TECHNICAL MEMORANDUM
WRE # 354

Water Budget Analysis for the Everglades Nutrient Removal Project

(August 20, 1996 to August 19, 1997)

by

W. Abtew and V. Mullen

November 1997

Resource Assessment Division
Water Resources Evaluation Department
South Florida Water Management District
West Palm Beach, Florida 33406

EXECUTIVE SUMMARY

The Everglades Nutrient Removal Project (ENR) is a 1,544 hectare (ha) or 3,815 acre (ac) constructed wetland designed and operated for the demonstration of phosphorus (P) reduction from agricultural runoff/drainage. The ENR 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 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% 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 (mg L^{-1}). The ENR is a field scale prototype for the large scale STAs. It is built on farm land that is owned by the State of Florida and was previously leased (until 1988) to Knight's Farm for sugarcane and corn production. Construction of the ENR started in August 1992 and was completed in October 1993. Full operation started in August 1994 and it has been in operation for three years. This report summarizes a one-year water budget analysis covering the period from August 20, 1996 to August 19, 1997. Water budget analysis for the previous two years of the project (August 19, 1994 to August 19, 1996) was reported in a South Florida Water Management District Technical Memorandum (SFWMD, 1996).

The total inflow through the inflow pump was 11,972 hectare-meters (ha-m) or 97,055 acre-feet (ac-ft) and the total outflow through the outflow pump was 11,872 ha-m (96,244 ac-ft). Seepage inflow from the L-7 levee through the roadside culverts was a total of 431 ha-m (3,494 ac-ft). The seepage recirculation pump had a total flow of 3,385 ha-m (27,442 ac-ft) and there was no measured flow through culverts G-258 and G-259 as the gates were closed. Compared to the flows of the previous two years, this period had 39% lower inflow and outflow pumping. Seepage recycle pumping was only lower by 5% while L-7 levee estimate of seepage through road side culverts was down by 28% compared to the average of the previous two years. Total areal average rainfall for the study period was 136.5 centimeters (cm) or 53.7 inches (in) and the total areal average evapotranspiration was 130.1 cm (51.2 in) which is close to the average ET reported for the previous two years the project was in operation. Compared to the average areal rainfall for the previous two years, rainfall was lower by 28 cm (11 in). The remainders in the water balance, the sum of the errors and unknowns, was 3.8% of the inflows or the outflows of the system.

The mean hydraulic loading rate for the one-year period, based on the G-250 pump inflow, was 2.12 centimeters per day (cm d^{-1}) or 0.84 inches per day (in d^{-1}). The mean hydraulic retention time was computed as the ratio of the mean-estimated volume of the ENR and the total inflow pumping. The mean-estimated volume was computed from the area-weighted (by cell) mean depth of 52 cm (20.5 in) and total area of 1544 ha (3,815 ac). The estimated mean hydraulic retention time was 24.5 days. The ENR is a new system with a relatively short period of hydrologic record. Longer periods of record are more favorable to characterize the operation and water balance of hydrologic systems. Groundwater modeling efforts will help in identifying and quantifying subsurface sources and sinks in the system.

ACKNOWLEDGEMENTS

Appreciation is extended to the Data Management Division of the Water Resources Evaluation Department for timely data processing and input to the database and to Kim Jacobs of the Resource Assessment Division for layout and graphics.

TABLE OF CONTENTS

TABLES

FIGURES

INTRODUCTION

Background

The Everglades Nutrient Removal (ENR) Project is a 1,544 hectare (ha) or 3,815 acre (ac) constructed wetland designed and operated for the demonstration of phosphorus reduction from agricultural runoff/drainage. The project 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 has been partially attributed to increase in phosphorus 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, and West Palm Beach).

A minimum of 25% 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 (Whalen and Whalen, 1994). Further removal of P is to be achieved through constructed wetland treatment systems known as Stormwater Treatment Areas (STAs). The ENR is a field scale prototype for the large scale STAs. It is built on farm land that was owned by the State of Florida and was previously leased (until 1988) to Knight's Farm for sugarcane and corn production. Originally, the land was part of the Everglades which consisted of wetland prairies, sloughs and stands of custard apple (Davis, 1943). Construction of the ENR started in August 1992 and was completed in October 1993.

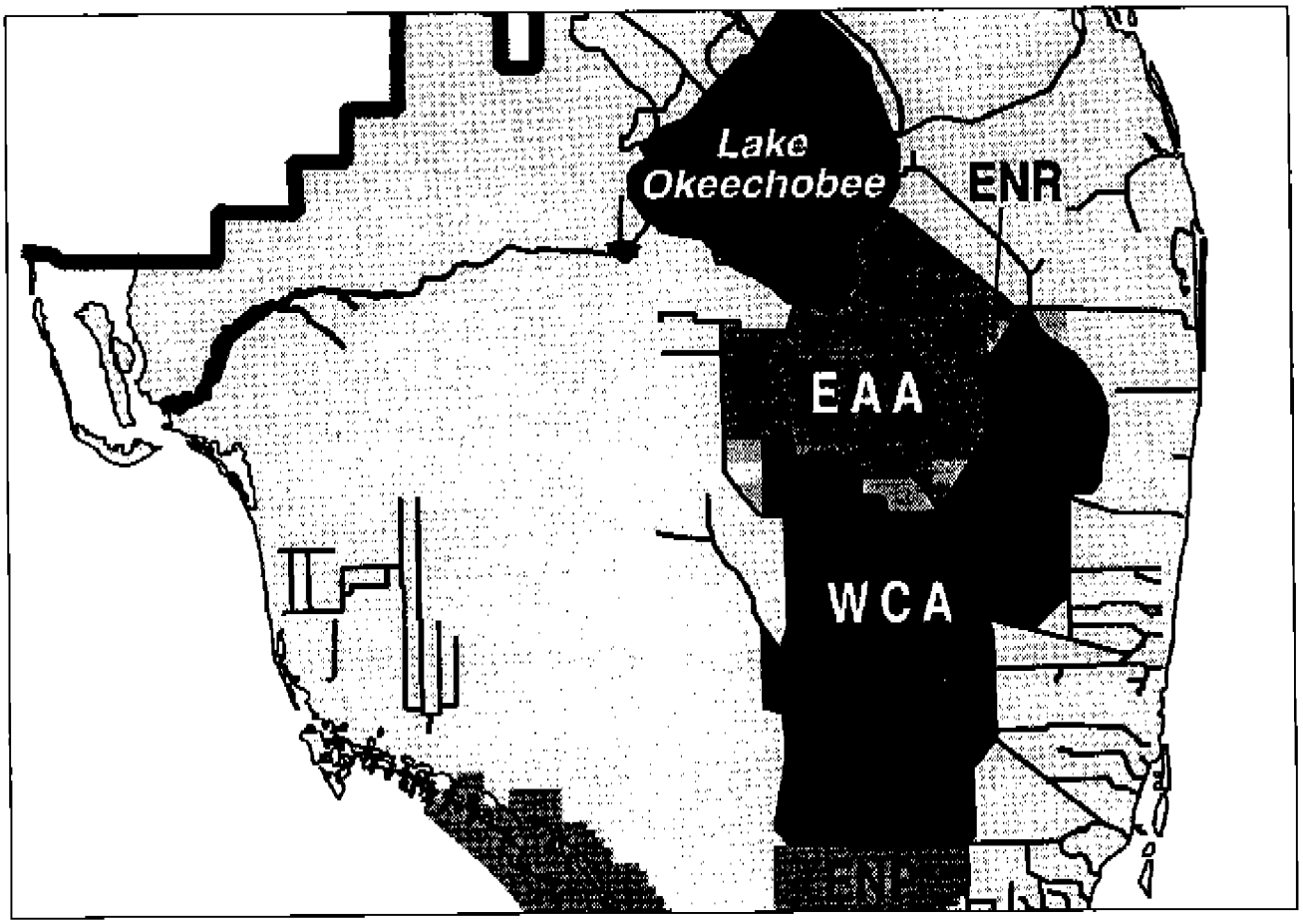

Figure 1. Location of the Everglades Nutrient Removal Project in South Florida.

Site Description

The ENR Project area is primarily covered by Okeechobee muck soils with very small topographic relief and an average ground elevation of 3 meters (m) or 9.84 feet (ft) NGVD; a 1 to 2 m of peat overlies on several meters of carbonate rock (Jammal and Associates, Inc., 1991). To the east, the L-7 levee separates the ENR Project from the Loxahatchee Wildlife Refuge (Water Conservation Area 1 (WCA1)). The northern and western sides of the ENR are encompassed by a seepage canal that separates the ENR levee from agricultural fields. The narrow southern ENR levee runs along the Knight's Farm which currently is not under cultivation. A 12 km (7.5 mile) levee surrounds the ENR and internal levees separate the five interior cells. The Project consists of two parallel treatment trains of two cells each and a buffer (distribution cell). As shown in **Figure 2**, the upper two cells, Cell 1 and 2, are treatment cells. The lower two cells, Cell 3 and 4, are polishing cells. The eastern treatment train carries water from the Buffer Cell to Cell 1, then to Cell 3 and finally to the outflow pump. The western treatment train carries water from the Buffer Cell to Cell 2, then to Cell 4 and finally to the outflow pump. Average ground elevation and area for each cell is shown in **Table 1**.

Vegetation Cover and Monitoring

As part of the ENR monitoring plan, temporal and spatial changes of vegetation have been documented using quarterly aerial photography prior to 1995 and semiannually since 1995. Average vegetation cover for the Buffer Cell and Cells 1, 2, 3, and 4 estimated from an areal photograph of November 27, 1996, is shown in **Table 1**. The dominant cover is cattails (47.7%), followed by mixed vegetation (30.2%) and open water/submerged vegetation (22.1%).

Table 1. Site characteristics of the Everglades Nutrient Removal Project

Cell	Area		Average Ground Elevation		Land Cover*		
	ha	ac	m NGVD	ft NGVD	cattails (%)	mixed veg. (%)	open water (%)
Buffer	55	136	3.10	10.17	40.3	52.4	7.3
Cell 1	525	1297	3.13	10.25	33.5	28.6	37.9
Cell 2	414	1023	2.94	9.65	76.3	12.6	11.1
Cell 3	404	998	3.10	10.18	37.7	47.4	14.9
Cell 4	146	361	3.00	9.83	3.4	3.3	93.3
Total	1544	3815	3.05	10.05	47.7	30.2	22.1

* average land cover (based on November 27, 1996 observations)

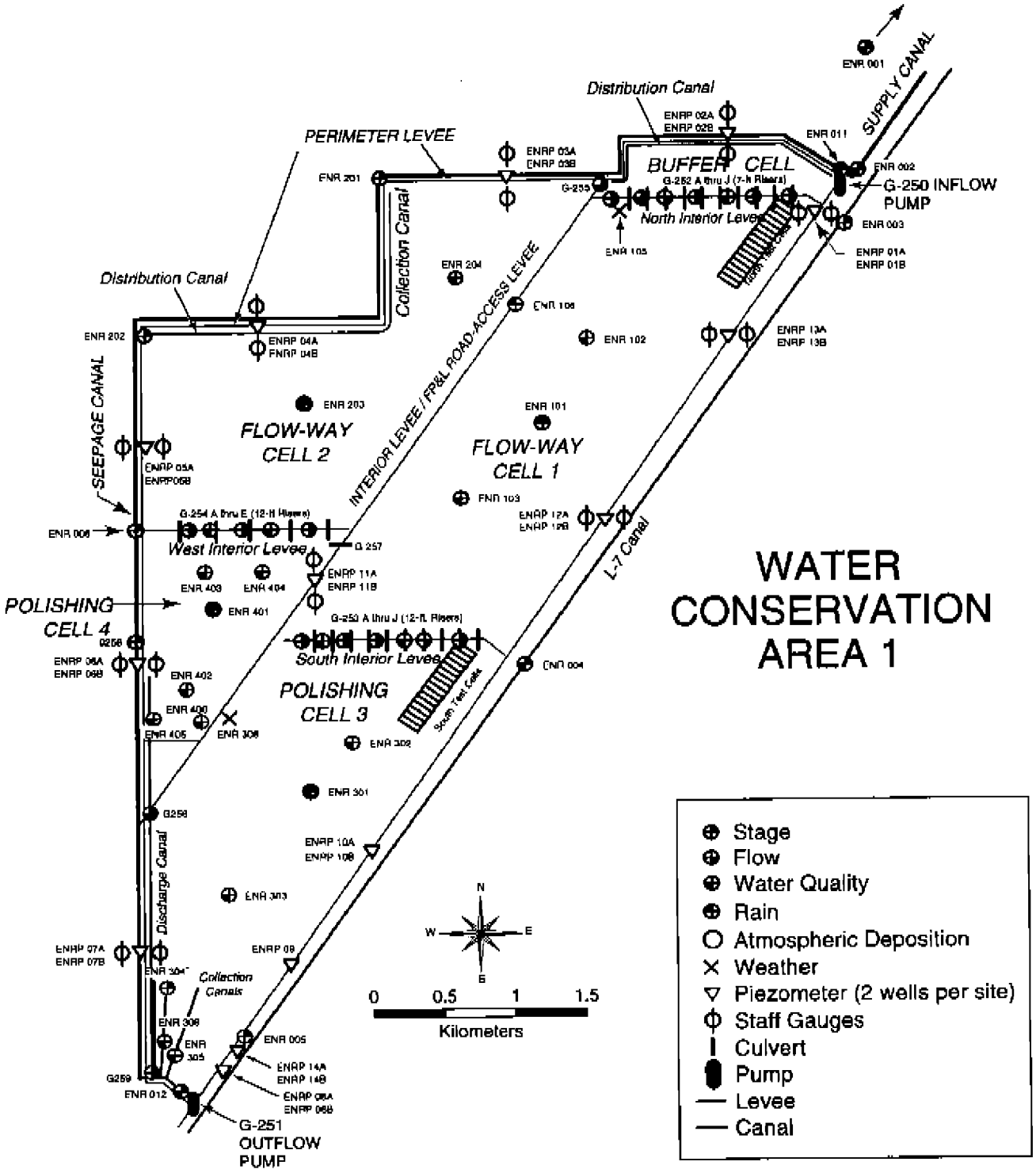

Figure 2. ENR structures and monitoring network.

