

**Technical Publication**

**EMA # 398**

**Water Budget Analysis  
for Stormwater Treatment Area 1 West  
(July 1, 2000 to June 30, 2001)**

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**by**

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## EXECUTIVE SUMMARY

Stormwater Treatment Area 1 West (STA-1W) is a constructed wetland that is part of the Everglades Construction Project mandated by the "Everglades Forever Act" [Section 373.4592, Florida Statutes] of the State of Florida. It was built as an expansion of the Everglades Nutrient Removal Project (ENR), a constructed wetland designed and operated for the demonstration of phosphorus (P) reduction from agricultural runoff/drainage. The ENR was operated for five years (1994 to 1999) and STA-1W started operation on July 1, 1999. STA-1W covers 2,772 hectares (6,849 acres) and is located in south Florida (26° 38' N, 80° 25' W) at the eastern edge of the Everglades Agricultural Area. The Everglades Agricultural Area is a 240,000 ha (593,000 ac) highly productive irrigation drainage basin with a major production of sugarcane. Ecological changes in the Everglades have been partially attributed to an increase in phosphorus (P) concentrations in the inflow waters. Local, state and federal initiatives have been taken to reduce P load from agricultural runoff/drainage. Agricultural runoff/drainage from the agricultural area flows to the south and southeast through four primary canals (Miami, North New River, Hillsboro, West Palm Beach).

A minimum of 25 percent of the P load in agricultural drainage/runoff is required to be removed at the farm level through the application of various agricultural Best Management Practices (BMPs). Further removal of P is to be achieved through constructed wetland treatment systems known as Stormwater Treatment Areas (STAs) to an initial outflow total P concentration of 0.05 milligrams per liter ( $\text{mg L}^{-1}$ ). STA-1W is one of the large-scale constructed wetlands that followed the successful operation of the ENR Project.

This report presents the second water budget for STA-1W (July 1, 2000 to June 30, 2001). Water budget analysis for five years of the ENR Project (August 19, 1994 to August 19, 1996; August 20, 1996 to August 19, 1997; August 20, 1997 to August 19, 1998; August 20, 1998 to June 30, 1999) and one year of STA-1W was reported in South Florida Water Management District Technical Memorandums (Guardo et al., 1996; Abteu and Mullen, 1997; Abteu and Downey, 1998; Abteu et al., 2000).

The total inflow into STA-1W through the inflow spillway for the study period (July 1, 2000 to June 30, 2001) was 8,890 hectare-meters (ha-m) or 72,069 acre-feet (ac-ft) and the total outflow through the outflow pumps was 9,596 ha-m (77,793 ac-ft). Estimated seepage inflow from the L-7 levee through the roadside culverts was 278 ha-m (2,254 ac-ft). The seepage recirculation pump had a total flow of 2,273 ha-m (18,427 ac-ft). Total areal average rainfall for the study period was 104.2 centimeters (cm) or 41 inches (in) and the total areal average evapotranspiration was 139.9 cm (55.1 in). A comparison with the previous periods' (July 1, 1999 to June 30, 2000) water budget shows that surface water inflow for this period was 62 percent of last period, indicating the effect of a continuing drought.

The mean hydraulic loading rate for the study period based on average flow was 0.88 centimeters per day (cm d<sup>-1</sup>), or 0.35 inches per day (in d<sup>-1</sup>). The mean hydraulic retention time was computed as the ratio of the mean-estimated volume of the STA-1W and the average flow rate. The mean-estimated volume was computed from the area-weighted (by cell) mean depth of 49.6 cm (19.5 in) and total area of 2,772 ha (6,849 ac). The estimated mean hydraulic retention time was 54 days.

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	i
TABLE OF CONTENTS .....	iii
LIST OF FIGURES .....	iv
LIST OF TABLES .....	v
LIST OF ABBREVIATIONS AND ACRONYMS .....	vi
CONVERSION FACTORS .....	vi
ACKNOWLEDGEMENTS .....	vii
INTRODUCTION .....	1
Background .....	1
Site Description .....	1
Vegetation Cover .....	4
SYSTEM HYDRAULICS AND OPERATION .....	4
System Hydraulics .....	4
Operation .....	9
HYDROLOGY AND HYDROLOGIC MONITORING .....	10
Rainfall .....	10
Evapotranspiration .....	10
Flows .....	13
Water Levels .....	13
WATER BUDGET COMPUTATIONS .....	18
STA-1W Water Balance Model .....	18
Discussion .....	20
WATER BUDGET SUMMARY .....	21
REFERENCES .....	25
APPENDIX I: Water Balance Terms With Calculated Remainders .....	26

## LIST OF FIGURES

<b>Figure 1.</b>	Location of Stormwater Treatment Area 1 West.....	2
<b>Figure 2.</b>	STA-1W structures and monitoring network.....	3
<b>Figure 3.</b>	Daily distribution of areal average rainfall and evapotranspiration in STA-1W .....	11
<b>Figure 4.</b>	Daily STA-1W inflows and outflows .....	15
<b>Figure 5.</b>	Daily pumping rates of the seepage/recirculation pump and seepage flow through L-7 levee roadside seepage collection culverts in STA-1W. ....	15
<b>Figure 6.</b>	Daily mean water levels in Cells 1 and 3 of STA-1W.....	16
<b>Figure 7.</b>	Daily mean water levels in Cells 2 and 4 of STA-1W .....	17
<b>Figure 8.</b>	Daily mean water levels in Cell 5 of STA-1W .....	17
<b>Figure 9.</b>	Schematic hydrologic model for STA-1W.....	19
<b>Figure 10.</b>	Distribution of daily remainders (errors and unknowns) from STA-1W water balance .....	21

## LIST OF TABLES

<b>Table 1.</b>	Site characteristics of Stormwater Treatment Area 1 West.....	2
<b>Table 2.</b>	Structure information for STA-1W stations .....	7
<b>Table 3.</b>	Hydraulic information for STA-1W internal structures and seepage pump station....	8
<b>Table 4.</b>	Rainfall stations in STA-1W, database retrieval keys and Thiessen weights.....	10
<b>Table 5.</b>	STA-1W monthly flows, areal weighted rainfall and ET (July 1, 1999 to June 30, 2000).....	12
<b>Table 6.</b>	Flow control structures, stage recorders and database retrieval keys used in the water budget analysis for STA-1W. ....	14
<b>Table 7.</b>	Observed water surface elevations and depths in STA-1W (July 1, 1999 to June 30, 2000).....	16
<b>Table 8.</b>	Summary of water budget for STA-1W (July 1, 1999 to June 30, 2000).....	23
<b>Table 9.</b>	Comparison of STA-1W water budget (2000-2001) components with the previous year.....	24

## LIST OF ABBREVIATIONS AND ACRONYMS

<b>ac</b>	acre
<b>ac-ft</b>	acre-foot
<b>BMP</b>	Best Management Practices
<b>cm</b>	centimeter
<b>cm d<sup>-1</sup></b>	centimeter per day
<b>cfs</b>	cubic foot per second
<b>EAA</b>	Everglades Agricultural Area
<b>ENR</b>	Everglades Nutrient Removal
<b>ET</b>	Evapotranspiration
<b>ft</b>	foot
<b>ha</b>	hectare
<b>ha-m</b>	hectare-meter
<b>HW</b>	Headwater
<b>in</b>	inch
<b>in d<sup>-1</sup></b>	inch per day
<b>m</b>	meter
<b>m<sup>3</sup>s<sup>-1</sup></b>	cubic meter per second
<b>MAX</b>	Maximum
<b>mm</b>	millimeter
<b>MIN</b>	Minimum
<b>NGVD</b>	National Geodetic Vertical Datum
<b>P</b>	Phosphorus
<b>Q</b>	Discharge
<b>rpm</b>	rotation per minute
<b>SFWMD</b>	South Florida Water Management District
<b>STA</b>	Stormwater Treatment Area
<b>TW</b>	Tailwater
<b>UVM</b>	Ultrasonic Velocity meter
<b>WCA</b>	Water Conservation Area

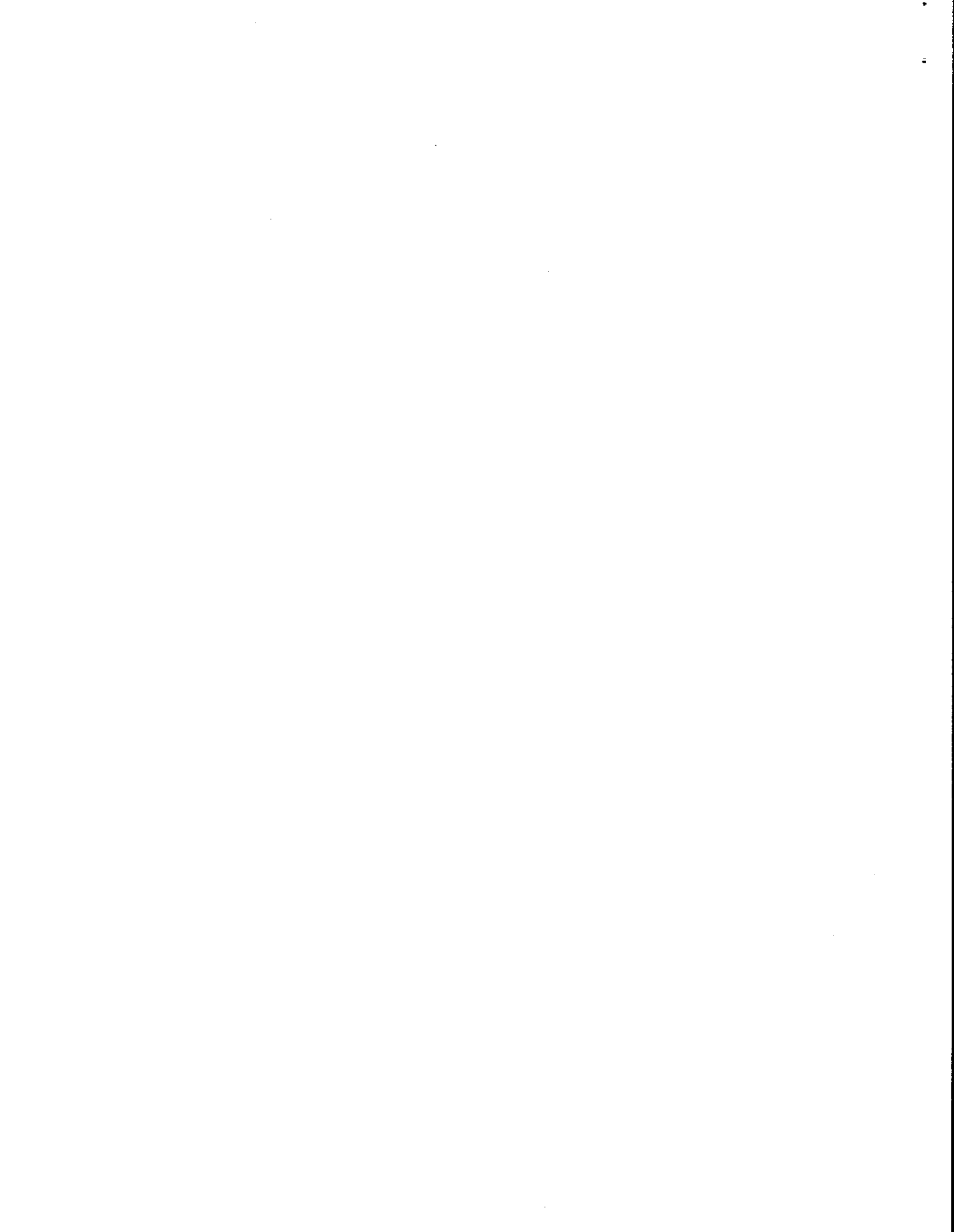
## CONVERSION FACTORS

METRIC	ENGLISH
mm	0.03937 in
cm	0.3937 in
m	3.2808 ft
ha	2.47 ac
m <sup>3</sup> s <sup>-1</sup>	35.33 cfs
ha-m	8.1068 ac-ft



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## INTRODUCTION

### Background

Stormwater Treatment Area 1 West (STA-1W) is a constructed wetland that is part of the Everglades Construction Project mandated by the "Everglades Forever Act" [Section 373.4592, Florida Statutes] of the State of Florida. It was built as an expansion of the Everglades Nutrient Removal Project (ENR), a constructed wetland designed and operated for the demonstration of phosphorus (P) reduction from agricultural runoff/drainage. The ENR was operated for five years (1994 to 1999) and STA-1W started operation on July 1, 1999. STA-1W covers 2,772 hectares (6,849 acres) and is located in South Florida (26° 38' N, 80° 25' W) at the eastern edge of the Everglades Agricultural Area (Figure 1). The Everglades Agricultural Area is a 240,000 ha (593,000 ac) highly productive irrigation drainage basin with a major production of sugarcane. Ecological changes in the Everglades have been partially attributed to an increase in phosphorus (P) concentrations in the inflow waters. Local, state and federal initiatives have been taken to reduce P load from agricultural runoff/drainage. Agricultural runoff/drainage from the agricultural area flows to the south and southeast through four primary canals, shown in Figure 1 (Miami, North New River, Hillsboro, West Palm Beach).

A minimum of 25 percent of the P load in agricultural drainage/runoff is required to be removed at the farm level through the application of various agricultural Best Management Practices (BMPs) (Whalen and Whalen, 1994). Further removal of P is to be achieved through constructed wetland treatment systems, known as Stormwater Treatment Areas (STAs) to an initial outflow total P concentration of 0.05 milligrams per liter ( $\text{mg L}^{-1}$ ). STA-1W is one of the large-scale constructed wetlands that followed the successful operation of the ENR.

### Site Description

A survey of the ENR Project indicated that the area is primarily covered by Okeechobee muck soils where one to two meter of peat overlies several meters of carbonate rock (Jammal and Associates, Inc., 1991). The topography of STA-1W is relatively flat, with an average ground elevation of 2.99 m (9.79 ft) NGVD. To the east, the L-7 levee separates STA-1W from the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Water Conservation Area 1, WCA-1). The seepage canal runs along the northern perimeter and the discharge canal on the west separates STA-1W from agricultural land. The narrow southern ENR levee separates STA-1W from the discharge area into WCA-1. STA-1W consists five cells (Cells 1, 2, 3, 4 and 5). Cell 1 and Cell 3 and Cell 2 and Cell 4 are two parallel treatment trains of pairs of cells from the previous ENR. As shown in Figure 2, the largest cell, Cell 5, has been added to the north. The total area of STA-1W is 2,772 ha (6,849 acres). Table 1 depicts the area and average ground elevation for each cell.

