LOWER COLORADO RIVER ACCOUNTING SYSTEM (LCRAS) COMPUTER PROGRAM AND DOCUMENTATION

By B.K. von Allworden, Sandra J. Owen-Joyce, John D. Sandoval, and Lee H. Raymond

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CONVERSION FACTORS

Multiply	By	To obtain
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
acre	0.4047	square hectometer (hm^2)
acre-foot (acre-ft)	0.001233	cubic hectometer (hm^3)

ACRONYMS

ASCII	American Standard for Computer Information Interchange
BLM	U.S. Bureau of Land Management
BWR	Bill Williams River subroutine within LCRAS
CAP	Central Arizona Project
CIDD	Cibola Valley Irrigation and Drainage District
CNWR	Cibola National Wildlife Refuge
CRIR	Colorado River Indian Reservation
DOS	Disk Operating System
DV2PK	Davis Dam to Parker Dam subroutine within LCRAS
ELAS	Earth Resources Laboratory Applications Software
GIS	Geographic Information System
HV2DV	Hoover Dam to Davis Dam subroutine within LCRAS
HV2ML	Hoover Dam to Morelos Dam subroutine within LCRAS
IP2ML	Imperial Dam to Morelos Dam subroutine within LCRAS
LCRAS	Lower Colorado River Accounting System computer program
NIB	Northerly International Boundary with Mexico
PVID	Palo Verde Irrigation District
PK2IP	Parker Dam to Imperial Dam subroutine within LCRAS
SIB	Southerly International Boundary with Mexico
USBR	U.S. Bureau of Reclamation
USGS	U.S. Geological Survey

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ABSTRACT

In 1964, the U.S. Supreme Court gave specific legal rights for the annual use of 7.5 million acre-feet of lower Colorado River water to the States of California, Arizona, and Nevada. In addition, under the Rio Grande, Colorado, and Tijuana Treaty of 1944, 1.5 million acre-feet per year of water must be supplied to Mexico. The water supply of the lower Colorado River is overapportioned. The U.S. Geological Survey, in cooperation with the U.S. Bureau of Reclamation, took a regional approach and developed an accounting system to estimate, distribute, and monitor the annual consumptive use of the water supply.

The Lower Colorado River Accounting System (LCRAS) computer program combines a water-budget estimate of consumptive use by vegetation with estimates of evapotranspiration by diverter from image processing of satellite data. Consumptive use by vegetation along a reach is calculated as the residual in a water budget. Evapotranspiration by diverter is calculated from vegetation types and areas determined from digital-image analysis of satellite data and water-use rates calculated using a modified Blaney-Criddle formula. Prorating consumptive use by vegetation with the estimates of evapotranspiration by diverter produces a good approximation of consumptive use by vegetation for each diverter.

LCRAS runs on a microcomputer and is written in a modular fashion so that modifications can be made easily as new data, new software, and improved techniques become available. LCRAS also can be used as an annual planning tool. The lower Colorado River is divided into four reaches, each beginning and ending at a dam. Each of these four reaches has a separate subroutine that calculates consumptive use by vegetation within that reach by adding all inflow components and subtracting change in reservoir storage and all outflow components except consumptive use. A fifth subroutine allows the river to be treated as a single reach from Hoover Dam to Morelos Dam. Documentation for the LCRAS program describes the modular subroutines and includes data input instructions, narratives, variable lists, flow charts, and code listings of the program.

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INTRODUCTION

The Colorado River is a life line to the southwestern United States. Beginning in the Rocky Mountains, the river acquires water from six states, winds through the Grand Canyon and the deserts of Nevada, Arizona, and California, and flows into Mexico (fig. 1). The river supplies water to towns and agricultural areas along its path and also, through pumped diversion to canals, water is exported to Los Angeles, San Diego, Phoenix, and Tucson.

The Colorado River Compact of 1922 apportioned 7.5 million acre-ft/yr of beneficial consumptive use to the lower basin of the Colorado River (Hely, 1969, p. 39). In 1964, a Decree by the U.S. Supreme Court granted legal rights to lower Colorado River water to Arizona, California, and Nevada. Arizona has rights to 2.8 million acre-ft/yr, California to 4.4 million acre-ft/yr, and Nevada to 0.3 million acre-ft/yr (U.S. Supreme Court, 1964). As an outcome of these rulings, the U.S. Bureau of Reclamation and U.S. Geological Survey cooperatively account for the quantities of water released through regulatory structures, diverted, returned, and consumptively used. Under the Decree (U.S. Supreme Court, 1964), these quantities must be stated separately as to each diverter, each point of diversion, and each of the States of Arizona, California, and Nevada. To meet the requirements stated in the Decree, an accounting system for consumptive use was developed.

The Lower Colorado River Accounting System (LCRAS) combines hydrologic water budgets, digital-image analysis of satellite data, and geographic information system (GIS) technologies to quantify consumptive use of water from the lower Colorado River. A regional water-budget approach is the basis for a system by which annual consumptive use of river water can be estimated within the 12,500-square-mile study area. Analysis of satellite data provides vegetation types and associated acreages. The acreages multiplied by water-use rates give estimates of evapotranspiration. The boundaries of each user's area are delineated, digitized, and entered in a data base by using GIS software to obtain the spatial distribution of consumptive use.