SYSTEM HYDRAULICS AND OPERATION

System Hydraulics

West Palm Beach canal water that would otherwise be pumped into the Loxahatchee Wildlife Refuge or WCA1 via the S5-A Pump Station is partially diverted to the ENR through five culverts and a 3.4 km (2.1 mile) supply canal. Inflow into the constructed wetland, outflow from the constructed wetland, and seepage recycling are performed with lift pumps. The inflow pump station (G-250) has six identical pumps with a total capacity of 16.98 cubic meters per second (m3 s-1) or 600 cubic feet per second (cfs). The inflow pumps lift water from the delivery canal into the Buffer Cell. The outflow pump station (G-251) has six identical pumps with a total capacity of 12.74 $m^3 s^{-1}$ (450 cfs). The outflow pumps lift treated effluent from the ENR into the Loxahatchee Wildlife Refuge. Seepage from the seepage canal is pumped into the Buffer Cell by three identical pumps (G-250S) with a total capacity of 5.66 $m^3 s^{-1}$ (200 cfs). Pump discharge is computed as a function of head and tail water stages and pump rotations per minute (rpm). Water surface elevation is monitored by automated stage recorders, and staff gages supplement stage readings for operation.

Inter-cell flows are regulated with risers through 16.7 m (55 ft) long and 1.83 m (6 ft) diameter culverts. In the eastern treatment train, water flows from the buffer Cell into Cell 1 through ten culverts (G252A-J) and from Cell 1 to Cell 3 through ten culverts (G253A-J). Water from Cell 3 is directed to the outflow pump through collection canals. In the western treatment train, water flows from the Buffer Cell into Cell 2 through five culverts (G255A-E) and from Cell 2 to Cell 4 through five culverts (G254A-E). Outflow from Cell 4 moves through five culverts (G256A-E) into a discharge canal that leads to the outflow pump. Water can be recirculated from Cell 2 and Cell 4 via the seepage canal by being released through culverts (G-258 and G-259, respectively) in the western levee. Water can be transferred from Cell 1 to Cell 4 through culvert G-257 when necessary. Flow through culverts is being monitored with Ultrasonic Velocity Meters (UVMs). ENR structure locations and monitoring network are shown in **Figure 2.**

Operation

A preliminary operation plan was developed for the ENR by Guardo and Kosier in 1993. The early start-up and late start-up water depths and stages which were recommended in this plan are presented for each cell in **Table 2.** The seepage pump started operation in December 1993. Pumping was mainly to recirculate water from the seepage canal and reroute

Table 2. Recommended water surface elevations and depths in the preliminary operation plan and observed stages.

Cell	Early Start-up Plan				Later Start-up Plan				Observed Stages					
	Target Stage		Target Depth		Target Stage		Target Depth		Minimum		Maximum		Mean	
	m	ft	cm	in	m	ft	cm	in	m	ft	m	ft	m	ft
	NGVD				NGVD				NGVD		NGVD		NGVD	
Buffer	3.78	12.40	67	26.4	3.78	12.40	67	26.4	3.43	11.25	4.17	13.70	3.66	12.01
Cell 1	3.63	11.91	49	19.3	3.66	12.00	52	20.5	3.42	11.22	3.91	12.84	3.62	11.88
Cell 2	3.54	11.61	58	22.8	3.63	11.91	67	26.4	3.40	11.15	4.13	13.56	3.60	11.82
Cell 3	3.51	11.51	40	15.8	3.57	11.71	46	18.1	3.39	11.13	3.79	12.45	3.51	11.53
Cell 4	3.29	10.79	30	11.8	3.57	11.71	58	22.8	3.25	10.66	3.86	12.66	3.51	11.50

water from cell to cell. The inflow and outflow pumps started operating on August 19, 1994, marking the beginning of full scale operation of the ENR. Inflow and outflow regulations have been a result of many conditions, such as the stage in each Cell, S-5A pump station status, seepage tests, construction operations, pump maintenance and others. Information on ENR operations is available in the periodic summary of ENR site observations by site managers (Memorandums by Tom Kosier and Richard Meeker, SFWMD).

HYDROLOGY AND HYDROLOGIC MONITORING

Rainfall

South Florida has a subtropical climate with relatively high rainfall frequency of occurrence and magnitude. On the average, 34% of the annual rainfall occurs in the dry season (November to May), with the remaining 66% occurring in the wet season (June to October). Mean annual rainfall for the area is 133 centimeters (cm) or 52 inches (in) as reported in Abtew and Khanal (1994). Frontal rainfalls occur in the dry season and have relatively lower spatial variation. Rainfall during the wet season is associated with daily convective and tropical systems which have high spatial variations.

Based on the high variation of summer rainfall observations in the area, a ten-gage rainfall network was established as a pilot network to evaluate the optimum gage density needed for the project area. Network analysis of the first wet season daily rainfall showed that five gages were sufficient for the area (Abtew et al., 1995). As a result, three gages were removed. However, a seven-gage network is maintained because two of the gages are associated with two weather stations, and four gages (one at the middle of each cell) are part of the monitoring network required by the operating permit. **Table 3** lists all the rainfall gaging stations and the corresponding database keys, while **Figure 2** shows the gage locations. Areal average rainfall on the project site was computed as a Thiessen-weighted average of the seven-gage network **(Table 3)**. Stations with greater than three consecutive days of data gaps were excluded from areal rainfall averaging for that specific period. The daily distribution of areal average rainfall for the study period (August 20, 1996 to August 19, 1997) is depicted by **Figure 3**. Monthly summary of areal average rainfall is shown in **Table 4**. The total areal average rainfall for the study period was 136.5 cm (53.7 in). Compared to the yearly average areal rainfall for the previous two years, rainfall was lower by 28 cm (11 in).

Table 3. Rainfall stations in the ENR, database retrieval keys and Thiessen weights

Station	DBKEY	Thiessen Weights			
ENR101	15851	0.160	0.160	0.198	0.197
ENR105	15861	0.143	0.143	0.192	0.192
ENR106	DU515	0.107	0.106	****	****
ENR203	15874	0.183	0.226	0.203	0.246
ENR301	15877	0.224	0.228	0.224	0.228
ENR308	15888	0.072	0.137	0.072	0.137
ENR401	15862	0.111	****	0.111	****

**** station is taken out of areal rainfall calculation due to data gaps

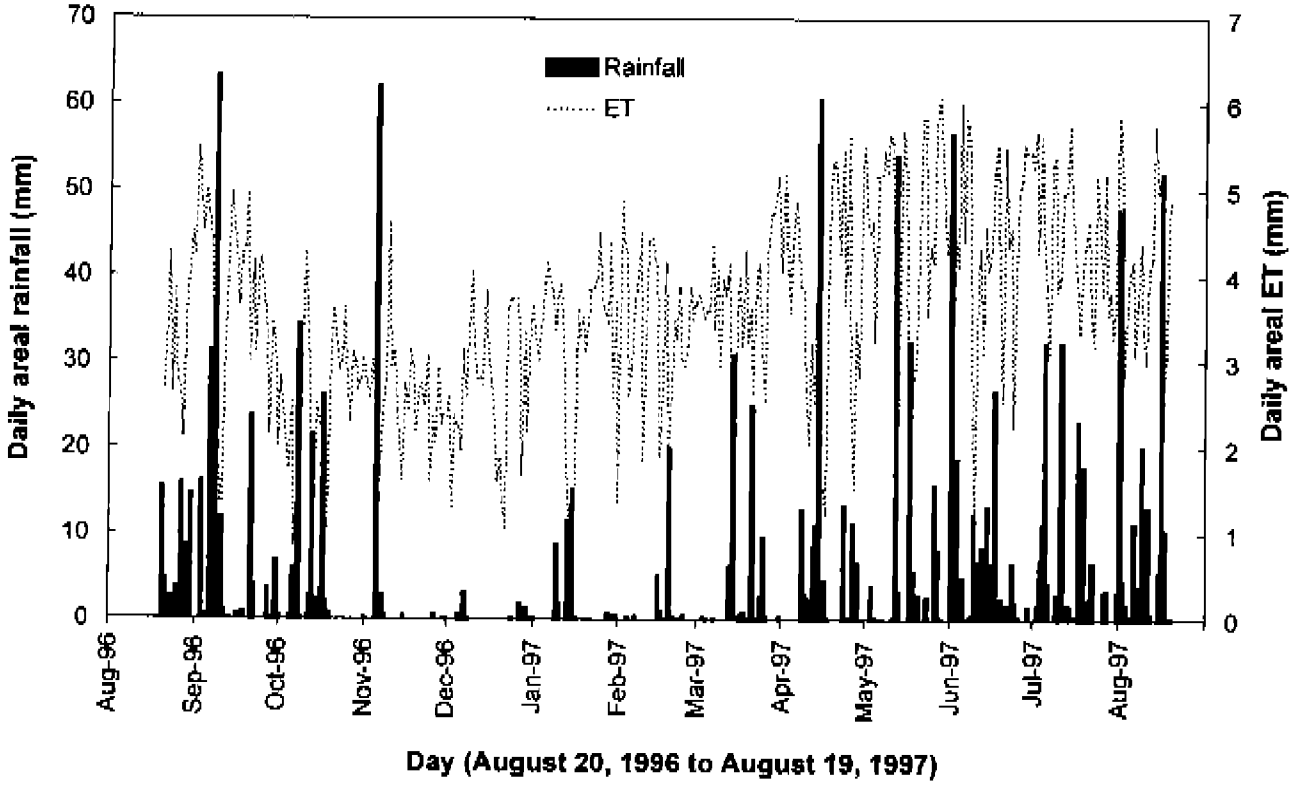

Figure 3. Daily distribution of areal average rainfall and evapotranspiration in the ENR.

Table 4. ENR Project monthly flows and area weighted rainfall and ET.

Month	Year	Inflow G-250	Outflow G-251	Rainfall		ET		Seepage Pump G-250_s	Recirculation G-258+G-259	Seepage L-7 culverts
		ha-m*	ha-m	cm	in	cm	in	ha-m	ha-m	ha-m
Aug.**	1996	376.89	237.51	7.37	2.90	4.11	2.08	152.48	0	7.38
Sep.	1996	1473.27	1517.58	18.26	7.19	11.31	4.45	332.53	0	41.43
Oct.	1996	2585.74	1986.69	10.40	4.11	7.68	3.02	280.59	0	59.50
Nov.	1996	1352.51	1745.76	0.79	0.31	7.56	2.98	244.27	0	53.39
Dec.	1996	1268.00	1127.10	4.29	1.69	8.57	3.37	253.55	0	39.90
Jan.	1997	686.89	620.17	6.83	2.69	10.12	3.98	263.80	0	36.13
Feb.	1997	762.23	766.49	2.82	1.11	11.42	4.50	217.84	0	30.70
March	1997	586.91	461.82	7.72	3.04	11.35	4.47	239.69	0	30.00
April	1997	502.75	450.10	13.44	5.29	12.72	5.01	227.67	0	26.27
May	1997	468.53	533.54	13.00	5.12	13.91	5.47	264.00	0	9.82
June	1997	703.83	781.61	18.06	7.11	13.09	5.15	300.94	0	32.29
July	1997	911.06	874.69	15.93	6.27	13.61	5.36	368.49	0	22.54
Aug.***	1997	293.27	769.04	17.42	6.86	7.63	3.01	239.53	0	36.78

* ha-m = 8.1068 ac-ft
** 12 days
*** 19 days

Evapotranspiration

Daily evapotranspiration is computed from high resolution weather data using two models. A complete weather station is located in Cell 1 (ENR105) and another is located in Cell 3 (ENR308). Based on initial observations, the Penman-Monteith model for cattails and mixed-marsh vegetation, and the Penman-Combination equation for shallow open water conditions were calibrated (Abtew and Obeysekera, 1995; Abtew, 1996). For the water budget analysis of the ENR, areal average daily ET was computed based on percent type of land cover (**Table 1**) and the area of each cell. Distribution of daily areal ET from the ENR, for the study period (August 20, 1996 to August 19, 1997), is presented in **Figure 3**, while the monthly summary of areal ET is shown in **Table 4**. The areal average ET for the year was 130.1 cm (51.2 in) which is close to the average ET of the previous two years the project was in operation.