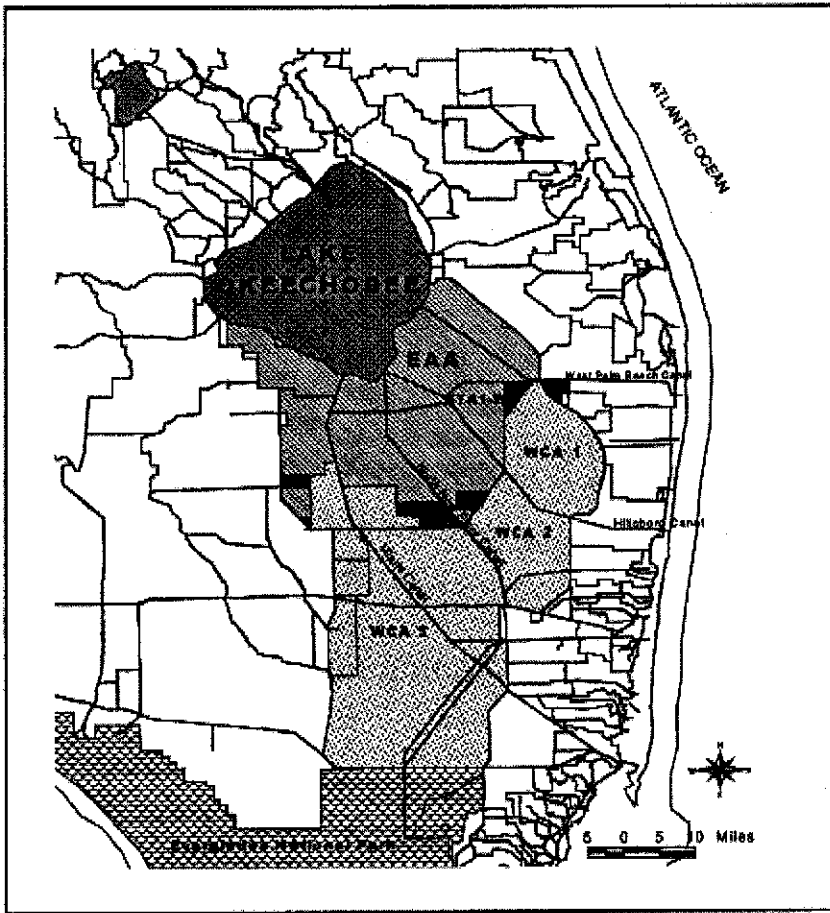


Figure 1. Location of Stormwater Treatment Area 1 West.

Table 1. Site characteristics of Storm Water Treatment Area 1 West.

Cell	Area ha (ac)	Average Ground Elev. m (ft) NGVD
Cell 1	580 (1433)	3.13 (10.25)
Cell 2	414 (1023)	2.94 (9.65)
Cell 3	404 (998)	3.10 (10.18)
Cell 4	146 (361)	3.00 (9.83)
Cell 5	1228 (3034)	2.90 (9.50)
Total	2772 (6849)	
Average		2.99 (9.79)

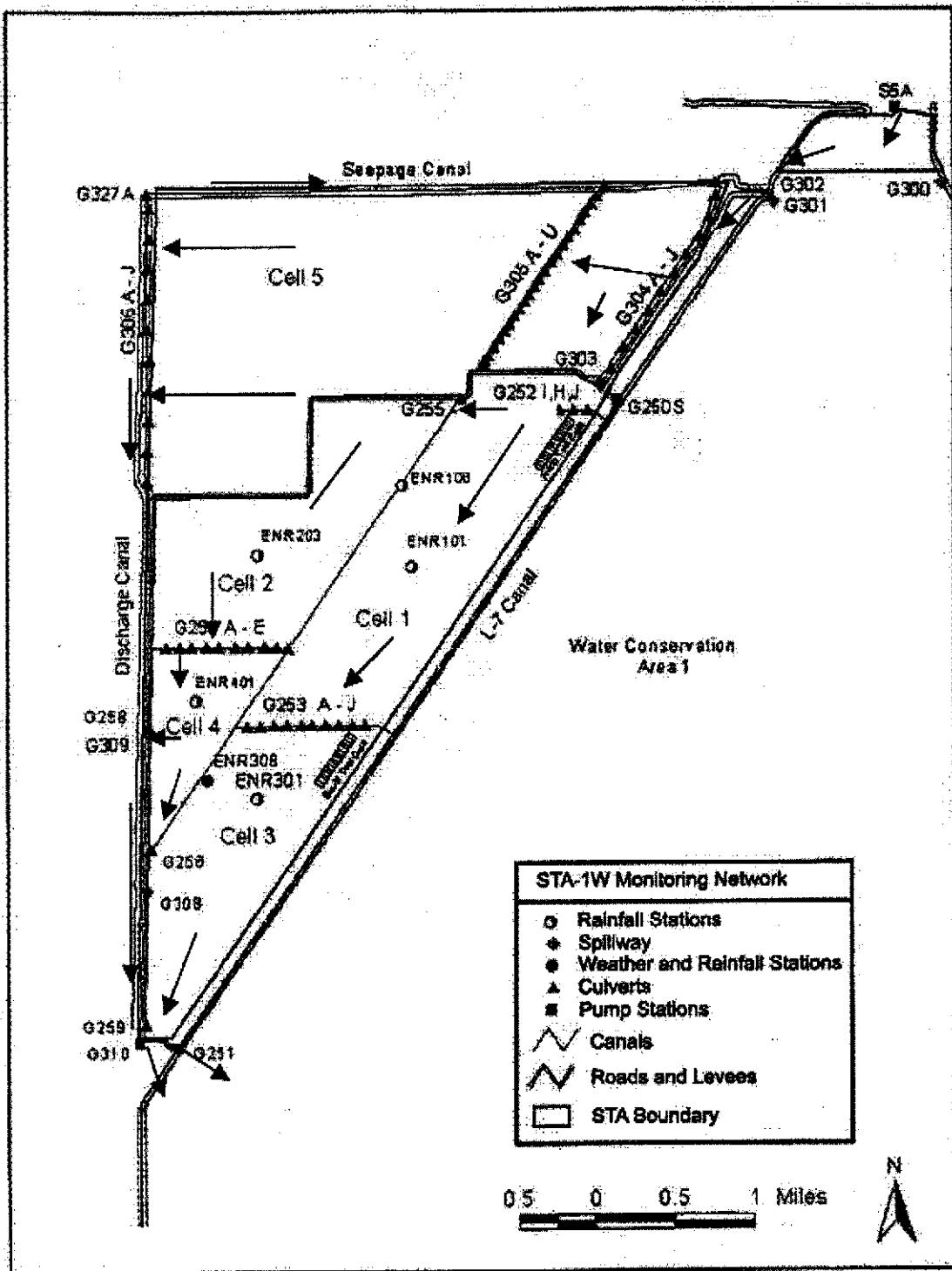


Figure 2 STA-1W structures and monitoring network

## Vegetation Cover

STA-1W vegetation cover generally varies from cell to cell with cattails (*Typha sp.*) or submerged aquatic vegetation (SAV) and periphyton being dominant (Everglades Consolidated Report, 2002, draft). Cell 1 is mostly covered with emergent vegetation dominated by cattail (*Typha sp.*), but also contains significant submerged aquatic vegetation and periphyton. Also, leather fern (*Acrostichum sp.*) and Calorina willow (*Salix caroliniana*) are present in Cell 1. Cell 2 is mostly covered with emergent vegetation dominated by cattail, but also contains significant submerged aquatic vegetation and periphyton. Cell 3 is mostly covered with emergent vegetation dominated by cattail, but also contains a mixture of native wetland plants that were planted during the construction of the ENR Project. Cell 4 is covered with submerged aquatic vegetation as designed and emergent species are controlled. Cell 5A (eastern) is covered with emergent vegetation containing cattail and Cell 5B (western) is covered with submerged aquatic vegetation and periphyton.

## STA-1W SYSTEM HYDRAULICS AND OPERATION

### System Hydraulics

#### STA-1W Inflow and Distribution

West Palm Beach (C-51) canal water that would have been otherwise pumped into the Loxahatchee Wildlife Refuge (WCA-1) via the S5A pump station and flow through the Refuge is diverted to STA-1W. A small portion of the area of WCA-1 near S5A pump station is leveed and forms the STA-1W Inflow and Distribution (STA-1 I & D) that serves as a storage area to divert water into STA-1W; and into STA-1E when it is built. There are two old and four new water control structures in the STA-1 I & D. The S5A pump station delivers water from C-51 (West Palm Beach canal); the S5AS spillway controls WCA-1 inflow and outflow at the junction of L-8 and C-51. The junction has culvert structures S5AW and S5AE. The four new spillway structures are G300, G301, G302 and G311.

G300 is a two-bay, reinforced concrete U-shaped spillway, with vertical lift gates installed on the crest of ogee-shaped weirs. The purpose of this structure is to bypass flows from the STA-1 I & D area into the L-40 borrow canal that runs along the eastern edges of WCA-1. G301 is a three-bay, reinforced concrete U-shaped spillway, with vertical lift gates on weirs. The purpose of this structure is to bypass flow from the STA-1 I & D area into WCA-1 along the L-7 borrow canal on the western edge of WCA-1. G302 is a fixed-crest concrete ogee spillway equipped with two vertical lift gates each 6 meters (20 ft) wide. The purpose of this structure is to supply inflow to the five cells of STA-1W from the STA-1 I & D area. It has a capacity of  $92 \text{ m}^3 \text{ s}^{-1}$  (3,250 cfs). G311 is a three-bay, reinforced concrete spillway, with lift gates on weirs. The purpose of this structure is to supply water for the future STA-1E from the STA-1 I & D area. Information for STA-1W structures is provided in Table 2. Structure locations are shown in Figure 2.

## STA-1W Inflow, Internal, and Discharge Structures

The Supply Canal to STA-1W is about 2.72 km (1.7 miles) long, extending between the inflow structure G302 and the structure controlling flow into Cells 1, 2, 3 and 4 (G303). The canal has side slopes of 2.5:1, with a bottom width of 18.3 m (60 ft) at elevation -1.52 m (-5 ft), NGVD. Expected velocities in the inflow canal vary between  $0.232 \text{ m s}^{-1}$  ( $0.76 \text{ ft s}^{-1}$ ) and  $0.418 \text{ m s}^{-1}$  ( $1.37 \text{ ft s}^{-1}$ ) (Hutcheon Engineers, 1996). G303 is a two-bay ogee spillway equipped with two lift gates each 4.9 m (16 ft) wide and with a discharge capacity of  $50.4 \text{ m}^3 \text{ s}^{-1}$  (1780 cfs). G303 is a two-bay ogee spillway equipped with two lift gates each 4.9 m (16 ft) wide and with a discharge capacity of  $50.4 \text{ m}^3 \text{ s}^{-1}$  (1780 cfs).

Perimeter and inter-cell levees facilitate mobility within the wetland. The levees have culverts underneath for inflows, outflows and inter-cell water delivery. Under each levee, the culverts are spread along the levee to facilitate distribution of flow over the downstream cell area. The evenness of flow distribution depends on the ground surface elevations and vegetation cover of the receiving cell.

Upstream of Cell 1 and Cell 2, there was a Buffer Cell, which received flow from G250S (seepage return pumps) and the inflow spillway G303. There was a levee with 10 culverts (G252A-J) between the Buffer Cell and Cell 1. The transition to STA-1W involved degrading about 70 percent of the levee and removing all but three of the culverts (G252H, I, J). The number of culverts between the Buffer Cell and Cell 2, which was five (G255A-E) was increased to seven (G255A-G) in the transition from ENR to STA-1W making direct connection between Cell 1 and Cell 2. Similarly, there were five G254 culverts between Cell 2 and Cell 4 under the ENR Project, but they were increased to nine as part of STA-1W (G254 A, A1, B, B1, C, C1, D, D1, and E). The levee between Cell 1 and Cell 3 has 10 culverts G253 (A-J), which did not change in the transition from ENR to STA-1W. Between Cell 4 and Cell 3, there are five culverts (G256A-E), which were not affected by the change from ENR to STA-1W.

Inflow to Cell 5 is through ten 29.3 m (96 ft) long corrugated metal pipe culverts (G304A-J). The combined capacity of the inflow culverts (G304A-J) is  $41.6 \text{ m}^3 \text{ s}^{-1}$  (1470 cfs). The Florida Power and Light (FPL) levee runs across Cell 5, dividing the cell into two parts. Twenty-two culverts (G305A-V) were constructed to deliver water from the eastern part to the western part of the cell. Each of the G305 culverts is 213 cm (84 inches) in diameter and 27.4 m (90 ft) long, with an invert elevation of 1.07 m (3.5 ft) NGVD. Seepage and recirculated water from Cell 5 is pumped through G250S to Cell 1 through the old ENR Buffer Cell, which is now part of Cell 1. G250S has three main pumps, with a combined capacity of  $5.66 \text{ m}^3 \text{ s}^{-1}$  (200 cfs) and three supplemental pumps from the old ENR inflow pump station G250, with a combined capacity of  $8.49 \text{ m}^3 \text{ s}^{-1}$  (300 cfs).

At the west end of Cell 3, are two outflow structures releasing to the discharge canal, G308 and G259. Similarly, G258 and G309 are the two outflow structures releasing to the discharge canal from Cell 4, located at the west end. Construction took place in 2000 that could affect the hydrodynamics inside STA-1W. The construction works included widening of canals D-1, C-6 and

C-7. G254 apron cuts were also done in November 2000. Hydraulic information for internal structures is shown in Table 3.

Outflow from Cell 5 to the discharge canal is through 10 corrugated metal pipes of 183 cm (72 in) diameter and 39.6 m (130 ft) long, with a combined discharge capacity of  $41.6 \text{ m}^3 \text{ s}^{-1}$  (1470 cfs). G327A is a gated culvert 213 cm (84 in) in diameter, 39.6 m (130 ft) long with  $2.83 \text{ m}^3 \text{ s}^{-1}$  (100 cfs) discharge capacity. G327C is a culvert 39.3 m (129 ft) long with  $2.83 \text{ m}^3 \text{ s}^{-1}$  (100 cfs) discharge capacity. STA-1W outflow structures are the G251 and G310 pump stations. G251 has six identical pumps, with a combined capacity of  $12.74 \text{ m}^3 \text{ s}^{-1}$  (450 cfs). G310 is equipped with six pumps of three different capacities, with a total capacity of  $86 \text{ m}^3 \text{ s}^{-1}$  (3,040 cfs). G310 has two electric pumps, with a combined discharge capacity of  $5.66 \text{ m}^3 \text{ s}^{-1}$  (200 cfs), two diesel pumps, with a combined discharge capacity of  $26.6 \text{ m}^3 \text{ s}^{-1}$  (940 cfs) and two diesel pumps with a combined discharge capacity of  $53.8 \text{ m}^3 \text{ s}^{-1}$  (1,900 cfs).