LCRAS is a modular computer program designed to process the large quantities of data and to combine the output from water budgets with the output from digital-image analysis. LCRAS was designed for (1) annual accounting but can also be operated as a planning tool and (2) easy modification as new data, software, and improved techniques become available. Within LCRAS, annual consumptive use of lower Colorado River water by vegetation is estimated with water budgets and distributed areally by using estimates of evapotranspiration calculated for each diverter from image analysis and digitized boundaries. LCRAS also accounts for evaporation from open-water surfaces and domestic, municipal, and industrial consumptive use. LCRAS contains

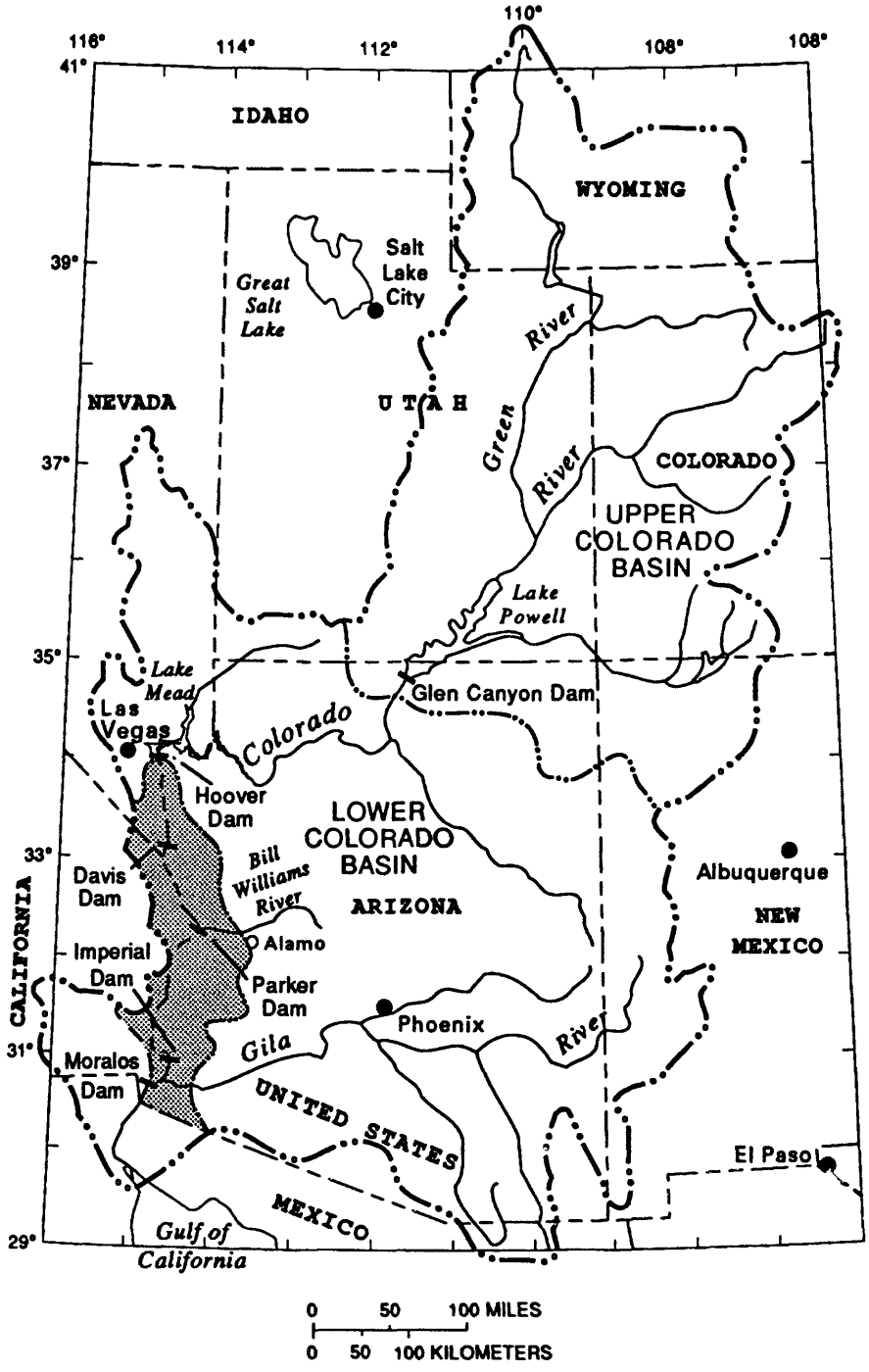

Figure 1.--The Colorado River basin and study area (shaded).

a single-reach option and a four-reach option that are used to estimate and distribute consumptive use to water users in the 320-mile reach between Hoover Dam and Morelos Dam. The single-reach option provides data for the entire flood-plain area. The four-reach option provides data for four subreaches. Water-data inputs to the program are selected to reflect the different hydrologic conditions in each individual subreach of the lower Colorado River.