Flows

Database keys for the flow structures and daily stage gages are listed in **Table 5**. For the study period, the inflow pump (G-250) and the outflow pump (G-251) were in operation 57% and 90% of the time, respectively. The seepage return pump (G-250S) operated every day except one during the study period. The daily pumping rates of the inflow and outflow pumps are shown in **Figure 4a**. Culverts G-258 and G-259 were closed through out the period. **Figure 4b** shows the estimated seepage from L-7 levee flowing through the road side culverts and the daily seepage recycling pumping. 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

Table 5. Flow control structures, stage recorders and database retrieval keys used in the water budget analysis of the ENR

Station	Description	Location	DBKEY	Remark
G250_P	pump	Feeder Canal/Buffer Cell	15847	inflow
G250S_P	pump	Seepage Canal/Buffer Cell	15846	seepage return
G251_P	pump	Cell 4/WCA 1	15848	outflow
G258_C	culvert	Cell 3/Seepage Canal	15940	recycle
G259_C	culvert	Cell 4/Seepage Canal	15939	recycle
G252EF_H	stage	Buffer Cell/Cell 1	15891	head water
G255_H	stage	Buffer Cell/Cell 2	15908	head water
G252EF_T	stage	Buffer Cell/Cell 1	15892	tail water
ENR101	stage	Cell 1	15850	center of cell
G253EF_H	stage	Cell 1/Cell 3	15897	head water
G255_T	stage	Buffer Cell/Cell 2	15909	head water
ENR203	stage	Cell 2	15873	center
G254C_H	stage	Cell 2/Cell 4	15903	head water
G253EF_T	stage	Cell 1/Cell 3	15898	tail water
ENR301	stage	Cell 3	15876	center
ENR012	stage	Cell 3	15849	upstream of G251_P
G254C_T	stage	Cell 2/Cell 4	15904	tail water
ENR401	stage	Cell 4	15727	center of cell
G256_H	stage	Cell 4B/Discharge Canal	15910	head water
ENR003	stage	East end of Buffer Cell	15812	WCA1
ENR004	stage	L7 canal at junction of ENR	15842	WCA1
ENR005	stage	L7 canal near G 251	15843	WCA1

of the ENR (Guardo, 1996). The regression fit had a coefficient of determination (R^2) of 0.93 and a standard error of 0.30 $m^3 s^{-1}$. The equation is given as follows:

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

where L-7 seepage is in $m^3 s^{-1}$; ΔWCA is the rise in stage in WCA 1 above 4.57 m (15 ft) NGVD and Δh is the difference in stage between WCA 1 and the eastern cells of the ENR. Monthly flow data for the study period are presented in **Table 4**. Compared to the previous two years flows, this period had 39% lower inflow and outflow pumping. Seepage recycle pumping was only lower by 5% while L-7 levee estimate of seepage through road side culverts was down by 28% compared to average of the previous two years.

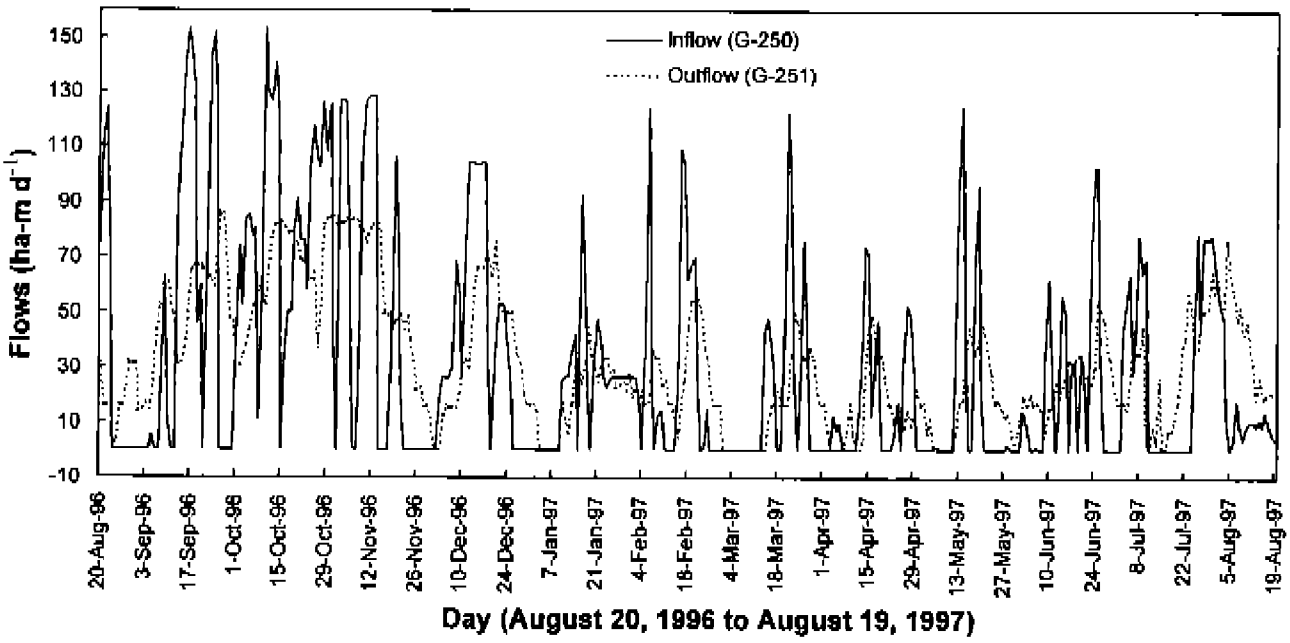

Figure 4a. Daily pumping rates of inflow and outflow pumps.

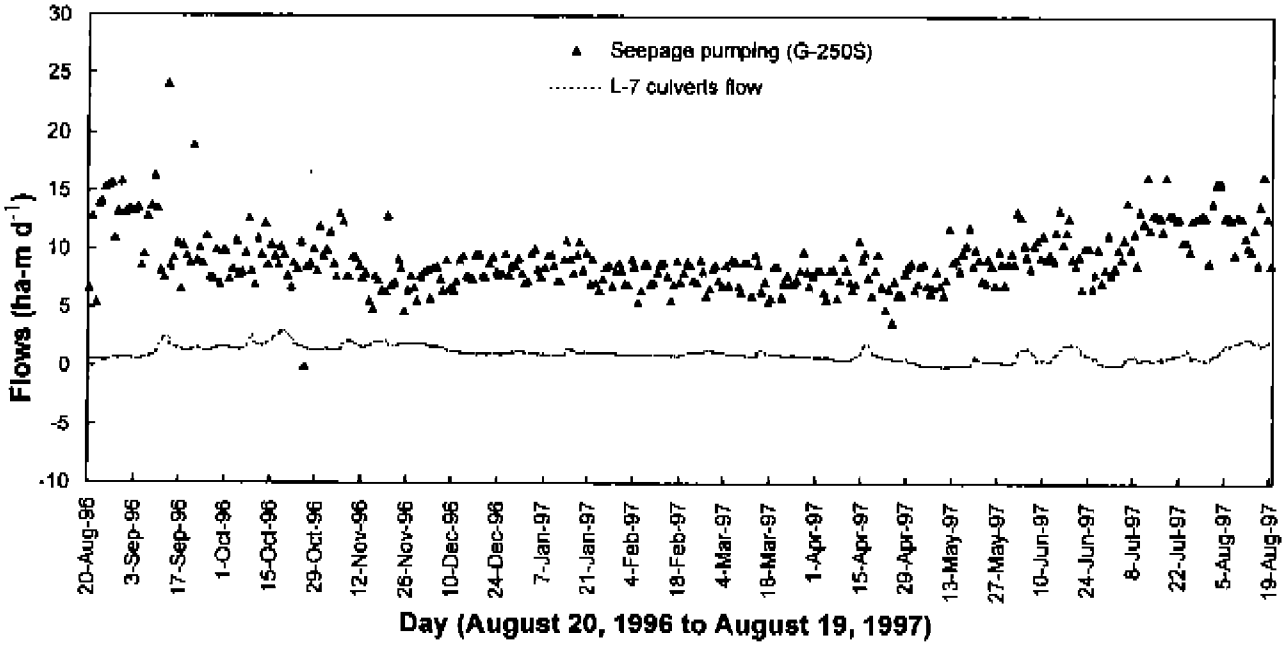

Figure 4b. Daily pumping rates of the seepage pump and seepage flow through L-7 levee roadside seepage collection culverts.

Water Levels

Daily water levels in each cell of the ENR are dependent on rainfall, evapotranspiration, seepage and daily operational decisions. Water levels have been regulated based on water depth, operation status of the S-5A pump station, pump maintenance, and other activities in ENR such as seepage studies and construction operations. The minimum, maximum, and mean of the daily average stage observations for the study period are shown in **Table 2**. The mean observed stage in the ENR was 5.5 cm (2.2 in) lower than the average stage in the previous two years. Average daily water level observations in the eastern treatment train of the ENR are shown in **Figure 5a,** while those in the western treatment train are shown in **Figure 5b**

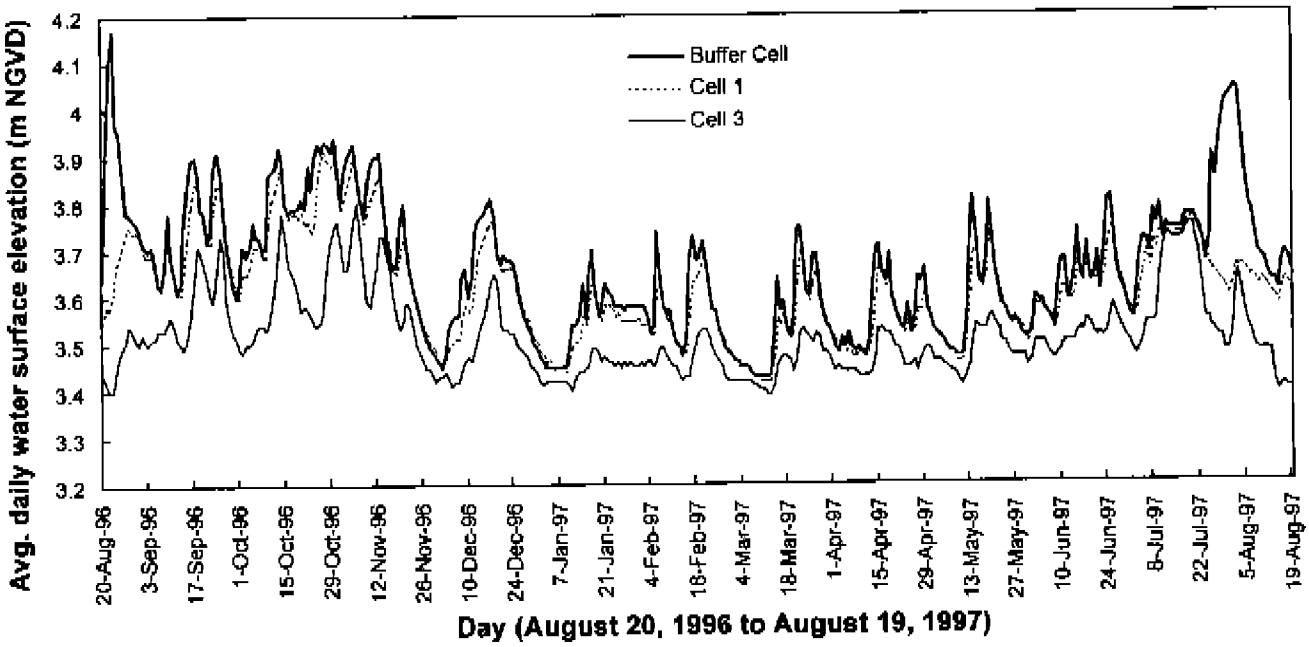

Figure 5a. Daily mean water levels in the eastern cells of the ENR and the Buffer Cell.

