LAKE OKEECHOBEE WATER QUALITY

MONITORING PROGRAM

ANNUAL REPORT

YEAR FIVE

OCTOBER 1987 - SEPTEMBER 1988

In Partial Fulfillment of Specific Condition

VI(E) of Florida Department of

Environmental Regulation Permit

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ABSTRACT

This report provides an update on the effectiveness of the South Florida Water Management District's (SFWMD) management actions to reduce tributary nutrient loads to the target levels specified in the Lake Okeechobee Operating Permit issued by the Florida Department of Environmental Regulation. Data collected during the period of October 1, 1987 to September 30, 1988 are discussed in relation to these targets. Other water quality data are also included.

The Operating Permit states that annual nutrient loads from the SFWMD's control structures and the Fisheating Creek basin shall not exceed 382 tons of phosphorus and 2,949 tons of nitrogen by September 1988. Individual target loads are also established for each controllable source basin. The basin-wide targets were achieved in both 1987-88 and the period of 1983-88. This was due mainly to low discharges, and secondarily to Interim Action Plan diversion and the implementation of Best Management Practices. Individually, several structures exceeded their respective target loading rates for phosphorus and/or nitrogen.

Among the priority basins, Taylor Creek/Nubbin Slough met its nitrogen loading target, but did not meet its target for phosphorus loading or its concentration targets, although phosphorus concentrations appeared to show a downward trend. Average annual loadings from the Lower Kissimmee River were below this basin's target rates, but the phosphorus target was exceeded in 1987-88. This inflow's phosphorus concentrations have been higher in recent years. The Interim Action Plan succeeded in limiting nutrient inputs from S-2 and S-3 during the last three years, but its suspension to allow water supply backpumping in 1985 brought the average annual loads above the targets for the S-2 and S-3 basins. S-154, which was not given target loads in the Operating Permit, had the highest phosphorus concentration of any inflow.

Although phosphorus inputs were low, the lake's mean total phosphorus concentration (0.122 mg P/L) for 1987-88 was the highest mean value recorded since monitoring began in 1973. It appeared to be related to prolonged wind resuspension of bottom sediments during the year. In phytoplankton-dominated lakes such as Lake Okeechobee, algal biomass generally increases with phosphorus concentration, but the mean chlorophyll a concentration (19.5 mg/m^3), an indicator of phytoplankton biomass, remained near the historical average. The lake experienced blue-green algal blooms during the year, but none caused apparent negative ecological impact.

Routine quarterly pesticide monitoring at SFWMD pump stations in the Everglades Agricultural Area detected atrazine, delta BHC, chlorpyrifos, DDE, and DDD. The herbicide atrazine was detected in water samples from five of the six pump stations in February and April during the season when it is normally applied to crops. Atrazine, delta BHC, and chlorpyrifos were also found in sediment samples at one site each in April. None of these compounds was found in concentrations high enough to present potential adverse health or environmental effects. The compounds DDD and DDE, which are degradation products of the insecticide DDT, were also detected in the sediment at various times at five of the six stations. These compounds have been found at several south Florida sites in the past and could be residues from the past use of DDT or could result from atmospheric disposition of DDT that originates outside of the U.S.

EXECUTIVE SUMMARY

This annual report on the Lake Okeechobee water quality monitoring program covers the period of October 1, 1987 to September 30, 1988. This was the fifth year of the South Florida Water Management District's Operating Permit issued by the Florida Department of Environmental Regulation for water control structures discharging to the lake. Included are: (1) water quality summaries for the lake, its inflows and outflows, and pump discharges to the Water Conservation Areas; (2) phosphorus and nitrogen inputs from each major lake tributary; (3) an update on the lake's trophic state; and (4) results of pesticide monitoring at water control structures in the Everglades Agricultural Area (EAA).

Lake Okeechobee water quality

Average water quality values in Lake Okeechobee for the year 1987-88 were within historical ranges, except for phosphorus. The mean total phosphorus concentration rose from the previous year to 0.122 mg P/L. This concentration was the highest mean value recorded since monitoring began in 1973, and it appeared to be related to prolonged wind resuspension of bottom sediments during the year. The mean total nitrogen concentration of 1.61 mg N/L was toward the low end of its range, and the mean chlorophyll a concentration (19.5 mg/m^3), an indicator of phytoplankton biomass, remained near the historical average. These nitrogen and chlorophyll levels represent a eutrophic condition, but the phosphorus concentration indicates that the lake has the potential to reach a hypereutrophic state. The lake experienced blue-green algal blooms during the year, but none caused apparent negative ecological impact.

Lake Okeechobee nutrient loading

The total discharge of water in 1987-88 from those basins identified in the Operating Permit (controllable source basins) was below the 1973-79 annual mean inflow. Individually, most inflows were above their 1973-79 averages, but they were countered by some major water control structures (S-2, S-3, S-65E, and S-191) that discharged much less than normal. The Interim Action Plan (IAP) was in effect this year, so S-2 and S-3 inputs were greatly reduced. However, the IAP resulted in greater discharges to the Water Conservation Areas.

Specific Condition V(A) of the Operating Permit states that "nutrient loads into Lake Okeechobee from the District's control structures and the Fisheating Creek basin shall not exceed 382 tons total phosphorus and 2,949 tons total nitrogen per year" by September 1988. Individual target loads are also established for each controllable source basin that cannot be exceeded by more than 10 percent. In this report, the basins meeting or exceeding these targets are evaluated on the basis of both (1) their inputs in the last year (1987-88) of the five year period, and (2) their average loadings over the five year period.

In 1987-88, nutrient loads from the controllable source basins were slightly below the Operating Permit target loads to the lake. However, individually, target loads for phosphorus were exceeded at several structures, including S-127, S-129, S-131, S-133, S-71, S-72, S-65E, and S-191. Nitrogen target loads were exceeded at S-2, S-4, S-127, S-129, S-131, S-133, S-135, S-71, and S-72.

The five-year average loads from these basins were also below the lake target loads. Individually, phosphorus targets were exceeded at S-3, S-127, S-133, and S-191, and nitrogen targets were exceeded at S-2, S-3, S-127, and S-133. The failure of S-2 and S-3 to meet their targets was largely due to the suspension of the IAP in 1985 for water supply backpumping.

Although no target loads were designated for the S-154 basin by the Operating Permit, this basin does contribute a significant amount of phosphorus even though its drainage area is relatively small. Phosphorus input was 67.1 tons in 1987-88 and averaged 35.3 tons per year for the five year period. The SFWMD's loading allocation for this basin is 6 tons per year.

The average flow-weighted phosphorus concentration from all inflows combined was 0.250 mg/L in 1987-88, which is similar to the average for 1973-79. However, some inflows have exhibited rising or falling trends. In the Lower Kissimmee River basin, phosphorus concentrations have been higher during the last five years, which suggests greater loadings from agricultural operations in the basin. The phosphorus concentration in Taylor Creek/Nubbin Slough (S-191) declined over the first four years of the Operating Permit, but increased in the fifth year. Target concentrations were not met, except for phosphorus in 1986-87. The 1987-88 phosphorus and nitrogen concentrations in the Harney Pond Canal (S-71) were also relatively high, but were within the historical range. The phosphorus concentration at S-154 was the highest of all the inflows (1.40 mg/L). In the EAA, S-2 and S-4 nitrogen values were much higher than in the previous year. Since discharges from these stations are usually infrequent, flow-weighted concentrations can vary greatly from year to year, depending on the runoff water quality at the time of pumping. Among all lake inflows, S-4 also had the third highest average phosphorus concentration over the five year period.

In summary, the total loadings from the controllable source basins were below the target loads of 382 tons phosphorus and 2,949 tons nitrogen per year mainly because of low discharges, and secondarily as the result of the IAP diversion and BMP implementation. Among the priority basins, Taylor Creek/Nubbin Slough met its nitrogen loading target, but did not meet its target for phosphorus loading (although it was within 10 percent) of its concentration targets. Average annual loadings from the Lower Kissimmee River were below this basin's target rates, but the phosphorus target was exceeded in 1987-88. The IAP succeeded in limiting nutrient inputs from S-2 and S-3 during the last three years, but its suspension to allow water supply backpumping in 1985 brought the average annual loads above the targets for the S-2 and S-3 basins. S-154, which was not given target loads in the Operating Permit, had the highest average phosphorus concentration of any inflow.

Although nutrient loads were lower than in the 1970's, flow-weighted nutrient concentrations did not decline substantially, and increased in some cases. The Taylor Creek/Nubbin Slough basin showed signs of improvement, but the lower portion of the Kissimmee River has exhibited higher phosphorus concentrations in recent years, and the S-154 and Harney Pond Canal basins are also areas of concern.

The recommendation to be drawn from these results is that water quality management plans should consider nutrient concentrations as well as loads. Because nutrient loads vary greatly with the amount of basin rainfall, they are not very useful for indicating year-to-year water quality trends. Flow-weighted concentrations provide a better means of measuring progress toward attaining

nutrient reduction goals. This is one reason why the SFWMD's Lake Okeechobee SWIM Plan established target flow-weighted concentrations as performance standards for assessing the effectiveness of phosphorus reduction efforts.

Pesticide monitoring

Routine quarterly pesticide monitoring was conducted at SFWMD pump stations in the EAA in October 1987, and February, April, and July 1988. Both water and sediment samples were taken and the compounds detected included atrazine, chlorpyrifos, delta BHC, DDE, and DDD.

Atrazine was the only compound detected in the water samples. This herbicide was found at five of the six pump stations in February and April during the season when it is normally applied to crops. Atrazine is considered only slightly toxic, and the concentrations were far below the levels considered hazardous in drinking water or dangerous to fish, wildlife, and other organisms. No State of Florida surface water or drinking water quality standards or U.S. EPA guidelines exist for atrazine. Atrazine was also detected in the sediment at one site in April.

The compounds DDD and DDE, which are degradation products of the insecticide DDT, were detected at various times at five of the six stations. These compounds have been found at several sites within the SFWMD in the past and are probably relic residues from the past use of DDT.

Two other compounds, delta BHC and chlorpyrifos, were found at one site each in April. Delta BHC is one of the isomers of technical BHC (benzene hexachloride) which was used as an insecticide until it was suspended in 1976. Chlorpyrifos is a non-restricted use, organophosphorus insecticide. Chlorpyrifos is extremely toxic to fish, birds, and other wildlife, but neither compound was found in concentrations high enough to present potential adverse health or environmental effects. No State of Florida or U.S. EPA criteria or standards exist for pesticide residues in sediment.

CONTENTS

CONTENTS (Continued)

INTRODUCTION

Lake Okeechobee Operating Permit

This report provides an update on the effectiveness of the South Florida Water Management District's (SFWMD) management actions to reduce tributary nutrient loads to the target levels specified in the Lake Okeechobee Operating Permit. Its main purpose is to document data collected during the period of October 1, 1987 to September 30, 1988. These data have been submitted to the Florida Department of Environmental Regulation (FDER) in accordance with the June 1, 1989 deadline required by Specific Condition VI(E) of the Operating Permit.

Lake Okeechobee is a shallow, eutrophic lake that receives runoff from agricultural watersheds. As part of its management activities, the SFWMD has been monitoring the water quality of the lake and its inflows and outflows since 1973. The first seven years of study (April 1973-March 1980) were summarized in SFWMD Technical Publication No. 81-2 (Federico et al., 1981). That publication served as the technical basis for the Operating Permit's nutrient reduction goals. Throughout this report, recent data are compared to the data from those first seven years, which are referred to here as the 1973-79 base period.

In response to recommendations in that 1981 report, nutrient loading allocations were assigned to each watershed within the Okeechobee basin on the basis of drainage area (SFWMD, 1982). In September 1983, the FDER issued a permit to the SFWMD for the operation of its inflow structures around Lake Okeechobee. Specific Condition (V) of this Operating Permit established interim nutrient loading targets for each major watershed. Overall, these targets called for a 24 percent reduction in the phosphorus load and 39 percent reduction in the nitrogen load relative to the 1973-79 base period. To ensure that these nutrient reductions were uniformly achieved, each inflow could not exceed its target loads by more than 10 percent by September 1988.

Further limitations on nutrient loads were set for certain water control structures (S-2, S-3, and S-191) that were deemed critical to the SFWMD's nutrient reduction strategy. S-2 and S-3 were required to achieve their loading targets in three, rather than five years. Likewise, S-191 was restricted to three-year target loads of 139 tons of phosphorus and 388 tons of nitrogen, and three-year target concentrations of 0.67 mg P/L and 1.72 mg N/L.

These target levels were designed to substantially reduce the loads from those basins with the highest nutrient runoff rates, while setting interim goals for a five-year period. The Operating Permit did not require nutrient loading reductions from the other sub-basins. Thus, these target levels are usually less stringent than the SFWMD's ultimate nutrient reduction goals (SFWMD, 1989a, 1989b).

Lake management

Through 1988, active nutrient control options were implemented in the S-2 and S-3 basins through the Interim Action Plan (IAP), and in the Taylor Creek/Nubbin Slough, Lower Kissimmee River, and S-154 basins by encouraging and supporting agricultural Best Management Practices (BMP's) (Table 1). The water quality

TABLE 1. SUMMARY OF WATER QUALITY MANAGEMENT STRATEGIES FOR LAKE OKEECHOBEE INFLOW STRUCTURES

Structure	Management Strategy
S-2	Interim Action Plan (implemented July 1979)
S-3	Interim Action Plan (July 1979)
S-4	Regulatory Control of New Drainage Systems
S-191	Best Management Practices (1981)
S-65E	Best Management Practices (1988)
S-154	Best Management Practices (1988)
S-84	Regulatory Control of New Drainage Systems
S-71	Regulatory Control of New Drainage Systems
S-72	Regulatory Control of New Drainage Systems
S-127	Regulatory Control of New Drainage Systems
S-129	Regulatory Control of New Drainage Systems
S-131	Regulatory Control of New Drainage Systems
S-133	Regulatory Control of New Drainage Systems
S-135	Regulatory Control of New Drainage Systems

management strategy in lower-priority basins during the five years of the Operating Permit consisted of regulatory control of new drainage systems to improve the quality of water being delivered off site. This form of regulatory control is effective only when land use intensifies and new drainage systems are needed. With the exception of the BMP programs on the north side of the lake, no existing drainage systems were retrofitted for the purpose of improving water quality.

In spite of intensified management efforts in recent years, major algal bloom events still occur in the lake. These events have prompted a higher degree of public concern. In 1985, the Governor asked the Secretary of the FDER to take the lead in conducting a study of Lake Okeechobee's problems and to provide the Governor with recommendations for management of the lake. As a result, the Secretary established the first Lake Okeechobee Technical Advisory Committee (LOTAC-I) to provide technical assistance to the SFWMD and to define management options. That council was re-authorized (LOTAC-II) to provide further assistance and recommendations to the SFWMD.

The FDER also initiated a regulatory program for dairies in the Lake Okeechobee watershed. It adopted a rule that requires the implementation of BMP's designed to control phosphorus loads at their source. When fully installed in June 1991, these dairy BMP's are anticipated to reduce phosphorus concentrations from dairies by 60 to 70 percent, assuming the BMP's are operated and maintained in accordance with their design and operational constraints.

The State legislature also responded to the public concern for the protection of Lake Okeechobee and other Florida water bodies by adopting the Surface Water Improvement and Management (SWIM) Act in 1987. The SWIM Act requires the SFWMD to develop management plans for priority water bodies within its jurisdiction, including Lake Okeechobee, and to design and implement a program to protect the water quality of the lake.

The SFWMD adopted an Interim SWIM Plan for the lake in March 1989 (SFWMD, 1989a). The Plan's primary focus is to reduce lake phosphorus levels by lowering the incoming phosphorus load to an average of 397 tons per year by 1992 as specified in the SWIM legislation. This will be achieved by enforcing a series of phosphorus performance standards.

Ultimately, the standard that all basins will be required to meet at lake inflow structures is an average annual total phosphorus concentration of 0.18 mg/L or the present average annual concentration, whichever is less. Basins that exceed the 0.18 mg/L standard must reduce their phosphorus concentrations and achieve compliance by 1991 according to the phosphorus reduction schedules outlined in the Plan (0.66 mg/L in 1989, 0.33 mg/L in 1990, and 0.18 mg/L in 1991). Water quality in basins that currently fall below 0.18 mg/L will not be allowed to degrade further.

The proposed concentration standard has become a central part of the SFWMD's lake management strategy, although it has yet to be incorporated into a revised FDER Operating Permit. The shift from an areal loading standard (as used in the Operating Permit) to a concentration standard has the following benefits:

1. It lays the foundation for a uniform and equitable off-site discharge concentration performance standard.

2. It is less sensitive to hydrologic variation than mass loadings and provides a more effective way of tracking progress in reducing phosphorus levels entering the lake.

The SWIM Plan also considers various management options, as identified by LOTAC, SFWMD staff, and other agencies, that are mostly directed at controlling phosphorus inputs to the lake. These options include:

1. Diversion of Taylor Creek/Nubbin Slough drainage waters to a new reservoir to be built in Martin County, and diversion of S-4 basin flows to Lake Hicpochee and the Caloosahatchee River.

2. Aquifer storage and recovery (ASR): Injection of nutrient-rich waters into the underlying limestone Floridan (saline-water) aquifer for storage and later recovery and use.

3. Continued use of BMP's on agricultural land that are designed to reduce the mass and/or concentration of excess phosphorus at its origin. Specific methods that have been investigated include a cooperative United States Soil Conservation Service (SCS) funding program, biological treatment, chemical treatment, a confinement dairy project, fertilizer management, phosphorus reduction in dairy cow feed, and improved farming practices in the Everglades Agricultural Area (EAA).

4. Continued use and refinement of the Interim Action Plan to divert EAA runoff from the lake to the south.

5. Physical removal of phosphorus already in the lake by mechanical harvesting of aquatic weeds.

6. Assessment of the ability of wetlands to absorb and remove nitrogen and phosphorus from drainage waters through uptake by soils or living plant communities.

MATERIALS AND METHODS

Lake Okeechobee

The SFWMD water quality monitoring program includes many in-lake stations and all major and minor inflows and outflows, but only those stations included in the Operating Permit are included in this report. Eight stations were monitored in the limnetic zone of Lake Okeechobee along with 17 inflow/outflow structures and Fisheating Creek (Figure 1). The frequency of monitoring and the parameters measured are shown in Table 2. Water quality in the lake was measured once or twice per month, depending on season. Sampling of inflows and outflows around the lake was conducted every two to four weeks, depending on discharge. Sampling and analytical procedures have been described by Federico et al. (1981).

Samples at S-2, S-3, and S-4 are collected flow-proportionally by automatic samplers as well as by grab sampling. These structures seldom discharged during the year, so most samples were collected during non-discharge periods using the grab method. Both types of samples were combined in the results presented here.

Water Conservation Areas

Water quality and discharge data from three pump stations (S-6, S-7, and S-8) discharging into the Water Conservation Areas (WCA's) from the EAA are also included in this report. As with S-2, S-3, and S-4, both grab and flow-proportional automatic sampling were conducted at these structures.

Taylor Creek/Nubbin Slough

Water quality from 25 stations (Figure 2) in the Taylor Creek/Nubbin Slough basin was sampled at 1 to 2 week intervals for the parameters listed in Table 2.

Nutrient loadings

Calculated nutrient loading rates for the major lake inflows are compared to target loading rates later in this report. Target loads deal only with portions of the lake basin identified as "controllable sources" (SFWMD, 1982). Consequently, inputs from the Upper Kissimmee and Lake Istokpoga basins are not included in the target loads for S-65E, S-71, S-72, and S-84. In Tables 5a, 5b, and 5c (see Results and Discussion section), the discharge and nutrient loads from the outflow of Lake Kissimmee (S-65) were subtracted from those at S-65E to obtain values for the Lower Kissimmee Basin. Likewise, the discharge and loads from the Lake Istokpoga outflow (S-68) were subtracted from the values at S-71, S-72, and S-84. The discharge from S-68 was divided among S-71, S-72, and S-84 in proportion to the amount of water that these three structures discharged into Lake Okeechobee.