The purpose of this report is to document the LCRAS computer program. This documentation includes the following:

1. A description of the general algorithms used to calculate consumptive use by vegetation and evapotranspiration.

2. A description of the input data format.

3. A narrative, variable list, flow chart, and program listing for each subroutine.

4. Attachments that show examples of input and output data files.

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ALGORITHMS AND TERMINOLOGY

Estimating Consumptive Use

The Lower Colorado River Accounting System uses a basic water-accounting system (water budget), which is similar to a financial balance sheet. Water that enters the system must be stored in the system or released from the system. The water budget for a given reach is expressed as

$$IF = OF_t + \Delta S_r, \quad (1)$$

where

IF = total inflow, in acre-feet, to the reach;
OF_t = total outflow, in acre-feet, from the reach; and
ΔS_r = change in reservoir storage, in acre-feet, in the reach.

Consumptive use of river water is an outflow component of the water budget that can be solved for by rewriting equation 1 as

$$CU_{cr} = IF - OF - \Delta S_r, \quad (2)$$

where

CU_{cr} = consumptive use, in acre-feet, of Colorado River water and
OF = total outflow other than consumptive use, in acre-feet, from the reach.

Inflow to the reach includes flow in the river below the upstream dam, precipitation that falls on the area of vegetation and open-water surfaces, and tributary inflow in the reach. Inflow can be expressed as

$$IF = Q_{us} + P + IF_{tr}, \quad (3)$$

where

Q_{us} = quantity, in acre-feet, of flow in the river below the upstream dam of the reach (read in from data file FLOW.DAT);
P = precipitation, in acre-feet, that falls on the area of vegetation and open-water surfaces in the reach; and
IF_{tr} = tributary inflow, in acre-feet, in the reach (read in from data file TRIB.DAT).

Precipitation as an inflow component is calculated as

$$P = (p_e/12)(A_v + A_w), \quad (4)$$

where

p_e = annual precipitation, in inches, at the weather station selected to represent the reach (annual precipitation is calculated as the sum of the monthly precipitation values in the weather-station precipitation data files, such as PARKER.PPT);

A_v = net vegetated area, in acres, (excluding multiple cropping) in the reach (calculated and stored as NETACR by reach); and

A_w = the area, in acres, of open-water surfaces in a reach of the river (calculated from single-image classifications of the individual reaches of the river and read in from data file AREA.DAT).

Outflow other than consumptive use from a reach includes flow in the river below the downstream dam and water exported out of the study area (fig. 1) and can be expressed as

$$OF = Q_{ds} + Q_{ex}, \quad (5)$$

where

Q_{ds} = quantity, in acre-feet, of flow in the river below the downstream dam and

Q_{ex} = quantity, in acre-feet, of water diverted from the river and exported out of the study area.

Consumptive use of Colorado River water must be broken down into individual components because not all the consumptive use is charged to users (diverters). These components include consumptive use by vegetation (crops and phreatophytes), evaporation from open-water surfaces, and domestic, municipal, and industrial use. Consumptive use of river water can be expressed as

$$CU_r = CU_v + E + CU_d, \quad (6)$$

where

CU_v = consumptive use by vegetation, in acre-feet, of Colorado River water;

E = evaporation, in acre-feet, from the open-water surfaces in the reach; and

CU_d = domestic, municipal, and industrial consumptive use, in acre-feet, in the reach (calculated in subroutine DUIN using data file DU.DAT).

Evaporation is the sum of water lost from the open-water surfaces that consist of the river, reservoirs, lakes, marshes, and flooded areas. Evaporation can be expressed as

$$E = A_w \cdot e, \tag{7}$$

where

e = evaporation rate, in feet/year, for that reach of the river (read in from data file AREA.DAT).

Consumptive use by vegetation of Colorado River water was calculated with a water budget derived from equation 2 by replacement of the components with those defined in equations 3, 5, and 6 and can be expressed as

$$CU_v = Q_{us} + P + IF_{tr} - Q_{ds} - Q_{ex} - CU_d - E - \Delta S_r. \tag{8}$$

Equation 8 can be used to calculate consumptive use by vegetation for the entire river or individual sections (reaches) of the river. Every component in equation 8 can be measured or calculated with the exception of consumptive use by vegetation.

Distribution of Consumptive Use

Consumptive use by vegetation can be approximated by estimating evapotranspiration; this relation provides a means to distribute consumptive use by vegetation among water users but not open-water evaporation or domestic, municipal, and industrial use. Evapotranspiration is the loss of water from a land area through transpiration by vegetation and evaporation from the soil surface under the vegetation and can be expressed as

$$ET = A \cdot Wu, \tag{9}$$

where

ET = estimated evapotranspiration, in acre-feet;
A = the area, in acres, of each vegetation type; and
Wu = water-use rate, in feet/year, for that vegetation type.

Areas for each vegetation type by diverter are determined from digital-image analysis of satellite data. Water-use rates for crops are calculated using a modification of the formula developed by Blaney and Criddle (1950). The modified formula is expressed as

$$U = \Sigma(k_m t_m d_m/100) - p_m/12, \tag{10}$$

where

U = vegetation water-use rate, in acre-feet/acre/year, during the growth of the vegetation (substitutes for Wu in equation 9);
k_m = monthly empirical water-use coefficient that is dependent on the type and location of the vegetation;
t_m = mean monthly temperature, in degrees Fahrenheit;
d_m = monthly percentage of total daylight hours of the year; and
p_m = monthly precipitation, in inches.