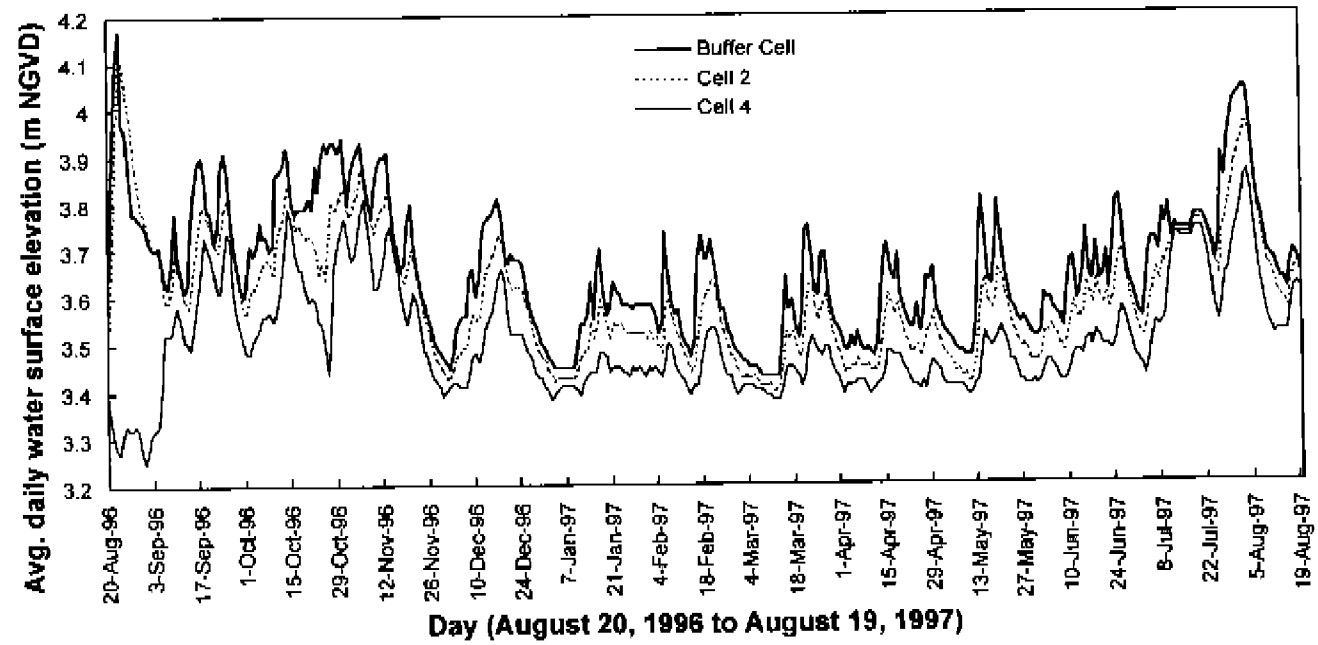

Figure 5b. Daily mean water levels in the western cells of the ENR and the Buffer Cell.

WATER BUDGET COMPUTATIONS

Water Balance Model

The schematic hydrologic model for the ENR is depicted in **Figure 6**. The influent pumped through the G-250 pump station accounts for about 82.5% of the known inflow to the system. The known inflows to the system are the G-250 pump station inflows, rainfall, and seepage through the roadside L-7 levee culverts (L-7a). Rainfall accounts for 14.5% and seepage through the roadside culverts (L-7) accounts for 3%. Outflow pumping (G-251) accounts for 82.3% of the outflows, with evapotranspiration constituting 13.9% of the total outflows. The unknowns in the system are subsurface inflows, outflows and errors. The schematic model (**Figure 6**) and the following set of water balance equations represent the hydrologic system of the ENR for water budget analysis purposes.

$$INFLOW - OUTFLOW = \Delta S + \varepsilon_T \qquad (2)$$

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. ΔS is the change in storage in the system during the time interval of interest. Sum of all errors is represented by ε_T. Because all inflow and outflow can not be entirely quantified, the following equation is introduced to represent the remainders, errors and unknowns:

$$REMAINDERS = \varepsilon_T + UNKNOWNS \qquad (3)$$

Figure 6 shows the possible inflows and outflows to and from the ENR system. The seepage canal which encompasses the northern and western sides of the ENR was designed and is operated to capture seepage from the ENR to the neighboring farms.

When opened, and/or through leakage, G-258 and G-259 culverts release water into the seepage canal.

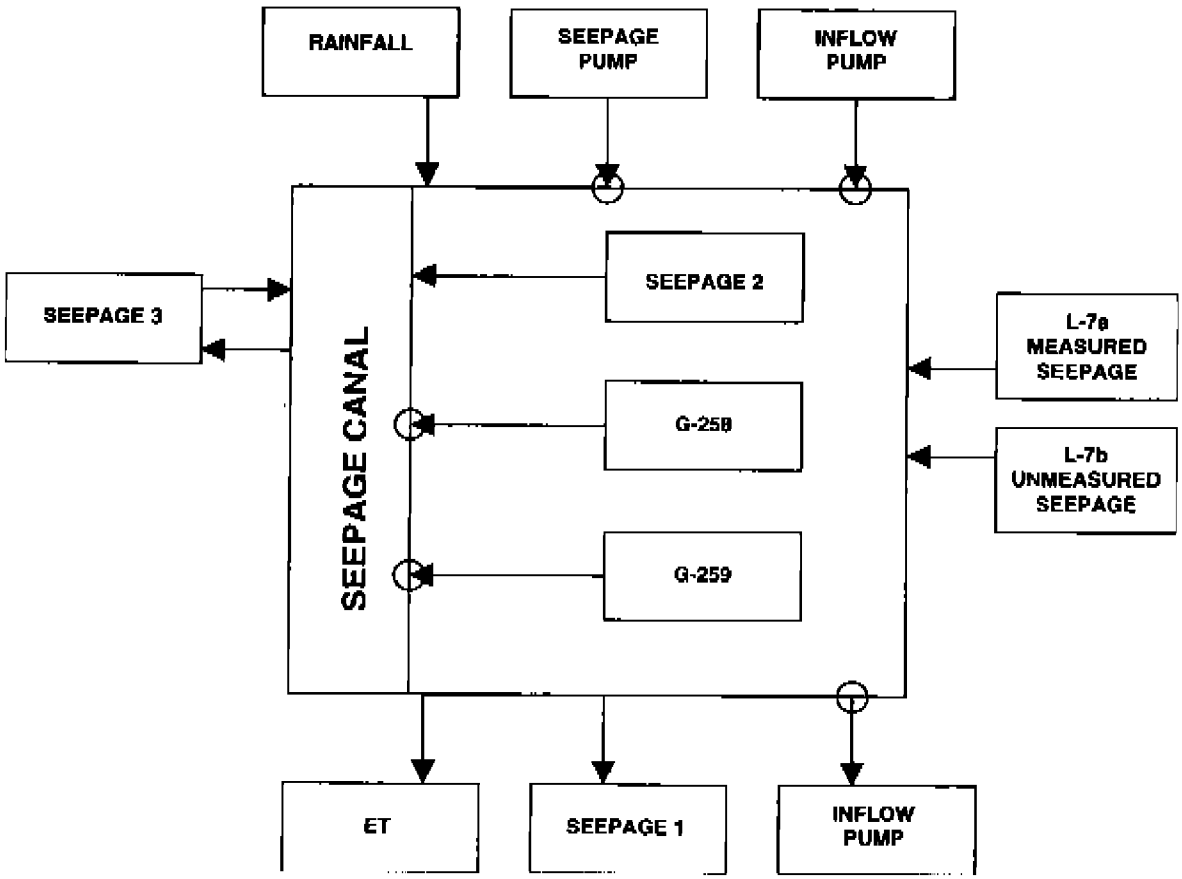

Figure 6. Schematic hydrologic model for the ENR

Seepage through the western and northern ENR levees is represented in the model by SEEPAGE 2, regardless of the magnitude. SEEPAGE 3 represents the two seepage possibilities into or out of the seepage canal from or to the surrounding farms, regardless of the magnitude. SEEPAGE 1 represents the possible seepage loss through the southern ENR levee into the Knight's Farm. The unmeasured seepage flow from WCA 1 into the ENR is represented by L-7b.

In computing the water balance for the ENR, the objectives are 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 (G-250S) are recirculations in the system as designed. This scenario is described or represented in the following equation:

$$S_P = \text{SEEPAGE 2} + G258 + G259 + \varepsilon_R \quad (4)$$

where S_P is seepage return pump flows (G-250S); SEEPAGE 2 is seepage from ENR to the seepage canal; G-258 and G-259 are flows through the respective culverts from ENR to the seepage canal; and ε_R is error in assumption and all other errors including measurement errors and calibration errors. The error term also includes the net effect of unknown variable SEEPAGE 3 which is the net subsurface flow of water from the seepage canal to the adjacent farms (west and north) or from the farms to the seepage canal. Also, SEEPAGE 1 (seepage through the southern levee of the ENR) and L-7b (subsurface seepage from WCA 1 that is not captured by the roadside culverts) are also unknowns. Equation 2 is expanded as follows:.

$$\Delta S = G250 + R + L7a + L7b - G251 - ET - \text{SEEPAGE 1} + \varepsilon_R + \varepsilon_I + \varepsilon_O \quad (5)$$

where ΔS is change in storage in the system; G-250 is inflow pump flows; R is rainfall; L-7a is seepage flows from WCA 1 through the roadside culverts; L-7b is unknown seepage subsurface flow from WCA 1 into the ENR; ET is evapotranspiration losses; SEEPAGE 1 is seepage loss through the southern levee of the ENR; ε_R represents errors in accounting for the recirculation water in the system; ε_I represents errors in inflow terms; and ε_O represents errors in outflow terms. The total error in the system is expressed as follows:.

$$\varepsilon_T = \varepsilon_R + \varepsilon_I + \varepsilon_O \quad (6)$$

Daily change in storage for the ENR was computed as a sum of storage changes in each of the five cells (Buffer Cell, Cell 1, Cell 2, Cell 3 and Cell 4). Change in storage volume in each cell was computed from the area of the cell and change in stage. Change in stage was computed as the difference between the beginning-of-day and end-of-day instantaneous stage readings averaged from two or three locations in each cell (**Table 5**).

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:

$$REMAINDERS = \varepsilon_T + \text{SEEPAGE 1} + L7b \quad (7)$$

where ε_T is the sum of all errors, SEEPAGE 1 is seepage from the ENR through the southern levee, and L-7b is seepage from WCA 1 into the ENR that is unaccounted for in the water budget.

Discussion

The total inflow through the inflow pump was 11,972 ha-m (97,055 ac-ft) and was almost equivalent to total outflow through the outflow pump which was 11,872 ha-m (96,244 ac-ft). Seepage inflow from the L-7 levee through the roadside culverts was a total of 431 ha-m (3,494 ac-ft). There was no measured flow into the seepage canal through culverts G-258 and G-259 as the culverts were closed. The seepage recirculation pump had a total flow of 3,385 ha-m (27,442 ac-ft). Total average areal rainfall for the study period was 136.5 cm (53.7 in) and the total average areal evapotranspiration was 130.1 cm (51.2 in).

For the study period, the mean daily remainders (errors and unknowns) was -1.5 hectare-meters per day (ha-m d^{-1}) or -12.2 acre-feet per day (ac-ft d^{-1}) with the total remainders being -547 ha-m (-4,434 ac-ft). The standard deviation of the remainders is 15.86

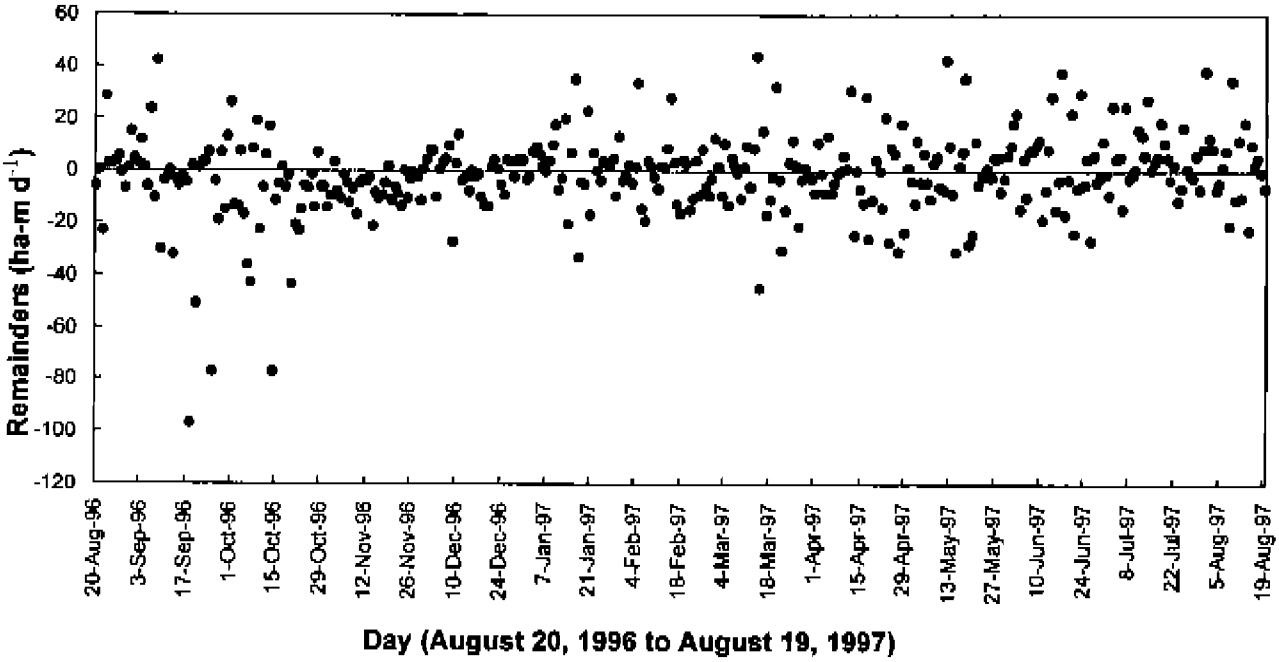

Figure 7. Distribution of daily remainders (error and unknowns) from the ENR water balance.

ha-m d^{-1} (128.6 ac-ft d^{-1}) which signifies high variation. **Figure 7** depicts the daily remainders distribution. The negative remainder indicates that there is an overall outflow from the system through unidentified directions. The remainder is 3.8% of the inflows or the outflows. Summary of the one-year water budget is shown in **Table 6**. Details of the water balance terms and calculations are shown in Appendix I.

