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August 17, 1999

Draft CFRSF Operations and Maintenance Manual

We are pleased to present the attached draft Operation and Maintenance Manual for the Celery Fields Regional Stormwater Facility (CFRSF). This manual provides a summary of the structures in the CFRSF (including the Main C weir) and a discussion of the design intent for operations procedures under various weather conditions. An overview of scheduled maintenance is provided and tables of recommended gates positions are provided in the appendix for quick reference.

Please review the manual and return your comments to my office by August 27, 1999. If you have any questions or require additional information please contact me at your convenience.

Boyle Engineering Corporation

Michael A. Hanson, P.E.
Senior Engineer

Enclosure: 1 Copy of Draft O&M Manual

Copies to: Sandra Newell
Tom Wilcox
Tom Medel
Jack Hickman
Fred Adams

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CELERY FIELDS REGIONAL STORMWATER TREATMENT FACILITY OPERATION AND MAINTENANCE GUIDELINES

CELERY FIELDS PROJECT OVERVIEW

The Celery Fields Regional Stormwater Facility (CFRSF) is located south of Fruitville Road and east of I-75 in northern Sarasota County. The project is within the Main C subbasin of Phillippi Creek and was originally conceived as part of the Phillippi Creek Basin Master Plan. The CFRSF is designed to divert all flows from the Main C canal into the facility and can provide off-line storage of floodwaters via the use of manually controlled gates. A total of over 1000-acre feet of storage is available for the design storm event (100 year/24 hour storm or 10" of rainfall). A secondary benefit provided by the CFRSF is water quality improvements in the basin. The facility will normally function as a flow-through detention system providing both physical sedimentation and wetland plant nutrient uptake for normal flows from the Main C canal. An estimated residence time of 5 days is available for one-inch of runoff from the contributing basin with an inter-event dry period of approximately 12 hours.

Additionally, the operation of the CFRSF can be coordinated with the Main C Weir to maximize flood storage in the basin. This structure is located downstream of Porter Road and just upstream of the confluence of Main C and Main A (Phillippi Creek). As part of the early preparations for the construction of the CFRSF the County constructed a replacement for the Main C Weir. The original structure was constructed and operated by the Fruitville Drainage District specifically to promote agriculture (celery) in the fields adjacent to the Main C canal south of Fruitville Road.

This document is divided into two sections. Section 1.0 describes the intended operating procedures for CFRSF and Main C structures with regard to varying climatological conditions. Section 2.0 provides a summary of the recommended maintenance procedures for the CFRSF and Main C structures. A more detailed description of procedures for maintenance can be found in the manufacturer's literature provided by the contractor at construction closeout.

This manual was developed for Sarasota County to explain the intended operations procedures envisioned by the designers of the CFRSF. The operator should note that actual storm events will vary from the limited series of simulated design storms upon which these procedures were based. Once the County has established a working knowledge of the facility they may find that certain modifications to the outlined procedures will provide for more efficient and effective operations. A summary table of

operation scenarios is included in Appendix A for use by field personnel for quick reference. It is recommended that managers and others with the responsibility for directing storm event response read and familiarize themselves with the full operations procedures provided below.