Pesticide monitoring

The SFWMD routinely monitors pesticides and herbicides quarterly at six pump stations (S-2, S-3, S-4, S-6, S-7, and S-8) that discharge from the EAA. Both

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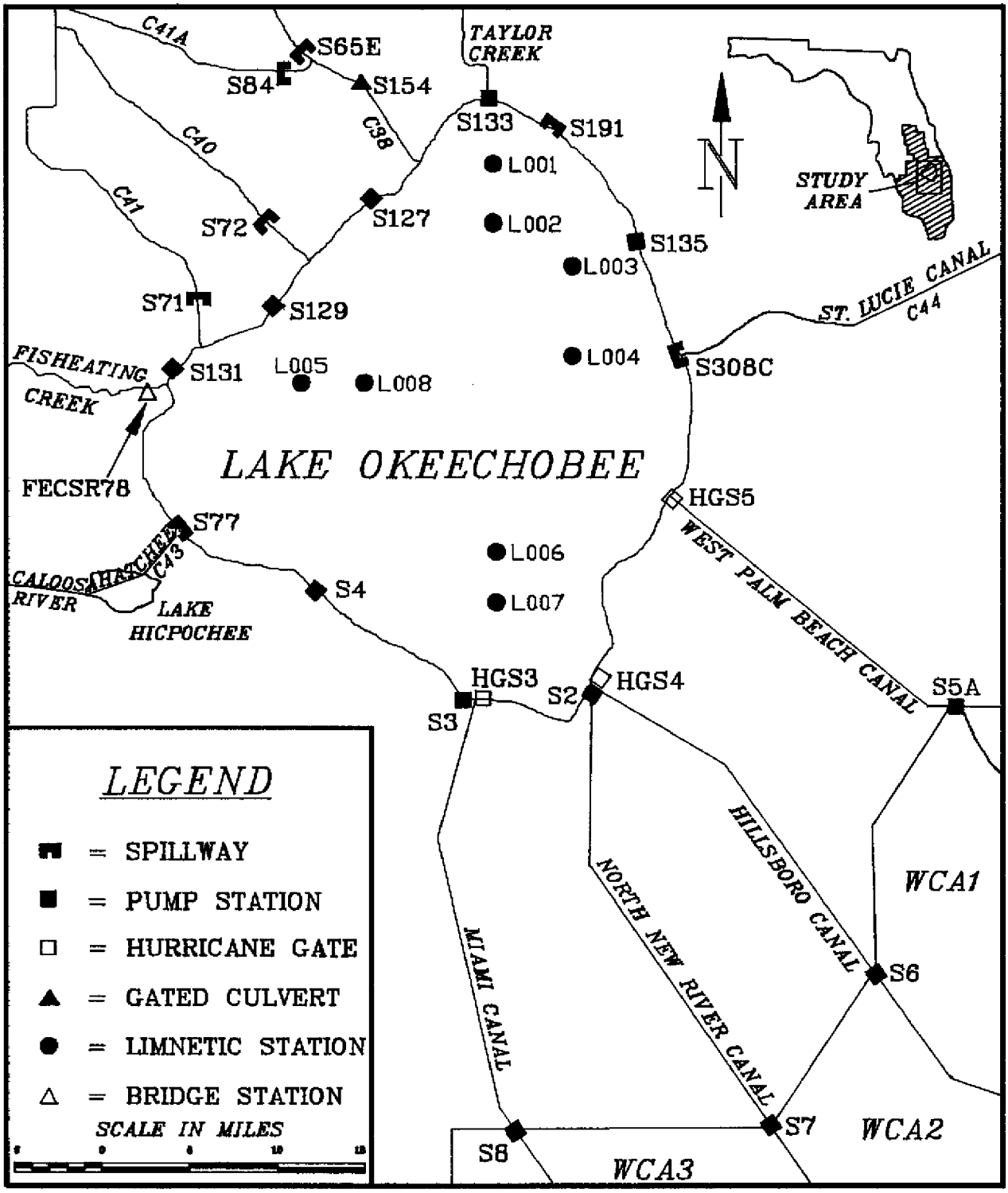

Figure 1. Lake Okeechobee Operating Permit Sampling Stations.

TABLE 2. WATER QUALITY PARAMETERS

Sampling Frequency			
Lake Limnetic Water Quality Stations	Lake Okeechobee Inflows/Outflows and WCA Inflows	Taylor Creek/ Nubbin Slough Basin	Parameter
2-4 Weeks	2-4 Weeks	Not Sampled	Temperature
2-4 Weeks	2-4 Weeks	Not Sampled	Dissolved Oxygen
2-4 Weeks	2-4 Weeks	1-2 Weeks	Specific Conductance
2-4 Weeks	2-4 Weeks	1-2 Weeks	pH
2-4 Weeks	2-4 Weeks	1-2 Weeks	Turbidity
2-4 Weeks	2-4 Weeks	1-2 Weeks	Color
2-4 Weeks	2-4 Weeks	1-2 Weeks	Nitrite
2-4 Weeks	2-4 Weeks	1-2 Weeks	Nitrate
2-4 Weeks	2-4 Weeks	1-2 Weeks	Ammonia
2-4 Weeks	2-4 Weeks	1-2 Weeks	Total Nitrogen
2-4 Weeks	2-4 Weeks	1-2 Weeks	Total Kjeldahl Nitrogen
2-4 Weeks	2-4 Weeks	1-2 Weeks	Ortho Phosphorus
2-4 Weeks	2-4 Weeks	1-2 Weeks	Total Phosphorus
2-4 Weeks	2-4 Weeks	Not Sampled	Total Suspended Solids
2-4 Weeks	2-4 Weeks	Not Sampled	Alkalinity
2-4 Weeks	2-4 Weeks	Not Sampled	Chloride
2-4 Weeks	Not Sampled	Not Sampled	Chlorophyll a
Quarterly	Quarterly	Not Sampled	Total Iron

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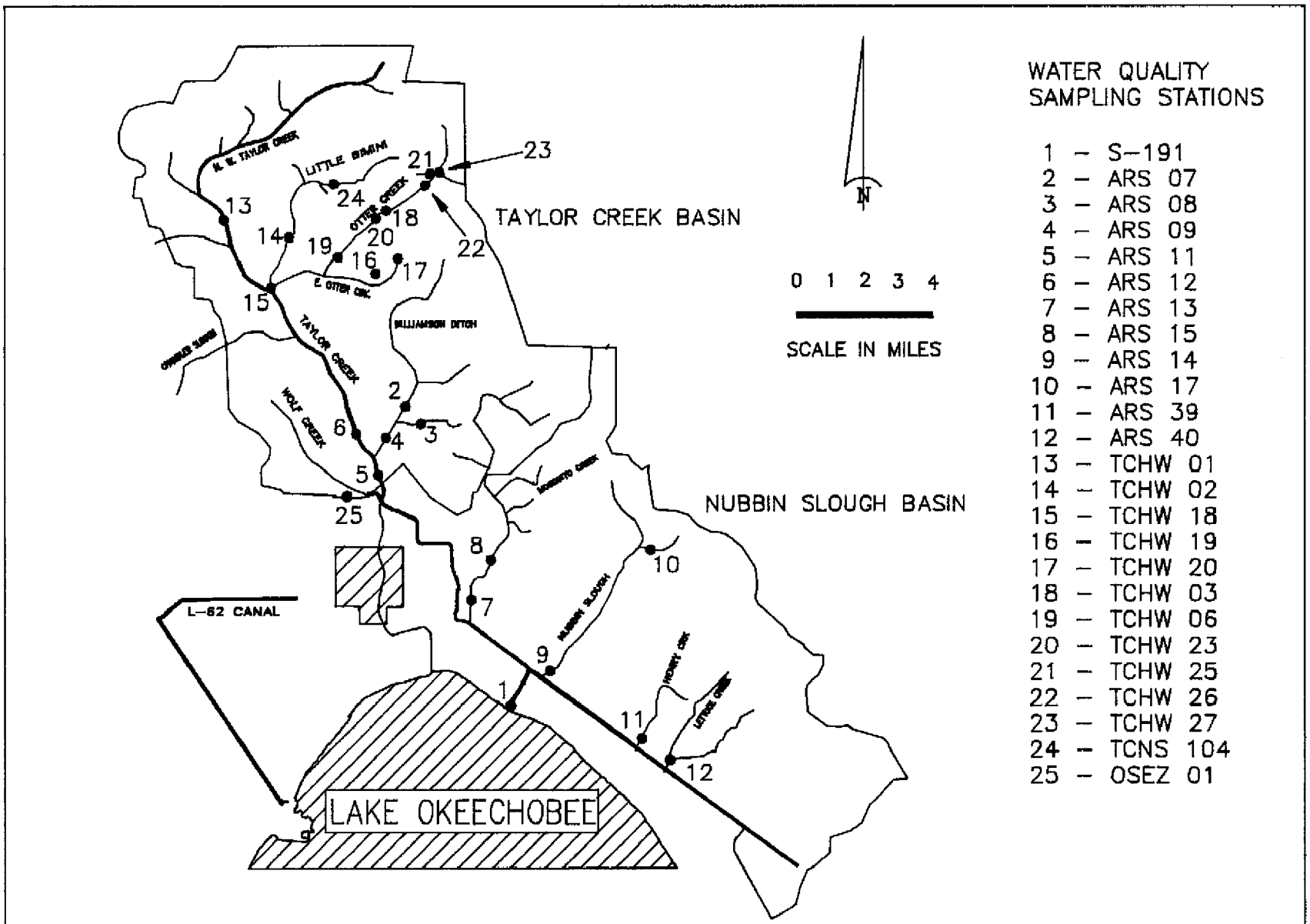

Figure 2. Taylor Creek/Nubbin Slough Sampling Stations for Operating Permit

water and sediment samples were taken on October 26-28, 1987, and February 22-24, April 11-13, and July 25-27, 1988. Samples were collected at mid-canal, upstream of each structure using a small boat. The water samples were surface grab samples and the sediment samples were collected with a petite Ponar dredge. The compounds monitored, along with their detection limits, are listed in Appendix A.

SFWMD personnel collected samples in containers provided by the contract laboratories (Everglades Laboratories, Inc. of West Palm Beach, Certification No. 86109; Environmental Science and Engineering, Inc. of Gainesville, Certification No. E82067; and University of Miami, Certification No. E76071). All sample bottles were teflon or aluminum foil-capped glass and were specifically prepared for pesticide residue analysis. The samples were placed on ice and shipped to the lab within 48 hours of collection. Analyses were performed in accordance with U.S. EPA, ASTM, Standard Methods or other approved methods. Split samples and travel blanks were used as quality assurance checks.

RESULTS AND DISCUSSION

Water quality data summary

Table 3 summarizes the water quality at each station in Lake Okeechobee and the lake average for the year 1987-88. Annual arithmetic averages for most water quality parameters were within the range of values reported in previous years. However, the mean total phosphorus concentration for the year was 0.122 mg/L, which was the highest level measured in 14 years of monitoring (Figure 3). Ortho-phosphorus (or soluble reactive phosphorus) was also relatively high (0.042 mg P/L).

The high phosphorus concentration appeared to be related to prolonged wind resuspension of bottom sediments during the year, based on wind measurements and levels of other water quality parameters influenced by sediment resuspension. Average daily wind speeds at the Moore Haven lock in 1988 were the highest since measurements began in 1976. Turbidity of the lake water averaged over 33 NTU, whereas in previous years it ranged from about 11 to 29 NTU. Along with turbidity, mean Secchi disk depth was relatively low (0.44 meters). Total iron also varies with turbidity, and it was also elevated this year (0.88 mg/L). The total nitrogen concentration did not increase, however. The mean 1987-88 value of 1.61 mg/L is toward the low end of its range for the period of record (Figure 3).

The average annual chlorophyll a concentration, a measure of phytoplankton biomass, was 19.5 mg/m^3. This is similar to other yearly values for the period of record. Although there were significant blooms during the warmer months, particularly in the spring, the presence of these blooms is not indicated in the chlorophyll results in Table 3. The data gathered from the eight limnetic stations discussed here are not sufficient to fully document these algal blooms, since the most concentrated areas of the blooms tend to form closer to shore. The SFWMD monitors many more sites in the near-shore and littoral zones where the densest blooms are usually found. These sites have been sampled since late 1986 and the results will be presented in a separate report.

Lake inflow and outflow water quality data are shown in Table 4. Water quality data for major pump stations (S-6, S-7, and S-8) that discharge into the WCA's from the EAA are also included in this table.

Water quality data for stations in the Taylor Creek/Nubbin Slough basin are listed in Appendix B.

Discharges, nutrient loads, and flow-weighted nutrient concentrations

Table 5a compares discharges from Lake Okeechobee and the WCA inflows for the five years of the Operating Permit to the 1973-1979 base period. As in the previous four years, the total discharge from controllable source basins in 1987-88 was below the 1973-79 mean annual inflow. Individually, most inflows were above their 1973-79 averages, but they were countered by some major water control structures (S-2, S-3, S-65E, and S-191) that discharged much less than normal. The IAP was in effect all year, so S-2 and S-3 inputs were greatly reduced, but this resulted in higher discharges to the WCA's through S-6, S-7, and S-8. (See Appendix C for criteria used to determine S-2 and S-3 pumping activity under the IAP.)

TABLE 3. LAKE OKEECHOBEE AVERAGE WATER QUALITY DATA

October 1987 - September 1988

Station	Temp (Celsius)	D.O. (mg/L)	Sp Conduct (micromhos/ cm)	pH	Turbidity (NTU)	Color (PTU)	Tot. Sus. Solid (mg/L)	NO2-N (mg/L)	NO3-N (mg/L)
L001	23.5	8.2	491	8.0	22.7	46	10	0.006	0.151
L002	24.3	8.2	522	8.0	28.3	43	12	0.005	0.214
L003	25.0	8.3	536	8.1	39.0	37	14	0.006	0.216
L004	24.6	8.4	549	8.1	47.2	35	17	0.007	0.244
L005	24.9	8.8	515	8.3	20.2	44	9	0.006	0.156
L006	24.7	8.2	535	8.0	39.6	38	13	0.005	0.264
L007	24.5	8.6	529	8.1	20.5	41	7	0.006	0.211
L008	25.1	8.4	532	8.1	47.8	37	20	0.005	0.253
Lakewide Average	24.6	8.4	526	8.1	33.2	40	13	0.006	0.214

Station	NH4-N (mg/L)	Total N (mg/L)	Ortho-P (mg/L)	Total P (mg/L)	Total Alk (mg/L CaCo3)	Chloride (mg/L)	Total Iron (mg/L)	Chlorophyll a (mg/m3)	Secchi Depth (meters)
L001	0.02	1.54	0.034	0.109	98.5	72.3	0.65	25.0	0.48
L002	0.01	1.67	0.042	0.117	105.0	77.5	0.97	19.7	0.41
L003	0.02	1.57	0.044	0.132	107.8	77.8	0.99	17.4	0.37
L004	0.02	1.72	0.048	0.149	107.8	77.7	1.25	16.5	0.33
L005	0.02	1.54	0.032	0.099	104.6	75.3	0.52	28.9	0.51
L006	0.02	1.61	0.051	0.134	111.2	79.1	0.97	12.4	0.41
L007	0.01	1.56	0.043	0.099	107.8	77.7	0.48	17.1	0.60
L008	0.02	1.67	0.044	0.137	111.1	80.6	1.23	18.7	0.41
Lakewide Average	0.02	1.61	0.042	0.122	106.7	77.3	0.88	19.5	0.44

FIGURE 3. MEAN ANNUAL LAKE OKEECHOBEE TOTAL NITROGEN AND PHOSPHORUS CONCENTRATIONS

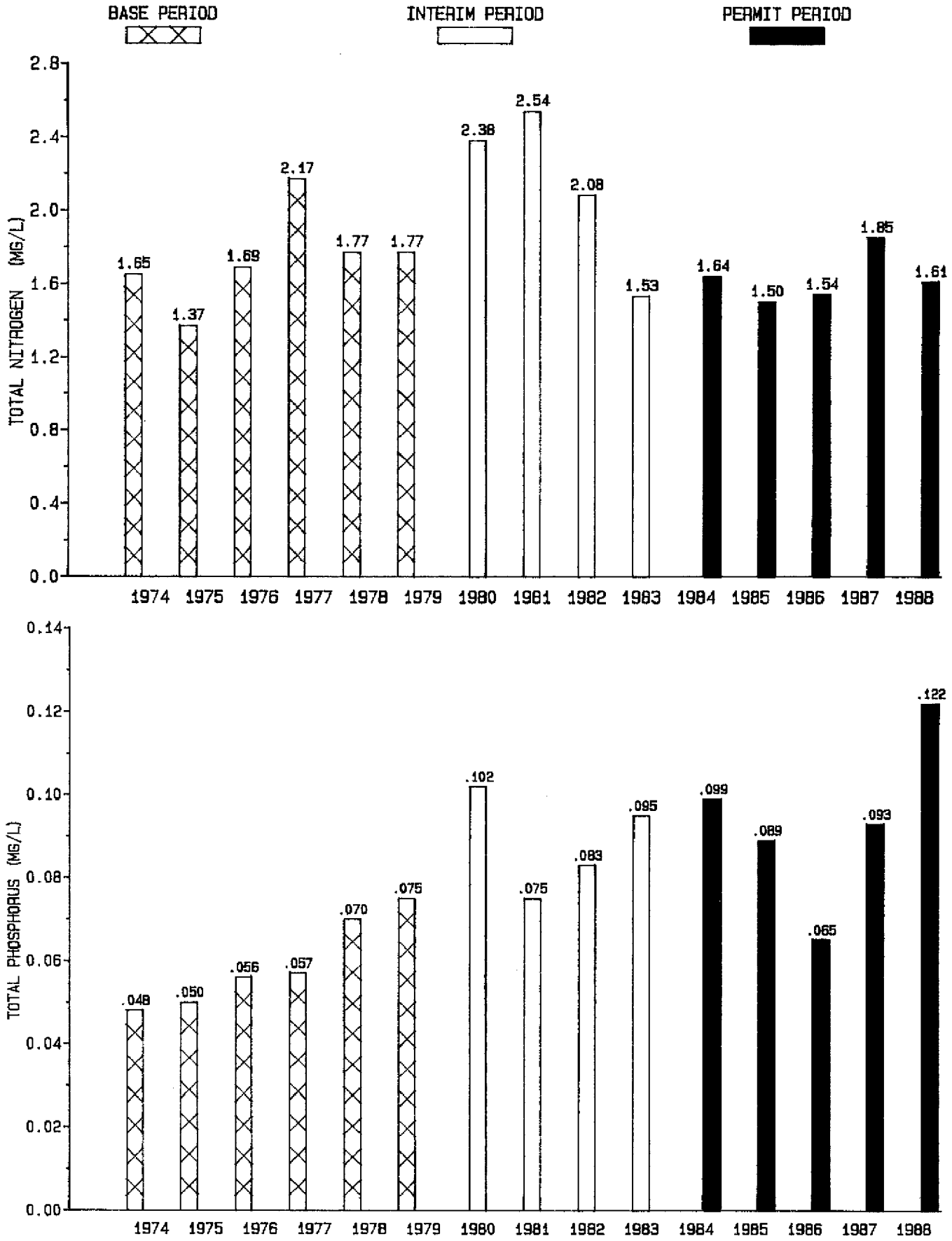

TABLE 4. MEAN WATER QUALITY DATA FOR LAKE OKEECHOBEE TRIBUTARIES AND WATER CONSERVATION AREA INFLOWS AND OUTFLOWS

OCTOBER 1987 - SEPTEMBER 1988

Station	TEMP	DO	COND	PH	TURB	COLOR	TSS	NO2
Lake Inflows								
CULV10	24.7	5.0	714	7.5	13.1	35	10	0.039
CULV10A	24.7	7.2	569	7.7	34.2	36	21	0.006
CULV12	25.2	5.0	643	7.5	0.8	36	6	0.038
CULV12A	24.7	3.7	1214	7.3	9.3	51	5	0.042
CULV4A	24.9	4.8	851	7.4	12.6	38	12	0.036
CULV5	25.5	2.5	546	6.7	3.2	55	4	0.005
FECSR78	26.2	4.9	259	6.9	2.7	48	2	0.010
INDUSCAN	25.1	5.7	841	7.2	9.2	66	11	0.014
L59E	27.1	3.7	1790	7.0	9.6	62	28	0.009
L59W	28.1	4.8	459	7.1	4.5	38	3	0.012
L60E	27.5	5.0	366	7.1	4.8	41	6	0.052
L60W	26.6	5.3	340	7.1	1.8	60	1	0.039
L61E	28.2	5.5	309	7.1	4.0	68	10	0.047
L61W	27.3	4.8	382	7.1	6.2	79	9	0.005
S127	26.6	6.4	896	7.5	8.7	55	11	0.013
S129	25.9	5.8	671	7.3	4.2	47	4	0.007
S131	26.0	5.9	664	7.4	3.2	51	3	0.008
S133	26.6	6.2	623	7.5	5.8	56	7	0.008
S135	26.9	7.7	741	7.7	5.0	51	5	0.009
S154	25.7	4.3	687	6.9	12.1	46	8	0.012
S154C	25.5	2.1	3381	6.6	3.2	58	3	0.004
S169	25.1	5.3	674	7.5	7.6	42	8	0.017
S191	25.7	6.4	931	7.2	2.6	64	2	0.015
S236	25.5	4.4	1199	7.3	4.1	69	3	0.043
S2IN	27.7	1.7	1237	7.1	11.9	83	53	0.141
S2OUT	24.2	5.9	606	7.8	16.3	34	18	0.005
S308IN	26.3	6.4	56	7.4	18.2	51	10	0.017
S4	26.8	6.7	672	7.7	5.1	52	5	0.019
S65	23.7	5.4	153	6.6	3.1	49	4	0.005
S65E	25.7	6.1	194	6.9	3.5	61	2	0.009
S68	24.9	7.9	159	7.4	1.9	43		0.004
S71	25.9	4.4	272	6.9	2.5	74	1	0.054
S72	25.3	4.8	342	6.9	2.9	54	3	0.027
S84	25.8	6.1	296	7.0	1.7	57	1	0.005
Lake Outflows								
S308OUT	24.7	7.7	80	7.9	30.1	39	29	0.004
S3OUT	24.9	5.8	626	7.8	10.6	41	12	0.013
S77IN	30.1	4.6	66	7.4	3.8	73	3	0.004
S77OUT	25.7	5.1	45	7.3	5.3	97	6	0.013
HGS5OUT	24.0	6.8	69	7.7	33.4	34	23	0.004
WCA Inflows								
S6	24.4	3.7	1071	7.2	5.9	53	2	0.048
S7	24.2	4.6	886	7.2	5.4	49	3	0.034
S8	24.5	4.7	706	7.3	5.1	49	3	0.026

TABLE 4. (CONTINUED)

