and restrictions set forth in this permit are binding and enforceable pursuant to Chapter 403, F.S. Any permit noncompliance constitutes a violation of Chapter 403, F.S., and is grounds for enforcement action, permit termination, permit revocation and reissuance, or permit revision. [62-620.610(1), F.A.C.]
2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications or conditions of this permit constitutes grounds for revocation and enforcement action by the Department. [62-620.610(2), F.A.C.]
5. This permit does not relieve the permittee from liability and penalties for harm or injury to human health or welfare, animal or plant life, or property caused by the construction or operation of this permitted source; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department. The permittee shall take all reasonable steps to minimize or prevent any discharge, reuse of reclaimed water, or residuals use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. It shall not be a defense for a permittee in an enforcement action that it would





have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. [62-620.610(5), F.A.C.]

7. The permittee shall at all times properly operate and maintain the facility and systems of treatment and control, and related appurtenances, that are installed and used by the permittee to achieve compliance with the conditions of this permit. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to maintain or achieve compliance with the conditions of the permit. [62-620.610(7), F.A.C.]

17. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements. The permittee shall be responsible for any and all damages which may result from the changes and may be subject to enforcement action by the Department for penalties or revocation of this permit. The notice shall include the following information:

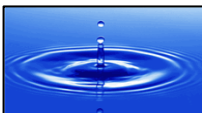
- a. A description of the anticipated noncompliance;
- b. The period of the anticipated noncompliance, including dates and times; and
- c. Steps being taken to prevent future occurrence of the noncompliance. [62-620.610(17), F.A.C.]

20. The permittee shall report to the Department's Tallahassee Office and the Southeast District Office any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within five days of the time the permittee becomes aware of the circumstances. The written submission shall contain: a description of the noncompliance and its cause; the period of noncompliance including exact dates and time, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

a. The following shall be included as information which must be reported within 24 hours under this condition:

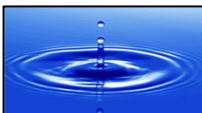
- (1) Any unanticipated bypass which causes any reclaimed water or effluent to exceed any permit limitation or results in an unpermitted discharge,
- (2) Any upset which causes any reclaimed water or the effluent to exceed any limitation in the permit,
- (3) Violation of a maximum daily discharge limitation for any of the pollutants specifically listed in the permit for such notice, and
- (4) Any unauthorized discharge to surface or ground waters.

b. Oral reports as required by this subsection shall be provided as follows:





- (1) For unauthorized releases or spills of untreated or treated wastewater reported pursuant to subparagraph a.(4) that are in excess of 1,000 gallons per incident, or where information indicates that public health or the environment will be endangered, oral reports shall be provided to the Department by calling the STATE WARNING POINT TOLL FREE NUMBER (800) 320-0519, as soon as practical, but no later than 24 hours from the time the permittee becomes aware of the discharge. The permittee, to the extent known, shall provide the following information to the State Warning Point:
 - (a) Name, address, and telephone number of person reporting;
 - (b) Name, address, and telephone number of permittee or responsible person for the discharge;
 - (c) Date and time of the discharge and status of discharge (ongoing or ceased);
 - (d) Characteristics of the wastewater spilled or released (untreated or treated, industrial or domestic wastewater);
 - (e) Estimated amount of the discharge;
 - (f) Location or address of the discharge;
 - (g) Source and cause of the discharge;
 - (h) Whether the discharge was contained on-site, and cleanup actions taken to date;
 - (i) Description of area affected by the discharge, including name of water body affected, if any; and
 - (j) Other persons or agencies contacted.
 - (2) Oral reports, not otherwise required to be provided pursuant to subparagraph b.(1) above, shall be provided to Department's Southeast District Office within 24 hours from the time the permittee becomes aware of the circumstances.
- c. If the oral report has been received within 24 hours, the noncompliance has been corrected, and the noncompliance did not endanger health or the environment, the Department's Southeast District Office shall waive the written report. [62-620.610(20), F.A.C.]
21. The permittee shall report all instances of noncompliance not reported under Conditions VIII.17, 18, 19, and 20 of this permit at the time monitoring reports are submitted. This report shall contain the same information required by Condition VIII.20. of this permit. [62-620.610(21), F.A.C.]
22. Bypass Provisions.
- a. Bypass is prohibited, and the Department may take enforcement action against a permittee for bypass, unless the permittee affirmatively demonstrates that:
 - (1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage; and
 - (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been

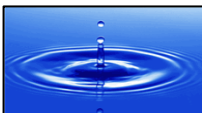




installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and
(3) The permittee submitted notices as required under Condition VIII.22.b. of this permit.

23. Upset Provisions

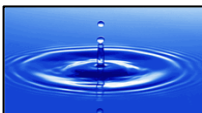
- a. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed contemporaneous operating logs, or other relevant evidence that:
- (1) An upset occurred and that the permittee can identify the cause(s) of the upset;
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 - (3) The permittee submitted notice of the upset as required in Condition VIII.20. of this permit; and
 - (4) The permittee complied with any remedial measures required under Condition VIII.5. of this permit.
- b. In any enforcement proceeding, the burden of proof for establishing the occurrence of an upset rests with the permittee.
- c. Before an enforcement proceeding is instituted, no representation made during the Department review of a claim that noncompliance was caused by an upset is final agency action subject to judicial review.





APPENDIX 8. SUMMARY OF CHANGES FROM FEBRUARY 2006 INTEGRATED OPERATION PLAN FOR STAs 5 & 6

1. Revised the STA structure reference table
2. Added an appendix with a summary of changes to the February 2006 STA-5/6 Integrated Operations Plan
3. Added an appendix the with STA-5 Stage-Volume / Stage-Area relationships for Flow-ways 1 & 2
4. Added an appendix the with STA-6 Stage-Volume / Stage-Area relationships for Cells 3 and 5
5. Reduced the maximum depth from 4.5 ft to 4.0 ft
6. Reduced the depth duration targets
7. Revised the target operating depths between storm events to generally 1.25 ft for emergent and 2 ft for SAV cells
8. Revised the G-406 and G-407 operations
9. Updated the flow rating curves at various STA-5/6 structures based on stream SFWMD gauging and URS design calculations
10. Added an appendix with surveys and record drawings (as-builts)
11. Revised the STA-5 and STA-6 operational envelopes based on the updated basin data sets, and included operational targets
12. Moved the relevant provisions from the EFA and NPDES permits for STA-5 and STA-6 to an appendix and updated the provisions to reflect the current permits
13. Revised text, tables and figures to reflect the construction of the expanded STA-5 and STA-6
14. Revised treatment cell areas and ground elevations based on updated information (see Table 2)
15. added a Pre-Storm Operation section
16. added a description of the C-139 Annex discharge facility
17. added photos of STA-5 3rd flow-way and STA-6 expansion and enhancements
18. developed preliminary gate openings for the G-342 structures as a function of stage, designed to balance the phosphorus loading rate among the flow-ways
19. updated the reference ground elevation in STA-6 Cells 3 and 5 based on recent topography survey





APPENDIX 9. STA-5 AND STA-6 SURVEYS AND RECORD DRAWINGS

Surveys and record drawings are contained in the DVD located in the envelope on the back cover of this *Operation Plan*.