Phreatophyte water-use rates were calculated for the density types (sparse, medium, and dense) classified by image analysis by using another modification of the formula developed by Blaney and Criddle (1950), which can be expressed as

$$U = \Sigma(k_m t_m d_m/100). \tag{11}$$

The same mean monthly temperatures used for estimating water-use rates for crops for the different reaches were used to estimate water-use rates for phreatophytes. Monthly precipitation was not included in equation 11 to estimate water-use rates for phreatophytes because phreatophytes are deep-rooted plants that use ground water in the alluvial aquifer.

For each diverter, the number of acres of each crop type is multiplied by the respective water-use rate to obtain an estimate of evapotranspiration by that crop. Total crop evapotranspiration by diverter is obtained by summing the individual crop evapotranspiration. Evapotranspiration by phreatophytes was summed separately by State to determine the proportion of evapotranspiration by crops for the reach. Total evapotranspiration by vegetation is then summed for each reach. To distribute consumptive use by vegetation to diverters, the percentage of evapotranspiration calculated for each diverter was applied to the estimate of consumptive use by vegetation calculated for the reach with equation 8.

Flow in the Bill Williams River is measured below Alamo Dam 36 mi upstream from Lake Havasu on the Colorado River. A water budget is used to estimate the amount of water that reaches the Colorado River. Inflow from the Bill Williams River is a component in the water budget for the Davis Dam to Parker Dam reach, which can be expressed as

$$Q_{bwr} = Q_{ad} + P + IF_{tr} - ET - E, \quad (12)$$

where

Q_{bwr} = flow, in acre-feet, in the Bill Williams River that enters the Colorado River and

Q_{ad} = flow, in acre-feet, in the Bill Williams River below Alamo Dam (read in from data file FLOW.DAT).

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LOWER COLORADO RIVER ACCOUNTING SYSTEM (LCRAS) PROGRAM

The accounting system developed for the lower Colorado River is complex because it combines the use of two technologies (water budget and remote sensing), which generate large amounts of data from a large study area. To help manage the data, this area is divided into four reaches. Each reach begins and ends at a dam to form independent hydrologic models that can be analyzed separately (fig. 2).

The LCRAS Program is divided into two parts or processors (fig. 3). The first part uses the water budget to calculate consumptive use by vegetation along a reach. The second part uses vegetation types and areas and water-use rates to estimate evapotranspiration for each diverter. In order to reduce the effect of any error associated with the water-use rates, evapotranspiration by diverter is converted to a percentage of total evapotranspiration. These percentages are multiplied by the total consumptive use by vegetation for the reach to compute consumptive use by vegetation for each diverter.

The format for the input data was a major concern when designing the LCRAS program. The input data for the water budget will be changed each year; therefore, the input files must be both easy to update and meaningful to the user independent of the program. This was done by allowing input to be read from fully annotated ASCII files (attachments A-J). Each subreach defined in the primary data file (attachment A) has a set of data files associated with it. The first data file that LCRAS needs for each subroutine is an image-classification data file (attachment F), which is the output data from image-processing software. Two files contain weather-station data in the subreach—a mean monthly temperature data file (attachment G) and a monthly precipitation data file (attachment H). Each year these files must be updated with current data from the National Climatic Data Center. The actual names of these data files are read from the primary data file, but they must have names that conform with the computer-operating system.

Satellite data for 1984 were processed using ELAS[1] to classify crop and phreatophyte-density types and to calculate areas. The output data file from the image processing must be formatted for input into LCRAS. A separate Fortran program reads the ELAS output data file and produces the input data file for use by LCRAS. This allows any method of vegetation classification and area measurement to be used. The format required for the image-processing output data file is shown in attachment F.

Another important concern in the development of the computer program was to allow new or updated calculation methods to be inserted easily into the program. To do this, a modular program design is used. Each type of input, such as gaged flows or domestic use, is read from