Table 2. Structure information for STA-1W stations.

Station	G300	G301	G302	G303	G304	G306	G308	G309	G327A	G310	G251
Type	spillway	spillway	spillway	spillway	culvert	culvert	spillway	spillway	culvert	pump	pump
Units	2	3	2	2	10	10	1	1	1	6	6
Max Q			$92 \text{ m}^3 \text{ s}^{-1}$ (3250 cfs)	$50.4 \text{ m}^3 \text{ s}^{-1}$ (1780 cfs)	$41.6 \text{ m}^3 \text{ s}^{-1}$ (1470 cfs)	$41.6 \text{ m}^3 \text{ s}^{-1}$ (1470 cfs)	$28.3 \text{ m}^3 \text{ s}^{-1}$ (1000 cfs)	$28.3 \text{ m}^3 \text{ s}^{-1}$ (1000 cfs)	$5.7 \text{ m}^3 \text{ s}^{-1}$ (200 cfs)	$86 \text{ m}^3 \text{ s}^{-1}$ (3040 cfs)	$12.7 \text{ m}^3 \text{ s}^{-1}$ (450 cfs)
Min Q	$-28.3 \text{ m}^3 \text{ s}^{-1}$ (-1000 cfs)	$-28.3 \text{ m}^3 \text{ s}^{-1}$ (-1000 cfs)	0	0	0	0	0	0	0	0	0
Design Q			$92 \text{ m}^3 \text{ s}^{-1}$ (3250 cfs)	$50.4 \text{ m}^3 \text{ s}^{-1}$ (1780 cfs)	$41.6 \text{ m}^3 \text{ s}^{-1}$ (1470 cfs)	$41.6 \text{ m}^3 \text{ s}^{-1}$ (1470 cfs)	$15.8 \text{ m}^3 \text{ s}^{-1}$ (560 cfs)	$15.8 \text{ m}^3 \text{ s}^{-1}$ (560 cfs)	$2.83 \text{ m}^3 \text{ s}^{-1}$ (100 cfs)	$86 \text{ m}^3 \text{ s}^{-1}$ (3040 cfs)	$12.7 \text{ m}^3 \text{ s}^{-1}$ (450 cfs)
Design HW	5.79 m (19 ft)	5.79 m (19 ft)	5.49 m (18 ft)	4.79 m (15.7 ft)	4.79 m (15.7 ft)	3.51 m (11.5 ft)	3.58 m (11.75 ft)	3.84 m (12.6 ft)	2.74 m (9 ft)	2.74 m (9 ft)	
Design TW			4.79 m (15.7 ft)	4.41 m (14.46 ft)		2.74 m (9 ft)	2.29 m (7.5 ft)	2.38 m (7.8 ft)	2.65 m (8.7 ft)		
Bypass stage	6.71 m (22 ft)	6.71 m (22 ft)			5.73 m (18.8 ft)	5.73 m (18.8 ft)	5.03 m (16.5 ft)	5.03 m (16.5 ft)	5.33 m (18.8 ft)		
Flow Min. Elevation	3.35 m (11 ft)	2.35 m (7.7 ft)	2.87 m (9.4 ft)		3.43 m 1.52 m (11.25 ft) (5 ft inv.)	2.38 m (7.8 ft) inv.	2.26 m (7.4 ft)	2.32 m (7.6 ft)	0.15 m (0.5 ft)		
Flow Width	6.1 m (20 ft)	6.71 m (22 ft)	6.1 m (20 ft)	4.88 m (16 ft)	1.83 m (6 ft) dia.	1.83 m (6 ft) dia.	4.27 m (14 ft)	4.27 m (14 ft)	2.13 m (7 ft) dia.		0.91 m (3 ft) dia.
Flow Height	2.56 m (8.4 ft)	3.57 m (11.7 ft)					2.04 m (6.7 ft)	2.04 m (6.7 ft)			
RPM										720	200

Table 3. Hydraulic information for STA-1W internal structures and seepage pump station.

Station	G250S	G252	G253	G254	G255	G256	G258	G259	G305
Type	pump	culvert	Culvert	culvert	culvert	culvert	culvert	culvert	culvert
Units	6	3	10	9	7	5	1	1	22
Dbkey	JK278	16207, 16235, 16236,	16237, 16238, 16208to16211, 16247to16450	16212 to16215, 16251	16731 to 16735	16736 to 16740	15940	15939	Stations not active
Bypass stage		15.5 ft.	15.5 ft.	15.5 ft.	15.5 ft.	15.5 ft.	15 ft.	15 ft.	18.8 ft.
Flow line Elevation		5 ft.	5 ft.	5 ft.	5 ft.	5 ft.	2.5 ft.	1.5 ft.	3.5 ft.
Flow line Length		54.5 ft. barrel	54.5 ft. barrel	54.5 ft. barrel	54.5 ft. barrel	54.5 ft. barrel	78 ft. barrel	78.5 ft.	90 ft.
Cross Section Diameter	3@42 in. 3@36 in propeller	72 inches	72 inches	72 inches	72 inches	72 inches	60 inches	72 inches	84 inches

Discharge from Cell 1 into Cell 3 flows through ten 183 cm (72 inches) diameter and 17.7 m (58 ft) long culverts (G253A-J). Discharge from Cell 2 into Cell 4 flows through nine 183 cm (72 inches) diameter and 16.5 m (54 ft) long culverts (G252A, A1, B, B1, C, C1, D, D1 and E). Discharge from Cell 3 is to the discharge canal through G308 and G259 and to WCA-1 through the G251 pump station. G308 is a gated weir, with a discharge capacity of  $15.85 \text{ m}^3 \text{ s}^{-1}$  (560 cfs). G259 is a gated culvert 183 cm (72 inches) in diameter and 23.9 m (78.5 ft) long. Discharge from Cell 4 is into the discharge canal through G309, G258 and into Cell 3 through G256A-E. G309 is a gated weir, with a discharge capacity of  $15.85 \text{ m}^3 \text{ s}^{-1}$  (560 cfs). G258 is a gated culvert 183 cm (72 inches) in diameter and 23.5 m (77 ft) long. G256A-E consists of five culverts 183 cm (72 inches) in diameter and 16.6 m (54.5 ft) long.

The discharge canal extends between G327A at the northwest corner and the G310 pump station at the southwestern corner. The discharge canal is about 9.12 km (5.7 miles) long with, bottom width varying from 15.2 m (50 ft) at G327A to 24.4 m (80 ft) at G308, and to 30.5 m (100 ft) at G259, to account for changes in flow magnitude and ground elevation.

## Operation

S5A diverts water from the West Palm Beach canal into the STA-1 Inflow and Distribution (STA-1 I&D) area. From the STA-1 I & D area, water flows to STA-1W through spillway G302 or can be bypassed to WCA-1 through G300 and G301 when the need arises. Water flows into Cell 5 via the Inflow Canal and through culverts G304 A-J, and into treatment Cells 1, 2, 3 and 4 through gated weir structure G303. The old ENR seepage pumps (G250S) control stages in the seepage canal north of Treatment Cell 5 and redirect flow to the old ENR (Cells 1, 2, 3 and 4).

Culverts, installed beneath G302, deliver seepage return flow to G250S pumps. The pumps, in turn, convey the seepage return flow into the Cell 1 which also receives inflow from G303 as well. Thus, flow is primarily direct (open surface flow) and partly through the remaining culverts G252 (H, I, J). Cell 2 receives flow from the Cell 1 through culverts G255 (A-G). From Cell 1, water flows to Cell 3 through the G253 (A-J) culverts. Water delivery between Cell 2 and Cell 4 is through nine culverts the G254 (A, A1, B, B1, C, C1, D, D1, and E).

Outflow from STA-1W is through pump stations G251 and G310. One objective of the operation was to maintain stage in Cell 5 at 3.41 m (11.2 ft) NGVD, with a fluctuation of 0.06m (0.2 ft). This objective was not realized for most of the reporting period because of a severe drought in the region.

## HYDROLOGY AND HYDROLOGIC MONITORING

### Rainfall

STA-1W has a six-gage rainfall monitoring network. Table 4 lists all the rainfall gaging stations, the corresponding database keys and the respective Thiessen weights. Figure 2 shows the gage locations. Areal average rainfall on the project site was computed as a Thiessen-weighted average of the six-gage network. Minimal data gaps at a station would be estimated, while extended gaps result in areal rainfall computation using remaining stations with a new set of Thiessen weights. The daily distribution of areal average rainfall for the study period (July 1, 2000 to June 30, 2001) is depicted in Figure 3. Monthly summary of areal average rainfall for STA-1W is shown in Table 5. The total areal average rainfall for STA-1W (July 1, 2000 to June 30, 2001) was 104.2 cm (41.0 in). Rainfall for the year was below the average annual rainfall for the area, indicating a drought condition. The six-year average areal rainfall for the previous ENR constructed wetland and the current STA-1W, from July 1, 1994 to June 30, 2000, was 141.4 cm (55.7 inches).

Table 4. Rainfall stations in STA-1W, database retrieval keys and Thiessen weights.

Stations	DBKEY	Thiessen Weights
ENR101	15851	0.087
ENR106	DU515	0.441
ENR203	15874	0.222
ENR301	15877	0.126
ENR308	15888	0.049
ENR401	15862	0.075

### Evapotranspiration

Daily evapotranspiration is computed from high-resolution weather data using a radiation-based evapotranspiration estimation model that was developed based on lysimeter studies in the ENR (Abtew, 1996a, 1996b). A complete weather station is located in Cell 3 (ENR308). The daily distribution of evapotranspiration for STA-1W for the study period (July 1, 2000 to June 30, 2001) is depicted in Figure 3. Monthly summary of evapotranspiration for STA-1W is shown in Table 5. The total evapotranspiration for STA-1W (July 1, 2000 to June 30, 2001) was 139.9 cm (55.1 inches). The higher ET is a reflection of the drought condition. The five-year average areal ET for the previous ENR and current STA-1W (July 1, 1995 to June 30, 2000) was 132 cm (52 inches).

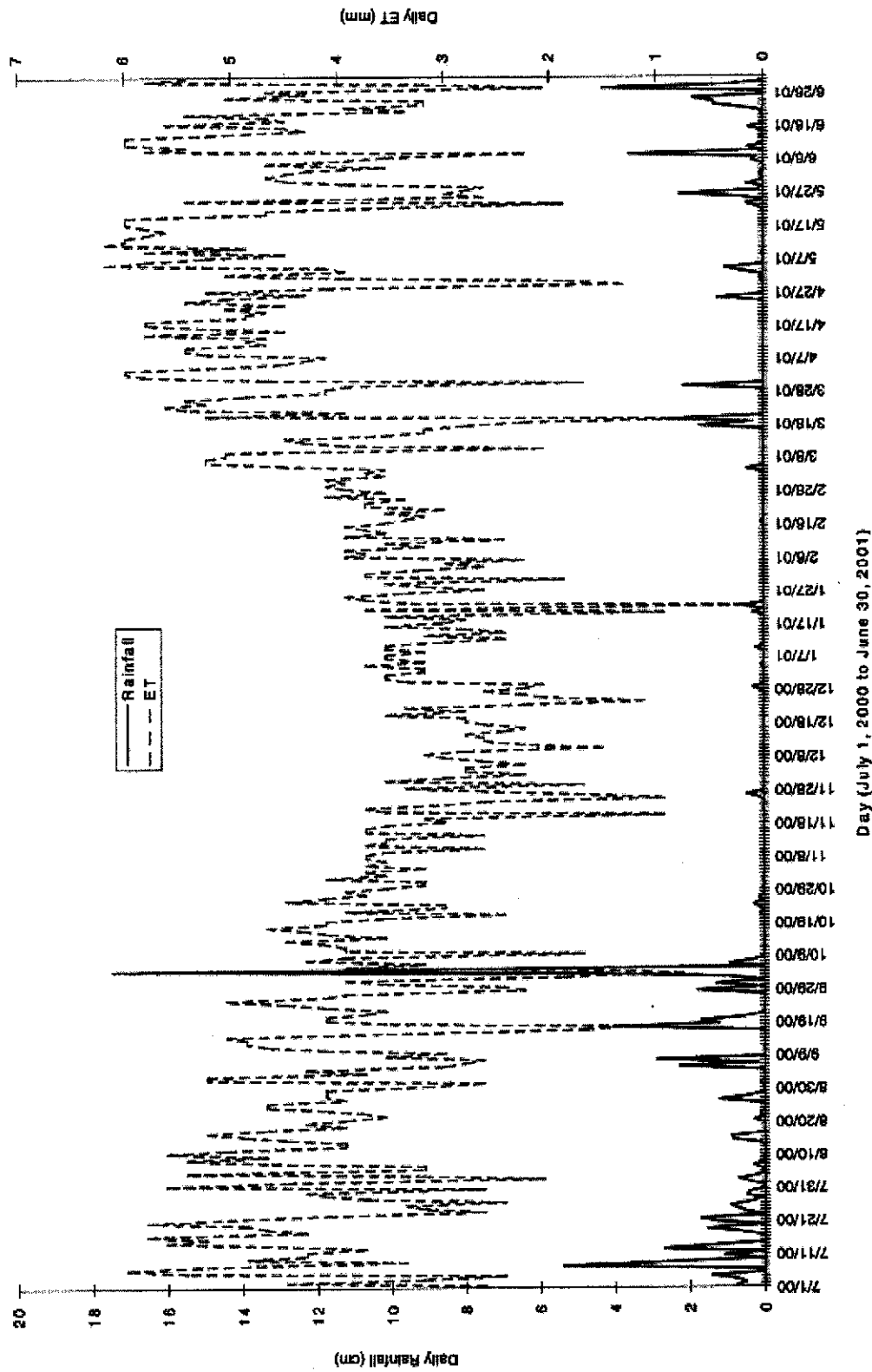


Figure 3. Daily distribution of areal average rainfall and evapotranspiration in STA-1W.