SECTION 1.0 – OPERATIONS

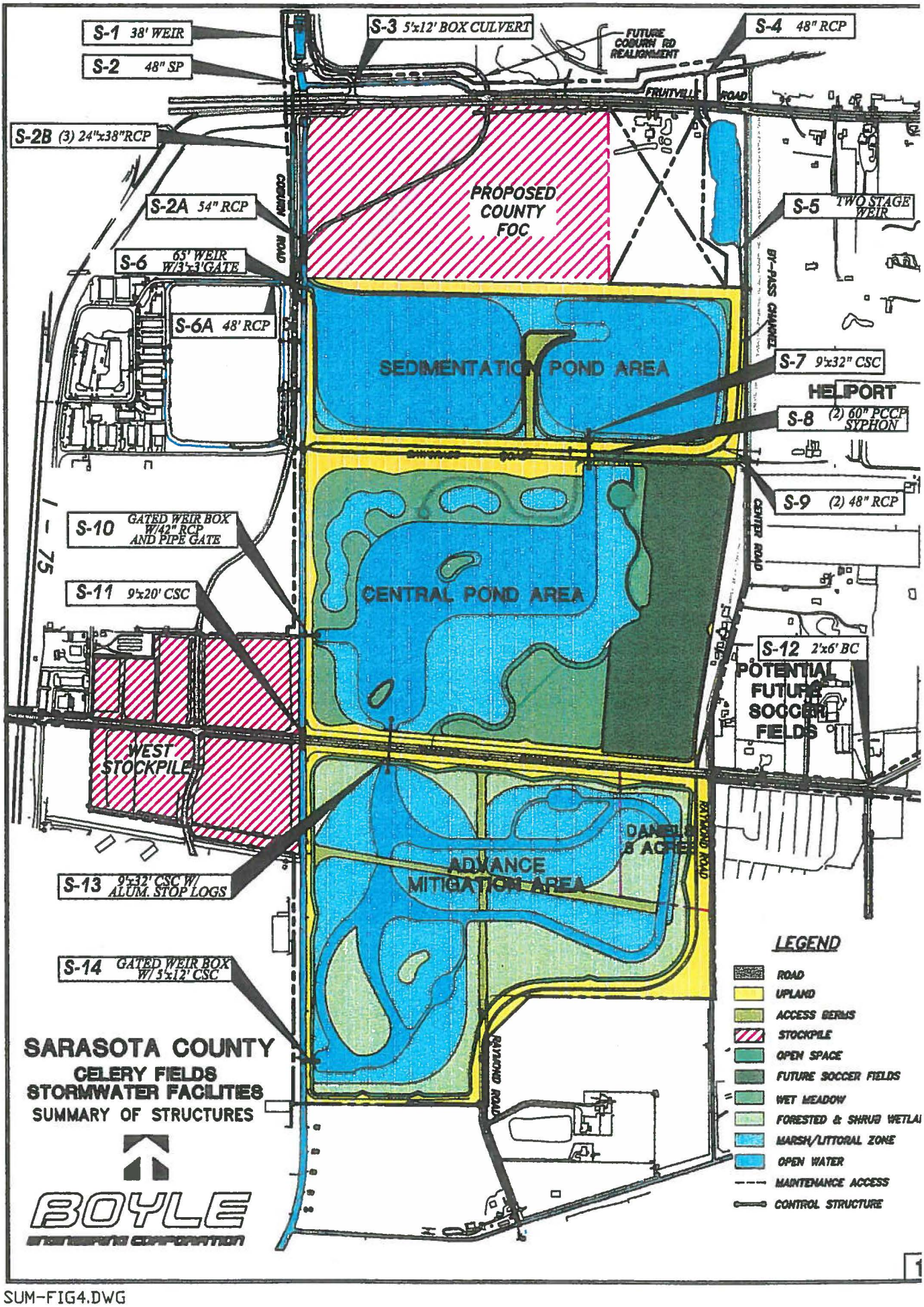
1.1 CFRSF MANUAL GATES

The CFRSF facility is comprised of 14 major control structures. Four of the structures are equipped with manually operated gates to facilitate the control and release of floodwaters. For quick reference Exhibit 1 provides a summary of CFRSF structure locations, Exhibit 2 provides a general description of the surface water flow patterns in the CFRSF and Table 1 provides a summary of structure sizes and functions.

TABLE 1
SUMMARY OF MAJOR STRUCTURES FOR CFRSF

DESCRIPTION	STRUCTURE NO.	LOCATION	SIZE	UPSTREAM INVERT	DOWNSTREAM INVERT	LENGTH	
Concrete Weir	S-1	North of Fruitville on Main 'C'	38' wide	11.0	N/A	N/A	Fixed weir upstream of dirt road crossing and Fruitville Rd crossing
Steel Pipe	S-2	Fruitville Rd. crossing west of Main 'C'	48"	15.5	15.0	188'	West By-pass - flows south to S-2B
Concrete Culverts	S-2B	Power line access crossing west of old Coburn Rd south of Fruitville Rd	3-24" x 38"	15.0	15.0	24'	West By-pass - flows south to S-2A
Concrete Culvert	S-2A	Between Main 'C' and Coburn Rd	54"	15.0	13.0		West By-pass - discharges to Main 'C' downstream of S-6
Concrete Box	S-3	Coburn Rd crossing north of Fruitville	10'x5'	15.3	15.0	60'	Ditch on north side of Fruitville Rd. flows east to East By-pass ditch
Concrete Culvert/ Steel pipe under Fruitville Rd	S-4	Fruitville Rd crossing east of Golf Range	2-48"	13.4	12.0	275'	East By-pass - flows to private lake south of Fruitville Road
Concrete Weir	S-5	Private Lake east of Golf Range	1st Stage 3.2' wide 2nd Stage 10' wide Top 30' wide	1st Stage 13.4 2nd Stage 16.6 Top 17.0	N/A N/A N/A	N/A N/A N/A	East By-pass - controls private lake discharge to canal upstream of siphon S-8
Concrete Weir	S-6	East of intersection of Interstate Blvd. and Coburn Rd	65' 3'x3' sluice gate	21.0 Top 23.0 15.0	N/A N/A N/A	N/A N/A N/A	Fixed weir – diverts Main 'C' into CFRSF. 100 year flood discharges over weir crest
Concrete Culvert	S-6A	Coburn Road crossing north of Interstate Blvd.	60"	13.3	13.0	115'	West By-pass – collects flow from ditch north of Interstate Blvd.
Concrete Span Culvert	S-7	Sawgrass Road crossing	9' high x 32'wide	11.1	11.0	149'	CFRSF main flow from sediment cell to central pond
RCCP Inverted Siphon	S-8	Span culvert crossing north of Sawgrass Rd	2-60"	12.3	12.0	120'	East By-pass – discharges downstream of S-6 to Main 'C'
Concrete Culvert	S-9	Sawgrass Road and Center Road	2-48"	14.3	13.0	298'	East By-pass – collects flow from ditch east of Center Rd
Gated Concrete Weir with Concrete Culvert Discharge	S-10	Central Pond east of Main 'C'	2'x2' gate 15' overflow 42" discharge	14.5 19.4 11.5	N/A N/A 11.0	N/A N/A 100'	Used to by-pass Advance Mitigation Area and discharge from central pond direct to Main 'C'

Concrete Span Culvert	S-11	Palmer Boulevard crossing on Main 'C'	9' high x 20' wide	11.3	11.0	108'	Conveys Main 'C' flows
Concrete Box Culvert	S-12	Niobe Rd crossing south of Palmer Blvd	2' high x 6' wide	22.0	22.0	75'	Conveys flow to Lateral CA
Concrete Span Culvert	S-13	Palmer Blvd crossing east of Main 'C'	9' high x 32' wide	11.1	11.0	232'	CFRSF main flow from central pond to wetland cell
Gated Concrete Weir with Concrete Span Culvert Discharge	S-14	Wetland cell east of Main 'C'	2-3' high x 6' wide 2-2' high x 6' wide 24' wide overflow 5' high x12' wide Discharge	15.5 16.5 21.0 12.0	N/A N/A N/A 11.5	N/A N/A N/A 100'	CFRSF main discharge to Main 'C'


S-1 38' WEIR
S-2 48" SP
S-3 5'x12' BOX CULVERT
FUTURE COBURN RD REALIGNMENT
S-4 48" RCP
FRUITVILLE ROAD
S-2B (3) 24"x38"RCP
S-2A 54" RCP
COBURN ROAD
PROPOSED COUNTY FOC
S-5 TWO STAGE WEIR
BY-PASS CHANNEL
S-6 65' WEIR W/3'x3'GATE
S-6A 48" RCP
SEDIMENTATION POND AREA
S-7 9'x32" CSC
HELIPORT
S-8 (2) 60" PCCP SYPHON
S-9 (2) 48" RCP
CENTER ROAD
I - 75
S-10 GATED WEIR BOX W/42" RCP AND PIPE GATE
S-11 9'x20' CSC
CENTRAL POND AREA
S-12 2'x6' BC
POTENTIAL FUTURE SOCCER FIELDS
WEST STOCKPILE
RAYMOND ROAD
ADVANCE MITIGATION AREA
S-13 9'x32' CSC W/ ALUM. STOP LOGS
S-14 GATED WEIR BOX W/ 5'x12' CSC
SARASOTA COUNTY
CELERY FIELDS
STORMWATER FACILITIES
SUMMARY OF STRUCTURES
BOYLE
LEGEND
ROAD
UPLAND
ACCESS BERMS
STOCKPILE
OPEN SPACE
FUTURE SOCCER FIELDS
WET MEADOW
FORESTED & SHRUB WETLAI
MARSH/LITTORAL ZONE
OPEN WATER
MAINTENANCE ACCESS
CONTROL STRUCTURE