[1]Use of brand name in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

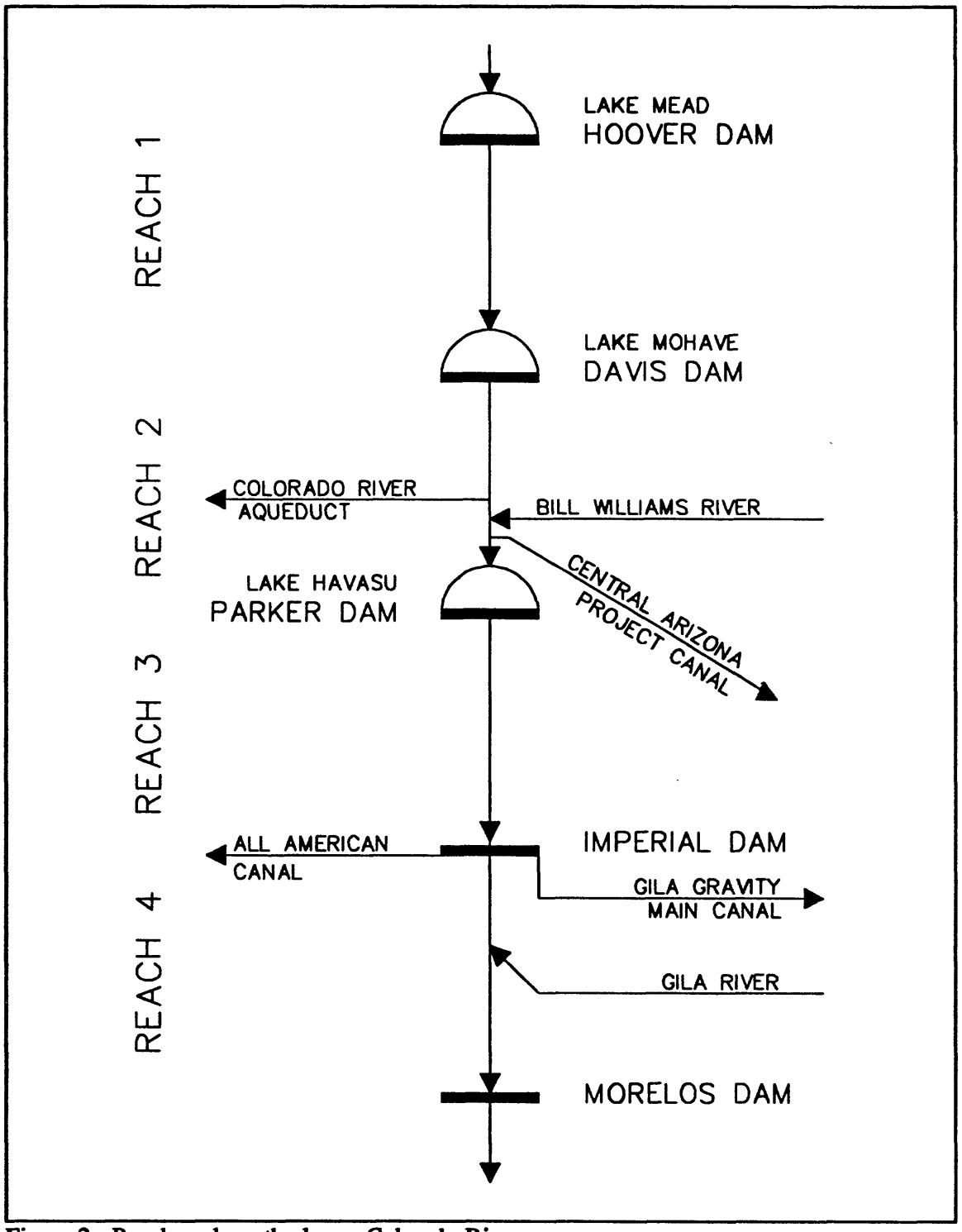

Figure 2.--Reaches along the lower Colorado River.