Table 5. STA-1W monthly flows, areal weighted rainfall and ET (July 1, 2000 to June 30, 2001).

Year	Month	Inflow	Outflow	Rainfall	ET	Seepage and recirculation pump		Seepage L-7
		G302 ha-m	G251+G310 ha-m	cm (in)	cm (in)	G250_S ha-m	culverts ha-m	
2000	July	1923	2228	25.30 (9.96)	13.18 (5.19)	306	17	
2000	Aug	2049	1970	5.89 (2.32)	12.90 (5.08)	143	32	
2000	Sept	1914	1916	16.03 (6.31)	11.25 (4.43)	153	31	
2000	Oct	1522	2775	24.97 (9.83)	10.85 (4.27)	198	93	
2000	Nov	0	145	0.64 (0.25)	9.38 (3.69)	165	47	
2000	Dec	63	62	0.36 (0.14)	8.05 (3.75)	293	35	
2001	Jan	0	13	1.32 (0.52)	9.51 (3.59)	328	19	
2001	Feb	0	0	0.08 (0.03)	9.78 (3.85)	192	4	
2001	Mar	580	194	7.21 (2.84)	12.45 (4.90)	201	0	
2001	Apr	89	264	1.32 (0.52)	14.43 (5.68)	228	0	
2001	May	113	0	5.74 (2.26)	14.69 (5.73)	66	0	
2001	June	638	29	15.39 (6.06)	13.40 (5.28)	0	0	

## Flows

Database keys for STA-1W flow structures and stage gages are listed in Table 6. The total inflow spillway discharge for the study period (July 1, 2000 to June 30, 2001), was 8,890 ha-m (72,069 ac-ft) and the total outflow through the outflow pump stations was 9,596 ha-m (77,793 ac-ft). The daily pumping rates of the inflow and outflow pumps are shown in Figure 4. Figure 5 shows estimated seepage from the L-7 levee flowing through the roadside culverts and the daily seepage recycling pumping. The total seepage and recirculation pumping was 2,273ha-m (18,427ac-ft). The L-7 seepage through the roadside culverts was estimated using a regression equation developed from 42 data points. A relationship was developed between the seepage from L-7 through the roadside culverts and the stage rise in WCA-1 above 4.57 m (15 ft) NGVD, and the difference in stages between WCA-1 and the eastern cells of the ENR (Guardo, 1996). The regression had a coefficient of determination ( $R^2$ ) of 0.93 and a standard error of  $0.30 \text{ m}^3 \text{ s}^{-1}$  (Equation 1). The total estimated seepage from L-7 through the roadside culverts was 278 ha-m (2,254 ac-ft). Monthly flow data for the study period are presented in Table 5.

$$L-7a = 0.217\Delta WCA^{1.311} * \Delta h^{2.025} \quad (1)$$

Where L-7a is seepage in  $\text{m}^3 \text{ s}^{-1}$ ,  $\Delta WCA$  is rise in stage in WCA 1 above 4.57 m (15 ft) NGVD and  $\Delta h$  is the difference in stage between WCA 1 and the eastern cells of STA-1W. The estimated total seepage from the L-7 levee through the roadside culverts was 278 ha-m (2,254 ac-ft). Monthly flow data for the study period are presented in Table 5.

## Water Levels

Daily water levels in each cell of STA-1W depend on rainfall, evapotranspiration, seepage and daily operational decisions. Water levels have been regulated based on water depth, operation status of the S5A pump station and maintenance. The minimum, maximum and mean of the daily average stage observations for the study period are shown in Table 7. The mean observed stage in Cell 1 was 3.62 m (11.87 ft) NGVD. The mean stage in Cell 2 was 3.62 m (11.87 ft) and the mean stage in Cell 3 was 3.55 m (11.65 ft) NGVD. The mean stage in Cell 4 was 3.58 m (11.75 ft) NGVD and the mean stage in Cell 5 was 3.35 m (10.99 ft) NGVD. Average daily stages for Cell 5 were computed from stage readings for G304 tailwater and G306 headwater. Average daily water level observations in Cell 1 and 3 of STA-1W are shown in Figure 6. Water levels for Cell 2 and 4 are shown in Figure 7. Figure 8 shows daily water levels for Cell 5. The mean water depths for Cells 1, 2, 3, 4 and 5 were 49 cm (19.3 in), 68 cm (26.8 in), 45 cm (17.7 in), 58 cm (22.8 in) and 45 cm (17.7 in), respectively.

Table 6. Flow control structures, stage recorders and database retrieval keys used in the water budget analysis for STA-1W.

Station	Description	Location	DBKEY	Remark
G302	Spillway	I&D/Supply Canal	JW221	inflow
G250S	Pump	Seepage Canal/Cell 1	JK278	seepage return, recirculation
G251	Pump	Cell 3/WCA 1	JW222	ouiflow
G310	Pump	Discharge Canal/WCA 1	M2901	ouiflow
ENR101	Stage	Cell 1	15850	center of cell
ENR203	Stage	Cell 2	15873	center
ENR301	Stage	Cell 3	15876	center
ENR401	Stage	Cell 4	15727	center of cell
G304E_T	Stage	Supply Canal/Cell 5	L9842	tailwater
G306A_H	Stage	Cell 5/Discharge Canal	L9951	headwater
G306J_H	Stage	Cell 5/Discharge Canal	L9954	headwater
G251_T	Stage	G251 tailwater	16219	WCA-1
G301_T	Stage	Inflow and Distribution/WCA-1	KS686	tailwater



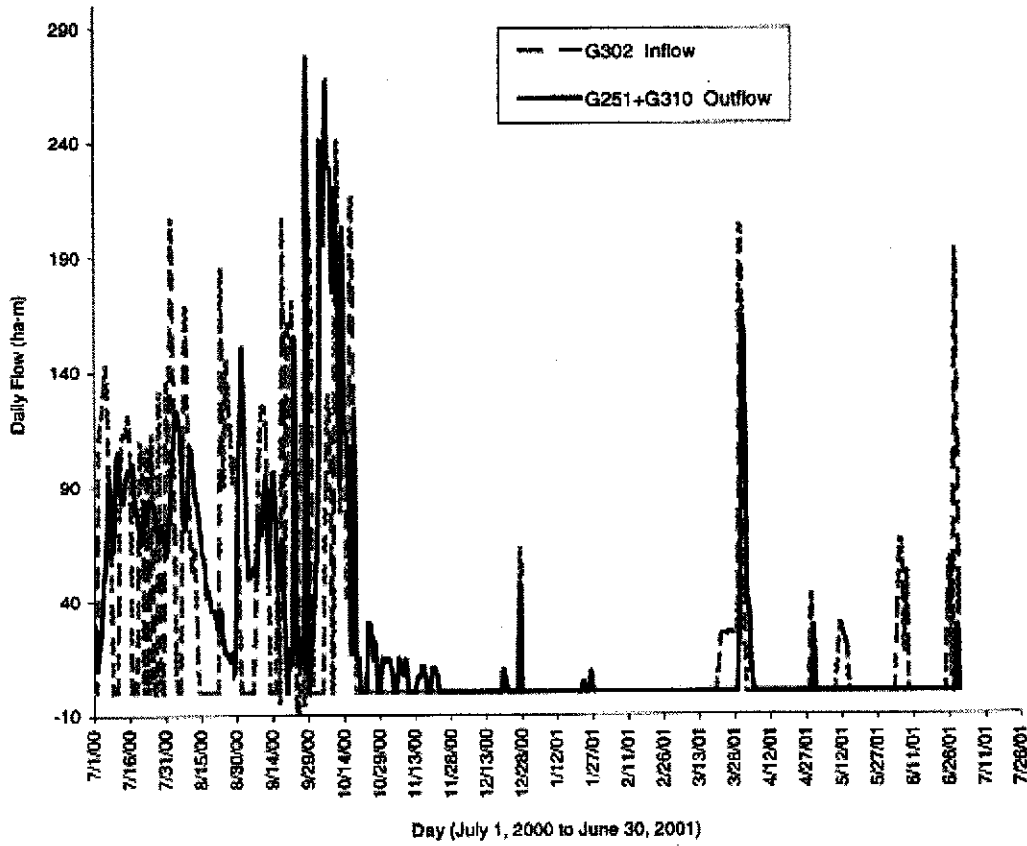


Figure 4. Daily STA-1W inflows and outflows.

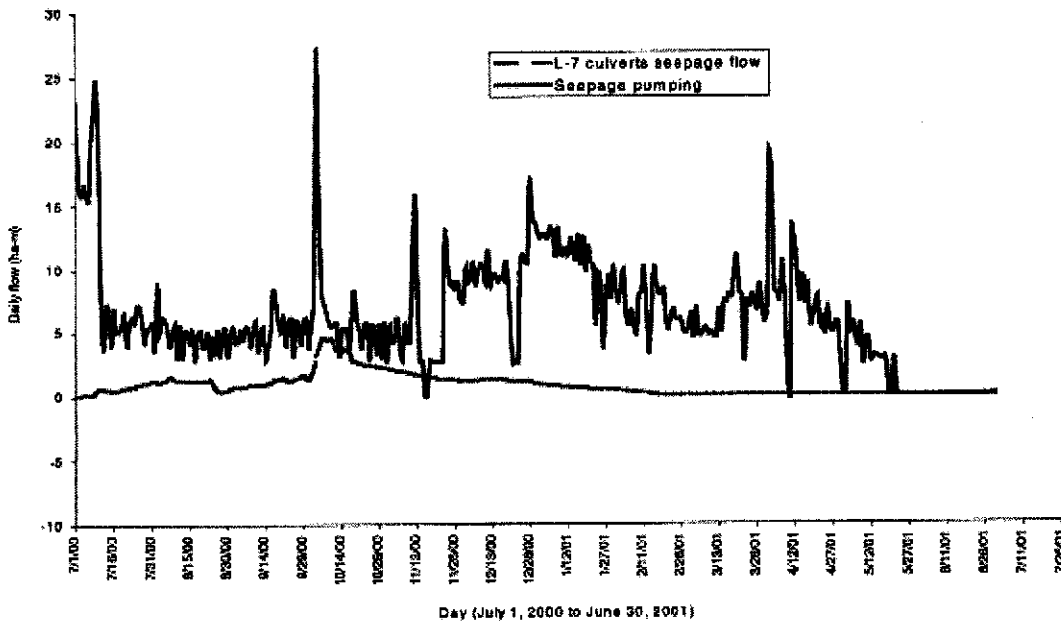


Figure 5. Daily pumping rates of the seepage/recirculation pump and seepage flow through L-7 levee roadside seepage collection culverts in STA-1W.

Table 7. Observed water surface elevations and depths in STA-1W (July 1, 2000 to June 30, 2001).

Cell	Water Surface Elevation			Depth
	Min. m (ft) NGVD	Max. m (ft) NGVD	Mean m (ft) NGVD	Mean cm (in)
Cell 1	3.26 (10.70)	4.05 (13.29)	3.62 (11.88)	49 (19.3)
Cell 2	3.23 (10.60)	4.06 (13.32)	3.62 (11.88)	68 (26.8)
Cell 3	3.26 (10.70)	3.98 (13.06)	3.55 (11.65)	45 (17.7)
Cell 4	3.17 (10.40)	4.02 (13.19)	3.58 (11.75)	58 (22.8)
Cell 5	3.02 (9.91)	3.71 (12.17)	3.35 (10.99)	45 (17.7)