Station	NO3	NH4	TN	SRP	TP	ALK	CL	FE
Lake Inflows								
CULV10	0.125	0.166	2.00	0.056	0.118	32.8	94.8	0.13
CULV10A	0.153	0.043	1.81	0.032	0.126	119.0	78.2	1.09
CULV12	0.525	0.187	2.25	0.033	0.088	143.7	84.5	0.20
CULV12A	0.290	0.446	2.53	0.067	0.133	227.3	192.0	0.16
CULV4A	0.642	0.395	2.68	0.026	0.084	180.9	115.0	0.12
CULV5	0.021	0.048	1.41	0.028	0.078	39.7	81.3	0.28
FECSR78	0.019	0.060	1.37	0.096	0.154	29.1	53.2	1.33
INDUSCAN	0.178	0.210	1.78	0.033	0.136	185.4	144.0	
L59E	0.029	0.209	2.48	0.075	0.222	64.8	653.0	0.25
L59W	0.067	0.106	1.54	0.177	0.256	40.3	59.2	0.24
L60E	0.072	0.308	2.02	0.130	0.235	41.5	46.0	0.52
L60W	0.314	0.053	1.84	0.089	0.137	38.1	41.7	0.25
L61E	0.448	0.050	1.73	0.093	0.157	46.4	42.6	0.26
L61W	0.029	0.028	1.55	0.031	0.115	43.7	44.5	0.65
S127	0.046	0.028	1.81	0.058	0.183	144.4	212.0	0.17
S129	0.033	0.038	1.44	0.034	0.102	129.4	80.2	0.20
S131	0.062	0.040	1.54	0.036	0.106	128.6	96.0	0.25
S133	0.032	0.070	1.62	0.052	0.148	117.9	93.1	0.22
S135	0.020	0.013	1.36	0.011	0.071	164.4	116.0	0.17
S154	0.037	0.084	1.60	0.273	0.467	45.0	140.0	2.35
S169	0.114	0.169	1.74	0.037	0.106	145.6	91.2	0.20
S191	0.147	0.062	1.34	0.424	0.486	78.5	199.0	0.47
S236	0.268	0.299	2.44	0.009	0.067	255.1	166.0	0.19
S2IN	1.564	0.635	5.17	0.116	0.199	286.1	118.0	
S308IN	0.230	0.081	1.58	0.060	0.129	138.7	94.2	1.10
S4	0.116	0.067	1.75	0.031	0.105	145.2	92.3	0.13
S65	0.012	0.020	1.10	0.019	0.060	29.4	22.6	0.31
S65E	0.082	0.041	1.16	0.031	0.070	34.2	29.3	0.26
S68	0.197	0.018	0.84	0.005	0.031	26.3	21.1	0.18
S71	0.515	0.130	1.64	0.079	0.132	29.7	33.5	0.27
S72	0.164	0.217	1.71	0.120	0.170	37.2	35.6	0.52
S77IN	0.014	0.130	1.27	0.022	0.076	101.3	62.7	
S84	0.061	0.036	1.10	0.013	0.037	29.1	50.4	0.32
Lake Outflows								
S2OUT	0.042	0.033	1.51	0.011	0.076	122.4	85.0	
S3OUT	0.261	0.049	1.99	0.015	0.078	131.7	85.7	
S308OUT	0.194	0.082	1.70	0.050	0.128	114.5	94.5	
S77OUT	0.040	0.058	1.49	0.053	0.116	101.7	73.0	0.47
HGS5OUT	0.145	0.034	1.68	0.027	0.129	117.9	81.0	1.16
WCA Inflows								
S6	0.475	0.209	2.75	0.057	0.105	45.9	149.0	0.19
S7	0.587	0.093	2.48	0.045	0.091	49.7	116.0	0.12
S8	0.363	0.061	1.99	0.041	0.089	43.4	81.1	0.26

TABLE 5a. DISCHARGE COMPARISONS FOR LAKE OKEECHOBEE AND THE WATER CONSERVATION AREAS

	Discharge (ac-ft/yr)						
Structure or Basin	Average 1973-79	WY 1983-84	WY 1984-85	WY 1985-86	WY 1986-87	WY 1987-88	Average 1983-88
S-2	195,880	51,047	164,863	11,648	868	11,697	48,025
S-3	55,733	23,171	145,422	6,153	0	2,345	35,418
S-4	34,887	74,580	4,036	11,669	4,169	35,167	25,924
S-127	10,886	33,685	1,769	9,006	11,052	39,597	19,022
S-129	11,169	14,682	1,964	1,009	6,674	22,975	9,461
S-131	5,277	5,607	960	1,751	1,614	8,781	3,743
S-133	15,680	50,384	7,652	5,528	13,428	32,012	21,801
S-135	17,432	32,947	7,476	14,479	11,328	26,753	18,597
S-71*	81,408	67,760	14,935	66,274	29,900	112,561	58,286
S-72*	17,432	6,727	49	9,068	1,200	25,585	8,526
S-84*	68,442	61,586	12,452	22,504	0	112,176	41,744
S-65E**	589,326	244,275	82,826	128,440	97,194	346,240	179,795
S-154	-----	25,785	12,202	31,689	12,899	35,275	23,570
S-191	153,586	108,073	71,304	100,272	54,673	95,315	85,927
Fisheating Creek	203,449	230,128	67,184	101,211	70,416	210,941	135,976
TOTAL* **	1,460,587	1,004,652	582,892	489,012	302,516	1,082,145	692,243
S-6	140,966	161,437	89,802	279,829	111,881	176,169	163,824
S-7	134,819	326,829	185,987	286,269	112,466	285,217	239,354
S-8	263,967	492,227	265,511	488,786	160,786	313,897	344,241

NOTES:

* Discharges for S-71, S-72, and S-84 do not include inputs from Lake Istokpoga through S-68 which totaled 238,854 ac-ft.

** Discharges from S-65E do not include inputs from the Upper Kissimmee Basin through S-65 which totaled 1,072,966 ac-ft.

*** The total Lake Okeechobee inflow does not include inputs from the Lake Istokpoga and Upper Kissimmee Basins, the S-154 basin, direct precipitation, and other minor basins in order to be consistent with the target loading rates in Tables 5b and 5c.

Specific Condition V(A) of the Operating Permit states that the nutrient loads into Lake Okeechobee shall not exceed the target loading rates by September 1988. This could be interpreted to mean either: (1) only inputs in the last year of the Permit are required to be below the targets, or (2) the average loads over the five year period must be below the targets. Tables 5b and 5c show where the target loadings were exceeded for each of these two interpretations.

For the first case, the 1987-88 phosphorus and nitrogen loads from the total of all controllable sources were slightly below the Operating Permit target loads to the lake. The Lower Kissimmee River, Taylor Creek/Nubbin Slough, S-154, Harney Pond Canal (S-71), and Fisheating Creek inflows were the major nutrient contributors. Individually, target loads for phosphorus were exceeded at S-127, S-129, S-131, S-133, S-71, S-72, S-65E, and S-191. Nitrogen target loads were exceeded at S-2, S-4, S-127, S-129, S-131, S-133, S-135, S-71, and S-72.

For the second case, the five-year average loads from the total of all controllable sources were also below the target loads of 382 tons phosphorus and 2,949 tons nitrogen per year. Individually, phosphorus targets were exceeded at S-3, S-127, S-133, and S-191 and target nitrogen loads were exceeded at S-2, S-3, S-127, and S-133. The failure of S-2 and S-3 to meet their targets was due in large part to the suspension of the IAP in 1985 for water supply backpumping.

Although no target loads were designated for the S-154 basin by the Operating Permit, this basin does contribute a significant amount (average of 5 percent annually) of the total lake phosphorus loading even though its drainage area is relatively small. Phosphorus input was 67.1 tons in 1987-88 and averaged 35.3 tons per year for the five year period. The SFWMD's loading allocation for this basin is 6 tons per year (derived from SFWMD (1989b), p. 5, Table 1).

Table 6 summarizes the flow-weighted nutrient concentrations for selected inflows. The average phosphorus concentration in 1987-88 from all inflows combined was 0.250 mg/L, which is similar to the average for 1973-79.

In the Lower Kissimmee River (C-38) basin, phosphorus concentrations at S-65E are usually higher than at the outlet from Lake Kissimmee at S-65. Agricultural activity in the C-38 basin (especially in Pools D and E) contributes to progressively higher phosphorus levels downstream in the canal (Federico, 1982). Flow-weighted concentrations for the C-38 basin are calculated after subtracting the nutrient loads from S-65. In 1985-86, the phosphorus concentration was nearly 0.6 mg/L, which is over four times the base period average for this basin. This was due to high concentrations at S-65E in July and August of that year. These concentrations have since returned to the normal range. The 1987-88 concentration was 0.231 mg/L. However, the average value for 1983-88 (0.316 mg/L) is more than twice the base period average, which suggests a trend toward greater loadings from the agricultural operations in the basin.

The flow-weighted phosphorus concentration for Taylor Creek/Nubbin Slough at S-191 showed a declining trend, but was still above the target level in 1987-88. The Operating Permit specified that S-191 must meet concentration targets of 0.67 mg P/L and 1.72 mg N/L by the Permit's third year (1986). These targets were not met then, because BMP's were still being implemented. BMP's had been installed on 78 percent of the critical acreage by the end of 1986 and 98 percent of this acreage by the end of 1987. The phosphorus concentration did meet the target in 1987, but

TABLE 5b. PHOSPHORUS LOAD COMPARISONS FOR LAKE OKEECHOBEE

Total Phosphorus Load
(tons/yr)

Structure or Basin	Average 1973-79	Target	WY 1983-84	WY 1984-85	WY 1985-86	WY 1986-87	WY 1987-88	Average 1983-88
S-2	35	[18]	18.6	45.1	3.6	0.2	3.7	14.2
S-3	7	[7]	11.8	37.3	2.1	0.0	0.2	{10.3}
S-4	15	15	58.1	2.1	2.8	1.2	10.7	15.0
S-127	7	7	15.3	0.4	2.9	4.8	{15.6}	{7.8}
S-129	3	3	2.3	0.3	0.1	1.4	{5.0}	1.8
S-131	1	1	0.6	0.1	0.2	0.2	{1.3}	0.5
S-133	7	7	26.7	2.3	1.9	3.4	{11.6}	{9.2}
S-135	4	4	3.9	1.0	1.3	1.0	2.7	2.0
S-71*	47	47	33.5	12.0	36.5	18.0	{51.6}	30.3
S-72*	8	11	3.7	0.1	6.0	1.0	{11.8}	4.5
S-84*	6	13	8.2	0.3	5.0	0.0	11.1	4.9
S-65E**	108	86	111.5	27.5	104.3	34.4	{108.8}	77.3
S-154	-----	-----	33.4	10.1	50.0	15.7	67.1	35.3
S-191	189	98 (139)	146.2	88.5	115.7	49.6	{106.6}	{101.3}
Fisheating Creek	65	65	82.9	32.6	32.6	8.8	26.8	36.7
TOTAL***	502	382	523.3	249.6	315.0	124.0	367.5	315.9

NOTES:

* Phosphorus loads for S-71, S-72, and S-84 do not include inputs from Lake Istokpoga through S-68 (10.0 tons).
** Phosphorus loads from S-65E do not include inputs from the Upper Kissimmee Basin through S-65 (74.4 tons).
*** The total Lake Okeechobee phosphorus load does not include inputs from the Lake Istokpoga and Upper Kissimmee Basins, the S-154 basin, direct precipitation, and other minor basins in order to provide a comparison with the target loading rate.
[] Target loads for S-2 and S-03 to be met in the third year of the permit.
( ) Target load for S-191 to be met in the third year of the permit.
{ } Indicates that the inflow exceeded its target load.

TABLE 5c. NITROGEN LOAD COMPARISONS FOR LAKE OKEECHOBEE

Total Nitrogen Load
(tons/yr)

Structure or Basin	Average 1973-79	Target	WY 1983-84	WY 1984-85	WY 1985-86	WY 1986-87	WY 1987-88	Average 1983-88
S-2	1,548	[156]	485.6	1,243.9	114.3	6.8	{158.7}	{401.9}
S-3	373	[95]	255.3	852.3	59.5	0.0	16.1	{236.6}
S-4	142	142	275.4	22.8	33.0	15.5	{237.9}	116.9
S-127	34	34	100.5	5.3	25.1	32.0	{97.3}	{52.0}
S-129	33	33	30.8	4.5	3.1	19.1	{52.9}	22.1
S-131	13	13	12.2	1.8	4.6	4.5	{18.4}	8.3
S-133	41	41	144.8	18.4	14.4	52.1	{108.7}	{67.7}
S-135	51	51	74.5	20.3	36.9	29.3	{53.0}	42.8
S-71*	323	323	238.9	105.4	326.2	193.0	{662.7}	305.2
S-72*	86	132	24.7	0.1	51.9	5.5	{139.2}	44.3
S-84*	110	258	132.1	34.0	103.7	0.0	224.5	98.9
S-65E**	997	838	295.1	33.4	432.5	13.0	538.3	262.5
S-154	---	---	---	---	92.6	39.2	109.7	48.3
S-191	479	258 (388)	283.6	209.1	279.4	163.0	240.5	235.1
Fisheating Creek	575	575	432.0	151.4	257.4	103.6	388.1	266.5
TOTAL* **	4,805	2,949	2,785.5	2,702.7	1,742.0	637.4	2,936.3	2,160.8

NOTES:

* Nitrogen loads for S-71, S-72, and S-84 do not include inputs from Lake Istokpoga through S-68 (235.2 tons).
** Nitrogen loads from S-65E do not include inputs from the Upper Kissimmee Basin through S-65 (2067.0 tons).
***The total Lake Okeechobee nitrogen load does not include inputs from the Lake Istokpoga and Upper Kissimmee Basins, the S-154 basin, direct precipitation, and other minor basins in order to provide a comparison with the target loading rate.
[ ] Target loads for S-2 and S-3 to be met in the third year of the permit.
( ) Target load for S-191 to be met in the third year of the permit.
{ } Indicates that the inflow exceeded its target load.

TABLE 6. COMPARISON OF FLOW - WEIGHTED CONCENTRATIONS

Structure or Basin	Average 1973-79	WY 1983-84	WY 1984-85	WY 1985-86	WY 1986-87	WY 1987-88	Average 1983-88
Total Phosphorus (mg/L)							
S-2	0.132	0.268	0.201	0.227	0.139	0.234	0.218
S-3	0.095	0.374	0.188	0.251	---	0.058	0.213
S-4	0.314	0.573	0.388	0.176	0.212	0.223	0.425
S-65E (minus S-65 input)	0.135	0.336	0.244	0.597	0.260	0.231	0.316
S-191*	0.906	0.995	0.913	{0.848}	0.667	{0.822}	{0.867}
S-71 (minus S-68 input)	0.425	0.364	0.591	0.405	0.443	0.337	0.383
Fisheating Creek	0.235	0.265	0.357	0.237	0.092	0.093	0.199
S-154	---	0.953	0.609	1.16	0.895	1.40	1.10
Average for Total Lake Inflow from all Controllable-Source Basins(Except S-154)	0.253	0.383	0.315	0.515	0.301	0.250	0.336
Total Nitrogen (mg/L)							
S-2	5.82	7.00	5.55	7.22	5.73	9.98	6.15
S-3	4.92	8.10	4.31	7.11	---	5.06	4.91
S-4	2.56	2.72	4.16	2.08	2.73	4.97	3.32
S-65E (minus S-65 input)	1.24	0.89	0.30	2.48	0.10	1.14	1.07
S-191*	2.29	1.93	2.16	{2.05}	{2.19}	{1.86}	{2.01}
S-71 (minus S-68 input)	2.92	2.59	5.19	3.62	4.75	4.33	3.85
Fisheating Creek	2.08	1.38	1.66	1.87	1.08	1.35	1.44
S-154	---	---	---	2.15	2.23	2.29	1.51
Average for Total Lake Inflow from all Controllable-Source Basins (Except S-154)	2.42	2.04	3.41	2.59	1.55	2.00	2.30

* Target Concentrations for S-191 are 0.67 mg P/L and 1.72 mg N/L by the third year of the Operating Permit.
{} Indicates that these target concentrations were exceeded.

rose the next year. The cause for this increase is unclear. The average flow-weighted nutrient concentrations for the five year period were 0.867 mg P/L and 2.01 mg N/L.

The 1987-88 flow-weighted phosphorus and nitrogen concentrations for the Harney Pond Canal (S-71) were also relatively high (0.337 mg P/L and 4.33 mg N/L), but were within the historical range. Outflow from Lake Istokpoga acts to dilute nutrient concentrations in the canal, so actual concentrations measured at S-71 are usually lower than these flow-weighted values, which do not include Lake Istokpoga's contribution.

S-154's flow-weighted phosphorus concentration (1.40 mg P/L) was the highest of all the inflows. This value was also the highest recorded at this structure in the last five years.

The 1987-88 flow-weighted nitrogen values at S-2 and S-4 were much higher than in the previous year. Because discharges are usually infrequent at these pump stations, flow-weighted concentrations can vary greatly from year to year, depending on the runoff water quality at the time of pumping. Among all lake inflows, S-4 also had the third highest phosphorus concentration over the five-year period.

Trends in flow-weighted concentrations for individual inflows must be regarded with caution, especially in years of low flow. This is because discharge events in low flow years are important to water quality, but are rare, and are less likely to be sampled adequately in such years. Therefore, only flow-weighted concentrations for the major inflows are reported in Table 6.

In summary, lake nutrient loads during the five year period met the target loads of 382 tons phosphorus and 2,949 tons nitrogen per year mainly because of low discharges, and secondarily as the result of the IAP diversion and BMP implementation. Among the priority basins, Taylor Creek/Nubbin Slough met its nitrogen loading target, but did not meet its target for phosphorus loading (although it was within 10 percent) or its concentration targets. Average annual loadings from the Lower Kissimmee River were below this basin's target rates, but the phosphorus target was exceeded in 1987-88. The IAP succeeded in limiting nutrient inputs from S-2 and S-3 during the last three years, but its suspension to allow water supply backpumping in 1985 brought the average annual loads above the targets for the S-2 and S-3 basins. S-154, which was not given target loads in the Operating Permit, had the highest phosphorus concentration of any inflow.

Although nutrient loads were lower than in the 1970's, flow-weighted nutrient concentrations did not decline substantially, and increased in some cases. The Taylor Creek/Nubbin Slough basin showed signs of improvement, but the lower portion of the Kissimmee River has exhibited higher phosphorus concentrations in recent years, and the S-154 and Harney Pond Canal basins are also areas of concern.

The recommendation to be drawn from these results is that water quality management plans should consider nutrient concentrations as well as loads. Because nutrient loads vary greatly with the amount of basin rainfall, they are not very useful for indicating year-to-year water quality trends. Flow-weighted concentrations provide a better means of measuring progress toward attaining nutrient reduction goals. This is one reason why the SFWMD's Lake Okeechobee SWIM Plan (SFWMD, 1989a) established target flow-weighted concentrations as

performance standards for assessing the effectiveness of phosphorus reduction efforts.

Lake Okeechobee trophic status

Trophic state indices (TSI's) based on total phosphorus, total nitrogen, and chlorophyll a concentrations have been used to evaluate Lake Okeechobee's trophic status over the years. Federico et al. (1981) explained how these indices are derived from the water quality data. The indices range from zero to 100, with zero to 53 being classified as oligotrophic to mesotrophic, 53 to 70 being eutrophic, and 70 or greater being considered hypereutrophic. These indices provide a convenient way of classifying the lake and charting trends in trophic state, but are not precise indicators of a lake's actual trophic condition. It is also important to recognize that the categories cited rely heavily on data from northern temperate-zone lakes outside of Florida.

Based on the water quality data collected since 1973, Lake Okeechobee has been classified as eutrophic (Figure 4). In recent years though, the TSI based on phosphorus levels (but no other TSI) indicates that the lake borders on the hypereutrophic classification. This TSI moved up into the hypereutrophic range in 1987-88. As explained earlier, the increase in the phosphorus TSI was not due to greater phosphorus inputs that year, but was caused by wind-induced turbidity and, probably, an accumulation of excess phosphorus inputs in the lake over a long period of time. The chlorophyll TSI, meanwhile, remained in the mid-eutrophic range, showing that phytoplankton biomass did not follow the increase in total phosphorus. Since chlorophyll is usually the most important parameter to consider when classifying a lake, the increase in the phosphorus TSI does not mean that the lake can be considered hypereutrophic yet. Instead, it indicates that the potential exists for the lake to become hypereutrophic if the phytoplankton shows a greater response to the higher phosphorus concentrations.

Pesticides

This section presents a summary of pesticide and herbicide residues that were detected in the quarterly sampling. Copies of the original data sheets for all the compounds analyzed are available upon request. These data have been submitted to FDER as required by the Operating Permit.

The only compound that was found in water samples was the herbicide atrazine, which was detected at S-2, S-4, S-6, S-7, and S-8. Levels of 0.3 to 3.0 ppb were found in February and April 1988 (Table 7). This is the season when atrazine is normally applied to crops. The minimum detection limit for this compound was 0.1 ppb. During these sampling events, S-7 and S-8 were discharging by gravity flow to the WCA's, and S-2 and S-3 were discharging to the EAA from Lake Okeechobee. Trace amounts of rain fell over the EAA the week before sampling. Atrazine was also detected in the sediment at S-6 in April at 134 ppb (Table 8).