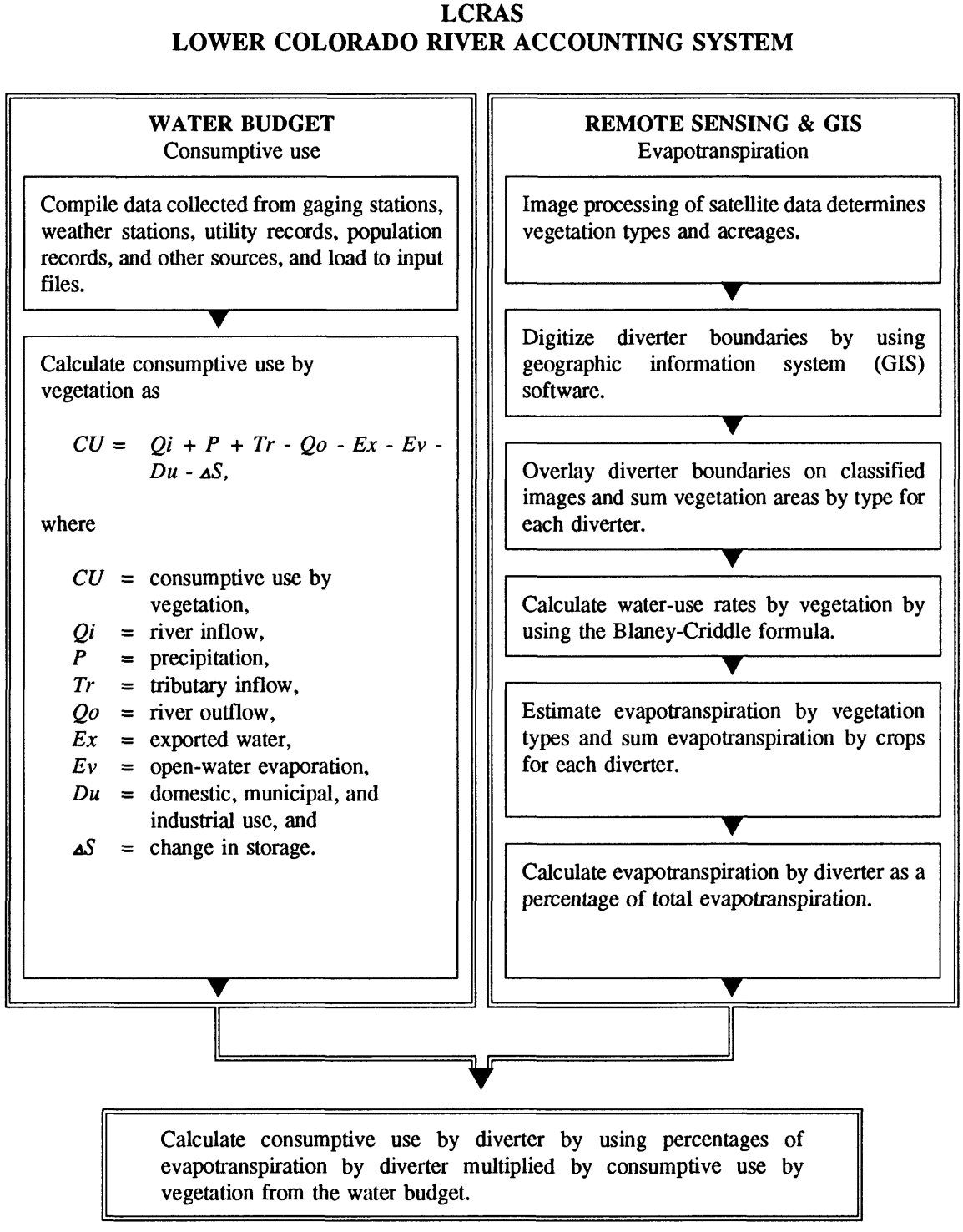

Figure 3.--Flow chart of LCRAS computer program.

a single input file by a single subroutine. Each reach also has a unique subroutine to calculate consumptive use by vegetation using equation 6. For the satellite data, three subroutines are common for all reaches. These subroutines read the data from the data file, sort the data, estimate evapotranspiration, and apportion consumptive use by vegetation to each diverter along the reach. Three subroutines produce output table files: (1) a table listing the water-use rates for each vegetation type per month by reach (attachment L), (2) a table for each reach listing the area of each crop by diverter (attachment M), and (3) a table for each reach listing the calculated evapotranspiration, the percentage of evapotranspiration used by each diverter, and the calculated consumptive use by vegetation for each diverter in each State as well as State totals (attachment O).

The main program is used primarily as a vehicle to call the subroutines. A small amount of overhead, such as variable initialization, defining common blocks, and reading the general data file, also is performed in the main program. No parameters are passed directly to any of the subroutines; instead, all shared variables are stored in the common blocks. The variables used in the program are shown in table 1.

Table 1.-- *List of variables in common blocks*

Name	Common block	Type	Subroutines involved	Action
AREAS	INDATA	INTEGER*4	AREAIN	Read from file
			BWR	Used to calculate BILOUT
			HV2ML	Used to calculate FDTOT
			HV2DV	Used to calculate RCHTS
			DV2PK	Used to calculate RCHTS
			PK2IP	Used to calculate RCHTS
BILOUT	RDAT4	REAL*8	MAIN	Used to set RCHTS
			BWR	Calculated
			HV2ML	Used to calculate FDTOT
			DV2PK	Used to calculate RCHTS
CORVEG	COUNTS	INTEGER*4	LUMP	Read from file
			BWR	Used to calculate BILOUT
			TABLE1	Used to calculate NETVEG
CRPCOF	WDATA	INTEGER*4	BC	Read from file
CRPNAM	WDATA	CHARACTER*20	BC	Read from file
DATFIL	IDATA	CHARACTER*50	AREAIN	Used to open file
			FLOWIN	Used to open file
			TRIBIN	Used to open file
			BC	Used to open file
			DUIN	Used to open file
			MAIN	Read from file
DIVNAM	VEGDAT	CHARACTER*40	LUMP	Read from file
			SORT	Sorts character array
			TABLE1	Written to a file
			TABLE2	Written to a file
			TABLE4	Written to a file
DTOTAL	PHRDAT	INTEGER*4	BC	Calculated
			BWR	Used to calculate BILOUT
			SORT	Sorts by DIVNAM
			TABLE2	Written to a file
			TABLE4	Written to a file

Table 1.-- *List of variables in common blocks -- Continued*

Name	Common block	Type	Subroutines involved	Action
DUS	INDATA	INTEGER*4	DUIN	Calculated
			HV2ML	Used to calculate FDTOT
			HV2DV	Used to calculate RCHTS
			DV2PK	Used to calculate RCHTS
			PK2IP	Used to calculate RCHTS
ETOTAT	BLCR1	INTEGER*4	BC	Calculated
			BWR	Used to calculate BILOUT
			SORT	Sorts by DIVNAM
			TABLE2	Written to a file
			TABLE4	Written to a file
EVAPS	INDATA	INTEGER*4	AREAIN	Calculated
			BWR	Used to calculate BILOUT
			HV2ML	Used to calculate FDTOT
			HV2DV	Used to calculate RCHTS
			DV2PK	Used to calculate RCHTS
FDNUM	SUMMRY	INTEGER*4	MAIN	Set to zero
FDETOT	SUMMRY	INTEGER*4	MAIN	None
FLOWS	INDATA	INTEGER*4	FLOWIN	Read from file
			BWR	Used to calculate BILOUT
			HV2ML	Used to calculate FDTOT
			HV2DV	Used to calculate RCHTS
			DV2PK	Used to calculate RCHTS
			PK2IP	Used to calculate RCHTS
INFILE	LUMP1	CHARACTER*50	MAIN	Read from file
			LUMP	Used to open file
			TABLE3	Written to a file
LOCLAT	BLCR1	INTEGER*4	MAIN	Read from file
			BC	Used in conditional
MTOTAL	PHRDAT	INTEGER*4	BC	Calculated
			BWR	Used to calculate BILOUT
			SORT	Sorts by DIVNAM
			TABLE2	Written to a file
			TABLE4	Written to a file