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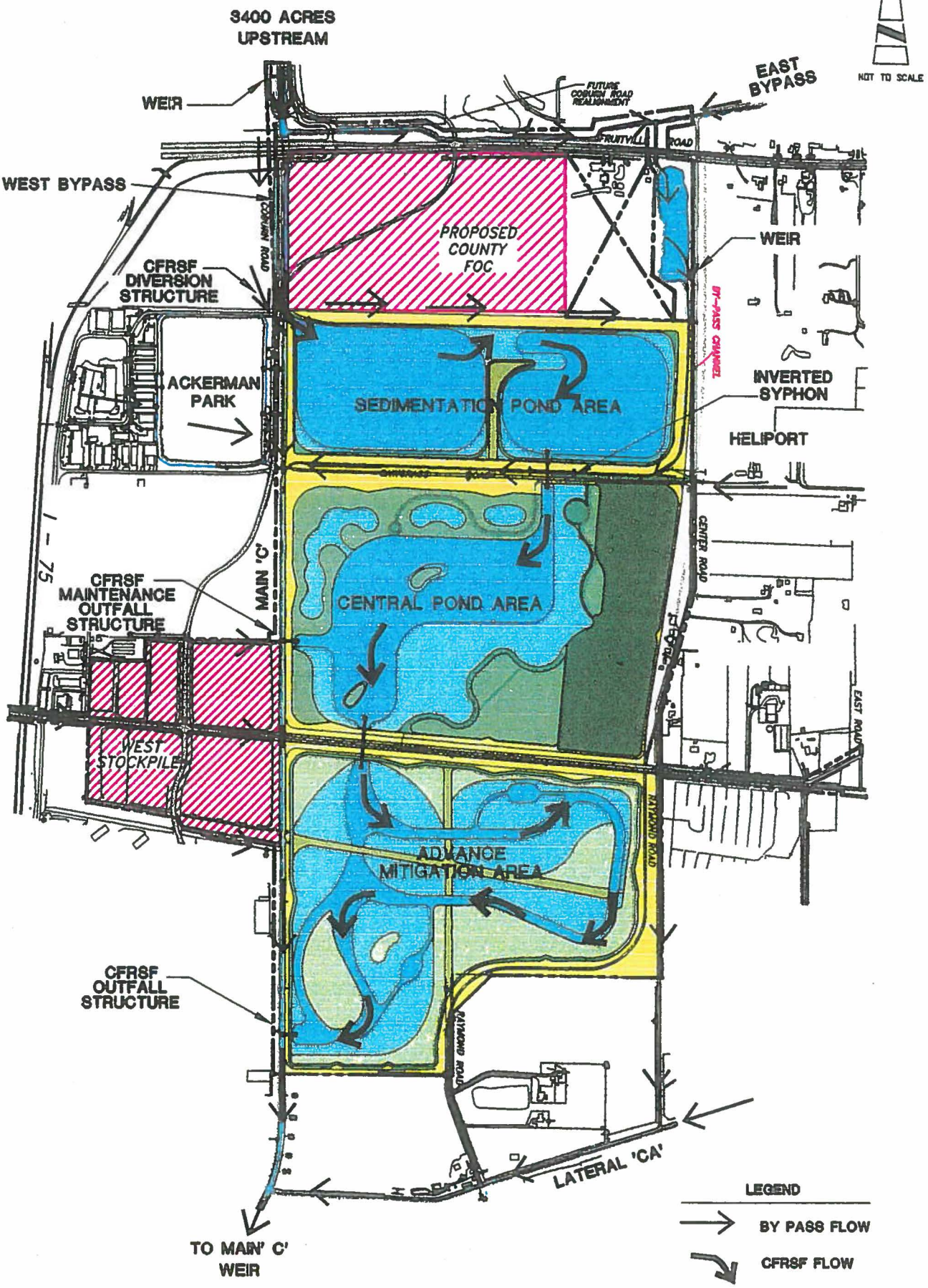

SARASOTA COUNTY

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PROJECT NO.

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1.1.1 NORMAL OPERATION (NON-STORM EVENT)

During normal (non-storm event) operations the CFRSF functions as a flow through system. All flows are diverted from the Main 'C' canal into the CFRSF by Structure S-6, a fixed concrete weir located in the northwest corner of the CFRSF. Flows enter the first (western) cell of the sedimentation area and proceed over the planted shelf into the second (eastern) cell of the sedimentation area. Flows then proceed through Structure S-7, a 9' high by 32' wide span culvert, into the central pond area. Flows exit the central pond under Palmer Blvd. via Structure S-13, a 9'high by 32' wide span culvert, to enter the advanced wetland mitigation area. Flows exit the advanced mitigation area through Structure S-14, a gated 5' high by 12' wide span culvert, into Main 'C' south of Palmer Blvd.

Normal operating water levels within the facility should range from a low elevation 15.0 to a seasonal high elevation of 16.5. At the low water level standing water will be confined to the open lake areas. However, at seasonal high water level (SHWL) the planted shelf (elevation range from 15.5 to 17.5) areas will become partially inundated. The gates on the control structure S-14 provide a range of control from elevation 15.5 to elevation 18.5 and can be used to vary the water levels in the CFRSF to promote vegetative growth. Table 2 summarizes the intended positions of the operative structures during normal operations.