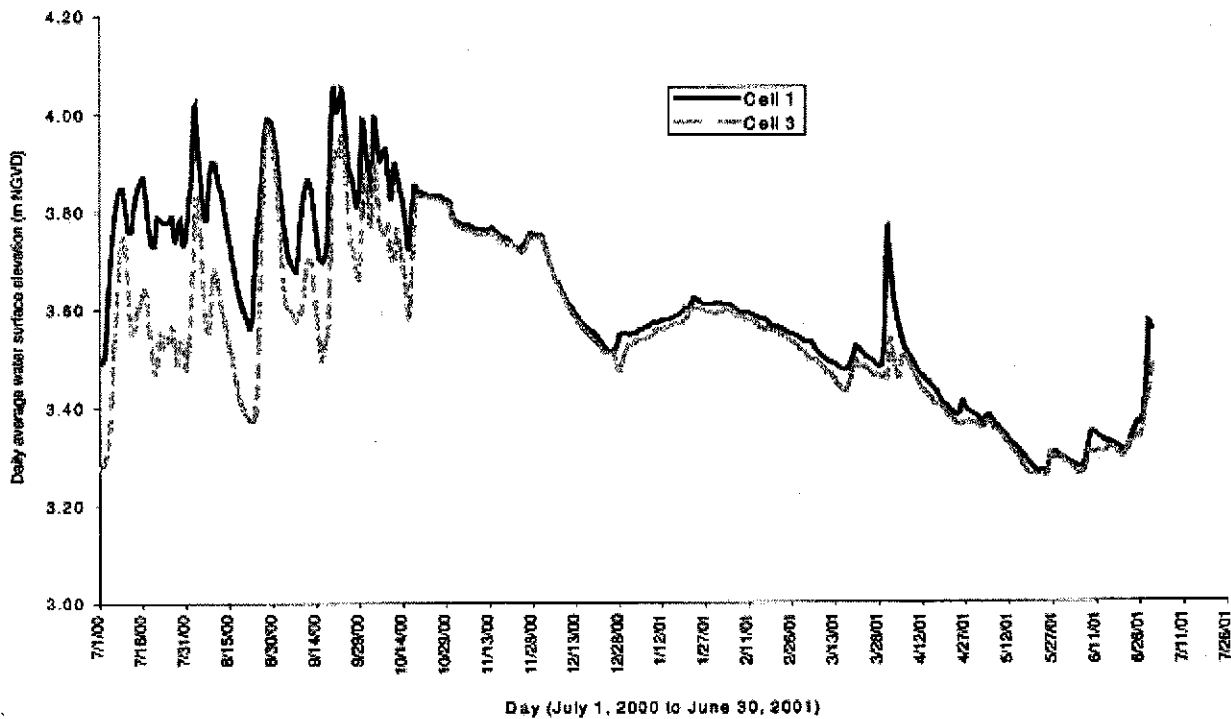
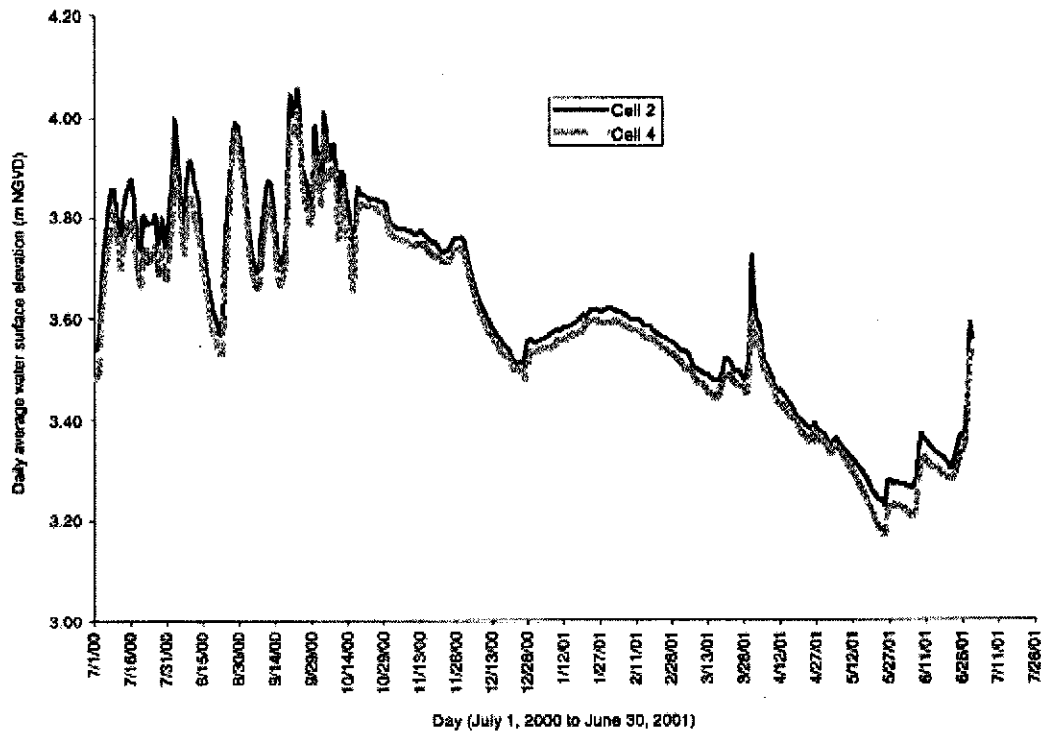
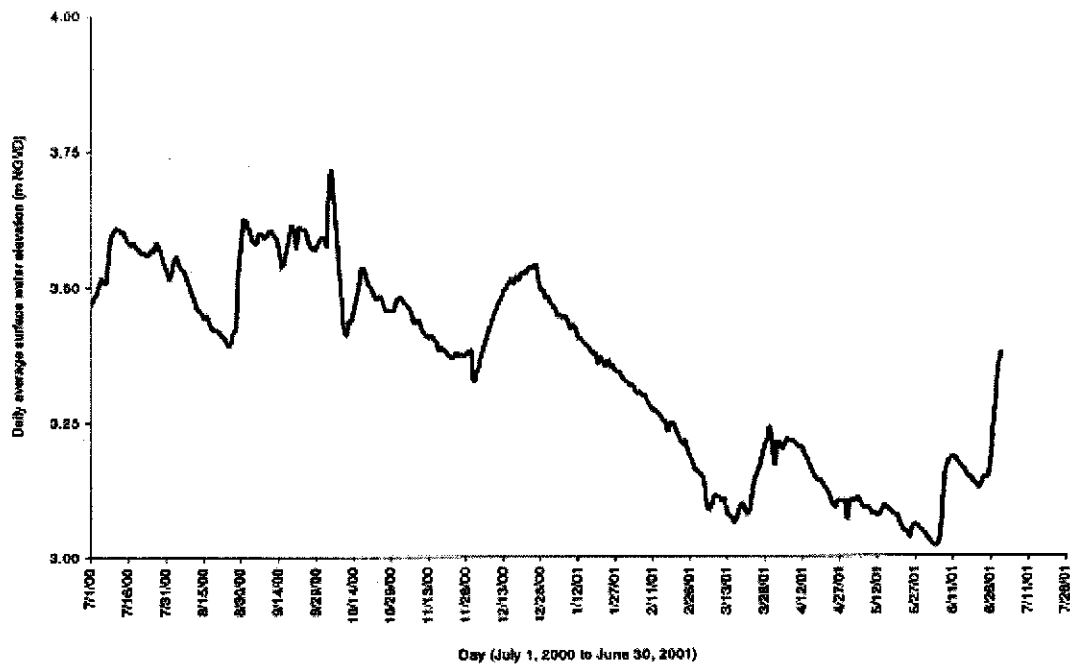


Figure 6. Daily mean water levels in Cells 1 and 3 of STA-1W.



**Figure 7.** Daily mean water levels in Cells 2 and 4 of STA-1W.



**Figure 8.** Daily mean water levels in Cell 5 of STA-1W.

## WATER BUDGET COMPUTATIONS

### STA-1W Water Balance Model

A schematic hydrologic model for STA-1W is depicted in Figure 9. The inflow supplied through the G302 spillway accounts for about 65.9 percent of the known inflow to the system. The known inflows to the system are G302 spillway inflows, rainfall, and seepage through the roadside L-7 levee culverts (L-7a). Rainfall accounts for 21.9 percent and seepage through the roadside culverts (L-7a) accounts for 2.1 percent. Outflow pumping (G251 and G310) accounts for 71.2 percent of the outflows, with evapotranspiration constituting 28.8 percent of the total outflows. The unknowns in the system are ungauged subsurface inflows, outflows and errors that account for 10.6 percent of the total inflows. The schematic model (Figure 9) and the following set of water balance equations represent the hydrologic system of STA-1W for water budget analysis purposes.

$$INFLOW - OUTFLOW = \Delta S + \epsilon_T \quad (2)$$

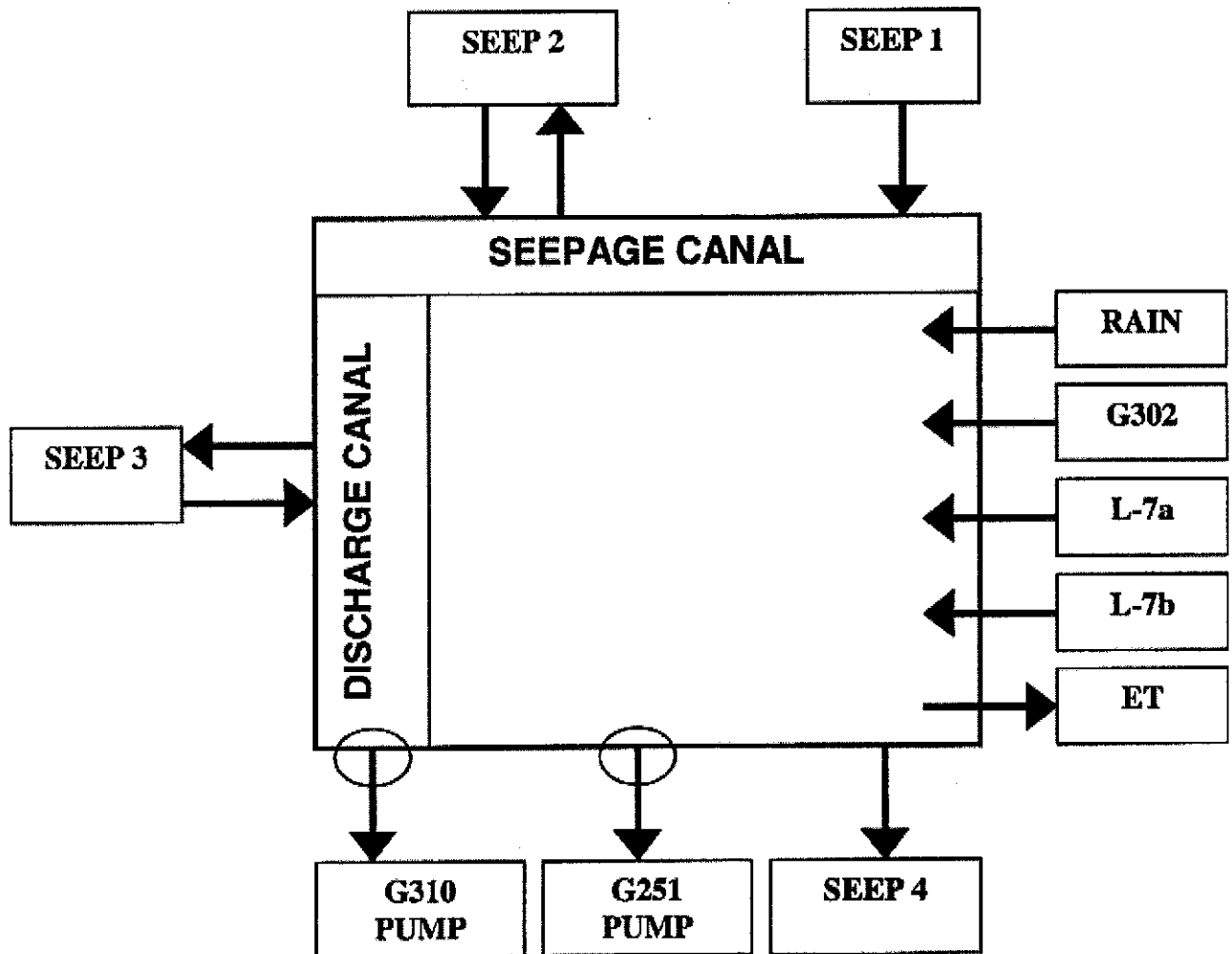
where INFLOW is the amount of water that enters the system from external sources, and OUTFLOW is water that leaves the system boundary and is not recirculated.  $\Delta S$  is the change in storage in the system during the time interval of interest. Sum of all errors is represented by  $\epsilon_T$ . Because all inflow and outflow can not be entirely quantified, the following equation is introduced to represent the remainders, errors and unknowns:

$$REMAINDERS = \epsilon_T + UNKNOWNNS \quad (3)$$

Figure 9 shows the possible inflows and outflows to and from the STA-1W system. The seepage canal, which encompasses the northern side of STA-1W, is designed to capture seepage from STA-1W to the neighboring area and to recirculate discharge from the discharge canal when needed. Seepage through the old ENR supply canal is represented as SEEP1, and seepage in and out of the seepage canal to the north is represented as SEEP2. SEEP3 represents the two seepage possibilities into or out of the discharge canal to the west, regardless of the magnitude. SEEP4 represents the possible seepage loss through the southern levee into the old Knight's Farm or into WCA-1. The unmeasured seepage inflow from WCA-1 into STA-1W from the east is represented by L-7b.

In computing the water balance for STA-1W, it is essential to identify quantifiable variables from unquantifiable variables, making reasonable assumptions to reduce the quantity of unknowns as much as possible. Since the purpose of the seepage canal is to recirculate seepage and recycled water, it is assumed that the seepage return pump flows are recirculation in the system. This assumption does not rule out the possibility of external seepage inflow being part of recirculation flow. Change in storage is represented as follows:

$$\Delta S = G302 + R + L7a + L7b - G251 - G310 - ET - SEEP1 - SEEP2 - SEEP3 - SEEP4 + \epsilon_T \quad (4)$$



**Figure 9.** Schematic hydrologic model for STA-1W.

where  $\Delta S$  is change in storage in the system; G302 is inflow; R is rainfall; L-7a is seepage flow from WCA-1 through the roadside culverts; L-7b is unknown subsurface seepage flow from WCA-1 into STA-1W; ET is evapotranspiration losses; SEEP1 is seepage inflow from the old ENR supply canal; SEEP2 is seepage to the north from or into the seepage canal; SEEP3 represents the two seepage possibilities into or out of the discharge canal to the west. SEEP4 represents the possible seepage loss or gain through the southern levee of STA-1W. G310 and G251 represent outflow pumping;  $\epsilon_T$  represents total errors in inflow and outflow terms.

Daily change in storage for STA-1W was computed as the sum of storage changes in each of the five cells (Cell 1, Cell 2, Cell 3, Cell 4 and Cell 5). Change in storage volume in each cell was computed from the area of the cell and change in stage. The remainders in the computation of daily water balances are the sum of all errors and unknowns in the system. Daily remainders were computed for the one-year study period based on the following equation:

$$\text{REMAINDERS} = \Delta S - \text{INFLOWS} + \text{OUTFLOWS} \quad (5)$$

## Discussion

The total inflow through the inflow spillway was 8,890 ha-m (72,069 ac-ft) and total outflow through the outflow pumps was 9,596 ha-m (77,793 ac-ft). Seepage inflow from the L-7 levee through the roadside culverts was a total of 278 ha-m (2,254 ac-ft). The seepage and recirculation pump had a total flow of 2,273 ha-m (18,427 ac-ft). Total average areal rainfall for the study period was 104.2 cm (41 inches) and the total average areal evapotranspiration was 139.9 cm (55.1 inches). Rainfall was drier than normal and ET was higher than the five-year average due to the drought.

For the study period, the mean daily remainders (errors and unknowns) was 3.91 ha-m per day, or 31.69 ac-ft per day, with the total remainder being 1,427 ha-m (11,568 ac-ft). The standard deviation of the remainders is 45 ha-m  $d^{-1}$  (365 ac-ft  $d^{-1}$ ), which signifies high variation. Figure 10 depicts the daily remainder distribution. The remainder is 10.6 percent of the total inflows. The high percentage is partially due to the relatively low inflows during the drought. The positive remainder indicate that there is an overall inflow to the system through unidentified directions, assuming total error is less than the remainders. The five-year ENR water budget indicated negative net remainders of -2,781 ha-m (8/19/94 to 8/9/96), -547 ha-m (8/26/96 to 8/19/97), -1,349 ha-m (8/20/97 to 8/19/98), and -97 ha-m (8/20/98 to 6/30/99). This indicates a net subsurface outflow while the last two years STA-1W water budget indicates net subsurface inflow: 197 ha-m (7/01/99 to 6/30/2000) and 1,427 ha-m (7/01/2000 to 6/30/2001). Future water budgets of STA-1W under non-drought conditions will help determine if STA-1W differs from the ENR in terms of net subsurface flow direction, assuming no systematic errors in flow monitoring.

Summary of the one-year water budget is shown in Table 8. Details of the water balance terms and calculation results are shown in Appendix I. The mean hydraulic loading rate for the study period, based on average flow, was 0.88 centimeters per day ( $cm d^{-1}$ ), or 0.35 inches per day ( $in d^{-1}$ ). The

mean hydraulic retention time was computed as the ratio of the mean-estimated water volume of the STA-1W and the average daily flow rate. The estimated mean volume was computed from the area-weighted (by cell) mean depth of 49.6 cm (19.5 inches) and total area of 2,772 ha (6,849 ac). The estimated mean hydraulic retention time was 54 days.