The mean hydraulic loading rate for the two-year period, based on the G-250 pump inflow, was 2.12 centimeters per day (cm d^{-1}) or 0.84 inches per day (in d^{-1}). The mean hydraulic retention time was computed as the ratio of the mean-estimated volume of the ENR and the total inflow pumping. The mean-estimated volume was computed from the area-weighted (by cell) mean depth of 52 cm (20.5 in) and total area of 1544 ha (3,815 ac). The estimated mean hydraulic retention time was 24.5 days. Comparison of the current year ENR water budget components and the previous two years is shown in **Table 7**.

Table 6. Summary of the one-year water budget of the ENR.

INFLOWS	ha-m#	Percent of Total	OUTFLOWS	ha-m	Percent of Total
Inflow Pump	11,972	82.5%	Outflow Pump	11,872	82.3%
Rain	2,108	14.5%	ET	2,008	13.9%
L-7 Culvert (L7a)	431	3%	Remainders	547	3.8%
Total	14,511	100%	Total	14,427	100%
Change in Storage	83				

#ha-m = 8.1068 ac-ft

Table 7. Comparison of ENR current year water budget components (ha-m) with the previous two years.

	8/19/94 to 8/19/96 (2 years)	8/20/96 to 8/19/97 (1 year)
INFLOWS		
Inflow Pump	39,000	11,972
Rain	5,068	2,108
L-7 Culverts (L7a)	1,198	431
Total	45,266	14,511
OUTFLOWS		
Outflow pump	38,802	11,872
ET	4,050	2,008
Remainders	2,781	547
Total	45,633	14,427
Change of Storage	-363	83
Seepage recirculation		
Seepage pump	7,143	3,385
Loading rate (cm d^{-1})	3.45	2.12
Average depth (cm)	57.5	52
Retention time (days)	17	24.5

SUMMARY

The ENR has been in full operation for the last three years. This water budget study covers the one-year period from August 20, 1996 to August 19, 1997. For the period of analysis, the total inflow through the inflow pump was 11,972 hectare-meters (ha-m) or 97,055 acre-feet (ac-ft) and the total outflow through the outflow pump was 11,872 ha-m (96,244 ac-ft). Seepage inflow from the L-7 levee through the road-side culverts was a total of 431 ha-m (3,494 ac-ft). The seepage recirculation pump had a total flow of 3,385 ha-m (27,442 ac-ft) and there was no measured flow through culverts G-258 and G-259 as the gates were closed. Compared to the previous two years flows, this period had 39% lower inflow and outflow pumping. Seepage recycle pumping was only lower by 5% while L-7 levee estimate of seepage through road side culverts was down by 28% compared to average of the previous two years. Total areal average rainfall for the study period was 136.5 centimeters (cm) or 53.7 inches (in) and the total areal average evapotranspiration was 130.1 cm (51.2 in) which is close to the average ET of the previous two years the project was in operation. Compared to the average areal rainfall for the previous two years, rainfall was lower by 28 cm (11 in). The remainders in the water balance, the sum of the errors and unknowns, was 3.8% of the inflows or the outflows of the system.

The mean hydraulic loading rate for the one-year period, based on the G-250 pump inflow, was 2.12 centimeters per day (cm d^{-1}) or 0.84 inches per day (in d^{-1}). The loading rate for this study period was significantly lower than the previous two years. The mean hydraulic retention time was computed as the ratio of the mean-estimated volume of the ENR and the total inflow pumping. The mean-estimated volume was computed from the area-weighted (by cell) mean depth of 52 cm (20.5 in) and total area of 1544 ha (3,815 ac). The estimated mean hydraulic retention time was 24.5 days. The ENR is a new system with a relatively short period of hydrologic record. Longer periods of record are more favorable to characterize the operation and water balance of hydrologic systems.

In the ENR, 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. Groundwater modeling efforts will help in identifying and quantifying subsurface sources and sinks in the system. Improvement in stage-volume relationships will also increase the accuracy of water balance analysis.

REFERENCES

Abtew, W. 1996. Evapotranspiration Measurements and Modeling for Three Wetland Systems in South Florida. Water Resources Bulletin. Vol. 32(3):465-473.

Abtew, W. and N. Khanal. 1994. Water Budget Analysis for the Everglades Agricultural Drainage Basin. Water Resources Bulletin Vol. 33(3):429-439.

Abtew, W. and J. Obeysekera. 1995. Lysimeter Study of Evapotranspiration of Cattails and Comparison of Three Estimation Methods. Transactions of the ASAE Vol. 38(1):121-129.

Abtew, W., J. Obeysekera and G. Shih. 1995. Spatial Variation of Daily Rainfall and Network Design. Transaction of ASAE. Vol. 38(3):843-845.

Davis, J.H. 1943. Vegetation of the Everglades and Conservation from the Point of View of the Ecologist. Soil Science Society of Florida Proceedings V-A:105-115.

Guardo, M. and T. Kosier. 1993. Preliminary Operation Scheme for the ENR Project. South Florida Water Management District, West Palm Beach, FL.

Guardo, M. 1996. Hydrologic Balance of a Subtropical Wetland Constructed for Nutrient Removal. Presented at AWRA 32nd Annual Conference and Symposium on GIS and Water Resources. September 22-26, 1996.

Jammal and Associates, Inc. 1991. Geotechnical Services SFWMD Everglades Nutrient Removal Project. Draft Report Submitted to the South Florida Water Management District. West Palm Beach, FL.

SFWMD. 1996. Water Budget Analysis for the Everglades Nutrient Removal Project (August 19, 1994 to August 19, 1996). Technical Memorandum WRE # 347.

Whalen, B.M. and P.J. Whalen. 1994. Nonpoint Source Regulatory Program for the Everglades Agricultural Area. ASAE Paper FL94-101.

APPENDIX

Appendix 1. Everglades Nutrient Removal Project water balance terms with calculated remainders.
ha-m = 8.1068 ac-ft

Date	Change in Storage (ha-m)	Inflow pump G-250 (ha-m)	Seepage pump G-250_S (ha-m)	Outflow pump G-251 (ha-m)	Culvert G-258 (ha-m)	Culvert G-259 (ha-m)	Seepage L-7a (ha-m)	Rain (ha-m)	ET (ha-m)	Remainders (ha-m)
8/20/96	57.234	75.011	6.599	31.868	0.000	0.000	0.523	23.727	4.167	-5.992
8/21/96	98.959	113.547	12.835	16.630	0.000	0.000	0.530	6.863	5.338	-0.013
8/22/96	78.747	124.232	5.383	16.422	0.000	0.000	0.528	0.000	6.568	-23.023
8/23/96	76.269	64.101	13.919	16.483	0.000	0.000	0.576	4.079	4.100	28.096
8/24/96	-0.338	0.000	14.103	0.000	0.000	0.000	0.515	2.275	5.921	2.793
8/25/96	0.937	0.000	15.302	3.898	0.000	0.000	0.489	5.843	4.258	2.761
8/26/96	-15.401	0.000	15.461	16.476	0.000	0.000	0.592	1.216	4.161	3.428
8/27/96	10.738	0.000	15.701	16.351	0.000	0.000	0.709	24.354	3.279	5.305
8/28/96	-16.514	0.000	11.025	23.315	0.000	0.000	0.753	13.059	6.051	-0.960
8/29/96	-45.118	0.000	13.178	32.637	0.000	0.000	0.668	0.078	6.053	-7.174
8/30/96	-14.551	0.000	15.762	32.054	0.000	0.000	0.770	22.511	6.950	1.172
8/31/96	-22.533	0.000	13.215	31.379	0.000	0.000	0.722	0.000	6.551	14.675
9/1/96	-17.019	0.000	13.479	13.968	0.000	0.000	0.710	0.078	8.458	4.619
9/2/96	-18.824	0.000	13.330	15.079	0.000	0.000	0.713	0.000	7.509	3.051
9/3/96	13.907	0.000	13.283	16.471	0.000	0.000	0.686	24.864	6.972	11.800
9/4/96	-19.254	0.000	13.584	14.426	0.000	0.000	0.693	0.745	7.684	1.418
9/5/96	-27.431	5.285	8.620	19.980	0.000	0.000	0.687	0.000	7.290	-6.133
9/6/96	27.091	0.000	9.616	38.670	0.000	0.000	0.717	48.277	6.782	23.549
9/7/96	-36.586	0.000	12.833	52.536	0.000	0.000	0.798	31.060	5.305	-10.603
9/8/96	124.071	39.062	13.719	51.102	0.000	0.000	0.815	97.495	4.443	42.244
9/9/96	-18.785	63.128	16.285	59.847	0.000	0.000	1.167	9.177	2.121	-30.289
9/10/96	-36.317	10.401	13.518	60.510	0.000	0.000	1.694	18.236	2.113	-4.025
9/11/96	-53.796	0.000	8.167	49.663	0.000	0.000	2.173	1.529	5.125	-2.710
9/12/96	-49.532	0.000	7.624	46.280	0.000	0.000	2.544	0.000	6.107	0.311
9/13/96	19.765	88.686	24.161	31.531	0.000	0.000	2.351	0.118	7.656	32.203
9/14/96	70.523	110.697	8.642	31.680	0.000	0.000	1.988	0.000	6.983	-3.499
9/15/96	91.743	139.494	9.346	37.413	0.000	0.000	1.759	0.000	6.653	-5.444
9/16/96	92.792	152.741	10.589	54.273	0.000	0.000	1.598	0.745	5.681	-2.338
9/17/96	73.138	148.099	6.577	65.173	0.000	0.000	1.433	0.000	6.557	-4.664
9/18/96	-34.665	133.243	10.443	67.108	0.000	0.000	1.335	1.137	6.675	-96.597
9/19/96	-24.941	46.776	9.457	67.387	0.000	0.000	1.334	0.000	7.618	1.954
9/20/96	-61.118	59.602	8.869	66.900	0.000	0.000	1.368	0.000	4.635	-50.553
9/21/96	-33.649	0.000	18.955	66.176	0.000	0.000	1.476	36.590	6.426	0.887
9/22/96	-0.176	58.777	9.075	65.195	0.000	0.000	1.594	6.236	4.828	3.240
9/23/96	80.302	143.057	10.154	61.075	0.000	0.000	1.548	0.000	6.313	3.085
9/24/96	93.600	151.481	8.847	59.440	0.000	0.000	1.381	0.000	6.490	6.668
9/25/96	-31.019	122.737	11.155	72.320	0.000	0.000	1.264	0.000	5.696	-77.004
9/26/96	-95.191	0.000	7.712	86.726	0.000	0.000	1.335	0.000	5.614	-4.186
9/27/96	-101.193	0.000	7.595	85.818	0.000	0.000	1.478	5.373	3.343	-18.883
9/28/96	-63.299	0.000	9.965	66.176	0.000	0.000	1.558	0.000	5.332	6.651
9/29/96	-66.108	0.000	7.069	48.053	0.000	0.000	1.594	0.275	5.011	-14.913
9/30/96	-24.802	0.000	9.865	46.600	0.000	0.000	1.640	10.393	3.129	12.894
10/1/96	34.476	42.634	9.892	32.027	0.000	0.000	1.684	0.667	4.342	25.860
10/2/96	27.418	73.932	7.519	31.110	0.000	0.000	1.603	0.000	3.770	-13.237
10/3/96	2.172	53.108	8.424	35.436	0.000	0.000	1.527	0.000	3.240	-13.787