Table 2
Gate Positions During Normal Operation

DESCRIPTION	STRUCTURE NUMBER	LOCATION	SIZE	CONTROL ELEVATION	GATE POSITION
Fixed Weir (small gated by-pass)	S-6	Main 'C' south of Interstate Blvd.	65' fixed weir 3'x3' sluice gate	21.0 15.0	N/A closed
Double Gated Discharge	S-10	Central Pond north of Palmer Blvd.	2'x2' sluice gate 15' fixed weir Round sluice gate on 42" discharge pipe	14.5 19.4 11.5	closed N/A closed
Span culvert with stop logs	S-13	Palmer Blvd. east of Main 'C'	9'x32' span culvert w/ 1' Alum. stop logs	11.1	open
Gated Discharge	S-14	Main 'C' south of Palmer Blvd.	2-6'x3' weir gates 2-6'x2' sluice gates 24' fixed weir 5'x12' span culvert	15.5 16.5 21.0 12.0	16.5 open N/A N/A

1.1.2 WET SEASON AND STORM EVENT OPERATIONS

During storm event operations, the CFRSF functions as a retention system. All flows up to the 100-year/24-hour storm event (10" rainfall) will be diverted from Main 'C' into the CFRSF by Structure S-6. Flows will enter the first (western) cell of the sedimentation area and proceed through the planted shelf into the second (eastern) cell of the sedimentation area. Flows then proceed through Structure S-7 into the central pond area. Flows continue under Palmer Blvd. through Structure S-13 into the advanced wetland mitigation area. The facility is intended to provide storage for the runoff from the 100-year/24-storm event without discharge. Larger rainfall events or consecutive storms generating flows in excess of the design storm will be stored to elevation 21.0 with excess flows discharging over the fixed weirs on Structures S-6 and S-14 into Main 'C' canal. For example the 100 year/48 hour event (14" rainfall) is estimated to produce a combined peak overflow discharge of 100 cfs from the CFRSF to the Main 'C' canal with all operative gates closed.

After sufficient recovery time is provided for the downstream water elevations to recede (approximately 2 days for the design storm event) flows can be discharged from the CFRSF. Flows exit the advanced mitigation area through Structure S-14 into Main 'C' south of Palmer Blvd. The system can be operated for a range of recovery times. The maximum discharge is regulated by the 5'x12' span culvert to be no greater than the 25 year flow downstream. The resultant recovery time is approximately 2 days. Table 3 summarizes the positions of the operative structures for storm retention, Table 4 summarizes the predicted water surface elevations within the CFRSF for each design storm event and Table 5 summarizes the positions of the operative structures for release of stored floodwaters.

Table 3
Storm Event Retention

DESCRIPTION	STRUCTURE NUMBER	LOCATION	SIZE	CONTROL ELEVATION	GATE POSITION
Fixed Weir (small gated by-pass)	S-6	Main 'C' south of Interstate Blvd.	65' fixed weir 3'x3' sluice gate	21.0 15.0	fixed closed
Double Gated Discharge	S-10	Central Pond north of Palmer Blvd.	2'x2' sluice gate 15' fixed weir Round sluice gate on 42" discharge pipe	14.5 19.4 11.5	closed fixed closed
Span culvert with stop logs	S-13	Palmer Blvd. east of Main 'C'	9'x32' span culvert w/ 1' Alum. stop logs	11.1	open
Gated Discharge	S-14	Main 'C' south of Palmer Blvd.	2-6'x3' weir gates 2-6'x2' sluice Gates 24' fixed weir 5'x12' span culvert	15.5 16.5 21.0 12.0	closed closed fixed fixed

Table 4
Storm Event Retention
Water Surface Elevations

STORM FREQUENCY	TOTAL RAINFALL	PREDICTED CFRSF PEAK WATER SURFACE ELEVATION
2 year/24 hour	4.5"	17.4
5 year/ 24 hour	6"	18.1
10 year/24 hour	7"	18.7
25 year/24 hour	8"	19.2
100 year/ 24 hour	10"	20.3
100 year/ 48 hour	14"	21.45

Note: Stages are based on SWMM/HEC-2 modeling performed for the SWFWMD Permit Application using ACOE rainfall distribution

Table 5
Storm Event Recovery

DESCRIPTION	STRUCTURE NUMBER	LOCATION	SIZE	CONTROL ELEVATION	GATE POSITION
Fixed Weir (small gated by-pass)	S-6	Main 'C' south of Interstate Blvd.	65' fixed weir 3'x3' sluice gate	21.0 15.0	fixed closed
Double Gated Discharge	S-10	Central Pond north of Palmer Blvd.	2'x2' sluice gate 15' fixed weir Round sluice gate on 42" discharge pipe	14.5 19.4 11.5	closed fixed closed
Span culvert with stop logs	S-13	Palmer Blvd. east of Main 'C'	9'x32' span culvert w/ 1' Alum. stop logs	11.1	open
Gated Discharge	S-14	Main 'C' south of Palmer Blvd.	2-6'x3' weir gates 2-6'x2' sluice gates 24' fixed weir 5'x12' span culvert	15.5 16.5 21.0 12.0	15.5* open fixed fixed

* Weir gates should be returned to the normal operating position of elevation 16.5 when sufficient recovery of storm event volumes have been achieved within the CFRSF.

1.1.3 ADVANCED WETLAND MITIGATION OFF-LINE (NORMAL OPERATIONS)

During the initial operations (first 2-3 years) of the CFRSF the advanced wetland mitigation area may require independent water level control for proper plant propagation. It may become necessary to provide flood storage within the sedimentation area and the central pond area while artificially maintaining wet season water levels within the wetland area. The CFRSF system can function as a flow through system with the advanced wetland mitigation area off-line. All flows will be diverted from Main 'C' into the CFRSF by Structure S-6. Flows will enter the first (western) cell of the sedimentation area and proceed through the planted shelf into the second (eastern) cell of the sedimentation area. Flows then proceed through Structure S-7 into the central pond area. Flows may exit the central pond (by-passing the wetland cell) through Structure S-10 into Main 'C' north of Palmer Blvd. Table 6 summarizes the position of the operative structures during this situation.