FIGURE 4. ANNUAL TROPHIC STATE INDICES FOR LAKE OKEECHOBEE

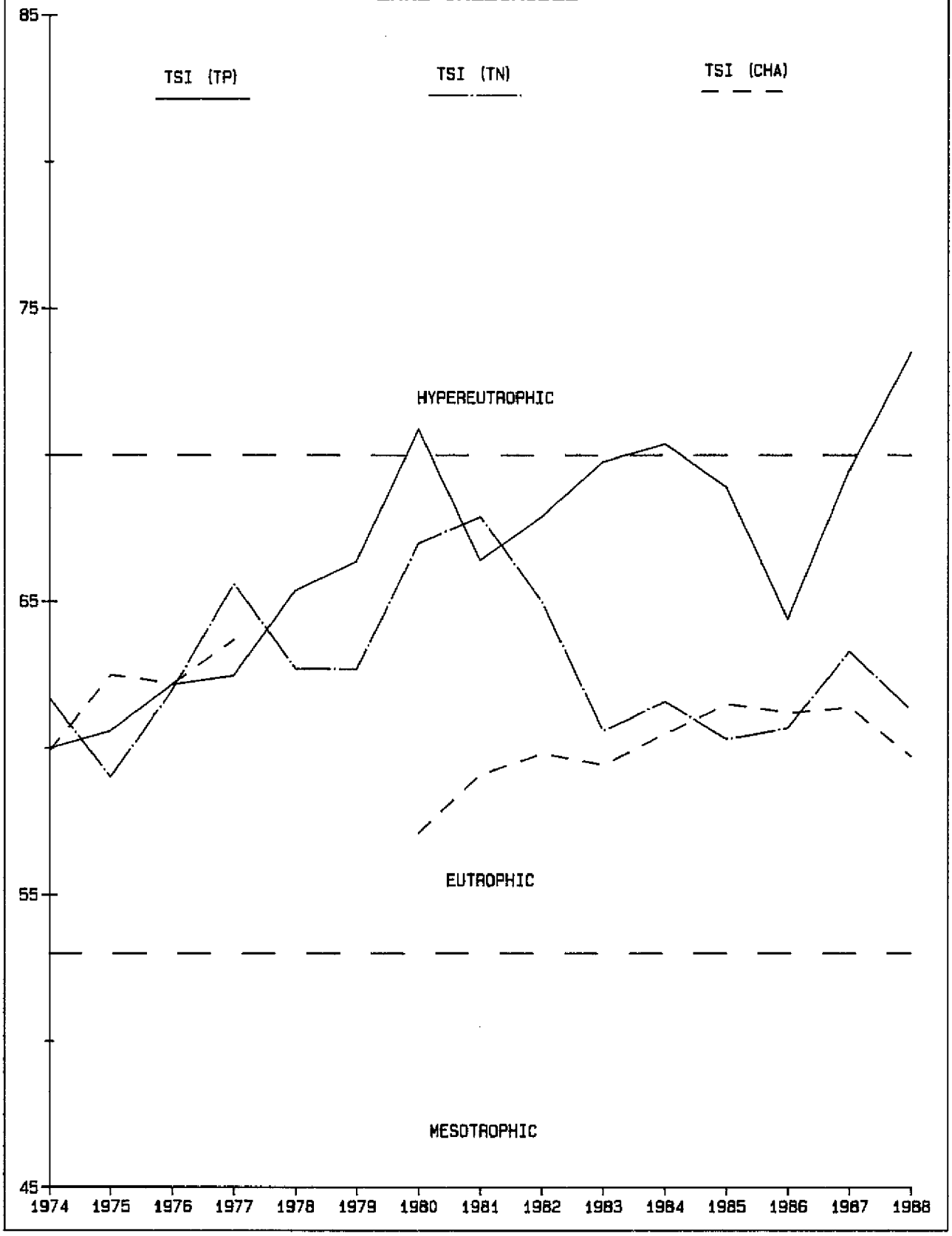

TABLE 7. Atrazine Detected In Water Samples At EAA Pump Stations

	Station (units in ppb)					
Date	S-2	S-3	S-4	S-6	S-7	S-8
Oct. 26-28, 1987	ND[1]	ND	ND	ND	ND	ND
Feb. 22-24, 1988	0.3	ND	0.3	1.0	3.0	0.5
Apr. 11-13, 1988	ND	ND	ND	0.9	0.4	ND
July 25-27, 1988	ND	ND	ND	ND	ND	ND

[1]ND = Not Detected

TABLE 8. Sediment Pesticide Residue Summary for EAA Pump Stations

		Station (units in ppb)					
Date	Compound	S-2	S-3	S-4	S-6	S-7	S-8
Oct. 26-28, 1987	P,P'DDE	59.6	ND[1]	ND	ND	38.0	ND
Feb. 22-24, 1988	P,P'DDD	7.9	1.6	5.3	5.9	5.2	ND
	P,P'DDE	10.0	2.1	12.7	5.2	6.4	ND
Apr. 11-13, 1988	P,P'DDD	ND	2	10	41	ND	ND
	P,P'DDE	ND	6	8	21	11	ND
	Delta BHC	ND	ND	ND	ND	23	ND
	Chlorpyrifos	ND	ND	ND	8	ND	ND
	Atrazine	ND	ND	ND	134	ND	ND
July 25-27, 1988	P,P'DDD	ND	ND	ND	11[2]	ND	ND
	P,P'DDE	28	ND	ND	9[2]	ND	ND

[1]ND = Not Detected
[2]Average of duplicate samples

Atrazine is a non-restricted use, selective herbicide that is registered for use on sugarcane, corn, and turf grasses. The half-life of atrazine is very site-specific, but is about 10 days in the water and 45 days in the soil (U.S. DHHS, 1981).

Atrazine is considered only slightly toxic. The LD_{50} (a calculated oral dose of an acutely-administered substance which is expected to cause death in 50 percent of a population of a test animal species) for rats is 3,080 mg/kg body weight. The LC_{50} (lethal concentration) for fish ranges from 6.3 to 78 ppm and a LC_{50} (48 hour) for fresh water invertebrates ranges from 0.72 to 6.7 ppm. The highest value detected (3.0 ppb or 0.003 ppm) is not high enough to cause possible toxic effects on fish or invertebrates.

To calculate a safe level of atrazine in drinking water, a U.S. EPA-developed acceptable daily intake value of 0.0375 mg/kg/day was used to calculate a 1310 ppb concentration. This value represents the maximum level of atrazine at which adverse health effects would not be expected in the average adult, based on a 70 kg body weight and the ingestion of 2 liters of water per day. This calculated value is over 400 times higher than the greatest value (3.0 ppb) detected. For a small child of 10 kg body weight who consumes one liter of water per day, the maximum contaminant level is 375 ppb. Again, this value is over 100 times higher than the field results. Therefore, the conclusion is that the levels of atrazine found did not represent a possible adverse health problem. No State of Florida surface water or drinking water quality standards or U.S. EPA guidelines exist for atrazine.

The compounds DDD and DDE, which are degradation products of the insecticide DDT, were detected at various times at pump stations S-2, S-3, S-4, S-6, and S-7 (Table 8). These compounds have been found at several sites within the SFWMD in the past and are probably relic residues from the past use of DDT.

Two other compounds, delta BHC and chlorpyrifos, were found in the sediment samples taken from S-7 and S-6, respectively, in April 1988 (Table 8). Delta BHC had not been detected at any sampling sites since 1983 and chlorpyrifos was detected for the first time. Delta BHC is one of the isomers of technical BHC (benzene hexachloride) which was used as an insecticide until it was suspended in 1976. Chlorpyrifos is a non-restricted use, organophosphorus insecticide. It is extremely toxic to fish, birds, and other wildlife. Hydrolysis in water occurs most readily at high pH and appears to be the main route of degradation. The half-life of chlorpyrifos ranges from 80 to 100 days in various soils (U.S. DHHS, 1981). The existence of these compounds in the sediment indicates their previous presence in the water column. Neither compound was found in concentrations high enough to present potential adverse health or environmental effects.

No State of Florida or U.S. EPA criteria or standards exist for pesticide residues in sediment.

REFERENCES

Federico, A. C. 1982. Water quality characteristics of the lower Kissimmee River Basin, Florida. South Florida Water Management District, West Palm Beach, Tech. Pub. No. 82-3.

Federico, A. C., K. G. Dickson, C. R. Kratzer, and F. E. Davis. 1981. Lake Okeechobee water quality studies and eutrophication assessment. South Florida Water Management District, Tech. Pub. No. 81-2.

South Florida Water Management District. 1982. Lake Okeechobee water quality management plan--alternatives evaluation. Technical Report, August 1982.

South Florida Water Management District. 1989a. Interim surface water improvement and management (SWIM) plan for Lake Okeechobee. Part 1: water quality, and Part VII: public information. March 1, 1989.

South Florida Water Management District. 1989b. Technical document in support of Chapter 40E-61, Works of the District within the Lake Okeechobee basin. September 13, 1989.

United States Department of Health and Human Services, Food and Drug Administration, Bureau of Foods. 1981. The FDA surveillance index for pesticides.

Appendix A

Pesticides Analyzed in 1987-88 and Their Minimum Detection Limits

October 26-28, 1987 Sampling Event

Surface water analyses were performed by University of Miami, Miami, Florida (HRS Certification #E76071). Sediment analyses were performed by Environmental Science and Engineering, Inc., Gainesville, Florida (DER/HRS Certification #E82067) with methods developed from Methods for Non-Conventional Pesticide Chemical Analysis of Municipal and Industrial Wastewater, US EPA 440/1-83/079-C, January 31, 1983. Zinc phosphide analyses were performed by Everglades Laboratories, Inc., West Palm Beach, Florida (Lab #86122, 86109, E86048). All analyses were performed in accordance with U.S. EPA, ASTM, Standard Methods or other approved methods. The compounds analyzed in the surface water and sediment samples included:

	Sediment	Water		Sediment	Water
2,4-D	371-2070[1]	2.0[2]	malathion	65.0-359	0.06
2,4-DP(dichlorprop)	63.9-356	0.8	methamidophos	520-2900	0.20
2,4,5-T	62.7-350	0.6	methomyl	92-510	20.0
2,4,5-TP(silvex)	63.9-356	0.4	methoxychlor	20.8-115	0.02
alachlor	52-290	0.02	methyl bromide	28-140	1.00
aldicarb	0.06-0.34	2.0	methyl parathion	26-140	0.06
aldrin	10.4-57.5	0.002	metolachlor	130-720	0.02
ametryn	26.0-144	10.0	metribuzin	26-140	0.004
atrazine	26.0-144	0.10	mevinphos	104-575	0.10
benomyl	NA[3]	20.0	monocrotophos (azodrin)	520-2870	1.0
BHC, alpha	19.5-108	0.002	oxamyl	100-560	2.0
BHC, beta	11.7-64.6	0.004	paraquat	760-830	3.0
BHC, delta	13.0-71.8	0.003	parathion	65.0-359	0.06
bromacil	260-1400	0.02	PCB 1016	268-1480	0.065
carbaryl(sevin)	56-310	NA	PCB 1221	270-1500	0.065
carbofuran	95-520	10.0	PCB 1232	270-1500	0.065
chlordane	13.0-71.8	0.01	PCB 1242	270-1500	0.065
chloropicrin	0.567-2.85	1.00	PCB 1248	270-1500	0.065
chlorpyrifos	26.0-144	0.06	PCB 1254	270-1500	0.065
chlorothalonil	260-1400	0.004	PCB 1260	270-1500	0.065
diazinon	65.0-359	0.06	perthane	270-1400	0.02
dieldrin	10.4-57.5	0.003	phorate	26.0-144	0.03
endosulfan, alpha	10.4-57.5	0.007	P,P'-DDD	10.4-57.5	0.008
endosulfan, beta	10.4-57.5	0.008	P,P'-DDE	10.4-57.5	0.004
endosulfan sulfate	10.4-57.5	0.017	P,P'-DDT	16.9-93.4	0.01
endrin	10.4-57.5	0.007	prometryn	26-140	10.0
endrin aldehyde	10.4-57.5	0.018	simazine	26-140	0.10
ethion	26-140	0.10	toxaphene	1330-7330	0.05
ethoprophosphorus	26.0-144	0.06	trifluralin	13-72	0.01
fonofos(dyfonate)	26-144	0.06	trithion (carbophenothion)	52-290	0.10
glyphosate	NA	100.0	zinc phosphide	NA	1.0
guthion (azinphos-methyl)	65.0-359	1.0			
heptachlor	10.4-57.5	0.002			
heptachlor epoxide	10.4-57.5	0.003			
kelthane(dicofol)	52-290	0.012			
lindane(BHC, gamma)	11.7-64.6	0.001			

[1] Range of minimum detection limit in ug/kg-dry weight or ppb.
[2] Minimum detection limit in ug/L or ppb.
[3] Parameter not analyzed due to lack of suitable analytical method.

February 22-24, 1988 Sampling Event

Surface water and sediment analyses were performed by University of Miami, Miami, Florida (HRS Certification #E76071). All analyses were performed in accordance with U.S. EPA, ASTM, Standard Methods or other approved methods. The compounds analyzed in the surface water and sediment samples included:

	Sediment	Water		Sediment	Water
2,4-D	200.0[1]	2.0[2]	malathion	6.0	0.06
2,4-DP(dichlorprop)	80.0	0.8	methamidophos	20.0	0.20
2,4,5-T	60.0	0.6	methomyl	2000.0	20.0
2,4,5-TP(silvex)	40.0	0.4	methoxychlor	2.0	0.02
alachlor	2.0	0.02	methyl bromide	NA	1.00
aldicarb	2.0	2.0	methyl parathion	6.0	0.06
aldrin	0.2	0.002	metolachlor	2.0	0.02
ametryn	1000.0	10.0	metribuzin	0.4	0.004
atrazine	10.0	0.10	mevinphos	10.0	0.10
benomyl	2000.0	20.0	monocrotophos (azodrin)	100.0	1.0
BHC, alpha	0.2	0.002	oxamyl	200.0	2.0
BHC, beta	0.4	0.004	paraquat	30.0	3.0
BHC, delta	0.3	0.003	parathion	6.0	0.06
bromacil	1000.0	0.02	PCB 1016	6.5	0.065
carbaryl(sevin)	100.0	5.0	PCB 1221	6.5	0.065
carbofuran	1000.0	10.0	PCB 1232	6.5	0.065
chlordane	1.0	0.01	PCB 1242	6.5	0.065
chloropicrin	NA[3]	1.00	PCB 1248	6.5	0.065
chlorpyrifos	6.0	0.06	PCB 1254	6.5	0.065
chlorothalonil	1000.0	0.004	PCB 1260	6.5	0.065
diazinon	6.0	0.06	perthane	2.0	0.02
dieldrin	0.3	0.003			
diuron	1000.0	10.0	phorate	3.0	0.03
endosulfan, alpha	0.7	0.007	P,P'-DDD	0.8	0.008
endosulfan, beta	0.8	0.008	P,P'-DDE	0.4	0.004
endosulfan sulfate	1.7	0.017	P,P'-DDT	1.0	0.01
endrin	0.7	0.007	prometryn	1000.0	10.0
endrin aldehyde	1.8	0.018	simazine	10.0	0.10
ethion	10.0	0.10	toxaphene	5.0	0.05
ethoprophosphorus	6.0	0.06	trifluralin	1.0	0.01
fonofos(dyfonate)	6.0	0.06	trithion (carbophenothion)	10.0	0.10
glyphosate	NA	100.0			
guthion (azinphos-methyl)	100.0	1.0			
heptachlor	0.2	0.002			
heptachlor epoxide	0.3	0.003			
kelthane(dicofol)	1.2	0.012			
lindane(BHC, gamma)	0.1	0.001			
linuron	1000.0	10.0			

[1] Minimum Detection Limit in ug/kg-dry weight or ppb.
[2] Minimum Detection Limit in ug/L or ppb.
[3] Parameter not analyzed due to lack of suitable analytical method.

April 11-13, 1988 Sampling Event

Surface water and sediment analyses were performed by University of Miami, Miami, Florida (HRS Certification #E76071). All analyses were performed in accordance with U.S. EPA, ASTM, Standard Methods or other approved methods. The compounds analyzed in the surface water and sediment samples included:

	Sediment	Water		Sediment	Water
2,4-D	2000.0[1]	2.0[2]	malathion	6.0	0.06
2,4-DP(dichlorprop)	800.0	0.8	methamidophos	20.0	0.20
2,4,5-T	600.0	0.6	methomyl	2000.0	20.0
2,4,5-TP(silvex)	400.0	0.4	methoxychlor	2.0	0.02
alachlor	2.0	0.02	methyl bromide	NA	1.00
aldicarb	80.0	2.0	methyl parathion	6.0	0.06
aldrin	0.2	0.002	metolachlor	2.0	0.02
ametryn	1000.0	10.0	metribuzin	0.4	0.004
atrazine	10.0	0.10	mevinphos	10.0	0.10
benomyl	2000.0	20.0	monocrotophos (azodrin)	100.0	1.0
BHC, alpha	0.2	0.002	oxamyl	200.0	2.0
BHC, beta	0.4	0.004	paraquat	10.0	3.0
BHC, delta	0.3	0.003	parathion	6.0	0.06
bromacil	1000.0	0.02	PCB 1016	6.5	0.065
carbaryl(sevin)	100.0	5.0	PCB 1221	6.5	0.065
carbofuran	1000.0	10.0	PCB 1232	6.5	0.065
chlordane	1.0	0.01	PCB 1242	6.5	0.065
chloropicrin	NA[3]	1.00	PCB 1248	6.5	0.065
chlorpyrifos	6.0	0.06	PCB 1254	6.5	0.065
chlorothalonil	1000.0	0.004	PCB 1260	6.5	0.065
diazinon	6.0	0.06	perthane	2.0	0.02
dieldrin	0.3	0.003			
diuron	1000.0	10.0	phorate	3.0	0.03
endosulfan, alpha	0.7	0.007	P,P'-DDD	0.8	0.008
endosulfan, beta	0.8	0.008	P,P'-DDE	0.4	0.004
endosulfan sulfate	1.7	0.017	P,P'-DDT	1.0	0.01
endrin	0.7	0.007	prometryn	1000.0	10.0
endrin aldehyde	1.8	0.018	simazine	10.0	0.10
ethion	10.0	0.10	toxaphene	5.0	0.05
ethoprophosphorus	6.0	0.06	trifluralin	1.0	0.01
fonofos(dyfonate)	6.0	0.06	trithion (carbophenothion)	10.0	0.10
glyphosate	NA	100.0			
guthion (azinphos-methyl)	100.0	1.0			
heptachlor	0.2	0.002			
heptachlor epoxide	0.3	0.003			
kelthane(dicofol)	1.2	0.012			
lindane(BHC, gamma)	0.1	0.001			
linuron	1000.0	10.0			

[1] Minimum Detection Limit in ug/kg-dry weight or ppb.
[2] Minimum Detection Limit in ug/L or ppb.
[3] Parameter not analyzed due to lack of suitable analytical method.

July 25-27, 1988 Sampling Event

Surface water and sediment analyses were performed by University of Miami, Miami, Florida (HRS Certification #E76071). All analyses were performed in accordance with U.S. EPA, ASTM, Standard Methods or other approved methods. The compounds analyzed in the surface water and sediment samples included:

	Sediment	Water		Sediment	Water
2,4-D	2000.0[1]	2.0[2]	malathion	6.0	0.06
2,4-DP(dichlorprop)	800.0	0.8	methamidophos	20.0	0.20
2,4,5-T	600.0	0.6	methomyl	2000.0	20.0
2,4,5-TP(silvex)	400.0	0.4	methoxychlor	2.0	0.02
alachlor	2.0	0.02	methyl bromide	NA	1.00
aldicarb	80.0	2.0	methyl parathion	6.0	0.06
aldrin	0.2	0.002	metolachlor	2.0	0.02
ametryn	1000.0	10.0	metribuzin	0.4	0.004
atrazine	10.0	0.10	mevinphos	10.0	0.10
benomyl	2000.0	20.0	monocrotophos (azodrin)	100.0	1.0
BHC, alpha	0.2	0.002	oxamyl	200.0	2.0
BHC, beta	0.4	0.004	paraquat	10.0	3.0
BHC, delta	0.3	0.003	parathion	6.0	0.06
bromacil	1000.0	0.02	PCB 1016	6.5	0.065
carbaryl(sevin)	100.0	5.0	PCB 1221	6.5	0.065
carbofuran	1000.0	10.0	PCB 1232	6.5	0.065
chlordane	1.0	0.01	PCB 1242	6.5	0.065
chloropicrin	NA[3]	1.00	PCB 1248	6.5	0.065
chlorpyrifos	6.0	0.06	PCB 1254	6.5	0.065
chlorothalonil	1000.0	0.004	PCB 1260	6.5	0.065
diazinon	6.0	0.06	perthane	2.0	0.02
dieldrin	0.3	0.003			
diuron	1000.0	10.0	phorate	3.0	0.03
endosulfan, alpha	0.7	0.007	P,P'-DDD	0.8	0.008
endosulfan, beta	0.8	0.008	P,P'-DDE	0.4	0.004
endosulfan sulfate	1.7	0.017	P,P'-DDT	1.0	0.01
endrin	0.7	0.007	prometryn	1000.0	10.0
endrin aldehyde	1.8	0.018	simazine	10.0	0.10
ethion	10.0	0.10	toxaphene	5.0	0.05
ethoprophosphorus	6.0	0.06	trifluralin	1.0	0.01
fonofos(dyfonate)	6.0	0.06	trithion (carbophenothion)	10.0	0.10
glyphosate	NA	100.0			
guthion (azinphos-methyl)	100.0	1.0			
heptachlor	0.2	0.002			
heptachlor epoxide	0.3	0.003			
kelthane(dicofol)	1.2	0.012			
lindane(BHC, gamma)	0.1	0.001			
linuron	1000.0	10.0			

[1] Minimum detection limit in ug/kg-dry weight or ppb.
[2] Minimum detection limit in ug/L or ppb.
[3] Parameter not analyzed due to lack of suitable analytical method.