Date	Change in Storage (ha-m)	Inflow pump G-250 (ha-m)	Seepage pump G-250_S (ha-m)	Outflow pump G-251 (ha-m)	Culvert G-258 (ha-m)	Culvert G-259 (ha-m)	Seepage L-7a (ha-m)	Rain (ha-m)	ET (ha-m)	Remainders (ha-m)
10/4/96	51.397	84.005	10.792	38.736	0.000	0.000	1.533	0.078	2.740	7.257
10/5/96	21.972	85.459	7.922	44.657	0.000	0.000	1.482	0.627	3.906	-17.033
10/6/96	-1.799	77.595	8.128	52.758	0.000	0.000	1.467	9.216	1.315	-36.004
10/7/96	-12.189	80.401	9.824	55.215	0.000	0.000	1.766	5.608	2.212	-42.537
10/8/96	13.959	10.641	12.725	59.093	0.000	0.000	2.205	53.061	0.932	8.077
10/9/96	15.904	55.504	8.204	56.404	0.000	0.000	2.536	0.314	5.055	19.009
10/10/96	73.067	153.037	7.027	52.878	0.000	0.000	2.157	0.000	6.573	-22.676
10/11/96	53.185	129.783	11.032	66.587	0.000	0.000	1.904	0.000	5.144	-6.771
10/12/96	56.901	126.860	9.645	78.941	0.000	0.000	1.748	4.196	2.888	5.926
10/13/96	108.926	140.984	12.263	82.092	0.000	0.000	1.795	33.296	1.818	16.761
10/14/96	-35.398	121.746	8.693	81.847	0.000	0.000	2.073	3.647	3.861	-77.156
10/15/96	-94.408	0.000	10.511	82.606	0.000	0.000	2.254	1.059	3.627	-11.488
10/16/96	-47.111	33.941	9.547	80.568	0.000	0.000	2.566	5.177	3.202	-5.025
10/17/96	13.780	50.302	8.735	79.325	0.000	0.000	2.743	40.394	1.833	1.499
10/18/96	-30.639	50.314	10.288	78.630	0.000	0.000	3.003	3.020	1.660	-6.686
10/19/96	-2.201	78.380	9.567	77.732	0.000	0.000	2.956	1.059	4.858	-2.006
10/20/96	-29.740	91.120	7.839	74.625	0.000	0.000	2.632	0.000	5.555	-43.312
10/21/96	-15.764	76.090	6.812	68.187	0.000	0.000	2.203	0.000	4.917	-20.953
10/22/96	-18.816	76.355	8.911	69.374	0.000	0.000	1.947	0.000	4.501	-23.243
10/23/96	-21.343	58.472	8.387	62.102	0.000	0.000	1.826	0.000	4.617	-14.922
10/24/96	32.971	104.543	10.655	62.090	0.000	0.000	1.757	0.000	5.619	-5.620
10/25/96	44.177	117.609	0.000	64.439	0.000	0.000	1.634	0.000	4.232	-6.395
10/26/96	64.753	105.845	8.622	37.486	0.000	0.000	1.548	0.000	3.571	-1.583
10/27/96	37.967	102.507	8.842	47.092	0.000	0.000	1.487	0.000	4.796	-14.139
10/28/96	47.979	126.160	10.063	81.740	0.000	0.000	1.419	0.000	4.634	6.774
10/29/96	16.178	108.543	8.216	83.680	0.000	0.000	1.358	0.000	4.114	-5.929
10/30/96	32.251	125.781	11.977	84.375	0.000	0.000	1.328	0.000	4.325	-6.158
10/31/96	-58.033	44.090	9.530	84.854	0.000	0.000	1.358	0.000	4.673	-13.954
11/1/96	-93.110	0.000	9.995	80.749	0.000	0.000	1.507	0.118	4.244	-9.742
11/2/96	45.392	127.295	11.448	82.770	0.000	0.000	1.486	0.000	4.007	3.388
11/3/96	33.291	127.058	8.769	82.574	0.000	0.000	1.382	0.078	4.656	-7.997
11/4/96	30.074	126.573	7.724	83.325	0.000	0.000	1.355	0.000	3.802	-10.727
11/5/96	90.007	77.319	13.068	81.639	0.000	0.000	1.485	95.730	1.090	-1.798
11/6/96	-86.004	0.431	12.427	83.873	0.000	0.000	1.811	3.294	2.776	-4.891
11/7/96	-92.797	0.000	7.702	83.156	0.000	0.000	2.023	4.236	3.686	-12.214
11/8/96	65.749	23.554	7.741	81.062	0.000	0.000	2.258	0.863	4.290	-7.072
11/9/96	7.799	108.521	9.371	79.222	0.000	0.000	2.129	0.078	7.097	-16.610
11/10/96	44.191	126.945	9.302	75.217	0.000	0.000	1.951	0.000	4.564	-4.924
11/11/96	41.168	128.411	8.634	80.272	0.000	0.000	1.784	0.000	4.807	-3.948
11/12/96	40.364	128.651	7.570	81.786	0.000	0.000	1.681	0.000	3.726	-4.456
11/13/96	41.470	128.643	7.996	83.355	0.000	0.000	1.627	0.039	3.175	-2.309
11/14/96	-104.204	0.046	5.593	82.322	0.000	0.000	1.782	0.000	2.514	-21.196
11/15/96	-73.737	0.000	4.964	63.776	0.000	0.000	1.991	0.667	4.225	-8.394
11/16/96	-62.197	0.000	7.832	49.950	0.000	0.000	2.037	0.000	3.775	-10.509
11/17/96	-61.261	0.000	7.428	49.353	0.000	0.000	2.079	0.000	4.837	-9.150
11/18/96	-18.247	33.021	6.508	44.082	0.000	0.000	2.093	0.000	4.546	-4.733
11/19/96	59.559	106.346	6.445	47.552	0.000	0.000	2.011	0.000	3.400	2.154
11/20/96	27.598	88.424	12.879	47.393	0.000	0.000	1.887	0.000	4.049	-11.271
11/21/96	-36.774	21.213	6.985	49.059	0.000	0.000	1.829	0.000	4.241	-6.516
11/22/97	-54.976	0.000	7.174	44.139	0.000	0.000	1.822	0.000	3.873	-8.786
11/23/96	-65.219	0.000	9.190	48.687	0.000	0.000	1.870	0.000	4.711	-13.691
11/24/96	-40.499	0.000	8.436	39.867	0.000	0.000	1.928	0.000	2.509	-0.051

Date	Change in Storage (ha-m)	Inflow pump G-250 (ha-m)	Seepage pump G-250_S (ha-m)	Outflow pump G-251 (ha-m)	Culvert G-258 (ha-m)	Culvert G-259 (ha-m)	Seepage L-7a (ha-m)	Rain (ha-m)	ET (ha-m)	Remainders (ha-m)
11/25/96	-44.409	0.000	4.769	32.150	0.000	0.000	1.978	0.000	3.659	-10.578
11/26/96	-25.741	0.056	6.562	21.952	0.000	0.000	1.938	1.020	3.201	-3.602
11/27/96	-26.001	0.000	7.815	22.774	0.000	0.000	1.896	0.039	4.472	-0.690
11/28/96	-20.309	0.000	6.692	16.190	0.000	0.000	1.909	0.000	3.505	-2.523
11/29/96	-29.165	0.000	5.581	16.156	0.000	0.000	1.923	0.000	3.685	-11.247
11/30/96	-12.029	0.000	7.670	11.363	0.000	0.000	1.940	0.275	3.648	0.767
12/1/96	1.894	0.000	8.106	0.000	0.000	0.000	1.898	0.000	3.980	3.976
12/2/96	8.202	0.000	8.260	0.000	0.000	0.000	1.793	0.000	2.000	8.409
12/3/96	22.814	17.178	5.774	0.000	0.000	0.000	1.728	0.000	3.650	7.558
12/4/96	2.386	26.606	8.483	12.331	0.000	0.000	1.669	0.000	3.465	-10.093
12/5/96	10.316	26.510	8.541	16.234	0.000	0.000	1.705	0.902	3.065	0.498
12/6/96	12.476	26.547	7.507	15.064	0.000	0.000	1.640	0.824	4.846	3.375
12/7/96	20.399	29.953	6.552	16.388	0.000	0.000	1.625	4.785	4.028	4.452
12/8/96	59.386	68.731	9.063	15.475	0.000	0.000	1.481	0.275	5.167	9.541
12/9/96	2.715	56.027	6.697	21.171	0.000	0.000	1.343	0.000	6.226	-27.258
12/10/96	3.749	26.554	6.523	29.407	0.000	0.000	1.366	0.000	4.901	2.639
12/11/96	48.088	69.810	7.264	32.644	0.000	0.000	1.364	0.000	4.326	13.884
12/12/96	67.150	104.431	9.119	30.312	0.000	0.000	1.274	0.000	4.324	-3.919
12/13/96	49.972	104.213	9.530	48.682	0.000	0.000	1.194	0.000	4.215	-2.538
12/14/96	28.382	104.110	7.778	63.167	0.000	0.000	1.121	0.039	5.890	-7.831
12/15/96	33.021	103.467	7.714	67.028	0.000	0.000	1.074	0.000	4.760	0.268
12/16/96	32.272	104.301	7.487	66.135	0.000	0.000	1.032	0.000	4.275	-2.651
12/17/96	31.293	104.105	9.640	68.870	0.000	0.000	1.005	0.000	3.804	-1.143
12/18/96	-11.036	39.984	9.562	69.288	0.000	0.000	1.006	0.000	2.507	-10.231
12/19/96	-78.180	0.000	7.790	63.321	0.000	0.000	1.064	0.000	2.886	-13.037
12/20/96	-57.124	33.148	7.661	75.559	0.000	0.000	1.056	0.000	2.109	-13.660
12/21/96	-1.037	52.974	8.838	54.963	0.000	0.000	1.065	0.000	1.639	1.526
12/22/96	2.383	53.123	9.437	50.534	0.000	0.000	1.116	0.000	5.625	4.303
12/23/96	-1.549	53.123	8.138	50.605	0.000	0.000	1.109	0.000	5.724	0.548
12/24/96	-21.520	38.731	7.878	50.566	0.000	0.000	1.088	0.471	5.815	-5.429
12/25/96	-39.769	24.372	8.057	50.202	0.000	0.000	1.077	0.000	5.771	-9.245
12/26/96	-40.019	0.000	9.745	39.940	0.000	0.000	1.119	0.000	5.221	4.023
12/27/96	28.994	0.000	7.766	33.921	0.000	0.000	1.154	2.824	2.612	3.561
12/28/96	-38.173	0.000	8.639	31.629	0.000	0.000	1.180	0.078	5.144	-2.658
12/29/96	-16.200	0.000	8.696	19.875	0.000	0.000	1.204	1.882	3.378	3.967
12/30/96	-16.935	0.000	9.285	16.895	0.000	0.000	1.226	0.157	5.376	3.953
12/31/96	-17.011	0.000	8.020	16.885	0.000	0.000	1.213	0.078	5.618	4.201
1/1/97	-23.952	0.000	7.144	16.809	0.000	0.000	1.218	0.196	5.038	-3.519
1/2/97	-19.345	0.000	7.267	13.990	0.000	0.000	1.187	0.000	4.664	1.878
1/3/97	3.266	0.000	9.718	0.000	0.000	0.000	1.163	0.078	5.260	7.285
1/4/97	4.237	0.000	10.093	0.000	0.000	0.000	1.148	0.078	5.918	8.929
1/5/97	1.292	0.000	8.336	0.000	0.000	0.000	1.117	0.000	6.401	6.576
1/6/97	-3.071	0.000	7.692	0.000	0.000	0.000	1.090	0.078	6.049	1.810
1/7/97	-5.122	0.000	8.512	0.000	0.000	0.000	1.064	0.078	5.913	-0.351
1/8/97	-0.331	0.000	9.457	0.000	0.000	0.000	1.033	0.078	5.221	3.779
1/9/97	18.289	0.000	9.606	0.000	0.000	0.000	1.072	13.177	5.893	9.933
1/10/97	24.381	25.947	8.669	16.860	0.000	0.000	1.054	2.784	6.013	17.469
1/11/97	3.575	26.606	7.299	11.573	0.000	0.000	1.038	0.000	5.078	-7.418
1/12/97	15.421	26.606	7.321	6.014	0.000	0.000	0.967	0.000	3.348	-2.790
1/13/97	54.700	35.656	9.217	17.540	0.000	0.000	0.979	17.569	1.750	19.786
1/14/97	-5.307	42.490	10.810	33.251	0.000	0.000	1.413	6.275	2.050	-20.184
1/15/97	2.425	0.000	9.217	33.104	0.000	0.000	1.524	23.374	1.160	6.941