Table 6
Advanced Wetland Mitigation Off-line (Normal Operations)

DESCRIPTION	STRUCTURE NUMBER	LOCATION	SIZE	CONTROL ELEVATION	GATE POSITION
Fixed Weir (small gated by-pass)	S-6	Main 'C' south of Interstate Blvd.	65' fixed weir 3'x3' sluice gate	21.0 15.0	fixed closed
Double Gated Discharge	S-10	Central Pond north of Palmer Blvd.	2'x2' sluice gate 15' fixed weir Round sluice gate on 42" discharge pipe	14.5 19.4 11.5	open fixed open
Span culvert with stop logs	S-13	Palmer Blvd. east of Main 'C'	9'x32' span culvert w/ 1' Alum. stop logs	11.1	16.5*
Gated Discharge	S-14	Main 'C' south of Palmer Blvd.	2-6'x3' weir gates 2-6'x2' sluice gates 24' fixed weir 5'x12' span culvert	15.5 16.5 21.0 12.0	varies* varies* fixed fixed

* Stop logs and weir gate will be adjusted as necessary to maintain desired water surface elevation in advanced wetland mitigation area.

1.1.4 ADVANCED WETLAND MITIGATION OFF-LINE (WET SEASON AND STORM EVENT OPERATIONS)

During the initial operations (first 2-3 years) of the CFRSF the advanced wetland mitigation area will require independent water level control for proper plant propagation. The CFRSF system has limited storm flow retention storage with the advanced wetland mitigation area off-line. All flows will be diverted from Main 'C' into the CFRSF by Structure S-6. Flows will enter the first (western) cell of the sedimentation area and proceed through the planted shelf into the second (eastern) cell of the sedimentation area. Flows then proceed through Structure S-7 into the central pond area. The central pond area and sedimentation area can contain the runoff volume generated by up to the 5 year/24 hour storm event with the wetland cell off-line without discharge. The 10-year/ 24-hour storm event can be contained with limited discharge to Main 'C' while the wetland cell remains off-line. The peak discharge from the 10-year/ 24-hour storm will be limited by the 42" discharge. **Retention of larger events will require allowing flood storage in the advanced wetland mitigation area via the removal of the stop logs in structure S-13.**

After sufficient recovery time is provided for the downstream water elevations to recede flows can be discharged from the CFRSF. Flows exit the central pond area through Structure S-10 into Main 'C' north of Palmer Blvd. The system can be operated for a range of recovery times. The 42" culvert regulates the maximum discharge. The resultant recovery time is approximately 3 days for this scenario with the advanced mitigation cell off-line. Table 7 summarizes the positions of the operative structures for storm retention and Table 8 summarizes the positions of the operative structures for storage recovery.

Table 7
Advanced Wetland Mitigation Off-line (Storm Event Retention)

DESCRIPTION	STRUCTURE NUMBER	LOCATION	SIZE	CONTROL ELEVATION	GATE POSITION
Fixed Weir (small gated by-pass)	S-6	Main 'C' south of Interstate Blvd.	65' fixed weir 3'x3' sluice gate	21.0 15.0	fixed closed
Double Gated Discharge	S-10	Central Pond north of Palmer Blvd.	2'x2' sluice gate 15' fixed weir Round sluice gate on 42" discharge pipe	14.5 19.4 11.5	closed fixed closed*
Span culvert with stop logs	S-13	Palmer Blvd. east of Main 'C'	9'x32' span culvert w/ 1' Alum. stop logs	11.1	closed
Gated Discharge	S-14	Main 'C' south of Palmer Blvd.	2-6'x3' weir gates 2-6'x2' sluice gates 24' fixed weir 5'x12' span culvert	15.5 16.5 21.0 12.0	closed closed fixed fixed

* The control gate over the 42" culvert inside the structure would be opened to allow discharge of the flows cresting the fixed weir during the 10 year event. The 2'x2' gate would remain closed.

Table 8
Advanced Wetland Mitigation Off-line (Storm Event Recovery)

DESCRIPTION	STRUCTURE NUMBER	LOCATION	SIZE	CONTROL ELEVATION	GATE POSITION
Fixed Weir (small gated by-pass)	S-6	Main 'C' south of Interstate Blvd.	65' fixed weir 3'x3' sluice gate	21.0 15.0	fixed closed
Double Gated Discharge	S-10	Central Pond north of Palmer Blvd.	2'x2' sluice gate 15' fixed weir Round sluice gate on 42" discharge pipe	14.5 19.4 11.5	open* fixed open*
Span culvert with stop logs	S-13	Palmer Blvd. east of Main 'C'	9'x32' span culvert w/ 1' Alum. stop logs	11.1	closed
Gated Discharge	S-14	Main 'C' south of Palmer Blvd.	2-6'x3' weir gates 2-6'x2' sluice gates 24' fixed weir 5'x12' span culvert	15.5 16.5 21.0 12.0	closed closed fixed fixed

* The gates should be closed upon sufficient recovery of storm event volume within the CFRSF.

1.1.5 LOW FLOW OPERATIONS

During extended periods of dry weather it may be desirable for the County to release periodic flows to the Main 'C' canal. Stored water in the CFRSF can be released, at the County's discretion, to provide periodic flushing of the Main 'C' canal from multiple gates. The 3' x 3' sluice gate by-pass located on Structure S-6 can be opened to introduce flows to Main 'C' downstream of the weir to an elevation of 15.0. Flows can also be released as desired from Structure S-10 to elevation 14.5 and via Structure S-14 to elevation 15.5. Table 9 summarizes the position of the operative structures for release of supplemental flows to Main 'C'.

Table 9
Low Flow Operations

DESCRIPTION	STRUCTURE NUMBER	LOCATION	SIZE	CONTROL ELEVATION	GATE POSITION
Fixed Weir (small gated by-pass)	S-6	Main 'C' south of Interstate Blvd.	65' fixed weir 3'x3' sluice gate	21.0 15.0	Fixed Open*
Double Gated Discharge	S-10	Central Pond north of Palmer Blvd.	2'x2' sluice gate 15' fixed weir Round sluice gate on 42" discharge pipe	14.5 19.4 11.5	Open* Fixed Open
Span culvert with stop logs	S-13	Palmer Blvd. east of Main 'C'	9'x32' span culvert w/ 1' Alum. stop logs	11.1	Open
Gated Discharge	S-14	Main 'C' south of Palmer Blvd.	2-6'x3' weir gates 2-6'x2' sluice gates 24' fixed weir 5'x12' span culvert	15.5 16.5 21.0 12.0	16.5* open fixed fixed

* Gates can be operated to release flows to Main 'C' as required.