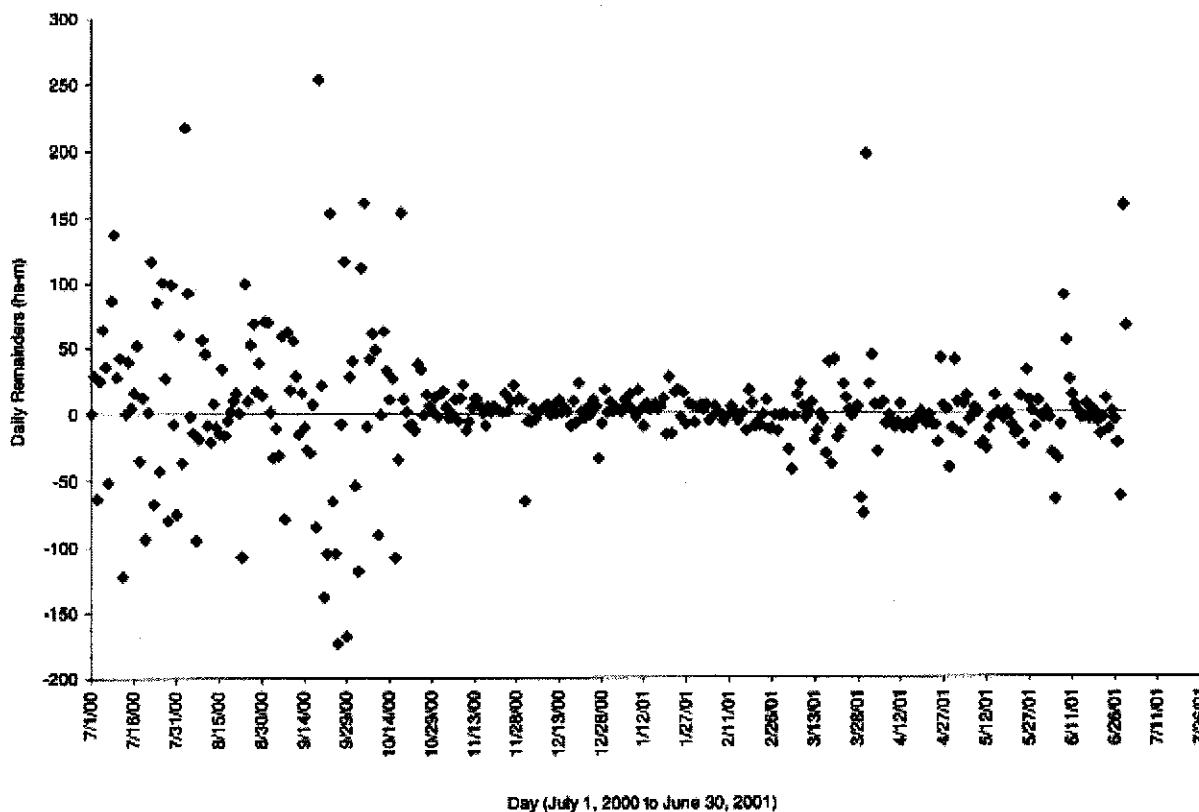


Figure 10. Distribution of daily remainders (errors and unknowns) from STA-1W water balance.

### WATER BUDGET SUMMARY

This water budget study covers the second year of operation of STA-1W (July 1, 2000 to June 30, 2001). For the period of analysis, the total inflow through the inflow spillway (G302) was 8,890 ha-m or 72,069 ac-ft and the total outflow through the outflow pump (G251 and G310) was 9,596 ha-m (77,793 ac-ft). Seepage inflow from the L-7 levee through the roadside culverts was a total of 278 ha-m (2,254 ac-ft). The seepage and recirculation pump had a total flow of 2,273 ha-m (18,427 ac-ft). Total areal average rainfall for the study period was 104.2 cm (41 inches) and the total areal average evapotranspiration was 139.9 cm (55.1 inches). The sum of the errors and unknowns was 1,427 ha-m (11,568 ac-ft), which equates to 10.6 percent of the total inflows to the system. It indicates net seepage inflow into STA-1W.

The mean hydraulic loading rate for the one-year period, based on average flow, was 0.88 cm d<sup>-1</sup> (0.35 in d<sup>-1</sup>). The mean hydraulic retention time was computed as the ratio of the estimated mean volume of STA-1W and the average daily flow rate. The estimated mean volume was computed from the area-weighted (by cell) mean depth of 49.6 cm (19.5 inches) and total area of 2,772 ha (6,849 ac). The estimated mean hydraulic retention time was 54 days. The change in storage was 12 (ha-m) or 97 (ac-ft).

In STA-1W, all hydrologic parameters, with the exception of seepage through the system, are well monitored. Since the direction of seepage is not in one direction, the remainders (errors and unknowns) could not be allocated to one variable. Comparison of previous reporting period and current reporting period water budget parameters is depicted in Table 9. The current reporting period surface inflows and outflows are 62 percent of the previous reporting period's water budget. The continued drought had a greater effect during the later period, which is demonstrated by the smaller hydraulic loading rate and a longer detention period.



Table 8. Summary of water budget for STA-1W (July 1, 2000 to June 30, 2001).

INFLOWS	ha-m	Percent of Total	OUTFLOWS	ha-m	Percent of Total
Spillway Inflow	8,890	65.9%	Outflow Pump	9,596	71.2%
Rain	2,890	21.4%	ET	3,877	28.8%
L-7 Culverts (L-7a)	278	2.1%			
Remainders	1,427	10.6 %			
Total	13,485	100%	Total	13,473	100%
Change in Storage	12				
Seepage/recirculation					
Seepage pump (ha-m)	2,273				
Loading Rate (cm d <sup>-1</sup> )	0.88				
Average depth (cm)	49.6				
Retention time (days)	54				

Table 9. Comparison of STA-1W water budget (2000-2001) components with the previous year.

	7/01/99 to 6/30/2000	7/01/2000 to 6/30/01
<b>INFLOWS (ha-m)</b>		
Inflow pump	14,636	8,890
Rain	2,794	2,890
L-7 Culverts (L7a)	438	278
Remainders	<u>197</u>	<u>1,427</u>
Total	18,065	13,485
<b>OUTFLOWS (ha-m)</b>		
Outflow pump	14,977	9,596
ET	<u>3,815</u>	<u>3,877</u>
Total	18,792	13,473
Change in Storage (ha-m)	-727	12
Seepage recirculation		
Seepage pump (ha-m)	6,688	2,273
Loading Rate (cm d <sup>-1</sup> )	1.45	0.88
Average depth (cm)	51.9	49.6
Retention time (days)	35	54

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## **APPENDIX I**

### **STA-1W Water Balance Terms With Calculated Remainders**

Date	Change in Storage	Inflow Spillway G302	Seepage Pump G250S	Outflow Pump G251,G310	Seepage L-7a	Rain	ET	Remainders
	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m
7/1/00	-15.987	0.000	22.987	30.124	0.013	21.123	7.263	0.264
7/2/00	19.169	0.000	16.535	11.022	0.056	14.082	12.446	28.501
7/3/00	44.155	112.370	15.828	16.329	0.122	20.419	8.815	-63.611
7/4/00	150.285	120.393	16.616	27.907	0.150	39.429	6.736	24.957
7/5/00	136.983	134.775	15.889	47.931	0.119	0.704	15.024	64.340
7/6/00	101.516	141.985	15.424	59.918	0.098	0.000	16.577	35.927
7/7/00	85.238	93.941	19.708	91.955	0.108	149.267	14.498	-51.626
7/8/00	128.321	61.280	22.537	80.585	0.465	69.705	9.314	86.770
7/9/00	62.053	0.000	24.658	62.225	0.572	0.000	13.472	137.178
7/10/00	-49.135	0.000	18.338	95.967	0.609	30.276	11.920	27.868
7/11/00	-73.265	0.000	5.667	104.844	0.577	0.704	11.920	42.218
7/12/00	-43.449	101.326	3.668	87.394	0.480	74.633	10.367	-122.127
7/13/00	57.265	112.656	7.220	82.880	0.502	39.429	12.446	0.004
7/14/00	45.091	112.801	6.379	92.141	0.454	0.000	15.551	39.528
7/15/00	12.993	120.222	3.973	97.364	0.427	0.000	14.498	4.206
7/16/00	9.311	105.363	6.836	96.413	0.448	0.000	16.050	15.962
7/17/00	-42.271	0.000	5.052	99.792	0.496	16.898	11.920	52.046
7/18/00	-85.968	0.000	4.979	80.582	0.570	42.245	12.945	-35.255
7/19/00	-77.057	0.000	5.561	77.255	0.649	0.704	13.472	12.317
7/20/00	-32.647	108.487	6.415	67.735	0.670	35.204	16.050	-93.224
7/21/00	70.859	104.034	3.927	68.190	0.644	47.174	13.999	1.195
7/22/00	23.331	0.000	5.645	83.536	0.759	0.704	11.393	116.796
7/23/00	-27.508	107.244	6.229	74.184	0.734	13.378	7.263	-67.417
7/24/00	13.949	0.000	5.701	83.966	0.861	20.419	8.815	85.451
7/25/00	3.788	112.818	7.120	82.799	0.900	25.347	9.314	-43.163
7/26/00	28.705	4.167	7.105	81.228	0.951	10.561	6.736	100.990
7/27/00	-54.713	0.000	5.769	73.670	0.975	1.408	10.367	26.941
7/28/00	-12.466	131.031	4.189	66.577	0.976	13.378	11.393	-79.881
7/29/00	32.139	4.798	5.334	72.870	1.077	11.969	11.920	99.084
7/30/00	-82.159	0.000	5.385	70.825	1.121	2.112	7.263	-7.305
7/31/00	-16.278	133.018	5.742	59.937	1.163	0.000	15.551	-74.971
8/1/00	82.871	94.673	3.584	71.258	1.108	10.561	12.446	60.233
8/2/00	91.190	205.130	8.970	92.354	1.028	19.714	5.710	-36.618
8/3/00	246.850	141.361	5.006	109.982	1.132	5.633	8.815	217.521
8/4/00	-28.947	14.856	6.180	122.842	1.210	0.000	15.024	92.853
8/5/00	-128.987	0.000	5.982	120.479	1.326	0.704	8.815	-1.724
8/6/00	-120.595	0.000	5.273	107.567	1.526	8.449	8.815	-14.187
8/7/00	-73.330	106.924	3.929	76.479	1.439	2.112	12.945	-94.380
8/8/00	63.796	168.260	4.690	72.026	1.291	0.000	15.024	-18.704
8/9/00	75.211	121.213	5.676	91.390	1.189	0.704	12.945	56.440
8/10/00	-5.254	69.893	2.987	106.155	1.193	0.000	15.551	45.367
8/11/00	-66.262	53.681	5.512	98.747	1.194	0.000	13.999	-8.392
8/12/00	-55.917	62.310	2.987	87.849	1.188	0.000	10.894	-20.673
8/13/00	-48.741	31.308	5.111	81.581	1.186	3.520	10.894	7.719
8/14/00	-72.089	0.000	5.016	74.255	1.189	23.235	12.446	-9.811
8/15/00	-63.600	0.000	4.101	61.136	1.182	24.643	13.472	-14.816

Date	Change in Storage	Inflow Spillway G302	Seepage Pump G250S	Outflow Pump G251,G310	Seepage L-7a	Rain	ET	Remainders
	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m
8/16/00	-36.641	0.000	5.177	57.591	1.178	0.000	14.498	34.269
8/17/00	-70.157	0.000	2.784	42.612	1.163	0.000	12.945	-15.763
8/18/00	-59.108	0.000	4.725	44.246	1.196	0.000	10.894	-5.164
8/19/00	-44.824	0.000	5.123	35.886	1.154	0.000	11.920	1.827
8/20/00	-27.696	0.000	3.763	35.720	1.142	7.745	10.894	10.030
8/21/00	-25.122	0.000	4.189	32.027	1.137	0.000	9.841	15.608
8/22/00	-32.484	0.000	4.964	27.692	1.250	3.520	10.367	0.804
8/23/00	29.328	183.178	2.961	36.265	0.979	0.000	11.393	-107.170
8/24/00	155.095	90.844	4.595	23.378	0.681	0.000	12.945	99.894
8/25/00	123.336	143.541	3.237	17.237	0.451	0.000	12.945	9.526
8/26/00	185.910	127.943	5.165	17.147	0.323	33.092	10.894	52.592
8/27/00	171.400	112.921	3.090	13.966	0.314	14.786	11.393	68.739
8/28/00	83.472	92.334	4.705	17.149	0.368	2.112	11.393	17.200
8/29/00	119.828	102.028	5.278	9.733	0.409	0.000	11.393	38.517
8/30/00	14.191	77.561	3.083	69.051	0.510	0.000	8.815	13.987
8/31/00	-0.185	49.358	4.810	116.189	0.633	2.816	7.263	70.461
9/1/00	-94.559	0.000	5.356	150.529	0.651	0.000	14.498	69.816
9/2/00	-121.104	0.000	4.157	108.732	0.649	0.000	14.498	1.476
9/3/00	-112.647	0.000	4.206	69.983	0.638	0.000	10.367	-32.934
9/4/00	-70.922	0.000	5.207	50.180	0.658	1.408	11.920	-10.889
9/5/00	-28.284	0.000	4.394	52.127	0.692	62.664	8.288	-31.225
9/6/00	2.469	0.000	5.380	54.332	0.779	4.929	7.762	58.855
9/7/00	-9.399	47.637	5.361	51.574	0.839	79.562	7.263	-78.601
9/8/00	75.629	100.044	3.829	77.827	0.855	0.000	9.841	62.398
9/9/00	66.022	124.817	4.933	69.264	0.813	0.000	8.288	17.945
9/10/00	84.127	124.868	5.789	85.816	0.807	0.000	11.393	55.662
9/11/00	36.720	113.092	3.501	92.902	0.830	0.000	12.945	28.646
9/12/00	-17.286	62.873	4.972	52.394	0.863	0.000	13.472	-15.156
9/13/00	-72.422	0.000	5.402	75.721	0.888	0.000	13.472	15.883
9/14/00	-119.365	0.000	2.806	96.444	0.954	0.000	13.999	-9.876
9/15/00	-112.281	0.000	3.841	76.462	1.057	0.000	9.841	-27.036
9/16/00	-22.596	59.213	5.128	49.035	1.129	0.000	4.657	-29.247
9/17/00	57.748	0.000	8.319	59.465	1.332	112.654	3.631	6.858
9/18/00	79.866	205.954	7.355	65.853	1.327	33.092	9.841	-84.813
9/19/00	305.669	46.992	5.806	31.411	1.328	46.470	11.393	253.684
9/20/00	187.533	160.365	4.991	0.000	1.423	15.490	11.393	21.649
9/21/00	-69.745	95.432	6.364	19.165	1.325	0.704	10.367	-137.673
9/22/00	44.551	170.749	3.944	12.845	1.120	0.000	9.841	-104.631
9/23/00	62.729	74.285	5.657	155.014	1.161	0.000	11.393	153.690
9/24/00	-98.571	-4.837	6.078	17.105	1.254	0.000	12.446	-65.437
9/25/00	-138.605	-9.532	3.085	11.830	1.359	0.000	13.999	-104.603
9/26/00	-90.539	116.970	5.899	23.430	1.391	0.000	11.393	-174.077
9/27/00	-34.856	-4.120	5.701	14.511	1.476	0.704	10.894	-7.511
9/28/00	-71.127	44.511	4.042	277.080	1.614	49.286	6.209	116.752
9/29/00	33.236	206.938	5.816	1.397	1.349	1.408	6.736	-168.326