Table 1.-- *List of variables in common blocks -- Continued*

Name	Common block	Type	Subroutines involved	Action
MWUR	WRATES	INTEGER*4	BC	Calculated
			TABLE3	Written to a file
NUMCRP	VDATA	INTEGER*4	BC	Set to number of crops
NUMDIV	VEGDAT	INTEGER*4	LUMP	Set to number of diverters
			BC	Used in calculation
			SORT	Modifies for double listings
NUMMR	COUNTS	INTEGER*4	MAIN	Read from file
NUMSUB	COUNTS	INTEGER*4	BC	Set in DO LOOP
			LUMP	Set in DO LOOP
			BWR	Used in DO LOOP
			TABLE3	Set in DO LOOP
NUMVEG	VEGDAT	INTEGER*4	LUMP	Read from file
			BC	Used in DO LOOP
			BWR	Used in DO LOOP
			TABLE1	Used in DO LOOP
			TABLE3	Used in DO LOOP
PFILE	SDATA	CHARACTER*50	MAIN	Read from file
			BC	Used to open file
PPTS	PPT1	INTEGER*4	BC	Calculated
			BWR	Used to calculate BILOUT
			HV2DV	Used to calculate RCHTS
			DV2PK	Used to calculate RCHTS
			PK2IP	Used to calculate RCHTS
PRECIP	PPT1	REAL*8	MAIN	Reset after call to BC
			HV2ML	Used to calculate FDTOT
RCHNUM	COUNTS	INTEGER*4	MAIN	Set in DO LOOP
			BC	Used in DO LOOP
			TABLE2	Used in DO LOOP
			TABLE4	Used in DO LOOP

Table 1.-- *List of variables in common blocks -- Continued*

Name	Common block	Type	Subroutines involved	Action
RCHTS	INDATA	REAL*8	MAIN	Set only value for BWR
			HV2DV	Calculated
			DV2PK	Calculated
			PK2IP	Calculated
			TABLE2	Used to calculate CO
			TABLE4	Used to calculate CO
STOTAL	PHRDAT	INTEGER*4	BC	Calculated
			BWR	Used to calculate BILOUT
			SORT	Sorts by DIVNAM
			TABLE2	Written to a file
			TABLE4	Written to a file
SUBNUM	COUNTS	INTEGER*4	MAIN	Read from file
			BC	Used in DO LOOP
			LUMP	Used in DO LOOP
			TABLE1	Used in DO LOOP
			TABLE3	Used in DO LOOP
TFILE	SDATA	CHARACTER*50	MAIN	Read from file
			BC	Used to open file
			TABLE3	Used in conditional
TOT	VEGDAT	INTEGER*4	LUMP	Set to number of diverters
			SORT	Modifies for double listings
TOTALS	BOTH4	INTEGER*4	MAIN	Set to zero
			SORT	Calculated
			TABLE1	Used for summation
TRIBS	INDATA	INTEGER*4	TRIBIN	Read from file
			BWR	Used to calculate BILOUT
			HV2ML	Used to calculate FDTOT
			HV2DV	Used to calculate RCHTS
			DV2PK	Used to calculate RCHTS
			PK2IP	Used to calculate RCHTS

Table 1.-- *List of variables in common blocks -- Continued*

Name	Common block	Type	Subroutines involved	Action
VEGNAM	VEGDAT	CHARACTER*20	LUMP	Read from file
			BC	Used in conditional
			TABLE1	Written to a file
			TABLE3	Written to a file
WUR	WRATES	INTEGER*4	BC	Calculated
			TABLE3	Written to a file
YEAR	BLCR1	INTEGER*4	MAIN	Read from file
			BC	Used in conditional

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MAIN PROGRAM

Narrative

The main program for the LCRAS system is a 'program shell' that calls the other modules. Some minor initialization is done, such as initializing the variables in the common blocks. The principal function of the main program is to read the data from the primary input data file. This data file contains the file names for all the other input data files, the file names for the output tables, the calendar year for which the data is to be compiled, the number and names of the reaches to be run, and the number and data file names for the subreaches for each reach. The format for the primary data file is shown in attachment A.

Another function of the main program is to open any data files that are used by more than one subroutine. The main program opens and closes two output data files that are written to by several subroutines. These are the domestic-use table and the water-use rate table. Several data files that contain title information for output files are opened by the main program. Although some subroutines create new files for each reach, the title information for all the tables is stored in one file that must remain open continuously.

The main loop in the program, which cycles through each subroutine, is in the main program. The data for each reach are read from the general data file and the appropriate subroutines are executed. When the first reach is complete, which includes producing or adding to the output table files, the data for the second reach are read and processed. This algorithm allows most of the variables to be reused for each reach.

The last function of the main program is to close any open files, including input and output files. Once the files are closed, the main program returns control back to the operating system.