1.2 – Main C Weir (Motor Operated Gates)

In addition to the CFRSF the channel storage capacity for Main 'C' and it's laterals can be used to augment the storage capacity in the basin. The operator is cautioned that use of the Main 'C' weir can impact private property and should be operated only in accordance with established County procedures. These procedures were coordinated with J.P. Marchand in March of 1998 and are summarized in the following sections.

The Main 'C' weir is equipped with four tandem gates. The gates are each 7.5 feet wide and have a fully closed hieght of 10.85 feet (top elevation of 20.08). The sluice and weir gates are each approximately 5.5 feet in height with the weir gate sliding behind the sluice gate to open. The gate operator shaft is directly connected to the weir gate and operation of the weir gate is normally independent of the sluice gate. The sluice gate is normally held closed by gravity (bottom invert 9.23). The sluice gate is raised by locking it to the weir gate via a manual cam lock. The gates will then operate in tandem and can be raised to allow full channel flow through the structure with the gates in their fully opened position (gate inverts raised to elevation 20.58)

Each gate has an 480-volt electric motor operator (EMO) mounted on the gate frame. The EMO's are accessed from the catwalk across the top of the weir. The EMO's can be operated locally via the control panel mounted on the motor housing or remotely via dedicated land-line telemetry in the stormwater office at 1301 Cattlemen Road. In addition to the gate operations two water level monitoring stations are also accessed via the telemtry. These are located just downstream of the weir and near the confluence of Main 'A' and Branch 'AA'. In case of EMO failure or a power outage the gates can be operated manually by using a 110-volt portable motor operator (PEMO). **The operator is cautioned that the use of the PEMO is a time intensive process. The PEMO can only operate one gate at a time and requires approximately 40 minutes to raise a gate through its full range.**

TABLE 10
SUMMARY OF MAJOR STRUCTURES FOR CFRSF

DESCRIPTION	LOCATION	SIZE	UPSTREAM INVERT	
Tandem sluice and weir gate #1	Main 'C' west of Porter Rd. Gate nearest control panel	7.5' wide x 10.85' high weir crest sluice invert	 15.0 9.23	Fixed weir upstream of dirt road crossing and Fruitville Rd crossing
Tandem sluice and weir gate #2	Main 'C' west of Porter Rd. Gate 2nd from control panel	7.5' wide x 10.85' high weir crest sluice invert	 15.0 9.23	West By-pass - flows south to S-2B
Tandem sluice and weir gate #3	Main 'C' west of Porter Rd Gate 3rd from control panel	7.5' wide x 10.85' high weir crest sluice invert	 15.0 9.23	West By-pass - flows south to S-2A
Tandem sluice and weir gate #4	Main 'C' west of Porter Rd. Gate 4th from control panel	7.5' wide x 10.85' high weir crest sluice invert	 15.0 9.23	West By-pass - discharges to Main 'C' downstream of S-6

1.2.1 NORMAL OPERATION (NON-STORM EVENT)

Normal operations of the weir are based on the need to reserve the maximum storage potential in the channels and the CFRSF. This is accomplished by allowing one or more of the sluice gates to be open thereby providing free discharge of flows in Main 'C'. Gates may be alternated to assist with maintenance procedures discussed in Section 2.0 of this manual. Table 11 summarizes the positions of the operative structures for normal operations.

Table 11
Main C Weir Normal Operations

DESCRIPTION	LOCATION	SIZE	CONTROL ELEVATION	GATE POSITION
Tandem sluice and weir gate #1	Main 'C' west of Porter Rd. Gate nearest control panel	7.5' wide x 10.85' high weir crest sluice invert	15.0 9.23	Open Varies*
Tandem sluice and weir gate #2	Main 'C' west of Porter Rd. Gate 2nd from control panel	7.5' wide x 10.85' high weir crest sluice invert	15.0 9.23	Open Varies*
Tandem sluice and weir gate #3	Main 'C' west of Porter Rd Gate 3rd from control panel	7.5' wide x 10.85' high weir crest sluice invert	15.0 9.23	Open Varies*
Tandem sluice and weir gate #4	Main 'C' west of Porter Rd. Gate 4th from control panel	7.5' wide x 10.85' high weir crest sluice invert	15.0 9.23	Open Varies*

* Sluice and weir gates are locked together to allow raising of sluice. Sluice invert is varied to allow release of channel storage.

1.2.1 WET SEASON AND STORM EVENT OPERATIONS

When a storm event is forecast the operator should attempt to release any stored channel volume remaining in Main 'C' to maximize potential storage. The CFRSF procedures discussed in Section 1.1 of this manual should be referenced for the primary flood event storage.

The operations of the Main 'C' weir are based on observance of channel response to the storm event. At the outset of a major event the sluice gates should be closed and unlocked from the weir gates. Weir should be left in the open position. As the water levels increase in the channel the weir gate should be raised in response to the upstream rise of the water level until the weir gates are fully closed.

The operator should note that depending on the areal distribution of the storm event the Main 'A' water levels (downstream of Main 'C') may rise faster than the water levels in Main 'C'. In this occurrence the weir gates should remain open to allow backwatering from Main 'A' into Main 'C'. Table 12 summarizes the positions of the operative structures for storm event operations.

During the use of the Main 'C' structure for flood storage the operator should periodically check the water levels in the upstream areas of the basin along Main 'C' at its' laterals to minimize off site impacts to private property.

Table 12
Main C Weir Storm Event Retention

DESCRIPTION	LOCATION	SIZE	CONTROL ELEVATION	GATE POSITION
Tandem sluice and weir gate #1	Main 'C' west of Porter Rd	7.5' wide x 10.85' high weir crest sluice invert	 15.0 9.23	 20.08* Closed
Tandem sluice and weir gate #1	Main 'C' west of Porter Rd.	7.5' wide x 10.85' high weir crest sluice invert	 15.0 9.23	 20.08* Closed
Tandem sluice and weir gate #1	Main 'C' west of Porter Rd	7.5' wide x 10.85' high weir crest sluice invert	 15.0 9.23	 20.08* Closed
Tandem sluice and weir gate #1	Main 'C' west of Porter Rd.	7.5' wide x 10.85' high weir crest sluice invert	 15.0 9.23	 20.08* Closed

* Sluice and weir gates are unlocked to allow independent raising of weir. Weir crest is varied based on channel water level to maximize storage in Main 'C'.