Date	Change in Storage	Inflow Spillway G302	Seepage Pump G250S	Outflow Pump G251,G310	Seepage L-7a	Rain	ET	Remainders
	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m
9/30/00	219.554	177.413	6.107	13.349	1.334	35.908	9.841	28.087
10/1/00	0.416	0.000	3.707	30.797	1.637	0.704	10.894	39.765
10/2/00	-82.250	0.000	5.838	51.315	2.117	26.051	5.184	-53.920
10/3/00	-76.171	0.000	7.462	83.174	3.140	123.919	2.079	-117.978
10/4/00	359.543	0.000	26.948	236.477	3.767	484.413	4.158	111.998
10/5/00	-40.090	0.000	15.473	195.316	4.466	0.704	10.894	160.950
10/6/00	-164.435	89.295	8.067	265.867	4.519	26.051	8.815	-9.618
10/7/00	-56.900	129.093	7.225	229.098	4.376	9.153	11.920	41.495
10/8/00	-63.802	109.444	6.447	227.816	4.344	0.000	10.894	61.120
10/9/00	-127.352	0.000	5.637	175.199	4.477	0.000	4.657	48.027
10/10/00	-161.922	155.454	5.380	219.759	3.934	0.000	10.894	-90.658
10/11/00	61.234	239.105	5.620	169.562	3.552	0.000	10.894	-0.967
10/12/00	45.629	83.007	5.684	92.168	3.511	0.000	11.393	62.671
10/13/00	-57.889	121.885	3.090	203.214	3.451	0.000	12.446	32.435
10/14/00	-11.782	99.657	5.334	115.888	3.505	0.000	9.841	10.785
10/15/00	-50.839	41.486	5.096	111.470	3.683	0.000	11.393	26.854
10/16/00	-57.642	131.609	5.165	72.706	3.246	0.000	11.920	-107.870
10/17/00	153.468	214.963	3.956	17.010	2.801	0.000	12.945	-34.341
10/18/00	127.644	106.782	6.281	123.980	2.644	0.000	11.393	153.591
10/19/00	-12.998	0.000	8.243	14.754	2.600	0.000	11.393	10.549
10/20/00	-20.825	0.000	6.075	14.717	2.555	0.000	9.841	1.177
10/21/00	-10.156	0.000	5.089	0.000	2.464	2.816	6.736	-8.700
10/22/00	-16.439	0.000	3.739	0.000	2.426	0.000	10.894	-7.971
10/23/00	-14.937	0.000	5.517	0.000	2.362	3.520	8.288	-12.531
10/24/00	8.787	0.000	5.725	30.442	2.363	7.745	8.288	37.410
10/25/00	-4.392	0.000	2.868	28.881	2.306	1.408	12.446	33.221
10/26/00	-20.570	0.000	5.569	14.648	2.291	4.225	11.393	-1.044
10/27/00	-14.557	0.000	5.282	21.110	2.243	0.000	10.367	14.678
10/28/00	-3.041	0.000	3.303	0.000	2.203	0.000	10.894	5.649
10/29/00	-4.510	0.000	5.532	0.000	2.154	0.704	9.841	2.473
10/30/00	-9.602	0.000	3.002	15.069	2.151	0.000	8.815	12.131
10/31/00	-22.810	0.000	5.742	14.543	2.147	0.704	8.815	-2.303
11/1/00	-6.640	0.000	2.726	13.437	2.091	0.704	11.393	15.396
11/2/00	-5.379	0.000	5.451	14.521	2.010	0.000	9.841	16.973
11/3/00	-13.149	0.000	4.152	9.393	1.952	0.000	10.367	4.659
11/4/00	-9.959	0.000	4.265	0.000	1.904	0.000	8.815	-3.048
11/5/00	-8.641	0.000	6.053	0.000	1.885	0.000	10.367	-0.158
11/6/00	-11.788	0.000	3.925	14.433	1.850	0.000	9.841	10.635
11/7/00	-25.755	0.000	2.794	12.075	1.816	0.000	10.367	-5.129
11/8/00	-4.193	0.000	5.591	7.734	1.802	0.704	10.367	11.403
11/9/00	-0.269	0.000	4.157	14.174	1.726	0.000	9.841	22.020
11/10/00	-18.105	0.000	4.167	0.000	1.668	0.000	7.263	-12.511
11/11/00	-14.527	0.000	9.887	0.000	1.634	0.000	10.367	-5.794
11/12/00	-3.643	0.000	15.781	0.000	1.619	0.000	9.841	4.579
11/13/00	3.061	0.000	8.094	0.000	1.594	0.000	9.841	11.308

Date	Change in Storage	Inflow Spillway G302	Seepage Pump G250S	Outflow Pump G251,G310	Seepage L-7a	Rain	ET	Remainders
	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m
11/14/00	-1.323	0.000	2.694	6.511	1.543	0.000	7.263	10.907
11/15/00	-10.294	0.000	2.701	6.944	1.550	0.000	10.367	5.468
11/16/00	-20.064	0.000	0.000	11.172	1.526	0.000	10.367	-0.051
11/17/00	-24.754	0.000	0.000	7.369	1.488	0.000	9.841	-9.032
11/18/00	-1.857	0.000	2.731	0.000	1.458	0.000	8.288	4.973
11/19/00	-6.895	0.000	2.655	0.000	1.373	0.000	8.815	0.547
11/20/00	-6.602	0.000	2.640	10.494	1.282	0.000	2.578	5.188
11/21/00	-15.864	0.000	2.630	10.205	1.283	0.000	9.841	2.899
11/22/00	-13.681	0.000	2.633	7.032	1.301	0.704	10.367	1.713
11/23/00	-5.850	0.000	2.635	0.000	1.296	0.000	8.288	1.142
11/24/00	8.595	0.000	12.843	0.000	1.286	0.000	7.263	14.572
11/25/00	3.286	0.000	10.961	0.000	1.280	2.816	2.578	1.768
11/26/00	18.594	0.000	8.813	0.000	1.206	12.674	4.657	9.371
11/27/00	15.346	0.000	8.979	0.000	1.193	0.000	7.263	21.416
11/28/00	1.301	0.000	8.346	0.000	1.184	0.000	9.314	9.431
11/29/00	8.263	0.000	9.011	0.000	1.136	0.000	4.657	11.783
11/30/00	1.102	0.000	7.609	0.000	1.149	0.000	9.841	9.794
12/1/00	-72.983	0.000	7.325	0.000	1.154	0.000	8.288	-65.848
12/2/00	-10.913	0.000	9.948	0.000	1.132	0.000	6.209	-5.836
12/3/00	-13.165	0.000	8.864	0.000	1.116	0.000	7.762	-6.520
12/4/00	-3.219	0.000	9.320	0.000	1.123	0.000	7.762	3.419
12/5/00	-8.898	0.000	10.462	0.000	1.150	0.000	6.209	-3.839
12/6/00	-4.933	0.000	8.742	0.000	1.169	0.000	7.263	1.161
12/7/00	-3.780	0.000	9.652	0.000	1.191	0.000	8.288	3.317
12/8/00	-3.551	0.000	10.359	0.000	1.206	0.000	8.815	4.058
12/9/00	-0.013	0.000	9.936	0.000	1.218	0.000	7.762	6.531
12/10/00	-4.292	0.000	8.938	0.000	1.252	0.000	4.158	-1.386
12/11/00	1.447	0.000	11.387	0.000	1.260	0.704	6.209	5.692
12/12/00	-6.290	0.000	8.610	0.000	1.268	0.000	7.263	-0.296
12/13/00	4.067	0.000	9.569	0.000	1.257	0.000	7.263	10.072
12/14/00	-5.571	0.000	9.635	0.000	1.244	0.000	7.762	0.946
12/15/00	-1.193	0.000	8.882	0.000	1.274	0.000	6.736	4.269
12/16/00	-3.874	0.000	9.366	0.000	1.224	0.000	6.209	1.111
12/17/00	-14.954	0.000	9.214	0.000	1.202	0.000	7.263	-8.894
12/18/00	2.745	0.000	10.526	0.000	1.166	0.000	7.762	9.340
12/19/00	-13.420	0.000	9.126	0.000	1.103	0.000	7.762	-6.761
12/20/00	4.447	0.000	6.038	9.755	1.130	0.000	9.841	22.913
12/21/00	-9.596	0.000	2.412	4.419	1.101	0.704	7.762	0.780
12/22/00	-11.781	0.000	2.733	0.000	1.080	0.000	9.314	-3.547
12/23/00	-0.993	0.000	2.523	0.000	1.060	0.000	6.209	4.157
12/24/00	-3.116	0.000	10.643	0.000	1.028	0.000	3.105	-1.039
12/25/00	5.483	0.000	11.106	0.000	1.079	0.000	5.710	10.114
12/26/00	-0.165	0.000	10.499	0.000	1.120	0.000	6.209	4.925
12/27/00	-25.111	62.695	10.413	47.459	1.114	0.000	7.263	-34.198
12/28/00	-4.029	0.000	16.956	0.000	1.006	8.449	6.209	-7.275



Date	Change in Storage	Inflow Spillway G302	Seepage Pump G250S	Outflow Pump G251,G310	Seepage L-7a	Rain	ET	Remainders
	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m
12/29/00	12.677	0.000	13.890	0.000	0.925	0.000	5.710	17.462
12/30/00	-8.131	0.000	13.611	0.000	0.862	0.000	9.314	0.321
12/31/00	-0.418	0.000	12.772	0.000	0.868	0.000	9.841	8.555
1/1/01	-7.687	0.000	12.380	0.000	0.810	0.000	9.841	1.344
1/2/01	-3.819	0.000	12.657	0.000	0.819	0.000	8.815	4.177
1/3/01	-5.136	0.000	12.623	0.000	0.767	0.704	8.815	2.208
1/4/01	-6.598	0.000	12.356	0.000	0.786	2.112	10.367	0.871
1/5/01	1.837	0.000	13.256	0.000	0.765	0.000	8.815	9.887
1/6/01	-2.853	0.000	12.924	0.000	0.763	0.000	9.841	6.225
1/7/01	5.098	0.000	10.974	0.000	0.766	0.000	9.841	14.173
1/8/01	-6.790	0.000	13.173	0.000	0.672	0.000	8.815	1.353
1/9/01	-6.028	0.000	11.054	0.000	0.639	6.337	9.841	-3.163
1/10/01	7.931	0.000	11.022	0.000	0.667	0.000	9.841	17.104
1/11/01	-5.127	0.000	11.593	0.000	0.659	0.000	8.288	2.502
1/12/01	-15.629	0.000	11.010	0.000	0.594	0.000	6.736	-9.487
1/13/01	-1.296	0.000	12.380	0.000	0.603	0.000	8.815	6.916
1/14/01	-3.135	0.000	11.363	0.000	0.600	0.704	6.736	2.297
1/15/01	-2.126	0.000	10.582	0.000	0.587	0.000	7.762	5.048
1/16/01	-1.615	0.000	12.564	0.000	0.574	0.704	9.841	6.948
1/17/01	-4.976	0.000	10.345	0.000	0.566	0.000	8.288	2.746
1/18/01	-2.058	0.000	12.420	0.000	0.587	0.000	7.762	5.116
1/19/01	1.725	0.000	9.855	0.000	0.527	0.000	9.841	11.039
1/20/01	-9.405	0.000	11.734	0.000	0.456	8.449	2.578	-15.733
1/21/01	17.216	0.000	10.411	0.000	0.479	0.000	10.367	27.105
1/22/01	1.437	0.000	10.247	0.000	0.462	16.898	0.527	-15.397
1/23/01	2.610	0.000	5.564	4.563	0.495	0.000	9.314	15.992
1/24/01	7.796	0.000	9.657	0.000	0.466	0.000	10.367	17.697
1/25/01	-13.621	0.000	8.899	0.000	0.477	0.000	10.894	-3.205
1/26/01	-1.938	0.000	3.685	8.512	0.475	0.000	9.314	15.413
1/27/01	-14.958	0.000	7.303	0.000	0.470	0.000	7.263	-8.166
1/28/01	-1.416	0.000	9.386	0.000	0.481	0.000	8.815	6.918
1/29/01	-3.572	0.000	7.712	0.000	0.466	0.000	9.841	5.803
1/30/01	-11.680	0.000	10.247	0.000	0.433	0.000	5.184	-6.930
1/31/01	-5.212	0.000	8.353	0.000	0.409	0.704	10.367	4.042
2/1/01	-3.790	0.000	7.303	0.000	0.374	0.000	10.367	6.203
2/2/01	-5.809	0.000	8.515	0.000	0.339	0.000	8.815	2.667
2/3/01	-0.676	0.000	9.794	0.000	0.356	0.000	7.263	6.230
2/4/01	-13.207	0.000	6.393	0.000	0.300	0.000	8.288	-5.219
2/5/01	-8.908	0.000	5.493	0.000	0.311	0.000	6.209	-3.010
2/6/01	-5.490	0.000	6.643	0.000	0.286	0.000	10.894	5.118
2/7/01	-9.895	0.000	5.745	0.000	0.250	0.000	10.367	0.222
2/8/01	-10.751	0.000	4.800	0.000	0.238	0.000	10.894	-0.094
2/9/01	-14.463	0.000	7.707	0.000	0.214	0.000	8.815	-5.863
2/10/01	-12.850	0.000	8.106	0.000	0.192	0.000	9.841	-3.201
2/11/01	-7.574	0.000	10.134	0.000	0.183	0.000	6.736	-1.020