Appendix B

Taylor Creek/Nubbin Slough Basin Water Quality Data

October 1987--September 1988

ARS07/TCNS245 Williamson Main at Williamson Cattle Co.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.152	0.223	0.52	2.06	15.2	314	6.97	1.62	0.030	0.08	0.409
10/27/87	0.191	0.227	0.18	1.44	1.0	1570	7.10	1.35	0.033	0.09	0.055
11/10/87	0.236	0.325	0.21	1.50	6.7	468	7.17	1.44	0.031	0.15	0.031
11/24/87	0.180	0.233	0.17		6.1	418	7.15		0.029	0.12	0.025
12/08/87	0.092	0.138	0.23	1.07	7.9	1320	6.88	1.01	0.061	0.17	0.004
12/21/87	0.077	0.101	0.06	0.88	1.9	1195	7.62	0.85	0.012	0.03	0.014
01/04/88	0.085	0.134	0.07	0.85	3.4	2330	6.98	0.83	0.005	0.05	0.011
01/20/88	0.101	0.113	0.13	0.96	2.4	1830	7.28	0.92	0.015	0.09	0.020
02/03/88	0.062	0.082	0.11	1.03	1.8	1186	8.19	1.01	0.009	0.09	0.012
02/16/88	0.065	0.105	0.07	1.23	3.6	946	7.63	1.21	0.012	0.05	0.012
03/03/88	0.178	0.245	0.01	0.71	2.6	2080	7.57	0.71	0.004	0.01	0.004
03/16/88	0.092	0.146	0.08	1.00	6.3	902	7.40	0.99	0.006	0.07	0.005
03/30/88	0.260	0.358	0.28	1.26	4.8	2060	7.05	1.20	0.017	0.22	0.043
04/13/88	0.123	0.158	0.02	0.68	1.6	1039	8.05	0.67	0.004	0.01	0.006
04/27/88	0.018	0.119	0.01	0.67	2.1	3930	7.48	0.67	0.004	0.01	0.004
05/11/88	0.049	0.088	0.07	0.82	1.2	901	7.50	0.81	0.004	0.06	0.004
05/25/88	0.049	0.099	0.02	0.84	1.9	637	7.48	0.83	0.009	0.01	0.004
06/08/88	0.035	0.092	0.05	0.82	1.3	791	7.55	0.80	0.005	0.03	0.013
06/22/88	0.016	0.057	0.01	0.73	0.9	761	6.97	0.73	0.005	0.01	0.004
07/07/88	0.034	0.091	0.13	1.65	2.0	468	7.36	1.64	0.007	0.12	0.004
07/20/88	0.094	0.239	0.09	1.71	3.0	258	6.97	1.65	0.016	0.03	0.046
08/10/88	0.247	0.314	0.12	1.74	3.7	377	7.28	1.63	0.026	0.01	0.088
08/17/88	0.237	0.332	0.03	1.71	1.3	323	7.12	1.69	0.018	0.01	0.004
08/24/88	0.190	0.270	0.09	1.94	3.7	388	6.55	1.87	0.022	0.02	0.045
08/31/88	0.250	0.333	0.35	1.49	4.6	446	7.31	1.38	0.042	0.24	0.069
09/07/88	0.221	0.321	0.33	1.52	4.5	980	7.40	1.37	0.036	0.18	0.114
09/14/88	0.178	0.229	0.12	1.13	6.4	454	6.33	1.05	0.018	0.04	0.064
09/21/88	0.188	0.272	0.01	0.98	2.9	1072	6.41	0.98	0.004	0.01	0.004
09/28/88	0.149	0.188	0.02	0.83	1.8	509	7.18	0.82	0.004	0.01	0.005

ARS08/TCNS246 Williamson East Lateral at Williamson Cattle Co.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.363	0.472	0.75	2.30	14.2	667	6.93	1.90	0.050	0.35	0.354
10/27/87	0.182	0.230	0.17	1.25	1.7	914	7.09	1.24	0.011	0.16	
11/10/87	0.849	1.008	0.66	2.09	5.8	854	7.24	2.04	0.031	0.61	0.015
11/24/87	0.664	0.675	0.38	2.22	5.3	795	6.97	2.03	0.068	0.19	0.118
12/08/87	0.242	0.295	0.16	1.23	4.2	1680	6.98	1.17	0.017	0.10	0.042
12/21/87	0.141	0.160	0.08	1.06	3.4	2160	7.49	0.99	0.016	0.01	0.050
01/04/88	0.076	0.111	0.03	0.95	2.4	4000	7.05	0.93	0.007	0.01	0.011
01/20/88	0.137	0.158	0.11	1.04	1.2	1820	7.27	0.96	0.017	0.03	0.062
02/03/88	0.433	0.509	2.16	3.29	2.1	1780	8.31	2.87	0.084	1.74	0.337
02/16/88	0.627	0.770	0.41	1.99	1.9	1800	7.47	1.66	0.030	0.08	0.307
03/03/88	0.068	0.115	0.07	0.50	3.1	905	7.62	0.50	0.004	0.07	0.004
03/16/88	0.212	0.210	0.11	0.93	3.6	2800	7.52	0.92	0.004	0.10	0.009
03/30/88	0.156	0.215	0.15	1.14	6.1	976	7.39	1.12	0.009	0.13	0.016
04/13/88	0.019	0.093	0.01	0.76	1.9	3660	8.23	0.76	0.004	0.01	0.004
04/27/88	0.093	0.162	0.01	0.68	2.8	3930	7.65	0.68	0.004	0.01	0.004
05/11/88	0.004	0.078	0.03	2.72	15.2	4150	8.38	2.72	0.005	0.03	0.004
05/25/88	0.160	0.289	0.30	1.14	1.7	2350	7.35	1.09	0.014	0.25	0.039
06/08/88	0.006	0.043	0.03	0.92	1.4	4600	7.45	0.90	0.004	0.01	0.012
06/22/88	0.114	0.224	0.02	0.88	0.4	1620	6.83	0.87	0.009	0.01	
07/07/88	0.160	0.212	0.06	1.18	1.6	1900	7.22	1.15	0.008	0.03	0.022
07/20/88	0.199	0.298	0.14	1.81	2.1	652	6.69	1.71	0.017	0.04	0.079
08/10/88	0.350	0.428	0.35	1.93	3.0	819	7.18	1.80	0.031	0.22	0.099
08/17/88	0.542	0.639	0.30	1.97	2.1	503	7.09	1.93	0.027	0.26	0.015
08/24/88	0.635	0.729	0.31	2.29	6.4	525	6.60	2.22	0.033	0.24	0.035
08/31/88	0.504	0.592	0.54	1.71	4.2	842	7.23	1.58	0.047	0.41	0.082
09/07/88	0.364	0.409	0.64	1.73	2.7	4120	7.39	1.41	0.105	0.32	0.216
09/14/88	0.305	0.423	0.29	1.40	2.9	1091	6.28	1.23	0.041	0.12	0.130
09/21/88	0.096	0.199	0.01	0.78	1.2	2240	6.47	0.78	0.004	0.01	0.004
09/28/88	0.053	0.072	0.05	0.74	1.5	978	7.20	0.70	0.004	0.01	0.038

ARS09/TCNS214 Williamson Main Below Boys School.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.221	0.355	0.56	2.26	24.0	453	6.97	1.85	0.043	0.15	0.368
10/27/87	0.191	0.309	0.25	1.31	4.9	1510	7.00	1.26	0.019	0.20	0.026
11/24/87	0.375	0.394	0.29	1.77	4.9	563	7.03	1.63	0.054	0.15	0.085
12/08/87	0.187	0.224	0.24	1.23	4.8	1212	7.09	1.06	0.028	0.07	0.139
12/21/87	0.171	0.209	0.22	1.10	4.2	1980	7.35	0.98	0.021	0.10	0.100
01/04/88	0.077	0.143	0.07	1.17	3.3	2730	7.24	1.16	0.004	0.06	0.009
01/20/88	0.153	0.163	0.17	1.06	2.9	1960	7.34	1.00	0.015	0.11	0.049
02/03/88	0.262	0.341	1.38	2.45	4.3	1690	7.99	2.13	0.069	1.06	0.253
02/16/88	0.416	0.527	0.32	1.57	4.6	1330	7.60	1.35	0.031	0.10	0.185
03/03/88	0.168	0.228	0.08	0.51	3.5	1450	7.59	0.50	0.004	0.07	0.010
03/16/88	0.161	0.222	0.17	1.02	6.0	1630	7.28	0.99	0.006	0.14	0.026
03/30/88	0.256	0.322	0.29	1.61	4.2	1450	6.77	1.53	0.021	0.21	0.057
04/13/88	0.096	0.151	0.04	0.73	5.2	2240	7.89	0.72	0.005	0.03	0.004
04/27/88	0.062	0.185	0.01	0.80	3.2	1780	7.53	0.80	0.004	0.01	0.004
05/11/88	0.040	0.105	0.01	0.83	2.6	1970	7.36	0.83	0.004	0.01	0.004
05/25/88	0.121	0.395	0.02	0.69	6.9	1590	7.33	0.68	0.006	0.01	
06/08/88	0.061	0.208	0.03	0.91	3.9	2920	7.36	0.89	0.004	0.01	0.015
06/22/88	0.097	0.167	0.03	0.64	0.7	1159	6.97	0.62	0.009	0.01	0.014
07/07/88	0.211	0.248	0.12	1.27	3.4	1003	7.28	1.22	0.012	0.07	0.039
07/20/88	0.121	0.400	0.10	2.05	5.6	385	6.93	1.96	0.018	0.01	0.072
08/10/88	0.318	0.383	0.36	1.83	2.3	519	7.20	1.63	0.048	0.16	0.148
08/17/88	0.333	0.021	0.04	2.45	1.8	411	7.11	2.42	0.019	0.01	0.012
08/24/88	0.352	0.443	0.29	2.12	6.0	443	6.43	2.00	0.039	0.17	0.082
08/31/88	0.403	0.452	0.52	1.55	2.4	525	7.37	1.32	0.061	0.29	0.170
09/07/88	0.301	0.615	0.40	2.08	2.8	1149	7.34	1.85	0.045	0.17	0.184
09/14/88	0.299	0.337	0.33	1.31	4.2	659	6.45	1.05	0.032	0.08	0.223
09/21/88	0.172	0.223	0.24	0.87	2.7	1350	6.08	0.75	0.007	0.12	0.113
09/28/88	0.141	0.167	0.12	0.74	2.8	637	7.02	0.68	0.004	0.06	0.051

ARS11/TCNS248 Taylor Creek Main at Cemetary Rd.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.316	0.430	0.41	2.00	17.3	349	6.95	1.69	0.037	0.10	0.276
10/27/87	0.504	0.577	0.17	1.45	2.4	667	7.00	1.41	0.019	0.13	0.024
11/10/87	0.701	0.838	0.26	1.76	5.2	427	7.03	1.62	0.035	0.12	0.109
11/24/87	0.935	0.926	0.20	1.75	5.5	238	6.98	1.61	0.037	0.06	0.104
12/08/87	0.424	0.427	0.42	1.56	2.7	653	7.16	1.15	0.021	0.01	0.388
12/21/87	0.316	0.353	0.33	1.50	1.7	886	7.55	1.28	0.017	0.11	0.207
01/04/88	0.159	0.227	0.06	0.94	4.5	1202	7.55	0.89	0.008	0.01	0.038
01/20/88	0.285	0.305	0.36	1.26	2.7	815	7.46	0.95	0.015	0.05	0.295
02/03/88	0.234	0.311	0.30	1.57	2.1	525	8.05	1.36	0.016	0.09	0.199
02/16/88	0.363	0.465	0.26	1.72	4.1	778	7.65	1.52	0.019	0.06	0.180
03/03/88	0.222	0.295	0.09	0.70	2.0	657	7.55	0.64	0.009	0.03	0.050
03/16/88	0.399	0.468	0.23	2.01	3.3	861	7.21	1.82	0.019	0.04	0.174
03/30/88	0.623	0.746	0.13	1.27	2.5	471	7.15	1.18	0.020	0.05	0.065
04/13/88	0.365	0.473	0.03	1.09	2.0	1117	7.74	1.07	0.010	0.01	0.013
04/27/88	0.362	0.470	0.01	1.38	2.0	988	7.49	1.38	0.004	0.01	0.004
05/11/88	0.270	0.400	0.02	0.95	3.7	915	7.38	0.94	0.004	0.01	0.004
05/25/88	0.249	0.322	0.09	0.53	0.9	910	7.41	0.50	0.009	0.06	0.019
06/08/88	0.169	0.192	0.03	1.06	1.7	1480	7.40	1.05	0.004	0.02	0.004
06/22/88	0.203	0.268	0.01	0.51	0.6	1026	7.07	0.51	0.004	0.01	0.004
07/07/88	0.333	0.360	0.08	1.41	2.8	476	7.35	1.39	0.008	0.06	0.012
07/20/88	0.278	0.530	0.22	2.36	10.1	311	6.66	2.24	0.021	0.10	0.095
08/10/88	0.961	1.068	0.23	1.85	1.9	292	6.88	1.75	0.033	0.13	0.066
08/17/88	0.554	0.643	0.02	1.70	1.5	300	7.00	1.69	0.019	0.01	
08/24/88	0.675	0.770	0.26	1.82	10.8	177	6.32	1.64	0.032	0.09	0.143
08/31/88	0.852	0.961	0.23	1.75	2.4	344	7.17	1.53	0.046	0.01	0.171
09/07/88	0.585	0.649	0.47	1.84	2.6	522	7.35	1.47	0.034	0.10	0.334
09/14/88	0.574	0.623	0.29	1.63	3.1	265	6.31	1.38	0.029	0.04	0.219
09/21/88	0.447	0.513	0.06	1.43	2.8	646	7.04	1.37	0.020	0.01	0.035
09/28/88	0.376	0.413	0.03	1.05	1.5	280	7.12	1.03	0.014	0.01	0.004

ARS12/TCNS247 Taylor Creek Main at Well Line B.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.498	0.723	0.26	1.84	14.0	144	6.98	1.59	0.030	0.01	0.218
10/27/87	0.565	0.706	0.10	1.44	7.1	285	7.05	1.36	0.024	0.02	0.053
11/10/87	1.089	1.268	0.23	2.04	10.3	202	7.15	1.82	0.029	0.01	0.190
11/24/87	1.071	1.094	0.17	2.02	5.4	167	7.07	1.87	0.037	0.02	0.115
12/08/87	0.480	0.534	0.23	1.43	4.8	305	7.29	1.32	0.025	0.12	0.083
12/21/87	0.381	0.414	0.44	1.32	3.4	320	7.49	0.91	0.011	0.03	0.395
01/04/88	0.318	0.360	0.34	1.19	3.6	366	7.53	0.87	0.015	0.02	0.304
01/20/88	0.311	0.315	0.42	1.24	2.3	425	7.59	0.85	0.012	0.03	0.382
02/03/88	0.301	0.470	0.26	2.80	4.3	325	8.22	2.58	0.011	0.04	0.213
02/16/88	0.317	0.416	0.45	2.02	3.6	310	7.84	1.72	0.013	0.15	0.289
03/03/88	0.246	0.355	0.31	0.84	4.4	321	7.39	0.58	0.005	0.05	0.259
03/16/88	0.533	0.611	0.30	1.53	2.4	375	7.24	1.29	0.011	0.06	0.229
03/30/88	0.654	0.777	0.11	1.77	4.4	275	7.09	1.67	0.016	0.01	0.083
04/13/88	0.336	0.389	0.03	1.16	6.2	458	7.91	1.14	0.012	0.01	0.007
04/27/88	0.339	0.433	0.01	0.64	2.0	414	7.55	0.64	0.004	0.01	0.004
05/11/88	0.244	0.499	0.05	2.06	2.2	616	7.38	2.05	0.005	0.04	0.006
05/25/88	0.230	0.369	0.08	0.65	3.4	875	7.42	0.62	0.008	0.05	0.022
06/08/88	0.342	0.423	0.07	0.87	2.6	651	7.49	0.85	0.004	0.05	0.020
06/22/88	0.405	0.505	0.01	0.83	0.5	361	7.19	0.83	0.004	0.01	0.004
07/07/88	0.353	0.555	0.06	2.40	2.9	305	7.42	2.38	0.007	0.05	0.008
07/20/88	0.354	0.578	0.31	2.57	6.5	246	6.80	2.38	0.029	0.12	0.165
08/10/88	1.108	1.266	0.36	2.19	3.0	166	7.43	1.97	0.140	0.14	0.182
08/17/88	0.793	0.948	0.26	2.63	2.1	195	7.21	2.42	0.050	0.05	0.173
08/24/88	0.684	0.999	0.58	4.31	9.1	134	6.41	4.17	0.440	0.44	0.112
08/31/88	0.978	1.074	0.51	2.03	2.6	201	7.52	1.62	0.100	0.10	0.360
09/07/88	0.437	0.516	0.44	1.72	9.1	519	7.49	1.32	0.040	0.04	0.375
09/14/88	0.663	0.767	0.39	2.04	6.2	140	6.56	1.66	0.010	0.01	0.353
09/21/88	0.601	0.655	0.42	1.56	3.5	215	6.31	1.19	0.050	0.05	0.351
09/28/88	0.525	0.631	0.14	1.61	3.2	129	7.23	1.52	0.050	0.05	0.071

ARS13/TCNS222 Mosquito Creek Below HWY 710.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	1.048	1.261	1.60	3.38	4.3	947	6.90	2.19	0.057	0.41	1.128
10/27/87	0.513	0.554	0.45	1.63	2.4	1053	6.67	1.19	0.016	0.01	0.425
11/10/87	1.137	1.323	0.42	2.24	9.6	466	6.86	1.96	0.035	0.14	0.241
11/24/87	0.975	0.976	0.21	1.77	3.3	403	6.91	1.62	0.039	0.06	0.108
12/08/87	0.484	0.516	0.17	1.23	4.2	718	6.79	1.07	0.015	0.01	0.143
12/21/87	0.397	0.436	0.70	1.83	2.2	999	7.50	1.14	0.016	0.01	0.677
01/06/88	0.420	0.507	0.95	1.94	2.6	874	7.07	1.01	0.007	0.02	0.927
01/20/88	0.464	0.480	0.69	1.57	1.4	848	7.48	0.90	0.014	0.02	0.659
02/03/88	0.459	0.525	0.58	1.85	2.1	644	7.96	1.28	0.011	0.01	0.561
02/17/88	0.504	0.624	0.52	2.13	2.6	647	6.86	1.67	0.015	0.06	0.448
03/04/88	0.393	0.469	1.03	1.88	2.2	538	7.34	0.90	0.007	0.05	0.974
03/16/88	0.379	0.409	0.71	1.71	2.8	715	7.35	1.06	0.006	0.06	0.643
03/30/88	0.395	0.473	0.44	1.42	2.2	532	6.95	1.01	0.016	0.03	0.391
04/13/88	0.285	0.327	0.30	1.90	2.0	1045	7.47	1.61	0.006	0.01	0.286
04/27/88	0.388	0.434	0.14	0.68	1.3	1030	7.37	0.56	0.004	0.02	0.116
05/11/88	0.362	0.436	0.27	1.31	0.9	992	6.76	1.09	0.005	0.05	0.218
05/25/88	0.538	0.586	0.44	1.66	1.3	655	7.18	1.27	0.011	0.05	0.374
06/08/88	1.146	1.317	1.89	3.20	4.2	1053	6.80	2.00	0.083	0.69	1.114
06/22/88	2.156	2.430	0.96	3.66	0.8	1320	6.72	3.14	0.062	0.44	0.456
07/07/88	0.864	0.861	1.08	2.66	0.9	692	7.03	1.63	0.015	0.05	1.011
07/20/88	0.989	1.076	0.77	2.08	1.3	926	6.60	1.47	0.061	0.16	0.553
08/10/88	0.756	0.849	0.66	2.28	1.8	450	7.21	1.74	0.035	0.12	0.501
08/16/88	1.138	1.308	0.35	2.14	6.3	350	6.93	1.98	0.037	0.19	0.121
08/23/88	1.516	1.610	0.17	2.45	4.2	301	7.21	2.30	0.033	0.02	0.122
08/30/88	0.794	0.873	0.58	2.20	2.5	369	7.30	1.72	0.033	0.10	0.443
09/07/88	0.687	0.850	0.63	2.12	4.1	588	7.05	1.56	0.029	0.07	0.529
09/13/88	0.673	0.744	0.59	2.14	3.8	207	7.45	1.56	0.018	0.01	0.562
09/20/88	0.505	0.602	0.31	1.77	3.1	550	7.41	1.59	0.155	0.14	0.020
09/28/88	0.463	0.490	1.09	2.57	1.9	168	7.36	1.51	0.004	0.03	1.052

ARS14/TCNS228 Nubbin Slough Below HWY 710.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.644	0.830	0.75	2.39	12.3	153	6.67	1.78	0.041	0.14	0.573
10/27/87	0.417	0.460	0.77	1.79	1.9	365	6.57	1.54	0.023	0.52	0.228
11/10/87	1.206	1.320	1.51	3.50	3.5	244	6.98	3.02	0.130	1.03	0.353
11/24/87	1.033	1.070	0.69	3.07	4.0	212	6.79	2.61	0.046	0.23	0.417
12/08/87	0.498	0.619	0.94	2.43	8.0	282	6.72	1.86	0.089	0.37	0.481
12/21/87	0.356	0.420	0.92	1.64	4.1	293	6.93	1.10	0.025	0.38	0.515
01/06/88	0.303	0.362	1.04	3.07	4.7	308	7.22	2.56	0.025	0.53	0.484
01/20/88	0.332	0.435	0.98	2.06	3.6	393	6.80	1.43	0.039	0.35	0.593
02/03/88	0.555	0.770	2.04	3.42	4.9	336	7.55	2.08	0.086	0.70	1.253
02/17/88	0.483	0.702	0.75	2.37	5.8	266	7.32	1.91	0.030	0.29	0.426
03/04/88	0.252	1.125	0.64	2.19	10.5	271	6.34	1.94	0.015	0.39	0.237
03/16/88	0.284	2.533	0.61	6.47	69.0	333	6.22	6.17	0.025	0.31	0.270
03/30/88	0.309	1.357	0.74	2.77	12.6	316	6.67	2.46	0.030	0.43	0.275
04/13/88	0.178	0.229	0.46	1.50	2.8	422	7.23	1.31	0.026	0.28	0.159
04/27/88	0.192	0.333	0.06	0.92	2.4	396	6.70	0.87	0.006	0.01	0.048
05/11/88	0.238	0.314	0.42	1.47	4.2	353	7.02	1.36	0.014	0.30	0.101
05/25/88	0.058	0.362	0.35	1.46	2.6	347	6.76	1.38	0.025	0.27	0.057
06/08/88	0.238	1.454	1.09	2.27	2.9	416	6.71	2.17	0.015	0.99	0.087
06/22/88	0.287	0.392	0.76	2.07	0.9	482	6.81	1.97	0.016	0.66	0.079
07/07/88	0.418	0.812	1.02	3.34	15.7	262	6.93	3.23	0.018	0.91	0.097
07/20/88	0.383	2.110	0.40	7.31	20.0	250	6.50	7.17	0.013	0.26	0.132
08/10/88	1.561	1.744	0.52	2.43	14.0	104	7.64	2.10	0.045	0.19	0.285
08/16/88	1.143	1.319	1.07	2.82	2.9	218	7.05	2.78	0.029	1.03	0.007
08/23/88	1.785	1.891	0.82	3.23	6.4	172	5.09	3.17	0.042	0.76	0.019
08/30/88	0.890	1.047	1.16	2.76	2.4	220	6.98	2.63	0.041	1.03	0.091
09/07/88	1.108	1.325	1.64	3.07	4.2	330	7.22	2.28	0.112	0.85	0.682
09/13/88	1.234	6.660	1.03	7.02	117.0	152	6.73	6.23	0.028	0.24	0.760
09/20/88	0.764	0.759	0.08	2.24	4.5	247	7.44	2.19	0.035	0.03	0.017
09/28/88	0.456	0.843	1.44	4.24	8.9	102	7.27	3.56	0.035	0.76	0.646