During flood storage release the operations of the Main 'C' weir are again based on observance of channel response. The weir gates are lowered to a point that allows approximately one-foot discharge flow over the weir crest. As the water levels decrease in the upstream channel the weir gate should be lowered to maintain the approximate one-foot of discharge over the weir. **At all times during discharge the operator should observe the downstream channel water level response. Monitoring of downstream locations on Main 'A' should be done concurrent to discharges to minimize off site impacts.**

When upstream water levels reach the lowest weir crest elevation of 15.0 the operator will need to lock the sluice and weir gate together to raise the sluice gate. Raising of the sluice gate should be done in increments of one-foot or less. **At all times during discharge the operator should observe the downstream channel water level response. Monitoring of downstream locations on Main 'A' should be done concurrent to discharges to minimize off site impacts.** Table 13 summarizes the positions of the operative structures for storm event recovery operations.

Table 13
Main C Weir Storm Event Recovery

DESCRIPTION	LOCATION	SIZE	CONTROL ELEVATION	GATE POSITION
Tandem sluice and weir gate #1	Main 'C' west of Porter Rd	7.5' wide x 10.85' high		
		weir crest	15.0	Varies*
		sluice invert	9.23	Varies*
Tandem sluice and weir gate #1	Main 'C' west of Porter Rd.	7.5' wide x 10.85' high		
		weir crest	15.0	Varies*
		sluice invert	9.23	Varies*
Tandem sluice and weir gate #1	Main 'C' west of Porter Rd	7.5' wide x 10.85' high		
		weir crest	15.0	Varies*
		sluice invert	9.23	Varies*
Tandem sluice and weir gate #1	Main 'C' west of Porter Rd.	7.5' wide x 10.85' high		
		weir crest	15.0	Varies*
		sluice invert	9.23	Varies*

* Sluice and weir gates are unlocked to allow independent lowering of weir. Weir crest is varied based on downstream channel water level for initial drawdown. Sluice and weir gates are locked to allow raising of sluice gate to complete drawdown.

SECTION 2.0 - MAINTENANCE

2.1 ALL STRUCTURES AND CONVEYANCES

All structures and conveyances (ditches) should be inspected on a semi-annual basis for presence of sediment and condition of structures. Additional inspections should be provided after each major storm event. Silt and debris removal should be provided as needed as well as mowing of all sideslopes.

2.2 GATES

Once the gates have been installed and properly adjusted they require only limited periodic maintenance. The following operations should be performed:

Monthly

- Operate all gates through their full range of travel
- Additional measures may be necessary to remove silt from the gate inverts on the Main 'C' structure. Close all gates for a sufficient time period to establish a two foot water level difference across the weir. Then open one gate six to eight inches. Visually monitor turbidity of gate discharge. When discharge has cleared close the gate. Repeat on each gate. If silt becomes cemented it may be necessary to temporarily drain the channel and use a high pressure hose or other means to remove the silt.

Three times per Year

- Inspect gate seals and guide frames for obstructions. Remove any debris that would interfere with the proper operation of the gate. If wear or deterioration of the seals is noted replace seals as recommended by the manufacturer.
- Inspect gate and frame for excessive wear or corrosion. If excessive wear or corrosion is present schedule those items for replacement as soon as possible.

2.3 GATE OPERATORS (MANUAL)

At least three times per year all grease fittings on floor stands and stem guides should be greased.

Once a year floor stands should be inspected for corrosion. If corrosion is noted the floor stand should be removed for sand blasting and repainting. All moving parts should be relubricated prior to installation and operation.

2.4 GATE OPERATORS (ELECTRICAL)

At least three times per year the electric motor operators (EMO) should be activated and inspected for proper operation. If the EMO does not function properly qualified

maintenance personnel or a manufacturer's representative should be contacted to perform all required maintenance.

On gates with EMO's the stem operating nut may be subject to accelerated wear. The stem operating nut should be removed and inspected at least three times per year. If excessive wear is noted the nut should be replaced as recommended by the manufacturer.

2.5 PORTABLE GATE OPERATORS (ELECTRICAL)

At least three times per year the portable electric motor operators (PEMO) should be activated and inspected for proper operation. If the PEMO does not function properly qualified maintenance personnel or a manufacturer's representative should be contacted to perform all required maintenance.

On gates where PEMO's are used the stem operating nut may be subject to accelerated wear. See above for normal maintenance.

2.6 OPERATING STEMS

Once every six months the operating stem for each gate should be cleaned and lubricated to remove dust and old grease. Depending on location the greased operating stem may collect inordinate amounts of debris and dust which can cause premature wear to the stem and operating nut. If environmental conditions warrant, the cleaning operation may need to be performed more frequently.

2.7 ALUMINUM STOP LOGS AND HOIST

The stop logs are intended for use on an as needed basis and should be installed and removed using the portable manual hoist mechanism supplied by the manufacturer. Prior to installation the gate frame and seats should be inspected for obstructions. Remove any debris that may interfere with the proper functioning of the stop logs. The aluminum stop logs should be stored in a clean, dry location when not in use.

The aluminum stop logs are manufactured with seals affixed to each stop log. Prior to and after use the seals should be inspected for deterioration or wear. If wear or deterioration of the seals is noted replace seals as recommended by the manufacturer.

2.8 SIPHON

The inverted siphon is designed for inspection and silt removal via a 48" manway for each pipe. Silt removal should be performed as needed through the use of a certified diver and a vacuum truck. Manned inspection (in the dry) of the siphon requires temporary diversion of upstream and downstream flows as well as removal of the remaining water in the siphon. If entry into the siphon is required for any purpose this should be performed by a

experienced personell in full accordance with established OSHA confined space entry procedures.