Date	Change in Storage (ha-m)	Inflow pump G-250 (ha-m)	Seepage pump G-250_S (ha-m)	Outflow pump G-251 (ha-m)	Culvert G-258 (ha-m)	Culvert G-259 (ha-m)	Seepage L-7a (ha-m)	Rain (ha-m)	ET (ha-m)	Remainders (ha-m)
1/16/97	99.827	92.652	8.025	24.147	0.000	0.000	1.414	0.275	5.552	35.185
1/17/97	-5.232	64.008	9.620	32.438	0.000	0.000	1.242	0.000	5.122	-32.922
1/18/97	-36.176	17.308	10.685	45.061	0.000	0.000	1.193	0.000	5.449	-4.167
1/19/97	-43.458	0.000	8.292	34.836	0.000	0.000	1.222	0.000	4.839	-5.005
1/20/97	17.784	31.374	9.755	32.321	0.000	0.000	1.253	0.000	5.327	22.805
1/21/97	1.055	47.875	7.132	25.189	0.000	0.000	1.195	0.000	5.922	-16.904
1/22/97	11.839	40.872	9.244	31.200	0.000	0.000	1.220	0.000	5.954	6.901
1/23/97	-11.957	26.591	7.240	33.517	0.000	0.000	1.190	0.000	6.162	-0.059
1/24/97	-20.337	22.754	6.528	33.380	0.000	0.000	1.255	0.000	6.917	-4.049
1/25/97	-0.544	26.576	7.480	26.273	0.000	0.000	1.201	0.000	5.761	3.713
1/26/97	-4.372	26.596	8.502	29.493	0.000	0.000	1.157	0.039	5.600	2.929
1/27/97	1.064	26.598	8.681	23.036	0.000	0.000	1.161	0.000	5.347	1.688
1/28/97	2.982	26.598	6.887	23.706	0.000	0.000	1.148	0.941	6.745	4.746
1/29/97	-12.791	26.593	8.231	26.804	0.000	0.000	1.116	0.000	3.980	-9.716
1/30/97	14.072	26.591	8.862	21.558	0.000	0.000	1.060	0.627	5.720	13.072
1/31/97	-6.057	26.598	8.285	28.071	0.000	0.000	1.038	0.510	2.104	-4.028
2/1/97	1.174	26.598	7.105	19.336	0.000	0.000	1.047	0.000	7.492	-1.991
2/2/97	-1.212	26.598	7.061	24.303	0.000	0.000	1.036	0.000	6.773	2.230
2/3/97	-12.779	14.803	9.219	17.049	0.000	0.000	1.007	0.000	6.593	-4.947
2/4/97	-23.095	0.000	8.652	21.903	0.000	0.000	1.018	0.392	4.030	1.428
2/5/97	52.076	38.638	5.500	16.973	0.000	0.000	1.092	0.078	4.574	33.815
2/6/97	87.143	124.188	6.523	17.751	0.000	0.000	1.031	0.000	5.779	-14.546
2/7/97	-35.618	24.499	8.771	36.334	0.000	0.000	1.004	0.627	6.152	-19.262
2/8/97	-36.266	0.000	8.779	34.058	0.000	0.000	1.004	0.000	6.920	3.708
2/9/97	-21.629	12.202	7.091	33.936	0.000	0.000	1.003	0.078	2.860	1.884
2/10/97	-15.745	14.453	7.245	23.753	0.000	0.000	0.984	0.078	5.136	-2.371
2/11/97	-38.365	0.000	8.077	25.353	0.000	0.000	0.973	0.000	6.790	-7.195
2/12/97	-21.010	0.000	8.842	16.978	0.000	0.000	1.019	0.000	6.837	1.786
2/13/97	-20.589	0.000	8.894	16.858	0.000	0.000	1.070	0.000	6.435	1.634
2/14/97	-5.354	0.000	7.781	8.989	0.000	0.000	1.088	0.078	6.344	8.813
2/15/97	53.340	24.741	5.686	4.791	0.000	0.000	1.019	7.647	2.966	27.690
2/16/97	94.541	109.322	7.007	16.965	0.000	0.000	0.978	1.569	3.460	3.097
2/17/97	58.835	103.146	9.153	26.212	0.000	0.000	0.932	0.118	6.402	-12.747
2/18/97	-1.981	61.904	7.274	45.629	0.000	0.000	0.952	0.118	3.158	-16.168
2/19/97	45.365	67.397	8.069	54.574	0.000	0.000	1.026	30.982	3.633	4.167
2/20/97	14.597	70.333	9.045	54.968	0.000	0.000	1.213	0.667	5.364	2.716
2/21/97	47.013	26.948	8.698	55.239	0.000	0.000	1.270	0.000	5.082	-14.910
2/22/97	-65.311	0.000	7.382	50.370	0.000	0.000	1.216	0.157	5.956	-10.358
2/23/97	-34.517	1.192	7.176	36.490	0.000	0.000	1.194	0.000	4.674	4.261
2/24/97	-30.002	15.267	9.214	33.569	0.000	0.000	1.247	0.745	4.554	-9.138
2/25/97	-19.205	0.000	8.189	23.829	0.000	0.000	1.284	0.078	4.962	8.224
2/26/97	-27.380	0.000	6.114	16.814	0.000	0.000	1.321	0.000	5.963	-5.924
2/27/97	-30.352	0.000	6.760	16.755	0.000	0.000	1.345	0.000	5.406	9.536
2/28/97	-24.200	0.000	8.527	16.709	0.000	0.000	1.323	0.000	5.718	-3.096
3/1/97	7.776	0.000	8.730	0.528	0.000	0.000	1.289	0.000	5.815	12.830
3/2/97	-2.621	0.000	7.436	0.000	0.000	0.000	1.250	0.000	5.729	1.858
3/3/97	-13.336	0.000	6.910	0.034	0.000	0.000	1.197	0.392	5.423	-9.468
3/4/97	6.084	0.000	8.686	0.000	0.000	0.000	1.144	0.196	5.610	10.354
3/5/97	-17.649	0.000	7.010	0.000	0.000	0.000	1.131	0.000	5.560	-13.220
3/6/97	-0.698	0.000	9.231	0.000	0.000	0.000	1.042	0.000	6.715	4.975
3/7/97	-1.536	0.000	9.006	0.000	0.000	0.000	1.028	0.118	5.252	2.570
3/8/97	-6.197	0.000	6.949	0.000	0.000	0.000	1.036	0.000	6.282	-0.951

Date	Change in Storage (ha-m)	Inflow pump G-250 (ha-m)	Seepage pump G-250_S (ha-m)	Outflow pump G-251 (ha-m)	Culvert G-258 (ha-m)	Culvert G-259 (ha-m)	Seepage L-7a (ha-m)	Rain (ha-m)	ET (ha-m)	Remainders (ha-m)
3/9/97	-14.059	0.000	6.430	0.000	0.000	0.000	1.018	0.000	4.559	-10.518
3/10/97	-3.775	0.000	9.038	0.000	0.000	0.000	0.999	0.000	6.100	1.326
3/11/97	4.563	0.000	8.950	0.000	0.000	0.000	0.972	0.000	5.829	9.420
3/12/97	-11.623	0.000	6.080	0.000	0.000	0.000	0.934	0.000	6.367	-6.190
3/13/97	15.265	0.000	9.562	0.000	0.000	0.000	0.968	9.491	3.705	8.511
3/14/97	136.583	44.758	8.759	0.000	0.000	0.000	1.232	47.610	1.108	44.091
3/15/97	-10.803	48.247	6.523	10.859	0.000	0.000	1.427	0.431	5.533	-44.516
3/16/97	30.819	37.285	7.311	16.848	0.000	0.000	1.260	0.000	6.127	15.249
3/17/97	-7.602	28.874	5.649	16.926	0.000	0.000	1.171	0.941	4.938	-16.724
3/18/97	-36.793	0.000	5.946	21.688	0.000	0.000	1.183	1.333	6.619	-11.002
3/19/97	-23.253	0.000	8.586	16.880	0.000	0.000	1.158	0.000	5.003	-2.528
3/20/97	58.633	47.302	8.566	16.836	0.000	0.000	1.119	0.157	5.589	32.480
3/21/97	137.185	122.292	6.056	16.853	0.000	0.000	1.021	38.316	4.103	-3.488
3/22/97	26.190	96.878	7.218	35.355	0.000	0.000	0.903	0.157	6.067	-30.326
3/23/97	-43.258	26.911	7.942	49.563	0.000	0.000	0.910	0.000	6.366	-15.150
3/24/97	-43.009	0.000	7.164	46.385	0.000	0.000	0.932	4.039	4.876	3.281
3/25/97	3.901	17.176	7.252	37.122	0.000	0.000	1.003	14.903	3.957	11.898
3/26/97	39.924	76.230	7.502	33.703	0.000	0.000	0.974	0.549	6.607	2.481
3/27/97	-20.621	40.963	8.314	33.887	0.000	0.000	0.971	0.000	7.271	-21.397
3/28/97	-47.331	0.000	9.914	37.425	0.000	0.000	0.963	0.000	7.304	-3.565
3/29/97	-38.994	0.000	8.162	33.202	0.000	0.000	0.948	0.000	7.679	0.939
3/30/97	-28.688	0.000	6.883	20.621	0.000	0.000	0.944	0.000	7.941	-1.070
3/31/97	-25.113	0.000	7.932	17.105	0.000	0.000	0.870	0.588	6.277	-3.189
4/1/97	-32.520	0.000	8.270	17.022	0.000	0.000	0.861	0.000	8.007	-8.352
4/2/97	-4.532	0.000	8.346	9.337	0.000	0.000	0.866	0.000	6.879	10.818
4/3/97	-6.025	0.000	6.440	0.000	0.000	0.000	0.837	0.000	5.510	-1.352
4/4/97	-1.677	12.605	5.870	0.000	0.000	0.000	0.804	0.000	6.738	-8.348
4/5/97	14.111	7.032	8.343	0.000	0.000	0.000	0.802	0.000	7.486	13.763
4/6/97	-4.676	9.782	8.451	0.000	0.000	0.000	0.760	0.000	6.913	-8.305
4/7/97	-8.851	0.998	5.916	0.000	0.000	0.000	0.695	0.000	5.986	-4.558
4/8/97	6.149	0.000	7.548	6.976	0.000	0.000	0.608	19.609	5.899	-1.193
4/9/97	-15.925	0.000	9.461	17.078	0.000	0.000	0.588	4.667	4.128	0.026
4/10/97	1.495	0.000	8.439	5.669	0.000	0.000	0.588	3.647	3.173	6.102
4/11/97	-2.983	0.000	7.296	0.000	0.000	0.000	0.666	0.118	4.953	1.186
4/12/97	55.057	14.450	6.601	0.000	0.000	0.000	0.715	12.824	3.916	30.984
4/13/97	21.323	37.926	7.132	4.365	0.000	0.000	0.911	16.942	5.827	-24.264
4/14/97	139.177	74.363	10.937	27.562	0.000	0.000	1.062	93.691	2.442	0.065
4/15/97	18.331	70.977	9.212	45.281	0.000	0.000	1.614	0.549	2.328	-7.200
4/16/97	-41.750	12.395	9.809	48.783	0.000	0.000	1.912	6.942	1.906	-12.310
4/17/97	17.312	31.866	7.692	37.904	0.000	0.000	1.736	0.196	6.886	28.304
4/18/97	-17.069	47.430	6.073	31.905	0.000	0.000	1.226	0.000	8.173	-25.647
4/19/97	-52.849	0.000	8.329	34.780	0.000	0.000	1.104	0.000	8.250	-10.923
4/20/97	-27.452	0.000	9.657	24.954	0.000	0.000	1.007	0.000	7.693	4.188
4/21/97	-22.261	0.406	6.892	17.149	0.000	0.000	0.942	0.000	6.573	0.113
4/22/97	-38.374	0.000	4.906	16.733	0.000	0.000	0.880	0.000	8.395	-14.126
4/23/97	33.259	4.977	6.716	7.984	0.000	0.000	0.827	20.550	5.679	20.568
4/24/97	-35.089	16.851	3.861	17.139	0.000	0.000	0.697	0.392	8.673	-27.217
4/25/97	-2.180	0.000	7.428	7.861	0.000	0.000	0.678	0.118	4.069	8.954
4/26/97	44.667	31.029	6.222	8.801	0.000	0.000	0.614	17.256	2.361	6.930
4/27/97	2.783	52.577	6.232	14.590	0.000	0.000	0.693	0.000	5.355	-30.542
4/28/97	64.381	49.223	8.020	8.977	0.000	0.000	0.630	10.040	4.393	17.858
4/29/97	-20.586	27.863	8.656	17.315	0.000	0.000	0.491	0.000	8.158	-23.467