ARS15/TCNS220 Mosquito Creek at HWY 70.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.774	0.926	2.11	3.70	7.5	527	6.83	2.48	0.072	0.89	1.145
10/27/87	0.422	0.463	0.86	1.86	2.9	869	6.40	1.40	0.039	0.40	0.417
11/10/87	0.785	0.932	0.40	2.17	9.3	347	7.00	1.95	0.041	0.18	0.182
11/24/87	0.747	0.778	0.42	1.81	3.5	326	6.31	1.48	0.040	0.09	0.290
12/08/87	0.356	0.405	0.04	1.32	7.4	540	6.22	1.30	0.020	0.02	0.004
12/21/87	0.298	0.345	1.06	1.83	3.6	802	6.77	0.99	0.045	0.22	0.797
01/06/88	0.386	0.430	1.32	2.18	3.9	610	7.07	1.31	0.056	0.45	0.817
01/20/88	0.367	0.373	1.25	2.24	3.4	513	7.03	1.24	0.048	0.25	0.955
02/03/88	0.360	0.445	1.28	2.57	3.2	480	5.94	1.47	0.023	0.19	1.072
02/17/88	0.322	0.417	0.91	2.08	4.3	485	7.18	1.35	0.046	0.18	0.684
03/04/88	0.330	0.407	2.38	3.00	2.4	418	6.98	0.87	0.024	0.25	2.106
03/16/88	0.255	0.315	1.09	2.49	3.4	626	6.51	1.58	0.017	0.18	0.896
03/30/88	0.257	0.376	0.59	1.98	4.2	515	6.29	1.40	0.020	0.01	0.560
04/13/88	0.143	0.183	0.49	1.27	1.2	1530	6.60	0.82	0.009	0.04	0.441
04/27/88	0.271	0.309	0.25	0.78	1.7	1073	6.24	0.76	0.008	0.23	0.013
05/11/88	0.433	0.526	0.48	1.12	1.4	789	6.55	1.08	0.009	0.44	0.034
05/25/88	0.629	1.456	0.94	3.77	3.5	536	6.78	3.75	0.013	0.92	0.004
06/08/88	0.428	0.511	0.82	1.50	2.8	806	6.92	1.47	0.008	0.79	0.023
06/22/88	0.714	0.735	1.47	2.31	0.5	859	6.51	2.25	0.023	1.41	0.035
07/07/88	0.932	1.227	2.68	3.60	1.4	770	7.19	3.59	0.010	2.67	0.004
07/20/88	0.484	0.544	1.25	2.29	1.8	852	6.68	1.90	0.050	0.86	0.336
08/10/88	0.578	0.653	1.09	2.72	1.4	478	5.78	2.60	0.026	0.97	0.098
08/16/88	0.981	1.083	0.32	1.29	4.3	308	7.35	1.26	0.024	0.29	0.007
08/23/88	1.218	1.400	0.39	2.53	4.6	306	6.26	2.50	0.025	0.36	0.004
08/30/88	0.732	0.860	0.79	2.54	2.5	470	7.70	2.50	0.029	0.75	0.012
09/07/88	0.577	0.660	1.14	2.47	8.7	466	6.97	2.39	0.023	1.06	0.060
09/14/88	0.524	0.609	1.00	2.23	4.2	230	6.97	2.11	0.024	0.88	0.099
09/21/88	0.475	0.522	1.31	2.45	1.8	506	7.11	2.15	0.025	1.01	0.278
09/28/88	0.446	0.476	1.65	2.72	1.3	178	7.25	2.11	0.046	1.04	0.560

ARS17/TCNS249 Nubbin Slough at Berman Rd.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.291	0.421	0.32	3.95	17.0	82	5.03	3.81	0.039	0.18	0.102
10/27/87	0.097	0.216	0.04	1.26	5.2	92	6.12	1.24	0.014	0.02	0.007
11/10/87	0.373	0.519	0.04	2.26	6.5	86	5.92	2.24	0.016	0.02	0.005
11/24/87	0.530	0.543	0.08	1.32	0.8	84	5.94	1.30	0.029	0.06	
12/08/87	0.098	0.171	0.40	1.34	7.8	65	5.40	1.26	0.035	0.32	0.048
12/21/87	0.103	0.152	0.02	1.24	8.6	64	6.86	1.23	0.014	0.01	
01/06/88	0.104	0.224	0.03	1.45	30.0	54	7.49	1.44	0.008	0.02	
01/20/88	0.042	0.078	0.03	0.75	3.8	65	7.46	0.73	0.014	0.01	0.008
02/03/88	0.111	0.305	0.03	24.36	22.0	77	6.18	24.35	0.008	0.02	0.004
02/17/88	0.236	0.322	0.04	1.39	4.6	90	7.63	1.38	0.012	0.03	0.004
03/04/88	0.044	0.730	0.04	19.17	82.0	54	5.60	19.16	0.006	0.03	0.004
03/16/88	0.028	0.124	0.01	1.06	9.8	69	5.21	1.06	0.004	0.01	0.004
03/30/88	0.071	0.426	0.02	2.23	26.0	69	5.12	2.22	0.007	0.01	0.004
04/13/88	0.102	0.333	0.02	1.08	101.0	63	6.39	1.07	0.007	0.01	0.004
04/27/88	0.135	0.673	0.58	3.32	28.0	1047	6.35	3.29	0.018	0.55	0.010
05/11/88	0.092	0.153	0.05	0.72	2.1	76	5.60	0.71	0.020	0.04	
07/07/88	0.118	0.185	0.15	0.87	2.1	123	6.77	0.86	0.008	0.14	0.004
07/20/88	0.276	0.657	0.03	1.93	1.3	97	6.04	1.91	0.016	0.01	
08/10/88	0.632	0.816	0.19	2.12	17.3	286	6.77	2.01	0.022	0.08	0.085
08/16/88	1.078	1.205	0.09	0.97	2.5	98	6.82	0.95	0.023	0.07	
08/23/88	1.536	1.750	0.18	2.56	5.2	92	7.10	2.54	0.025	0.16	
09/13/88	0.635	0.728	0.03	1.58	8.1	150	7.05	1.56	0.018	0.01	0.006

ARS39/TCNS230 Henry Creek Below HWY 710.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	4.005	4.810	5.58	12.7	14.0	889	7.16	12.3	0.087	5.18	0.316
11/10/87	1.841	2.080	2.51	4.76	4.0	1035	7.02	4.42	0.117	2.17	0.218
11/24/87	1.316	1.375	1.75	3.13	1.9	697	6.79	2.75	0.121	1.37	0.257
12/08/87	2.110	2.155	0.95	4.34	6.9	703	6.91	3.85	0.032	0.46	0.458
12/21/87	2.170	2.345	3.56	4.31	1.6	564	7.24	3.70	0.096	2.95	0.517
01/06/88	3.540	3.645	5.29	7.28	2.3	590	7.31	6.19	0.125	4.20	0.969
01/20/88	2.820	2.832	4.19	5.71	1.5	674	7.50	4.54	0.121	3.02	1.053
02/03/88	1.725	2.070	2.59	4.16	1.2	643	7.50	2.97	0.101	1.40	1.089
02/17/88	1.025	1.320	1.70	3.14	1.8	764	7.18	2.50	0.075	1.06	0.561
03/04/88	1.264	1.370	1.07	2.47	1.8	586	7.16	1.95	0.048	0.55	0.471
03/16/88	3.169	3.445	4.33	6.11	7.7	738	7.45	5.34	0.115	3.56	0.653
03/30/88	1.332	1.515	1.02	2.60	3.7	581	6.91	2.25	0.057	0.67	0.295
04/13/88	1.097	1.275	0.44	2.03	1.9	489	7.44	1.79	0.032	0.20	0.208
04/27/88	0.739	0.910	0.02	1.72	5.4	448	6.88	1.71	0.010	0.01	0.004
05/11/88	0.866	1.098	0.10	2.21	3.8	482	7.03	2.16	0.013	0.05	0.037
05/25/88	1.675	2.035	0.74	1.81	2.3	551	7.24	1.71	0.025	0.64	0.076
06/08/88	1.159	1.153	0.41	8.86	1.6	530	6.98	8.78	0.016	0.33	0.065
06/22/88	1.584	1.831	0.18	2.63	0.7	575	6.74	2.59	0.016	0.14	0.021
07/07/88	1.154	1.385	0.16	1.85	4.2	501	7.12	1.84	0.010	0.15	
08/10/88	3.146	3.340	3.38	5.70	0.9	827	7.27	5.27	0.069	2.95	0.365
08/16/88	1.340	2.605	0.74	6.42	59.0	370	7.00	6.23	0.075	0.55	0.115
08/23/88	1.515	1.931	1.58	3.43	3.4	625	7.41	3.35	0.057	1.50	0.026
08/30/88	0.945	1.102	0.69	2.65	2.5	356	6.63	2.60	0.036	0.64	0.009
09/07/88	1.530	1.630	1.51	3.19	3.8	799	7.69	3.09	0.039	1.41	0.059
09/13/88	1.181	1.182	1.11	3.74	3.6	331	7.25	3.61	0.041	0.98	0.087
09/20/88	0.948	1.032	0.80	2.48	2.6	419	7.27	2.35	0.057	0.67	0.072
09/28/88	0.796	0.852	0.49	2.22	2.5	149	7.75	2.03	0.033	0.30	0.154

ARS40/TCNS233 Lettuce Creek Below HWY 710.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.207	0.269	0.07	1.48	4.5	131	6.16	1.44	0.022	0.03	0.019
10/27/87	0.143	0.254	0.18	3.23	7.5	304	6.59	3.21	0.017	0.16	0.004
11/10/87	1.216	1.390	0.17	2.05	2.8	229	6.81	2.02	0.027	0.14	0.004
11/24/87	0.800	0.815	0.16	1.52	1.6	159	6.86	1.46	0.043	0.10	0.012
12/08/87	0.307	0.346	0.47	2.04	5.9	216	6.90	1.58	0.075	0.01	0.382
12/21/87	0.267	0.304	0.15	2.39	1.7	248	7.14	2.30	0.026	0.06	0.060
01/06/88	0.163	0.195	0.17	1.19	2.5	280	7.40	1.11	0.017	0.09	0.066
01/20/88	0.197	0.210	0.15	1.24	1.7	254	7.50	1.14	0.017	0.05	0.084
02/03/88	0.105	0.197	0.12	7.51	2.0	236	7.59	7.43	0.029	0.04	0.050
02/16/88	0.342	0.434	0.07	1.61	1.8	243	7.28	1.55	0.021	0.01	0.036
03/04/88	0.180	0.215	0.12	1.01	1.7	218	7.09	0.96	0.014	0.07	0.039
03/16/88	0.164	0.200	0.08	1.23	6.7	277	6.98	1.19	0.010	0.04	0.031
03/30/88	0.226	0.676	0.07	2.87	13.8	222	6.65	2.82	0.020	0.02	0.027
04/13/88	0.107	0.131	0.05	1.44	2.1	385	7.42	1.41	0.009	0.02	0.019
04/27/88	0.114	0.167	0.04	0.86	2.3	435	6.98	0.83	0.005	0.01	0.023
05/11/88	0.062	0.499	0.09	2.24	15.9	421	6.76	2.22	0.005	0.07	0.017
05/25/88	0.081	0.198	0.10	0.71	1.6	430	7.30	0.65	0.009	0.04	0.047
06/08/88	0.111	0.890	0.09	1.10	30.0	394	7.05	1.04	0.008	0.03	0.053
06/22/88	0.045	0.091	0.01	0.71	0.8	430	6.56	0.71	0.005	0.01	0.004
07/07/88	0.079	0.271	0.10	2.69	5.7	393	6.32	2.65	0.007	0.06	0.030
07/20/88	0.041	0.115	0.07	0.96	1.2	653	6.81	0.91	0.008	0.02	0.039
08/10/88	0.342	0.477	0.22	2.68	1.8	480	7.55	2.61	0.027	0.15	0.048
08/16/88	0.759	1.122	0.08	2.87	21.0	193	7.00	2.84	0.034	0.05	
08/23/88	0.710	0.797	0.09	1.93	2.8	150	6.72	1.89	0.037	0.05	0.004
08/30/88	0.571		0.08	1.69	1.7	188	6.79	1.66	0.033	0.05	
09/07/88	0.516	0.635	0.12	1.65	5.4	265	7.67	1.61	0.028	0.08	0.010
09/13/88	0.553	0.578	0.05	1.60	3.1	142	7.37	1.56	0.025	0.01	0.011
09/20/88	0.342	0.405	0.47	1.81	3.4	324	6.79	1.80	0.019	0.46	
09/28/88	0.272	1.821	0.12	7.86	31.0	147	7.57	7.81	0.015	0.07	0.030

TCHW01/TCNS201 N.W. Taylor Creek at HWY 68.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.330	0.420	0.18	1.58	9.2	105	6.74	1.41	0.029	0.01	0.144
10/27/87	0.643	0.717	0.16	1.69	3.7	163	7.09	1.59	0.022	0.06	0.076
11/10/87	1.109	1.231	0.09	1.44	4.9	143	7.03	1.39	0.029	0.04	0.020
11/24/87	0.782	0.798	0.06	1.74	7.5	126	7.07	1.70	0.032	0.02	0.010
12/08/87	0.324	0.369	0.15	1.30	4.3	173	6.90	1.22	0.015	0.07	0.061
12/21/87	0.291	0.313	0.07	0.87	4.2	205	6.86	0.82	0.016	0.02	0.036
01/04/88	0.350	0.394	0.11	0.81	3.6	229	7.83	0.75	0.011	0.05	0.050
01/20/88	0.254	0.260	0.12	1.03	2.4	206	6.98	0.98	0.006	0.07	0.043
02/03/88	0.257	0.309	0.06	1.14	2.1	191	7.05	1.10	0.010	0.03	0.025
02/17/88	0.177	0.252	0.05	1.25	1.9	149	7.07	1.22	0.011	0.02	0.020
03/03/88	0.205	0.259	0.12	0.95	3.2	201	7.31	0.94	0.004	0.11	0.005
03/16/88	0.173	0.291	0.06	1.15	4.5	219	7.16	1.10	0.010	0.01	0.038
03/30/88	0.452	0.630	0.11	1.80	2.6	187	7.19	1.73	0.015	0.04	0.053
04/13/88	0.292	0.310	0.08	0.81	2.7	304	6.89	0.77	0.004	0.04	0.040
04/27/88	0.244	0.349	0.01	0.50	3.6	374	6.84	0.50	0.004	0.01	0.004
05/11/88	0.237	0.359	0.01	0.73	3.1	368	6.74	0.73	0.004	0.01	0.004
05/25/88	0.318	0.374	0.02	0.78	2.0	341	7.15	0.77	0.004	0.01	0.006
06/08/88	0.529	0.649	0.05	1.16	7.2	234	7.00	1.15	0.007	0.04	0.005
06/20/88	0.345	0.555	0.04	0.61	0.6	208	7.35	0.60	0.004	0.03	0.004
07/07/88	0.305	0.407	0.19	0.97	4.7	170	6.90	0.94	0.007	0.16	0.020
07/20/88	0.252	0.336	0.03	2.30	6.6	129	6.86	2.28	0.016	0.01	0.004
08/10/88	0.678	0.826	0.05	2.27	2.8	104	7.46	2.23	0.031	0.01	0.007
08/17/88	0.818	0.956	0.06	1.94	2.8	125	7.02	1.89	0.029	0.01	0.023
08/24/88	0.514	0.703	0.07	1.78	8.2	104	7.35	1.74	0.024	0.03	0.018
08/31/88	0.481	0.614	0.25	1.83	8.7	130	7.28	1.74	0.022	0.16	0.067
09/08/88	0.329	0.447	0.31	1.97	7.8		7.39	1.90	0.027	0.24	0.042
09/14/88	0.439	0.554	0.10	1.51	9.0	84	7.75	1.43	0.019	0.02	0.063
09/21/88	0.327	0.397	0.24	1.44	4.5	192	7.46	1.30	0.020	0.10	0.122
09/27/88	0.340	0.403	0.25	1.14	5.6	90	7.36	0.94	0.018	0.05	0.184

TCHW02/TCNS204 Little Bimini at Potter Rd.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.716	0.854	2.18	3.76	7.4	345	6.74	2.83	0.069	1.25	0.859
10/27/87	0.619	0.921	2.45	4.15	14.9	442	7.00	1.72	0.012	0.02	2.416
11/10/87	1.872	2.335	2.01	3.85	18.2	392	6.97	2.24	0.259	0.40	1.351
11/24/87	2.531	2.625	0.96	6.18	2.8	307	7.00	5.40	0.113	0.18	0.663
12/08/87	0.607	0.854	2.19	4.02	7.7	407	6.76	1.87	0.049	0.04	2.098
12/21/87	0.528	0.534	2.07	3.25	4.1	410	6.90	1.19	0.021	0.01	2.036
01/04/88	0.599	0.622	1.74	2.77	1.6	402	7.95	1.06	0.019	0.03	1.691
01/20/88	0.484	0.487	2.15	3.58	1.3	399	6.95	1.46	0.008	0.03	2.110
02/03/88	0.476	0.545	1.97	3.26	1.4	191	7.05	1.33	0.008	0.04	1.918
02/17/88	0.567	0.710	1.81	3.36	2.2	428	6.61	1.67	0.054	0.12	1.638
03/03/88	0.443	0.527	2.58	3.94	2.0	324	7.28	1.37	0.013	0.01	2.555
03/16/88	0.559	0.757	1.54	3.13	3.9	376	7.02	1.65	0.010	0.06	1.470
03/30/88	0.880	1.187	1.43	3.20	1.6	367	7.07	1.91	0.009	0.14	1.278
04/13/88	0.507	0.558	2.11	3.43	1.2	294	6.74	1.33	0.009	0.01	2.095
04/27/88	0.627	0.746	1.10	2.26	2.8	439	7.14	1.17	0.012	0.01	1.080
05/11/88	0.394	0.473	1.10	2.13	1.4	397	6.95	1.04	0.005	0.01	1.088
05/25/88	0.501	0.539	0.15	0.78	1.9	382	7.18	0.64	0.010	0.01	0.127
06/08/88	0.574	1.100	0.84	8.74	2.0	343	7.08	7.97	0.014	0.07	0.761
06/20/88	0.475	0.698	0.81	1.68	0.6	385	7.33	0.90	0.009	0.03	0.774
07/07/88	0.404	0.453	0.91	2.47	1.1	381	6.79	1.62	0.016	0.07	0.829
07/20/88	0.637	0.757	1.28	3.79	3.7	319	6.71	2.68	0.041	0.17	1.073
08/10/88	1.661	1.728	1.95	3.89	1.9	330	7.27	1.96	0.077	0.02	1.855
08/17/88	1.927	1.990	1.91	4.02	2.0	369	6.98	2.19	0.071	0.08	1.763
08/24/88	2.016	2.143	0.57	2.97	8.1	192	7.00	2.53	0.055	0.13	0.388
08/31/88	1.959	2.093	2.26	4.44	3.1	290	7.07	2.76	0.309	0.58	1.371
09/08/88	1.080	1.440	1.89	3.70	11.2	368	7.18	1.82	0.078	0.01	1.801
09/14/88	1.137	1.239	2.52	4.17	5.1	237	6.95	1.68	0.061	0.03	2.427
09/21/88	0.802	0.826	2.39	3.84	2.9	414	7.48	1.49	0.019	0.04	2.332
09/27/88	0.651	0.957	2.54	4.62	2.6	142	7.32	2.11	0.010	0.03	2.503