Date	Change in Storage	Inflow Spillway G302	Seepage Pump G250S	Outflow Pump G251,G310	Seepage L-7a	Rain	ET	Remainders
	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m
2/12/01	-5.942	0.000	6.980	0.000	0.157	0.000	10.894	4.796
2/13/01	-9.820	0.000	3.237	0.000	0.122	0.000	9.841	-0.101
2/14/01	-15.340	0.000	5.777	0.000	0.070	0.000	10.367	-5.043
2/15/01	-11.923	0.000	10.036	0.000	0.047	0.000	10.894	-1.075
2/16/01	-7.143	0.000	8.803	0.000	0.019	2.112	9.841	0.566
2/17/01	-22.132	0.000	7.944	0.000	0.000	0.000	9.314	-12.818
2/18/01	8.523	0.000	8.297	0.000	0.000	0.000	8.815	17.338
2/19/01	-2.223	0.000	8.378	0.000	0.000	0.000	9.841	7.618
2/20/01	-17.869	0.000	5.750	0.000	0.000	0.000	8.288	-9.581
2/21/01	-17.211	0.000	5.121	0.000	0.000	0.000	10.367	-6.844
2/22/01	-19.316	0.000	6.379	0.000	0.000	0.000	10.367	-8.949
2/23/01	-10.170	0.000	6.702	0.000	0.000	0.000	9.314	-0.856
2/24/01	-1.567	0.000	5.975	0.000	0.000	0.000	11.393	9.826
2/25/01	-21.689	0.000	5.972	0.000	0.000	0.000	9.841	-11.848
2/26/01	-22.096	0.000	5.992	0.000	0.000	0.000	10.894	-11.202
2/27/01	-12.995	0.000	4.986	0.000	0.000	0.000	11.393	-1.602
2/28/01	-24.108	0.000	4.881	0.000	0.000	0.000	10.894	-13.215
3/1/01	-13.907	0.000	5.177	0.000	0.000	0.000	11.393	-2.514
3/2/01	-10.717	0.000	6.437	0.000	0.000	0.000	9.841	-0.876
3/3/01	-12.014	0.000	4.519	0.000	0.000	0.000	10.367	-1.647
3/4/01	-25.460	0.000	6.836	0.000	0.000	11.969	9.841	-27.589
3/5/01	-55.017	0.000	4.659	0.000	0.000	0.000	12.446	-42.571
3/6/01	-16.977	0.000	4.607	0.000	0.000	0.000	14.498	-2.480
3/7/01	-0.732	0.000	5.089	0.000	0.000	0.000	14.498	13.766
3/8/01	8.082	0.000	5.287	0.000	0.000	0.000	13.999	22.080
3/9/01	-8.806	0.000	4.712	0.000	0.000	0.000	13.999	5.192
3/10/01	-8.912	0.000	4.950	0.000	0.000	0.000	5.710	-3.202
3/11/01	-10.156	0.000	4.580	0.000	0.000	0.000	10.894	0.738
3/12/01	-3.969	0.000	4.551	0.000	0.000	0.000	11.920	7.951
3/13/01	-32.969	0.000	6.711	0.000	0.000	0.000	12.446	-20.523
3/14/01	-22.847	0.000	4.999	0.000	0.000	0.000	9.841	-13.006
3/15/01	-9.519	0.000	7.384	0.000	0.000	0.000	8.815	-0.704
3/16/01	-13.823	0.000	7.338	0.000	0.000	0.000	8.815	-5.008
3/17/01	8.825	0.000	7.935	0.000	0.000	47.174	7.762	-30.588
3/18/01	40.935	0.000	7.768	0.000	0.000	8.449	6.209	38.695
3/19/01	31.884	0.000	9.784	0.000	0.000	71.817	1.552	-38.381
3/20/01	25.862	0.000	10.998	0.000	0.017	0.000	14.498	40.343
3/21/01	-18.550	10.673	8.067	0.000	0.000	0.000	10.894	-18.329
3/22/01	-3.248	24.903	7.829	0.000	0.000	0.000	15.024	-13.126
3/23/01	31.351	25.177	2.735	0.000	0.000	0.000	15.551	21.726
3/24/01	21.984	25.135	7.440	0.000	0.000	0.000	14.498	11.346
3/25/01	12.243	25.025	7.000	0.000	0.000	0.000	15.024	2.243
3/26/01	10.239	25.886	7.908	0.000	0.000	0.000	13.472	-2.175
3/27/01	17.020	25.869	7.582	0.000	0.000	1.408	11.393	1.136
3/28/01	18.443	25.412	6.748	0.000	0.000	0.000	11.393	4.424

Date	Change in Storage	Inflow Spillway G302	Seepage Pump G250S	Outflow Pump G251,G310	Seepage L-7a	Rain	ET	Remainders
	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m
3/29/01	10.005	25.338	8.723	0.000	0.008	59.143	10.894	-63.590
3/30/01	87.649	199.820	6.929	32.333	0.043	0.000	4.657	-75.224
3/31/01	188.791	166.761	5.711	161.615	0.087	0.000	12.945	196.504
4/1/01	-97.209	46.042	6.393	149.132	0.043	0.000	16.050	21.887
4/2/01	-15.123	0.000	18.908	42.291	0.056	0.000	16.577	43.689
4/3/01	-45.879	0.000	16.882	35.321	0.038	0.000	16.577	5.979
4/4/01	-51.895	0.000	8.263	9.077	0.024	0.000	13.999	-28.843
4/5/01	-6.060	0.000	8.011	0.000	0.025	0.000	12.446	6.362
4/6/01	-4.023	0.000	7.465	0.000	0.023	0.000	11.920	7.873
4/7/01	-19.323	0.000	10.518	0.000	0.012	0.000	11.393	-7.942
4/8/01	-16.101	0.000	8.094	0.000	0.004	0.000	14.498	-1.607
4/9/01	-21.271	0.000	2.134	0.000	0.000	0.000	15.024	-6.247
4/10/01	-25.751	0.000	0.000	0.000	0.000	0.000	15.024	-10.727
4/11/01	-20.362	0.000	13.227	0.000	0.000	0.000	12.945	-7.417
4/12/01	-7.021	0.000	12.045	0.000	0.000	0.000	13.472	6.451
4/13/01	-24.270	0.000	9.449	0.000	0.000	0.000	12.945	-11.325
4/14/01	-24.135	0.000	7.448	0.000	0.000	0.000	16.050	-8.086
4/15/01	-22.589	0.000	9.488	0.000	0.000	0.000	12.446	-10.142
4/16/01	-25.914	0.000	7.274	0.000	0.000	0.000	14.498	-11.417
4/17/01	-21.899	0.000	8.732	0.000	0.000	0.000	16.050	-5.849
4/18/01	-19.151	0.000	5.510	0.000	0.000	0.000	16.050	-3.102
4/19/01	-12.520	0.000	5.953	0.000	0.000	0.000	13.472	0.952
4/20/01	-15.435	0.000	6.949	0.000	0.000	0.000	13.472	-1.963
4/21/01	-20.726	0.000	7.724	0.000	0.000	0.000	12.945	-7.781
4/22/01	-15.687	0.000	5.446	0.000	0.000	0.000	13.999	-1.688
4/23/01	-20.581	0.000	6.222	0.000	0.000	0.000	12.446	-8.135
4/24/01	-24.338	0.000	4.771	0.000	0.000	0.000	15.024	-9.314
4/25/01	-2.366	0.000	7.005	0.000	0.000	33.796	13.999	-22.164
4/26/01	30.815	0.000	5.177	0.000	0.000	1.408	11.920	41.326
4/27/01	-9.614	0.000	4.908	0.000	0.000	0.000	14.498	4.884
4/28/01	-8.851	0.000	5.591	0.000	0.000	0.000	11.393	2.542
4/29/01	-2.338	42.678	5.740	0.000	0.000	0.000	3.631	-41.384
4/30/01	-43.909	0.000	2.877	28.534	0.000	1.408	5.184	-11.600
5/1/01	31.821	0.000	0.000	0.000	0.000	2.816	10.894	39.899
5/2/01	-5.518	0.000	0.000	0.000	0.000	0.704	13.999	7.776
5/3/01	-10.976	0.000	7.015	0.000	0.000	15.490	10.894	-15.572
5/4/01	23.635	0.000	4.928	0.000	0.000	28.164	11.393	6.865
5/5/01	-4.378	0.000	5.764	0.000	0.000	0.000	17.103	12.726
5/6/01	-21.357	0.000	4.583	0.000	0.000	0.000	16.050	-5.307
5/7/01	-16.283	0.000	3.920	0.000	0.000	0.000	14.498	-1.785
5/8/01	-8.436	0.000	5.476	0.000	0.000	0.704	12.446	3.306
5/9/01	-15.068	0.000	2.476	0.000	0.000	0.000	16.050	0.982
5/10/01	-20.579	16.594	4.245	0.000	0.000	0.000	13.472	-23.701
5/11/01	-10.627	28.788	4.470	0.000	0.000	0.000	17.103	-22.312
5/12/01	-16.842	26.522	2.662	0.000	0.000	0.000	16.577	-26.788

Date	Change in Storage	Inflow Spillway G302	Seepage Pump G250S	Outflow Pump G251,G310	Seepage L-7a	Rain	ET	Remainders
	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m
5/13/01	-5.830	22.847	3.100	0.000	0.000	0.000	16.577	-12.101
5/14/01	-1.123	18.416	3.000	0.000	0.000	0.000	16.050	-3.489
5/15/01	-2.240	0.000	2.975	0.000	0.000	0.000	15.551	13.311
5/16/01	-15.759	0.000	2.811	0.000	0.000	0.000	16.050	0.291
5/17/01	-18.971	0.000	2.924	0.000	0.000	0.000	16.577	-2.394
5/18/01	-20.824	0.000	2.510	0.000	0.000	0.000	16.577	-4.247
5/19/01	-15.491	0.000	0.000	0.000	0.000	0.000	16.577	1.086
5/20/01	-14.170	0.000	0.000	0.000	0.000	0.000	12.945	-1.225
5/21/01	-22.404	0.000	2.811	0.000	0.000	0.000	12.945	-9.459
5/22/01	-21.401	0.000	0.000	0.000	0.000	4.225	9.841	-15.785
5/23/01	-7.159	0.000	0.000	0.000	0.000	12.674	5.184	-14.649
5/24/01	-2.448	0.000	0.000	0.000	0.000	0.000	15.024	12.576
5/25/01	-15.597	0.000	0.000	0.000	0.000	15.490	7.263	-23.825
5/26/01	85.040	0.000	0.000	0.000	0.000	61.256	8.288	32.073
5/27/01	6.348	0.000	0.000	0.000	0.000	4.929	7.762	9.181
5/28/01	-5.883	0.000	0.000	0.000	0.000	0.000	7.263	1.380
5/29/01	-9.642	0.000	0.000	0.000	0.000	11.969	10.894	-10.718
5/30/01	-3.462	0.000	0.000	0.000	0.000	0.000	12.446	8.984
5/31/01	-14.692	0.000	0.000	0.000	0.000	0.704	12.945	-2.451
6/1/01	-13.248	0.000	0.000	0.000	0.000	2.816	12.446	-3.618
6/2/01	-10.805	0.000	0.000	0.000	0.000	0.000	11.920	1.115
6/3/01	-13.577	0.000	0.000	0.000	0.000	0.000	9.841	-3.736
6/4/01	-9.910	33.307	0.000	0.000	0.000	0.000	12.945	-30.272
6/5/01	-1.661	65.699	0.000	0.000	0.000	8.449	10.894	-64.915
6/6/01	25.013	64.373	0.000	0.000	0.000	4.929	9.841	-34.448
6/7/01	101.609	17.472	0.000	0.000	0.000	99.276	6.209	-8.930
6/8/01	126.231	52.320	0.000	0.000	0.000	0.000	16.050	89.960
6/9/01	50.861	0.000	0.000	0.000	0.000	11.265	15.024	54.620
6/10/01	8.590	0.000	0.000	0.000	0.000	0.000	16.577	25.167
6/11/01	-3.047	0.000	0.000	0.000	0.000	0.000	16.577	13.530
6/12/01	-8.499	0.000	0.000	0.000	0.000	2.112	16.577	5.966
6/13/01	-12.484	0.000	0.000	0.000	0.000	0.000	13.999	1.515
6/14/01	-14.921	0.000	0.000	0.000	0.000	0.704	11.920	-3.705
6/15/01	-5.165	0.000	0.000	0.000	0.000	10.561	12.446	-3.280
6/16/01	-9.046	0.000	0.000	0.000	0.000	0.000	15.551	6.505
6/17/01	-16.919	0.000	0.000	0.000	0.000	0.000	12.446	-4.472
6/18/01	-11.666	0.000	0.000	0.000	0.000	0.000	12.945	1.280
6/19/01	-12.982	0.000	0.000	0.000	0.000	1.408	15.024	0.634
6/20/01	-16.064	0.000	0.000	0.000	0.000	0.000	9.314	-6.750
6/21/01	-10.640	0.000	0.000	0.000	0.000	16.194	10.894	-15.940
6/22/01	23.537	0.000	0.000	0.000	0.000	35.908	8.815	-3.556
6/23/01	38.296	0.000	0.000	0.000	0.000	36.613	8.815	10.499
6/24/01	25.152	0.000	0.000	0.000	0.000	51.398	13.999	-12.248
6/25/01	25.771	37.048	0.000	0.000	0.000	0.000	11.920	0.642
6/26/01	39.414	57.662	0.000	0.000	0.000	0.000	12.945	-5.303

Date	Change in Storage	Inflow Spillway G302	Seepage Pump G250S	Outflow Pump G251,G310	Seepage L-7a	Rain	ET	Remainders
	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m	ha-m
6/27/01	100.482	10.139	0.000	0.000	0.000	118.991	5.710	-22.938
6/28/01	143.950	189.640	0.000	0.000	0.025	26.051	8.815	-62.951
6/29/01	223.707	110.163	0.000	28.602	0.018	0.000	16.050	158.178
6/30/01	50.894	0.000	0.000	0.000	0.000	0.000	15.024	65.919