Appendix A

OPERATIONS SCENARIOS SUMMARY
CFRSF GATED STRUCTURES

	STRUCTURE NUMBER	STRUCTURE LOCATION	GATE	CONTROL ELEVATION	GATE POSITION
Normal Operation	S-6	Main 'C' south of Interstate Blvd.	3'x3' sluice	15.0	closed
	S-10	Central Pond north of Palmer Blvd.	2'x2' sluice 42" pipe sluice	14.5 11.5	closed closed
	S-13	Palmer Blvd. east of Main 'C'	Alum. stop logs	11.1	open
	S-14	Main 'C' south of Palmer Blvd.	2-6'x3' weir 2-6'x2' sluice	15.5 16.5	16.5 open
Storm Event Retention	S-6	Main 'C' south of Interstate Blvd.	3'x3' sluice	15.0	closed
	S-10	Central Pond north of Palmer Blvd.	2'x2' sluice 42" pipe sluice	14.5 11.5	closed closed
	S-13	Palmer Blvd. east of Main 'C'	Alum. stop logs	11.1	open
	S-14	Main 'C' south of Palmer Blvd.	2-6'x3' weir 2-6'x2' sluice	15.5 16.5	closed closed
Storm Event Recovery	S-6	Main 'C' south of Interstate Blvd.	3'x3' sluice	15.0	closed
	S-10	Central Pond north of Palmer Blvd.	2'x2' sluice 42" pipe sluice	14.5 11.5	closed closed
	S-13	Palmer Blvd. east of Main 'C'	Alum. stop logs	11.1	open
	S-14	Main 'C' south of Palmer Blvd.	2-6'x3' weir 2-6'x2' sluice	15.5 16.5	Open to 15.5* Open

* Weir gates should be returned to the normal operating position of elevation 16.5 when sufficient recovery of storm event volumes have been achieved within the CFRSF.

	STRUCTURE NUMBER	STRUCTURE LOCATION	GATE	CONTROL ELEVATION	GATE POSITION
Advanced Wetland Mitigation Off-line (Normal Operations)	S-6	Main 'C' south of Interstate Blvd.	3'x3' sluice	15.0	closed
	S-10	Central Pond north of Palmer Blvd.	2'x2' sluice 42" pipe sluice	14.5 11.5	open open
	S-13	Palmer Blvd. east of Main 'C'	Alum. stop logs	11.1	16.5*
	S-14	Main 'C' south of Palmer Blvd.	2-6'x3' weir 2-6'x2' sluice	15.5 16.5	Varies* Varies*
* Stop logs and weir gate will be adjusted as necessary to maintain desired water surface elevation in advanced wetland mitigation area.					
Advanced Wetland Mitigation Off-line (Storm Event Retention)	S-6	Main 'C' south of Interstate Blvd.	3'x3' sluice	15.0	closed
	S-10	Central Pond north of Palmer Blvd.	2'x2' sluice 42" pipe sluice	14.5 11.5	Closed Closed
	S-13	Palmer Blvd. east of Main 'C'	Alum. stop logs	11.1	Closed
	S-14	Main 'C' south of Palmer Blvd.	2-6'x3' weir 2-6'x2' sluice	15.5 16.5	Closed Closed
* The control gate over the 42" culvert inside the structure would be opened to allow discharge of the flows cresting the fixed weir during the 10- year event. The 2'x2' gate would remain closed.					

	STRUCTURE NUMBER	STRUCTURE LOCATION	GATE	CONTROL ELEVATION	GATE POSITION
Advanced Wetland Mitigation Off-line (Storm Event Recovery)	S-6	Main 'C' south of Interstate Blvd.	3'x3' sluice	15.0	closed
	S-10	Central Pond north of Palmer Blvd.	2'x2' sluice 42" pipe sluice	14.5 11.5	Open* Open*
	S-13	Palmer Blvd. east of Main 'C'	Alum. stop logs	11.1	Closed
	S-14	Main 'C' south of Palmer Blvd.	2-6'x3' weir 2-6'x2' sluice	15.5 16.5	Closed Closed
* The gates should be closed upon sufficient recovery of storm event volume within the CFRSF.					
Low Flow Operations	S-6	Main 'C' south of Interstate Blvd.	3'x3' sluice	15.0	Open*
	S-10	Central Pond north of Palmer Blvd.	2'x2' sluice 42" pipe sluice	14.5 11.5	Open* Open*
	S-13	Palmer Blvd. east of Main 'C'	Alum. stop logs	11.1	Open
	S-14	Main 'C' south of Palmer Blvd.	2-6'x3' weir 2-6'x2' sluice	15.5 16.5	Open* Open*
* Gates can be operated to release flows to Main 'C' as required.					

OPERATIONS SCENARIOS SUMMARY
MAIN 'C' WEIR

	DESCRIPTION	SIZE	CONTROL ELEVATION	GATE POSITION
Normal Operations	Tandem sluice and weir gate #1	weir crest sluice invert	15.0 9.23	Open Varies*
	Tandem sluice and weir gate #2	weir crest sluice invert	15.0 9.23	Open Varies*
	Tandem sluice and weir gate #3	weir crest sluice invert	15.0 9.23	Open Varies*
	Tandem sluice and weir gate #4	weir crest sluice invert	15.0 9.23	Open Varies*
* Sluice and weir gates are locked together to allow raising of sluice. Sluice invert is varied to allow release of channel storage.				
Storm Event Retention	Tandem sluice and weir gate #1	weir crest sluice invert	15.0 9.23	20.08* Closed
	Tandem sluice and weir gate #2	weir crest sluice invert	15.0 9.23	20.08* Closed
	Tandem sluice and weir gate #3	weir crest sluice invert	15.0 9.23	20.08* Closed
	Tandem sluice and weir gate #4	weir crest sluice invert	15.0 9.23	20.08* Closed
* Sluice and weir gates are unlocked to allow independent raising of weir. Weir crest is varied based on channel water level to maximize storage in Main 'C'.				
Storm Event Recovery	Tandem sluice and weir gate #1	weir crest sluice invert	15.0 9.23	Varies* Varies*
	Tandem sluice and weir gate #2	weir crest sluice invert	15.0 9.23	Varies* Varies*
	Tandem sluice and weir gate #3	weir crest sluice invert	15.0 9.23	Varies* Varies*
	Tandem sluice and weir gate #4	weir crest sluice invert	15.0 9.23	Varies* Varies*
* Sluice and weir gates are not locked to allow independent lowering of weir. Weir crest is varied based on downstream channel water level for initial drawdown. Then sluice and weir gates are locked to allow raising of sluice gate to complete drawdown.				