TCHW03/TCNS207 Otter Creek at S-13B.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.374	0.507	1.91	3.17	6.5	231	6.76	3.02	0.037	1.76	0.115
10/27/87	1.660	2.045	0.22	0.55	11.3	340	6.60	0.52	0.020	0.19	0.008
11/10/87	0.994	1.075	0.51	2.22	2.6	304	6.95	2.09	0.067	0.38	0.060
11/24/87	1.085	1.132	0.49	2.36	1.3	324	6.63	1.89	0.031	0.02	0.441
12/08/87	0.938	0.965	0.70	2.04	1.4	378	6.72	1.35	0.013	0.01	0.680
12/21/87	0.647	0.659	0.28	1.92	3.4	370	6.65	1.65	0.007	0.01	0.261
01/04/88	0.726	0.801	0.11	0.90	3.3	336	7.47	0.80	0.004	0.01	0.099
01/20/88	0.794	0.756	0.29	2.21	1.9	388	6.83	1.98	0.009	0.05	0.226
02/03/88	0.578	0.729	0.21	6.49	2.4	363	6.56	6.36	0.004	0.08	0.125
02/17/88	0.303	0.413	0.13	1.82	7.1	334	6.46	1.73	0.008	0.04	0.083
03/03/88	0.648	0.746	0.04	1.21	2.3	465	7.31	1.18	0.008	0.01	0.025
03/16/88	0.837	1.071	0.13	1.21	3.2	561	7.12	1.15	0.006	0.07	0.056
03/30/88	1.246	1.595	0.05	1.51	2.7	409	6.76	1.51	0.004	0.05	0.004
04/13/88	0.708	0.709	0.04	1.19	3.0	196	6.68	1.17	0.005	0.02	0.018
04/27/88	3.030	4.220	0.01	1.73	26.0	250	6.38	1.73	0.004	0.01	0.004
05/11/88	0.459	0.754	0.04	0.51	3.9	246	6.43	0.50	0.004	0.03	0.005
05/25/88	0.816	1.666	0.02	1.28	14.2	241	6.70	1.27	0.005	0.01	0.008
06/08/88	0.875	1.298	0.04	1.70	6.2	222	6.65	1.69	0.007	0.03	0.004
06/20/88	0.656	1.410	0.05	0.72	1.7	219	7.40	0.71	0.004	0.04	0.010
07/07/88	0.589	0.760	0.29	2.99	3.9	215	6.55	2.98	0.004	0.28	0.004
07/20/88	0.557	0.734	0.13	2.62	2.1	273	6.74	2.52	0.013	0.03	0.084
08/10/88	1.107	1.301	0.80	2.93	2.3	328	7.66	2.87	0.033	0.74	0.028
08/17/88	0.974	1.143	0.30	2.52	2.6	323	7.12	2.23	0.104	0.01	0.182
08/24/88	1.185	1.339	0.30	2.21	4.6	226	6.20	2.11	0.039	0.19	0.066
08/31/88	1.459	1.515	1.42	3.19	2.2	340	7.31	2.93	0.085	1.16	0.174
09/08/88	1.445	1.695	2.49	4.44	2.9	512	6.98	4.02	0.106	2.08	0.309
09/14/88	1.646	1.724	1.98	3.55	3.4	289	6.83	3.12	0.063	1.55	0.371
09/21/88	1.301	1.506	1.39	2.65	4.7	426	7.30	2.15	0.042	0.89	0.459
09/27/88	1.066	1.294	0.62	1.83	5.1	366	7.79	1.39	0.026	0.18	0.414

TCHW06/TCNS209 Otter Creek at S-13.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.820	0.999	0.80	2.49	11.3	199	6.49	1.70	0.063	0.01	0.727
10/27/87	0.687	0.933	0.02	1.49	6	312	6.79	1.48	0.008	0.01	0.004
11/10/87	1.035	1.130	0.31	1.85	1.5	283	7	1.57	0.021	0.03	0.261
11/24/87	1.137	1.165	0.47	2.30	1.8	289	6.95	1.84	0.027	0.01	0.433
12/08/87	0.596	0.643	0.31	1.38	2.3	302	6.62	1.08	0.009	0.01	0.289
12/21/87	0.368	0.403	0.11	0.91	3	276	6.86	0.81	0.010	0.01	0.089
01/04/88	0.380	0.416	0.06	0.83	2.4	270	7.97	0.78	0.004	0.01	0.047
01/20/88	0.409	0.411	0.11	1.35	1.4	305	6.93	1.27	0.008	0.03	0.075
02/03/88	0.348	0.425	0.12	1.35	1.7	285	7.05	1.28	0.004	0.05	0.069
02/17/88	0.302	0.417	0.14	1.35	2.8	375	6.74	1.24	0.008	0.03	0.102
03/03/88	0.300	0.346	0.02	1.00	3.2	312	6.98	0.99	0.004	0.01	0.004
03/16/88	0.315	0.464	0.05	1.26	4.2	420	6.81	1.24	0.005	0.03	0.020
03/30/88	0.505	0.691	0.05	1.84	1.7	307	6.95	1.81	0.023	0.02	0.008
04/13/88	0.434	0.719	0.02	1.08	8.4	187	6.53	1.07	0.006	0.01	0.007
04/27/88	0.996	2.115	0.02	1.68	21	229	6.52	1.67	0.004	0.01	0.004
05/11/88	0.609	1.113	0.05	1.86	17.1	224	6.76	1.85	0.004	0.04	0.005
05/25/88	0.775	0.760	0.07	0.63	4.8	230	6.93	0.57	0.004	0.01	0.052
06/08/88	0.872	0.817	0.01	1.68	8.2	208	6.98	1.68	0.004	0.01	0.004
06/20/88	0.779	1.308	0.02	0.52	0.6	237	7.26	0.51	0.004	0.01	0.004
07/07/88	0.692	0.814	0.01	1.40	2.9	197	6.84	1.40	0.004	0.01	0.004
07/20/88	0.480	0.521	0.04	1.35	1.9	238	6.61	1.32	0.008	0.01	0.021
08/10/88	0.950	1.038	0.07	1.51	0.9	334	7.55	1.49	0.013	0.05	0.011
08/17/88	1.115	1.153	0.73	1.81	0.9	322	7.60	1.62	0.017	0.54	0.169
08/24/88	1.227	1.330	0.28	2.10	4.2	180	6.90	1.83	0.021	0.01	0.247
08/31/88	1.281	1.338	0.22	1.60	1.4	270	7.09	1.41	0.015	0.03	0.179
09/08/88	0.964	1.021	0.20	1.36	2.0	347	7.02	1.32	0.009	0.16	0.031
09/14/88	0.134	1.137	0.14	2.06	3.6	239	7.17	1.96	0.007	0.04	0.088
09/21/88	1.593	2.865	0.20	1.37	24.0	307	7.27	1.37	0.009	0.20	0.004
09/27/88	1.238	3.480	0.12	1.64	32.0	248	7.59	1.64	0.004	0.12	0.004

TCHW18/TCNS213 Taylor Creek Headwaters at S-2.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.328	0.424	0.32	1.73	11.3	305	6.90	1.44	0.025	0.03	0.267
10/27/87	0.456	0.492	0.40	1.46	2.5	267	7.02	1.07	0.023	0.01	0.364
11/10/87	1.082	1.198	0.22	1.51	4.2	184	6.98	1.30	0.067	0.02	0.138
03/04/88	0.263	0.319	0.26	1.60	4.5	296	7.47	1.35	0.005	0.01	0.246
03/16/88	0.396	0.457	0.47	1.20	3.0	341	7.31	0.88	0.011	0.15	0.307
03/30/88	0.511	0.720	0.27	1.50	2.5	257	7.19	1.30	0.019	0.07	0.184
04/13/88	0.345	0.381	0.26	1.07	1.3	317	7.07	0.82	0.005	0.01	0.241
04/27/88	0.475	0.502	0.01	0.58	0.9	347	7.00	0.58	0.004	0.01	0.004
05/11/88	0.302	0.363	0.02	0.51	1.3	401	7.74	0.50	0.004	0.01	0.005
05/25/88	0.508	0.597	0.03	0.51	4.6	379	7.17	0.50	0.004	0.01	0.011
06/08/88	0.482	0.485	0.04	0.58	1.1	310	7.07	0.57	0.004	0.03	0.004
06/20/88	0.108	0.274	2.14	2.98	1.5	807	6.77	1.00	0.078	0.16	1.897
07/07/88	0.251	0.371	0.74	1.90	3.4	456	6.74	1.29	0.038	0.13	0.571
07/20/88	0.602	0.715	0.43	1.84	6.4	204	7.16	1.44	0.028	0.03	0.372
08/10/88	1.101	1.226	0.30	2.14	3.8	157	7.46	1.90	0.035	0.06	0.208
08/17/88	0.888	1.157	0.28	2.66	2.2	191	7.30	2.42	0.025	0.04	0.218
08/24/88	0.954	1.070	0.30	2.07	11.4	148	6.67	1.83	0.031	0.06	0.210
08/31/88	0.784	0.906	0.54	1.95	6.1	348	7.00	1.61	0.038	0.20	0.307
09/08/88	0.615	0.665	0.60	2.24	8.1	240	7.00	1.77	0.031	0.14	0.434
09/14/88	0.644	0.707	0.52	2.09	10.8	226	6.50	1.63	0.027	0.06	0.437
09/21/88	0.508	0.635	0.54	1.47	11.6	335	6.91	0.98	0.021	0.05	0.465
09/28/88	0.492	0.583	0.67	1.55	10.4	161	7.59	0.94	0.011	0.06	0.602

TCHW19/TCNS211 East Otter Creek at Potter Rd.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.657	0.742	0.03	1.25	2.4	117	6.42	1.23	0.016	0.01	0.005
11/10/87	0.724	0.882	0.06	1.64	1.7	201	7.00	1.61	0.031	0.03	0.004
11/24/87	0.431	0.471	0.14	1.84	0.9	197	6.82	1.81	0.031	0.12	
12/08/87	0.189	0.346	0.03	1.55	6.7	144	6.81	1.53	0.016	0.01	0.004
12/21/87	0.091	0.112	0.02	0.56	1.0	112	6.86	0.55	0.010	0.01	0.004
01/20/88	0.888	1.254	0.06	6.31	16.0	143	6.95	6.28	0.029	0.03	
02/03/88	0.058	0.148	0.04	1.03	1.3	128	7.29	1.02	0.004	0.04	0.004
02/17/88	0.058	0.093	0.02	1.11	1.3	194	6.88	1.10	0.004	0.01	0.004
03/03/88	0.032	0.152	0.14	0.96	62.0	109	6.16	0.90	0.038	0.08	0.026
03/16/88	0.040	0.077	0.05	0.65	2.0	152	6.01	0.65	0.004	0.05	0.004
03/30/88	0.213	0.587	0.17	1.77	7.9	188	6.96	1.75	0.011	0.15	0.013
04/13/88	0.022	0.211	0.01	0.77	6.9	95	6.53	0.77	0.004	0.01	0.004
05/11/88	0.014	0.071	0.02	0.60	2.9	97	5.53	0.59	0.004	0.01	0.004
05/25/88	0.027	0.071	0.03	0.84	4.5	87	5.25	0.82	0.011	0.01	0.011
06/08/88	0.048	0.278	0.01	1.94	18.8	128	5.28	1.94	0.004	0.01	0.004
06/20/88	0.028	0.083	0.01	0.50	0.3	112	7.05	0.50	0.004	0.01	0.004
07/07/88	0.093	1.203	0.01	1.39	62.0	115	7.10	1.39	0.006	0.01	0.004
07/20/88	0.071	0.128	0.02	0.83	1.7	123	6.70	0.82	0.006	0.01	0.004
08/10/88	0.293	0.374	0.03	1.67	17.5	195	7.59	1.65	0.021	0.01	
08/17/88	0.725	0.890	0.12	2.39	3.6	211	7.20	2.36	0.019	0.09	0.007
08/24/88	0.414	0.519	0.31	2.32	2.9	181	6.86	2.30	0.021	0.29	0.004
08/31/88	0.158	0.223	0.07	1.60	1.5	160	7.14	1.58	0.018	0.05	0.004
09/14/88	0.129	0.223	0.03	1.58	6.5	102	7.34	1.56	0.015	0.01	0.004
09/21/88	0.321	0.195	0.13	1.16	3.1	140	7.46	1.15	0.009	0.12	0.004
09/27/88	0.081	0.109	0.03	0.63	2.7	119	8.00	0.62	0.007	0.01	0.008

TCHW20/TCNS244 East Otter Creek at Dark Hammock Rd.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.247	0.388	0.07	1.68	38.0	151	7.04	1.63	0.028	0.02	0.021
11/10/87	0.719	0.895	0.09	1.56	2.7	211	7.03	1.49	0.031	0.02	0.037
11/24/87	0.382	0.428	0.18	1.83	2.2	206	7.02	1.79	0.034	0.14	0.004
12/08/87	0.106	0.181	0.04	1.45	1.3	164	7.47	1.43	0.021	0.02	0.004
12/21/87	0.135	0.183	0.07	1.34	7.1	153	7.43	1.31	0.019	0.04	0.010
01/04/88	0.044	0.094	0.19	1.11	7.7	331	7.36	0.93	0.008	0.01	0.169
01/20/88	0.083	0.149	0.04	3.43	2.8	144	6.83	3.41	0.016	0.02	
02/03/88	0.065	0.135	0.07	1.34	2.2	138	6.89	1.33	0.011	0.06	
02/17/88	0.061	0.105	0.02	1.32	2.6	162	6.89	1.31	0.010	0.01	0.004
03/03/88	0.049	0.080	0.08	1.19	4.0	168	6.93	1.19	0.004	0.08	0.004
03/16/88	0.048	0.255	0.05	1.11	2.4	167	6.62	1.09	0.011	0.04	0.004
03/30/88	0.063	0.117	0.05	1.05	1.3	200	7.65	1.01	0.011	0.01	0.031
06/08/88	0.201	0.507	0.31	2.49	6.8	230	6.29	2.28	0.018	0.10	0.192
07/07/88	0.091	0.202	0.07	2.23	2.3	163	7.16	2.21	0.014	0.05	0.004
07/20/88	0.126	0.224	0.02	1.40	3.9	161	7.17	1.39	0.014	0.01	
08/10/88	0.447	0.611	0.07	1.58	3.0	178	7.48	1.52	0.028	0.01	0.036
08/17/88	0.555	0.769	0.03	1.82	1.4	206	7.28	1.80	0.022	0.01	0.004
08/24/88	0.247	0.344	0.05	1.78	3.7	170	6.97	1.76	0.017	0.03	0.005
08/31/88	0.339	0.494	0.20	1.90	4.6	140	7.19	1.86	0.024	0.16	0.014
09/08/88	0.177	0.458	0.18	2.41	35.0	217	6.58	2.34	0.018	0.11	0.053
09/14/88	0.197	0.329	0.15	1.78	31.0	107	7.18	1.75	0.022	0.11	0.013
09/21/88	0.077	0.201	0.18	2.06	81.0	224	7.25	1.99	0.024	0.11	0.042
09/27/88		0.212			78.0	219	7.82	1.66			

TCHW23/TCNS208 Wilson Rucks Runoff to Otter Creek.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	1.180	1.377	2.01	5.96	3.8	351	6.53	5.70	0.047	1.75	0.213
10/27/87	0.597	0.686	1.41	3.75	3.5	328	6.76	3.49	0.171	1.15	0.089
11/24/87	1.121	1.150	0.42	2.55	4.7	349	6.81	2.16	0.023	0.03	0.364
12/08/87	0.969	1.678	0.98	3.97	27.0	412	6.74	3.19	0.021	0.20	0.758
12/21/87	0.564	0.644	0.66	3.00	6.8	323	6.77	2.41	0.016	0.07	0.578
01/20/88	0.647	0.661	0.28	1.85	3.4	363	6.88	1.65	0.015	0.08	0.184
02/03/88	0.539	0.857	0.17	7.01	1.9	340	6.74	6.88	0.005	0.04	0.127
03/04/88	0.347	0.411	0.06	1.99	3.2	263	7.02	1.93	0.009	0.01	0.046
03/16/88	0.215	0.354	0.57	1.88	4.6	349	6.76	1.43	0.006	0.12	0.442
03/30/88	0.331	0.520	0.20	2.01	2.9	292	6.75	1.94	0.007	0.13	0.063
04/13/88	0.307	0.526	0.12	4.03	19.1	229	6.84	3.99	0.015	0.08	0.027
04/27/88	0.416	0.566	0.12	2.50	2.9	280	6.70	2.42	0.006	0.04	0.078
05/11/88	0.329	0.610	0.07	2.64	9.8	290	6.69	2.58	0.009	0.01	0.054
05/25/88	0.375	0.450	0.07	1.96	10.9	262	6.91	1.90	0.008	0.01	0.056
06/08/88	0.685	0.911	0.14	3.77	11.3	368	6.71	3.71	0.020	0.08	0.045
07/07/88	0.840	0.979	0.27	2.10	3.2	239	6.86	2.08	0.009	0.26	0.006
07/20/88	0.843	1.015	0.12	3.51	2.9	313	8.00	3.45	0.028	0.06	0.028
08/10/88	0.508	0.702	0.57	3.61	16.7	278	7.67	3.14	0.027	0.10	0.439
08/17/88	0.629	0.763	0.71	3.09	1.3	304	7.18	2.39	0.021	0.01	0.675
08/24/88	2.247	2.340	1.05	3.85	5.4	215	6.53	3.60	0.034	0.80	0.212
08/31/88	0.839	1.144	2.12	4.63	7.1	230	7.38	4.31	0.086	1.80	0.232
09/08/88	0.739	0.870	1.83	4.53	2.4	371	6.66	3.57	0.119	0.87	0.837
09/14/88	0.917	1.035	1.56	3.92	6.9	167	7.22	3.24	0.121	0.88	0.560
09/21/88	0.634	0.714	1.02	3.11	2.9	304	7.41	2.61	0.074	0.52	0.428
09/27/88	0.599	0.729	0.43	2.86	10.7	307	7.91	2.59	0.071	0.16	0.198

TCHW25/TCNS242 McArthur 1&2 Runoff to Otter Creek.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	3.586	4.580	3.13	6.30	13.0	557	7.24	6.17	0.078	3.00	0.053
10/27/87	3.060	3.300	2.54	3.88	1.3	1360	7.53	2.96	0.693	1.62	0.225
11/10/87	8.370	8.841	4.91	9.76	4.9	1320	7.56	9.69	0.072	4.84	0.004
11/24/87	7.930	8.149	3.57	11.25	2.7	1130	7.35	10.39	0.429	2.71	0.431
12/08/87	2.455	2.864	1.33	4.61	2.0	777	6.90	3.42	0.088	0.14	1.103
12/21/87	0.622	0.813	0.24	1.69	6.5	510	7.16	1.48	0.010	0.03	0.205
01/04/88	2.678	2.692	0.07	2.22	1.8	1169	7.61	2.16	0.011	0.01	0.048
01/20/88	0.009	0.029	0.06	0.72	1.4	112	7.05	0.70	0.004	0.04	0.012
02/03/88	0.970	1.076	0.19	1.82	1.6	576	7.00	1.68	0.015	0.05	0.120
02/17/88	2.408	3.520	0.85	6.48	0.9	1005	5.61	6.48	0.004	0.85	0.004
03/03/88	1.885	1.504	0.13	1.61	2.2	714	7.56	1.49	0.008	0.01	0.111
03/16/88	1.471	1.493	0.33	1.84	1.3	631	7.14	1.53	0.006	0.02	0.301
03/30/88	0.433	0.550	0.06	0.95	3.5	238	6.91	0.93	0.004	0.04	0.012
05/25/88	0.073	0.955	0.11	5.34	23.0	230	6.41	5.33	0.010	0.10	0.004
07/07/88	2.845	2.730	0.68	5.15	3.5	770	7.47	5.09	0.032	0.62	0.025
07/20/88	6.116	6.640	1.91	6.91	4.6	786	7.17	6.87	0.038	1.87	0.005
08/10/88	7.093	7.420	5.08	8.40	2.0	1182	7.46	8.38	0.022	5.06	
08/17/88	2.315	6.570	0.03	5.00	5.9	596	7.04	4.98	0.017	0.01	
08/24/88	1.685	1.888	1.32	3.42	2.8	304	7.00	3.40	0.012	1.30	0.005
08/31/88	0.081	7.015	6.24	10.18	4.1	1020	7.05	10.14	0.022	6.20	0.018
09/08/88	4.590	4.890	7.60	9.95	2.5	1100	6.06	9.94	0.014	7.58	0.004
09/14/88	5.840	6.840	8.44	10.71	3.1	685	6.56	10.70	0.015	8.43	
09/21/88	0.025	0.157	0.03	1.42	5.6	103	7.48	1.42	0.005	0.03	0.004
09/27/88	0.085	0.141	0.22	1.27	2.9	284	7.98	1.26	0.008	0.21	

TCHW26-Discontinued 7/20/88. Otter Creek at McArthur Farms.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.101	0.146	0.03	1.33	4.3	71	6.55	1.31	0.023	0.01	
10/27/87	0.090	0.149	0.05	1.20	6.8	143	6.05	1.18	0.024	0.03	
11/10/87	0.115	0.260	0.17	1.31	5.9	143	6.90	1.29	0.016	0.15	0.007
11/24/87	0.169	0.199	0.12	1.43	1.4	136	6.46	1.40	0.022	0.09	0.011
12/08/87	0.041	0.163	0.06	1.32	3.9	167	6.62	1.30	0.005	0.04	0.013
12/21/87	0.099	0.151	0.07	0.83	1.3	187	6.97	0.80	0.006	0.04	0.026
01/04/88	0.129	0.724	0.02	2.98	19.4	177	7.84	2.97	0.006	0.01	0.004
01/20/88	1.755	1.586	0.06	1.96	1.0	585	6.95	1.94	0.006	0.04	0.014
02/03/88	0.033	0.419	0.11	5.69	9.4	153	6.74	5.68	0.004	0.10	0.004
02/17/88	0.018	0.086	0.04	0.90	1.7	136	5.53	0.89	0.006	0.03	0.005
03/03/88	0.023	2.230	0.01	3.37	38.0	134	5.92	3.37	0.004	0.01	0.004
03/16/88	0.004	0.916	0.06	2.06	25.0	149	5.60	2.05	0.004	0.05	0.006
03/30/88	0.030	0.923	0.11	1.89	39.0	143	6.30	1.82	0.007	0.04	0.062
04/13/88	0.029	1.311	0.03	3.34	46.0	110	6.54	3.33	0.004	0.02	0.008
04/27/88	0.285	0.681	0.02	2.30	19.2	293	6.28	2.29	0.005	0.01	0.004
05/11/88		4.060			94.0	245	5.76	2.51			
05/25/88	0.102	0.730	0.08	4.03	59.0	179	6.32	4.02	0.010	0.07	0.004
06/08/88	0.079	0.871	0.13	4.49	41.0	269	6.65	4.48	0.008	0.12	0.006
07/07/88	0.052	0.325	0.02	3.66	14.1	152	6.31	3.65	0.008	0.01	0.004
07/20/88	0.165	0.209	0.10	1.69	2.0	117	7.04	1.65	0.018	0.06	0.024