Date	Change in Storage (ha-m)	Inflow pump G-250 (ha-m)	Seepage pump G-250_S (ha-m)	Outflow pump G-251 (ha-m)	Culvert G-258 (ha-m)	Culvert G-259 (ha-m)	Seepage L-7a (ha-m)	Rain (ha-m)	ET (ha-m)	Remainders (ha-m)
4/30/97	-28.254	0.000	8.918	21.937	0.000	0.000	0.458	0.000	8.483	1.708
5/1/97	-26.902	0.000	6.577	16.430	0.000	0.000	0.405	0.000	7.079	-3.798
5/2/97	-36.408	0.000	7.250	17.653	0.000	0.000	0.350	0.000	6.964	-12.141
5/3/97	4.772	0.000	8.735	6.234	0.000	0.000	0.273	6.040	7.140	11.833
5/4/97	-20.967	0.000	8.872	11.710	0.000	0.000	0.149	0.118	4.993	-4.531
5/5/97	2.451	0.000	7.047	1.585	0.000	0.000	0.127	0.000	7.957	6.964
5/6/97	-10.773	1.441	6.423	0.000	0.000	0.000	0.144	0.000	8.006	-4.352
5/7/97	-18.882	0.000	6.795	0.000	0.000	0.000	0.140	0.000	8.406	-10.616
5/8/97	-4.650	0.000	8.170	0.000	0.000	0.000	0.126	0.000	8.058	3.282
5/9/97	-3.189	0.000	7.005	0.000	0.000	0.000	0.112	0.000	8.702	5.401
5/10/97	-14.665	0.000	6.212	0.000	0.000	0.000	0.073	0.000	8.560	-6.178
5/11/97	-12.100	0.000	7.489	0.000	0.000	0.000	0.061	0.275	5.303	-7.133
5/12/97	142.145	23.276	11.923	6.697	0.000	0.000	0.080	83.494	0.773	42.765
5/13/97	86.885	96.158	8.979	17.577	0.000	0.000	0.170	4.785	6.380	9.729
5/14/97	88.471	124.799	9.187	18.722	0.000	0.000	0.178	0.000	8.778	-9.006
5/15/97	-41.055	32.801	8.319	35.343	0.000	0.000	0.151	0.000	7.982	-30.682
5/16/97	-47.533	0.000	9.841	44.697	0.000	0.000	0.154	0.000	4.748	1.758
5/17/97	14.215	0.000	10.514	39.475	0.000	0.000	0.180	50.042	3.995	7.463
5/18/97	73.640	69.176	12.006	35.294	0.000	0.000	0.196	8.510	4.393	35.445
5/19/97	26.077	96.038	8.698	40.378	0.000	0.000	0.666	2.667	4.864	-28.052
5/20/97	-51.810	22.752	10.100	47.870	0.000	0.000	0.949	4.353	7.534	-24.460
5/21/97	-39.180	0.000	9.231	42.470	0.000	0.000	0.758	0.000	9.005	11.537
5/22/97	-48.172	0.000	7.418	34.557	0.000	0.000	0.542	0.000	9.027	-5.130
5/23/97	-31.548	0.000	7.296	28.147	0.000	0.000	0.531	3.765	5.475	-2.222
5/24/97	-23.727	0.000	9.351	17.401	0.000	0.000	0.488	0.000	6.686	-0.128
5/25/97	-22.215	0.000	8.745	17.357	0.000	0.000	0.471	0.000	6.398	1.069
5/26/97	-1.149	0.000	7.027	14.345	0.000	0.000	0.430	24.119	8.915	-2.438
5/27/97	-3.147	0.000	10.014	12.077	0.000	0.000	0.459	12.589	9.392	5.274
5/28/97	-13.252	2.087	8.877	12.728	0.000	0.000	0.404	0.118	8.392	5.259
5/29/97	-22.772	0.000	7.117	7.966	0.000	0.000	0.373	0.000	7.213	-7.966
5/30/97	-9.308	0.000	8.943	0.000	0.000	0.000	0.346	0.078	6.594	-3.138
5/31/97	-7.635	0.000	9.841	6.824	0.000	0.000	0.338	0.000	6.991	5.842
6/1/97	81.579	0.000	8.882	11.103	0.000	0.000	0.446	87.377	4.882	9.741
6/2/97	20.917	13.951	13.254	19.175	0.000	0.000	1.128	13.922	6.832	17.923
6/3/97	38.167	8.877	12.892	16.650	0.000	0.000	1.557	28.864	6.352	21.871
6/4/97	-42.459	0.000	10.450	20.315	0.000	0.000	1.528	0.039	9.284	-14.427
6/5/97	-9.694	0.000	9.530	16.701	0.000	0.000	1.523	7.530	6.805	4.759
6/6/97	-34.041	0.869	8.549	17.110	0.000	0.000	1.273	0.157	9.002	-10.228
6/7/97	-14.419	0.000	10.457	14.790	0.000	0.000	0.919	0.000	8.393	7.845
6/8/97	-6.310	0.000	10.910	11.933	0.000	0.000	0.609	0.588	3.470	7.896
6/9/97	56.145	35.864	9.400	7.458	0.000	0.000	0.473	18.942	1.865	10.189
6/10/97	63.023	61.921	11.336	15.510	0.000	0.000	0.777	10.197	6.249	11.887
6/11/97	-12.954	27.562	9.249	17.269	0.000	0.000	0.557	1.412	6.650	-18.566
6/12/97	-23.456	0.000	9.721	24.827	0.000	0.000	0.509	12.981	4.817	-7.302
6/13/97	-3.843	11.480	9.158	19.065	0.000	0.000	0.948	1.608	7.047	8.233
6/14/97	77.093	56.969	11.617	23.361	0.000	0.000	1.113	20.197	6.289	28.464
6/15/97	12.400	49.920	13.513	27.002	0.000	0.000	1.432	9.883	6.667	-15.166
6/16/97	41.027	0.000	10.616	32.710	0.000	0.000	1.879	1.529	8.025	-3.700
6/17/97	68.360	27.897	11.575	31.418	0.000	0.000	1.862	41.022	8.505	37.502
6/18/97	-21.604	32.691	12.747	33.004	0.000	0.000	1.841	0.000	6.189	-16.943
6/19/97	-36.292	0.000	9.305	34.738	0.000	0.000	1.996	3.569	3.915	-3.204
6/20/97	21.614	35.167	8.754	29.647	0.000	0.000	1.860	0.745	8.489	21.978

Date	Change in Storage (ha-m)	Inflow pump G-250 (ha-m)	Seepage pump G-250_S (ha-m)	Outflow pump G-251 (ha-m)	Culvert G-258 (ha-m)	Culvert G-259 (ha-m)	Seepage L-7a (ha-m)	Rain (ha-m)	ET (ha-m)	Remainders (ha-m)
6/21/97	-25.827	30.317	9.552	29.458	0.000	0.000	1.575	2.549	6.707	-24.103
6/22/97	-38.851	0.000	6.711	26.593	0.000	0.000	1.312	0.039	7.000	-6.609
6/23/97	84.404	72.100	10.318	24.704	0.000	0.000	1.146	9.883	3.477	29.456
6/24/97	65.137	102.813	10.342	30.459	0.000	0.000	1.038	2.981	6.217	-5.019
6/25/97	46.376	102.366	6.858	54.111	0.000	0.000	0.883	0.392	7.651	4.497
6/26/97	-51.696	33.067	7.979	50.941	0.000	0.000	0.723	0.000	7.907	-26.638
6/27/97	-49.139	0.000	10.210	47.280	0.000	0.000	0.496	0.000	8.492	6.137
6/28/97	-49.574	0.000	7.316	37.104	0.000	0.000	0.367	0.000	8.430	-4.407
6/29/97	-41.320	0.000	8.392	32.969	0.000	0.000	0.284	2.353	8.380	-2.608
6/30/97	20.966	0.000	11.350	24.205	0.000	0.000	0.234	0.000	8.129	11.134
7/1/97	-27.461	0.000	7.996	17.655	0.000	0.000	0.237	0.000	8.751	-1.292
7/2/97	-30.397	0.000	8.529	17.555	0.000	0.000	0.278	2.549	6.589	-9.080
7/3/97	51.784	42.852	10.078	17.445	0.000	0.000	0.294	10.197	8.668	24.554
7/4/97	52.827	53.118	9.310	14.998	0.000	0.000	0.288	16.903	6.946	4.462
7/5/97	88.396	63.788	11.005	25.375	0.000	0.000	0.505	49.767	5.951	5.662
7/6/97	-27.173	27.919	14.034	43.123	0.000	0.000	0.844	6.392	4.803	-14.402
7/7/97	23.609	41.922	10.235	35.967	0.000	0.000	0.875	0.039	8.147	24.887
7/8/97	32.321	78.376	11.524	35.587	0.000	0.000	0.855	0.000	8.295	-3.028
7/9/97	16.971	64.419	8.806	44.951	0.000	0.000	0.599	4.353	5.906	-1.543
7/10/97	63.466	69.068	13.386	2.143	0.000	0.000	0.545	1.608	6.175	0.563
7/11/97	58.602	0.000	12.420	0.000	0.000	0.000	0.652	49.806	7.643	15.787
7/12/97	-1.610	0.000	16.261	8.111	0.000	0.000	0.738	0.000	7.699	13.462
7/13/97	-1.918	0.000	11.798	2.310	0.000	0.000	0.684	2.784	8.875	5.799
7/14/97	-4.211	0.000	13.087	26.804	0.000	0.000	0.567	2.431	7.582	27.177
7/15/97	-5.470	0.000	13.002	0.732	0.000	0.000	0.738	0.627	6.630	0.527
7/16/97	-2.110	0.000	12.909	0.262	0.000	0.000	0.750	0.000	6.123	3.525
7/17/97	29.784	0.000	11.685	6.738	0.000	0.000	0.558	35.570	5.165	5.559
7/18/97	12.961	0.000	16.236	7.232	0.000	0.000	0.710	7.020	6.079	18.542
7/19/97	20.902	0.000	13.036	11.730	0.000	0.000	0.832	27.688	6.746	10.858
7/20/97	-15.571	0.000	13.026	17.763	0.000	0.000	0.902	3.412	7.113	4.991
7/21/97	-45.869	0.000	12.723	38.174	0.000	0.000	1.020	0.039	5.472	-3.282
7/22/97	-33.312	0.000	12.789	41.905	0.000	0.000	1.075	9.961	4.932	2.489
7/23/97	-75.344	0.000	10.834	57.204	0.000	0.000	1.273	0.078	7.944	-11.547
7/24/97	-64.636	0.000	10.768	52.228	0.000	0.000	1.296	0.000	7.131	-6.573
7/25/97	18.158	43.417	9.985	36.948	0.000	0.000	0.947	0.000	5.849	16.591
7/26/97	39.998	78.987	12.591	37.821	0.000	0.000	0.753	4.902	8.007	1.184
7/27/97	-5.872	43.089	12.772	47.728	0.000	0.000	0.959	5.020	5.476	-1.736
7/28/97	18.759	77.167	12.747	50.953	0.000	0.000	0.779	0.039	5.864	-2.409
7/29/97	25.294	76.213	13.053	52.316	0.000	0.000	0.675	0.039	5.085	5.768
7/30/97	0.695	77.796	12.845	65.205	0.000	0.000	0.638	0.000	5.520	-7.014
7/31/97	20.483	72.924	9.019	57.728	0.000	0.000	0.676	4.785	9.016	8.842
8/1/97	101.768	59.551	14.034	62.496	0.000	0.000	0.936	73.455	7.878	38.200
8/2/97	16.345	52.470	15.701	52.477	0.000	0.000	1.042	6.863	4.400	12.847
8/3/97	2.618	48.112	15.757	52.560	0.000	0.000	1.267	2.706	5.537	8.630
8/4/97	-77.651	10.986	15.803	76.523	0.000	0.000	1.495	0.118	6.254	-7.473
8/5/97	-72.875	0.000	12.884	64.160	0.000	0.000	1.971	0.549	6.421	-4.814
8/6/97	-38.209	2.995	12.985	56.810	0.000	0.000	1.874	17.217	4.779	1.294
8/7/97	-20.549	17.920	12.676	47.951	0.000	0.000	1.831	5.843	5.759	7.567
8/8/97	-68.971	8.767	9.743	52.113	0.000	0.000	2.027	0.118	6.723	-21.047
8/9/97	24.440	3.866	13.017	42.250	0.000	0.000	2.135	31.139	5.157	34.707
8/10/97	-45.835	8.693	12.818	46.749	0.000	0.000	2.225	5.569	4.624	10.949
8/11/97	2.110	10.384	11.226	36.439	0.000	0.000	2.394	20.119	6.304	11.956

Date	Change in Storage (ha-m)	Inflow pump G-250 (ha-m)	Seepage pump G-250_S (ha-m)	Outflow pump G-251 (ha-m)	Culvert G-258 (ha-m)	Culvert G-259 (ha-m)	Seepage L-7a (ha-m)	Rain (ha-m)	ET (ha-m)	Remainders (ha-m)
8/12/97	-34.547	10.147	10.291	31.631	0.000	0.000	2.584	0.863	6.503	-10.007
8/13/97	2.075	8.913	9.990	18.774	0.000	0.000	2.482	0.000	8.864	18.318
8/14/97	-43.895	10.925	11.884	26.796	0.000	0.000	2.268	0.078	7.688	-22.682
8/15/97	2.266	8.473	8.877	18.825	0.000	0.000	2.078	8.275	7.896	10.161
8/16/97	74.774	13.579	13.866	19.623	0.000	0.000	1.839	80.122	3.464	2.321
8/17/97	5.963	8.833	16.391	21.189	0.000	0.000	1.931	16.040	4.826	5.174
8/18/97	-21.861	5.253	12.791	21.308	0.000	0.000	2.150	0.000	7.250	-0.706
8/19/97	-28.788	3.406	8.796	20.369	0.000	0.000	2.250	0.118	7.538	-6.655