TCHW27/TCNS205 McArthur Farms Hayfield Runoff to Otter Creek.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.095	0.144	0.06	1.27	4.5	90	6.72	1.24	0.022	0.03	0.011
10/27/87	0.037	0.101	0.04	1.19	4.3	122	6.09	1.17	0.024	0.02	
11/10/87	0.080	0.176	0.14	1.41	6.2	128	6.69	1.38	0.017	0.11	0.014
11/24/87	0.033	0.058	0.14	1.38	0.7	121	6.46	1.34	0.017	0.10	0.019
12/08/87	0.011	0.033	0.04	0.62	1.2	113	6.05	0.60	0.004	0.02	0.011
12/21/87	0.012	0.026	0.02	0.55	0.9	105	6.51	0.54	0.006	0.01	0.005
01/04/88	0.012	0.056	0.01	0.56	2.2	103	7.79	0.56	0.004	0.01	0.004
01/20/88	0.060	0.099	0.43	1.35	2.3	173	7.12	0.98	0.007	0.06	0.359
02/03/88	0.006	0.035	0.02	0.93	1.1	108	6.71	0.93	0.004	0.02	0.004
02/17/88	0.005	0.582	0.01	9.28	37.0	108	5.47	9.28	0.004	0.01	0.004
03/03/88	0.007	0.015	0.01	0.50	1.7	93	5.73	0.50	0.004	0.01	0.004
03/16/88	0.004	0.073	0.07	1.00	5.3	118	5.66	0.99	0.004	0.06	0.004
03/30/88	0.005	0.190	0.05	1.02	6.4	114	5.43	0.98	0.004	0.01	0.036
04/13/88	0.005	0.020	0.01	0.74	1.1	84	6.42	0.74	0.004	0.01	0.004
05/25/88	0.039	0.154	0.07	2.68	35.0	109	5.86	2.65	0.025	0.04	0.008
07/07/88	0.006	0.054	0.01	1.13	8.8	133	6.31	1.13	0.006	0.01	0.004
07/20/88	0.041	0.099	0.03	1.78	1.8	105	6.70	1.76	0.017	0.01	0.004
08/10/88	0.030	0.171	0.02	3.96	15.5	142	7.78	3.95	0.013	0.01	
08/17/88	0.031	0.399	0.02	3.17	4.0	130	7.25	3.16	0.014	0.01	
08/24/88	0.060	0.112	0.04	1.31	2.6	86	6.98	1.30	0.013	0.03	0.004
08/31/88	0.056	0.679	0.07	1.40	3.7	120	7.54	1.37	0.012	0.04	0.015
09/08/88	0.013	0.641	0.03	4.35	26.0	150	5.32	4.35	0.004	0.03	0.004
09/14/88	0.032	0.068	0.03	0.77	3.5	92	7.12	0.76	0.011	0.01	0.004
09/21/88	0.357	0.641	0.59	2.09	5.2	244	7.44	2.09	0.006	0.59	
09/27/88	0.015	0.062	0.03	0.80	2.5	152	8.11	0.80	0.004	0.03	0.004

TCNS104/TCNS203 McArthur Farms 4&5 Runoff to Little Bimini.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/13/87	0.762	0.902	2.88	4.15	7.3	331	6.72	4.12	0.019	2.85	0.008
10/27/87	0.584	0.722	6.80	7.47	7.8	578	6.41	7.45	0.013	6.78	0.005
11/09/87	2.342	2.923	3.95	6.80	10.5	575	6.77	6.77	0.025	3.92	0.007
11/16/87	2.314	2.420	0.07	2.37	1.9	419	7.35	2.31	0.022	0.01	0.041
11/24/87	3.525	3.655	2.19	5.51	6.6	450	6.82	5.47	0.030	2.15	0.013
12/08/87	0.521	7.835	6.24	16.61	84.0	666	6.48	16.53	0.027	6.16	0.050
12/21/87	0.460	9.190	4.55	36.65	80.0	674	6.32	36.60	0.019	4.50	0.030
01/04/88	0.563	1.760	4.01	9.25	26.0	593	7.13	9.23	0.012	3.99	0.007
01/20/88	0.329	0.420	5.04	9.18	7.9	605	6.71	9.17	0.008	5.03	0.006
02/03/88	0.281	0.780	5.04	9.00	9.6	499	6.71	8.97	0.006	5.01	0.020
02/17/88	0.460	1.740	3.73	9.46	11.3	726	6.6	9.38	0.021	3.65	0.059
03/03/88	0.381	0.816	7.60	6.18	27.0	477	6.67	6.11	0.018	7.53	0.055
03/16/88	1.429	1.654	0.44	2.38	5.7	231	6.76	2.24	0.016	0.30	0.122
03/30/88	0.730	1.336	3.78	7.60	9.9	543	6.77	7.49	0.027	3.67	0.080
04/13/88	0.401	0.627	0.17	5.64	5.6	495	6.86	5.48	0.024	0.01	0.133
04/27/88	0.466	1.199	3.37	4.33	19.8	544	6.36	4.23	0.095	3.27	0.007
05/11/88	0.180	2.061	3.44	6.51	23.0	591	6.28	6.48	0.011	3.41	0.015
05/25/88	0.220	0.748	3.42	3.72	5.9	530	6.55	3.69	0.007	3.39	0.024
06/08/88	0.206	0.432	3.07	3.99	12.1	514	6.27	3.96	0.010	3.04	0.018
06/22/88	0.258	0.539	3.34	5.01	1.5	605	6.91	4.98	0.014	3.31	0.017
07/07/88	0.405	0.732	5.07	7.86	18.6	545	6.72	7.85	0.007	5.06	
07/20/88	1.565	0.836	0.16	9.37	0.9	729	7.21	9.34	0.029	0.13	0.004
08/10/88	2.300	2.605	4.51	7.63	8.0	572	7.44	7.59	0.022	4.47	0.016
08/24/88	3.265	3.540	1.30	4.37	7.2	286	7.64	4.34	0.030	1.27	
08/31/88	2.404	2.930	4.13	6.81	6.9	510	7.21	6.78	0.021	4.10	0.008
09/08/88	1.310	2.200	5.75	9.60	14.4	601	5.04	9.58	0.014	5.73	0.008
09/14/88	1.375	1.465	5.43	6.54	6.5	301	6.68	6.53	0.013	5.42	
09/21/88	0.765	2.175	5.64	10.20	29.0	559	7.27	10.15	0.012	5.59	0.038
09/27/88	0.560	2.710	5.46	10.62	31.0	610	7.70	10.58	0.009	5.42	0.031

OSEZ01/TCNS216 Sloan Ray Dairy Outfall at Wolf Creek.

DATE MO/DA/YR	OPO4 MG P/L	TPO4 MG P/L	NOX+NH4 MG N/L	TOTAL N MG N/L	TURB NTU	LAB COND UMHOS/CM	LAB pH UNITS	TKN MG N/L	NO2 MG N/L	NH4 MG N/L	NO3 MG N/L
10/05/87	0.305	6.206	3.75	14.09	110.0	482	7.73	14.05	0.025	3.71	0.018
10/13/87	1.950	2.455	0.82	3.14	165.0	238	7.02	3.02	0.056	0.70	0.062
10/19/87	1.065	1.620	1.14	2.96	8.2	316	7.17	2.93	0.030	1.11	
10/26/87	0.436	0.723	1.70	3.20	7.4	423	6.93	3.19	0.010	1.68	0.005
11/02/87	2.440	2.935	0.91	6.15	9.5	226	7.16	6.11	0.034	0.87	0.010
11/09/87	1.980	2.480	0.84	3.39	7.6	332	7.05	3.34	0.039	0.79	0.012
11/16/87	2.245	2.710	0.25	3.44	9.1	400	7.38	3.35	0.065	0.16	0.020
11/23/87	1.115	1.156	0.19	2.14	2.6	132	6.84	2.10	0.032	0.15	0.009
11/30/87	0.530	0.568	0.83	1.66	4.7	237	6.68	1.55	0.053	0.72	0.059
12/07/87	0.567	0.960	9.06	4.63	12.0	635	7.24	4.34	0.094	8.77	0.196
12/14/87	0.358	0.532	1.32	2.31	8.5	309	7.24	2.05	0.059	1.06	0.201
12/23/87	0.564	0.801	1.58	4.16	10.5	424	7.17	2.59	1.568	0.01	0.004
01/04/88	0.642	1.037	0.63	7.15	13.5	604	7.90	6.83	0.032	0.31	0.291
01/11/88	0.590	0.987	4.71	2.37	17.3	517	7.49	2.14	0.086	4.48	0.142
01/21/88	0.535	0.642	1.35	3.42	8.4	522	7.48	2.95	0.049	0.88	0.419
01/25/88	0.388	0.469	1.96	2.79	6.7	427	7.14	1.81	0.103	0.98	0.876
02/01/88	0.320	0.482	1.07	2.59	8.1	478	7.43	1.82	0.061	0.30	0.712
02/11/88	1.960	2.470	3.94	6.00	7.0	468	6.95	5.68	0.065	3.62	0.254
02/16/88	1.180	1.768	3.46	6.00	8.1	423	7.47	5.35	0.070	2.81	0.581
02/22/88	0.947	3.680	3.30	10.80	9.0	794	7.62	9.62	0.063	2.12	1.117
02/29/88	0.364	0.769	4.32	5.11	8.8	578	7.41	3.97	0.049	3.18	1.089
03/14/88	1.435	1.814	1.03	2.63	6.1	469	7.38	2.20	0.030	0.60	0.403
03/24/88	1.315	1.691	1.65	3.31	7.7	429	7.48	2.66	0.090	1.00	0.564
03/31/88	0.673	1.173	2.66	4.40	10.3	578	7.54	3.81	0.052	2.07	0.540
04/13/88	1.914	2.285	0.95	1.69	13.6	435	7.42	1.10	0.025	0.36	0.565
04/20/88	0.448	0.756	0.47	2.09	10.8	545	7.44	1.74	0.031	0.12	0.316
04/26/88	0.573	0.626	0.18	1.52	28.0	518	7.19	1.35	0.017	0.01	0.156
05/04/88	0.453	0.837	0.25	1.45	15.8	435	7.34	1.32	0.010	0.12	0.124
05/11/88	0.467	0.967	0.10	2.49	15.1	334	7.41	2.40	0.007	0.01	0.083
05/25/88	0.424	0.723	0.09	1.30	11.8	458	7.66	1.22	0.008	0.01	0.069
06/08/88	0.440	0.708	0.05	1.77	15.0	392	6.71	1.75	0.007	0.03	0.017
06/22/88	0.510	0.764	2.81	4.84	6.2	756	6.91	4.75	0.039	2.73	0.046
07/07/88	0.452	0.708	0.38	1.70	10.6	592	7.92	1.33	0.005	0.01	0.369
07/20/88	0.488	0.574	0.34	2.05	6.0	489	7.36	1.72	0.013	0.01	0.321
08/11/88	2.379	2.690	4.38	7.22	4.4	411	6.95	7.19	0.022	4.35	0.008
08/17/88	1.540	1.813	0.14	2.55	3.2	229	7.07	2.53	0.023	0.12	
08/24/88	0.481	3.065	1.90	4.59	16.6	337	7.07	4.55	0.026	1.86	0.012
08/31/88	1.423	1.642	3.33	4.72	6.9	401	7.23	4.70	0.030	3.31	
09/07/88	1.803	2.490	7.74	9.66	24.0	661	7.34	9.64	0.007	7.72	0.013
09/14/88	1.259	1.692	3.88	4.79	17.7	323	6.06	4.78	0.008	3.87	0.005
09/21/88	1.336	2.355	5.91	8.03	35.0	612	6.96	7.89	0.073	5.77	0.067
09/28/88	1.053	1.862	3.25	5.11	26.0	159	7.12	4.91	0.046	3.05	0.155

Appendix C

Interim Action Plan Points Summary and Flood Control Pumping Volume Summary for S-2 and S-3

October 1987--September 1988

The Interim Action Plan (IAP) was implemented by the SFWMD in July 1979 to reduce the amount of EAA runoff entering the lake. This plan was expected to reduce S-2 and S-3 discharges by 90 percent by diverting water south to the Water Conservation Areas.

Initially, the decision to pump at S-2 and S-3 was made using a point system based on 14 factors (Table C-1) which included hurricane condition, season of year, Lake Okeechobee and WCA stages, canal levels, pump notification, rain prediction, antecedent and current rainfall, time of day, and day of the week (these last two factors were later omitted from practical consideration). Three pumping decisions were possible: (1) no pumping; (2) pump to WCA's only; and (3) pump to Lake Okeechobee and the WCA's. It was assumed that, for day-to-day operations, five of the 14 factors would remain constant for any extended period of time: (1) no hurricane condition; (2) either wet or dry season; and (3) levels of Lake Okeechobee and the three WCA's below regulation stage. A weighted point system was devised for the conditions of the remaining nine factors (Table C-2). As each factor's condition became more severe, it received more points. Zero to 11 points would mean that no pumping was required. An accumulation of 12 to 20 points would allow pumping to the WCA's only. Pumping to both Lake Okeechobee and the WCA's would take place if the points totaled 21 to 34 (Table C-3).

In practice, as SFWMD staff became familiar with operating under the IAP, they found that this point system was usually not critical to decision making since the Army Corps of Engineers also has a pumping criterion that the SFWMD must observe to prevent flooding in the northern part of the EAA. This criterion states that S-2 or S-3 must be activated if the corresponding canal stages rise above 13 feet NGVD. These stages are measured in the North New River, Hillsboro, and Miami Canals at mid-length, as well as at S-2 and S-3. Therefore, if canal water rises above the critical level, pumping must occur even if the IAP point total is below 21. This was the case for two of the three pumping events listed in this appendix. Pumping on October 12 was in anticipation of the arrival of Hurricane Floyd.

If canal stages remain below 13 feet, pumping into the lake is usually avoided. Operations under this criterion and refinements in operating procedures have resulted in few pumping events in recent years, and the goal of the IAP is being achieved.

Unfortunately, the occurrence of droughts in the 1980's has dampened the SFWMD's effort to reduce EAA discharges to the lake. In 1981-82, 1985, and 1989, the lake's stage declined drastically and the IAP was suspended so that EAA runoff could be stored in the lake for use later during the dry season. Consequently, actual discharges to the lake since 1979 have been much greater than they would have been if the IAP had been in effect continuously since that time.

The Interim Plan Points Summary and Flood Control Volume Summary for S-2 and S-3 is provided here (Tables C-4 to C-9) to comply with Specific Condition II(C) of the Lake Okeechobee Operating Permit, which states that a summary of monthly operation reports for the S-2 and S-3 pump stations shall be submitted annually to the FDER. The summary shall note the point value as established in the IAP during each pumping event, the volume of discharge and the dates operated.

TABLE C-1

Everglades Agricultural Area

Pumping Factors and Alternative Conditions

Factor	Condition 1	Condition 2	Condition 3	Condition 4
Hurricane Condition	No	Yes	-----	-----
Season of Year	Dry	Wet	-----	-----
Lake Okeechobee Schedule	Below Schedule	Above Schedule	-----	-----
W.C.A. 3 Schedule	Below Schedule	Above Schedule	-----	-----
W.C.A. 1 and W.C.A. 2 Schedules (Sum)	Below Schedule	Above Schedule	-----	-----
Time of Week	Sat., Sun., or Holiday	Monday - Thursday	Friday	-----
Time of Day	4:00 pm - 8:00 am	Noon - 4:00 pm	8:00 am - Noon	-----
Average Canal Level	Less than 11'	(a) 11' - 11.5' (b) 11.5' - 12'	12' - 13'	Greater than 13'
Change in Canal Level	Negative	Positive, 0-1/4 ft/hr increase	Positive, greater than 1/4 ft/hr increase	-----
Pump Notification	None	Less than 100,000 GPM	Greater than 100,000 GPM	-----
Rain Prediction	None	Less than 2" within next 6 hrs.	Greater than 2" within next 6 hrs.	-----
Rain in Preceding 2 hrs.	None	Less than 1" total	1" - 2" total	Greater than 2" total
Rain, between 2 hrs. and 48 hrs. prior to present	None	Less than 4" total	Greater than 4" total	-----
Rain at present	No	Yes	-----	-----

TABLE C-2

Everglades Agricultural Area

Pumping Factors and Assigned Points

Factor	Condition 1 (Points)	Condition 2 (Points)	Condition 3 (Points)	Condition 4 (Points)
Time of Week	Sat., Sun. or Holiday (1)	Monday-Thursday (2)	Friday (3)	-----
Time of Day	4:00 pm - 8:00 am (1)	Noon - 4:00 pm (2)	8:00 am - Noon (3)	-----
Average Canal Level	Less than 11' (-1)	11'-11.5' (1) 11.5'-12.0' (3)	12' - 13' (4)	Greater than 13' (6)
Change in Canal Level	Negative (-1)	Positive, 0-1/4 ft/hr increase (1)	Positive, greater than 1/4 ft/hr increase (4)	-----
Pump Notification	None (0)	Less than 100 K GPM (1)	Greater than 100 k GPM (4)	-----
Rain Prediction	None (0)	Less than 2" within next 6 hrs. (2)	Greater than 2" within next 6 hrs. (4)	-----
Rain in preceding 2 hrs.	None (0)	Less than 1" total (1)	1" - 2" total (2)	Greater than 2" total (6)
Rain, between 2 and 48 hrs. prior to present	None (0)	Less than 4" total (1)	Greater than 4" total (3)	-----
Rain at present	No	Yes	-----	-----

TABLE C-3

Pumping Decisions

Total Points	Miami, North New River, and Hillsboro Canal Basins	West Palm Beach Canal Basin
0 - 11	No pumping required	No pumping required
12 - 20	Pump to W.C.A.'s only	Pump (to W.C.A. 1)
21 - 34	Pump to Lake Okeechobee and W.C.A.'s	Pump (to W.C.A. 1)

TABLE C-4

Interim Action Plan Points Summary, October 12, 1987

	S-2 (Hillsboro/NNRC)	
Point Factor Categories	Status	Points
Current Canal Level	11~11.5	1
Change in Level	<.25'/hr	1
Pump Notification	>100K GPM	4
Rainfall, Last 2 Hours	<1"	1
Rainfall, Last 2-48 Hours	<4"	1
Raining Now	Yes	1
Rainfall Predicted, Next 6 Hours	5"~10" Hurricane Floyd	4
Time of Day	10:00	2
Day of Week	Monday	2
	Total Points	17

TABLE C-5

Interim Action Plan Points Summary, October 12, 1987

	S-3 (Miami Canal)	
Point Factor Categories	Status	Points
Current Canal level	11~11.5	1
Change in Level	<.25'/hr	1
Pump Notification	>100K GPM	4
Rainfall, Last 2 Hours	<1"	1
Rainfall, Last 2-48 Hours	<4"	1
Raining Now	Yes	1
Rainfall Predicted, Next 6 Hours	5"~10" Hurricane Floyd	4
Time of Day	10:00	2
Day of Week	Monday	2
	Total Points	17

TABLE C-6

Interim Action Plan Points Summary, November 4, 1987

	S-2 (Hillsboro/NNRC)	
Point Factor Categories	Status	Points
Current Canal Level	>13'	6
Change in Level	<.25'/hr	1
Pump Notification	>100K GPM	4
Rainfall, Last 2 Hours	None	0
Rainfall, Last 2-48 Hours	>4"	3
Raining Now	No	0
Rainfall Predicted, next 6 Hours	None	0
Time of Day	0200	1
Day of Week	Wednesday	2
	Total Points	17

TABLE C-7

Interim Action Plan Points Summary, November 4, 1987

	S-3 (MIAMI CANAL)	
Point Factor Categories	Status	Points
Current Canal Level	>13'	6
Change in Level	<.25'/hr	1
Pump Notification	>100K GPM	4
Rainfall, Last 2 Hours	None	0
Rainfall, Last 2 -48 Hours	<4"	1
Raining Now	No	0
Rainfall Predicted, Next 6 Hours	None	0
Time of Day	11:00	3
Day of Week	Wednesday	2
	Total Points	17

TABLE C-8

Interim Action Plan Points Summary, July 23, 1988

	S-2 (Hillsboro/NNRC)	
Point Factor Categories	Status	Points
Current Canal Level	>13'	6
Change in Level	<.25'/hr	1
Pump Notification	>100K GPM	4
Rainfall, Last 2 Hours	<1"	1
Rainfall, Last 2-48 Hours	<4"	1
Raining Now	Yes	1
Rainfall Predicted, Next 6 Hours	<2"	2
Time of Day	22:00	1
Day of Week	Saturday	1
	Total Points	18

TABLE C-9

FLOOD CONTROL BACKPUMPING SUMMARY

Date	S-2 (Hillsboro/NNRC)		S-3 (Miami Canal)	
	Volume (Acre Feet)	Points	Volume (Acre Feet)	Points
10/12/87	734	17	498	17
11/04/87	8926	17	1847	17
7/23/88	2037	18	____	
Total	11697		2345	