Variable List

Name	Common	Description
BILOUT	[RDAT4]	Discharge from the Bill Williams River into the Colorado River between Davis Dam and Parker Dam.
DATFIL(10)	[IDATA]	The array DATFIL contains the names of the input data files.
These are:		
DATFIL(1)		Flow Data file.
DATFIL(2)		Tributary-Inflow Data file.
DATFIL(3)		Domestic-Use Data file.
DATFIL(4)		Open-Water Surface Area and Evaporation-Rates Data file.
DATFIL(5)		Crop-Coefficient Data file.
DATFIL(6)		Daylight Data file.
DATFIL(7)		Information for Table 1.
DATFIL(8)		Information for Table 2.
DATFIL(9)		Information for Table 3.
DATFIL(10)		Information for Domestic-Use Tables.
FDNUM	[SUMMRY]	Total number of diverters in the system.
FILNAM		Name of the domestic-use output file.
INFILE(10)	[LUMP1]	Array containing names of the subreach image-classification data files within a single reach.
LOCLAT(10)	[BLCR1]	Array containing the latitude for each subreach within a single reach.
NUMMR	[COUNTS]	Number of major reaches contained in the model are stored in this variable.
PFILE(10)	[SDATA]	Array containing the names of the precipitation data files for each subreach within a single reach.
PRECIP(4)	[PPT1]	Precipitation for each area in each subreach.

Name	Common	Description
RCHNAM		Name of the reach that is compared to the subroutine names for execution, must match a subroutine name exactly.
RCHNUM	[COUNTS]	Number of the current subreach being processed.
RCHTS(4)	[INDATA]	Consumptive use by vegetation for each subreach.
SUBNUM		Number of subreaches within a single reach.
TEMP		Temporary variable to save the RCHTS value while BWR subroutine is called.
TFILE(10)	[SDATA]	Array containing the names of the temperature data files for each subreach within a single reach.
TITLE		String variable is used to read the title from the data file and write it to the output file.
TOTALS(100,25)	[BOTH4]	Array containing the total area of each crop for each diverter along a single reach.
WUNAME		Name of the output file for the water-use table.
YEAR	[BLCR1]	Year for the data.
YLINES		Number of lines in a table title.

Flow chart

Lower Colorado River Accounting System

Main Program

Begin program

Set Bill Williams River outflow value equal to zero

Open primary data file

Set K equal to zero

Increment K

Read the input data file names

Repeat until all names are read in

Read the output file name for the domestic - use data table

Open file containing titles and output file names for table 1

Open file containing titles and output file names for table 2

Open file containing titles and output file names for table 3

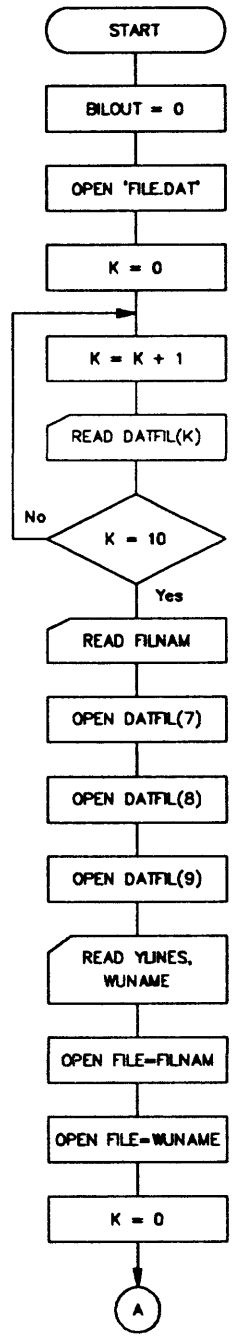
Read the number of lines in the title and the output file name for table 3

Open the output file for the domestic - use data table

Open the output file for table 3

Set K equal to zero

Continued on next page



Lower Colorado River Accounting System

Main Program — Continued

Read the title line for table 3

Write the title line to the output file for table 3

Repeat until title is complete

Write blank line for table 3

Write blank line for table 3

Write heading of the months for table 3

Read the inflow data from the inflow file

Read the tributary data from the tributary data file

Read in and calculate the domestic-use data from the domestic-use file

Read the open-water surface areas and the evaporation rates

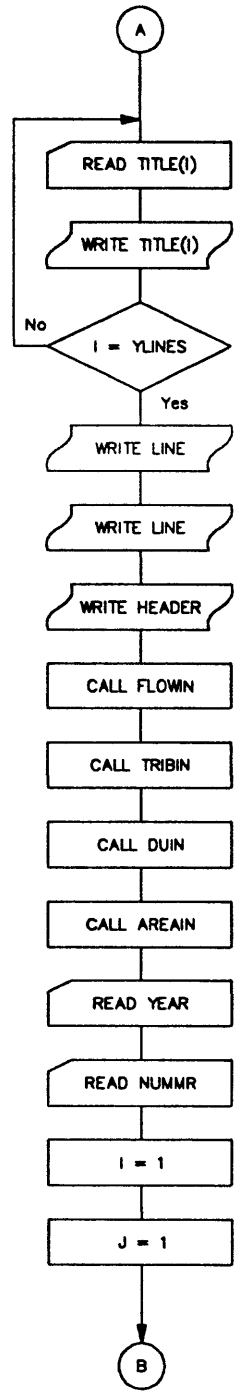
Read the current year to be processed

Read the number of reaches to be processed

Set I equal to one

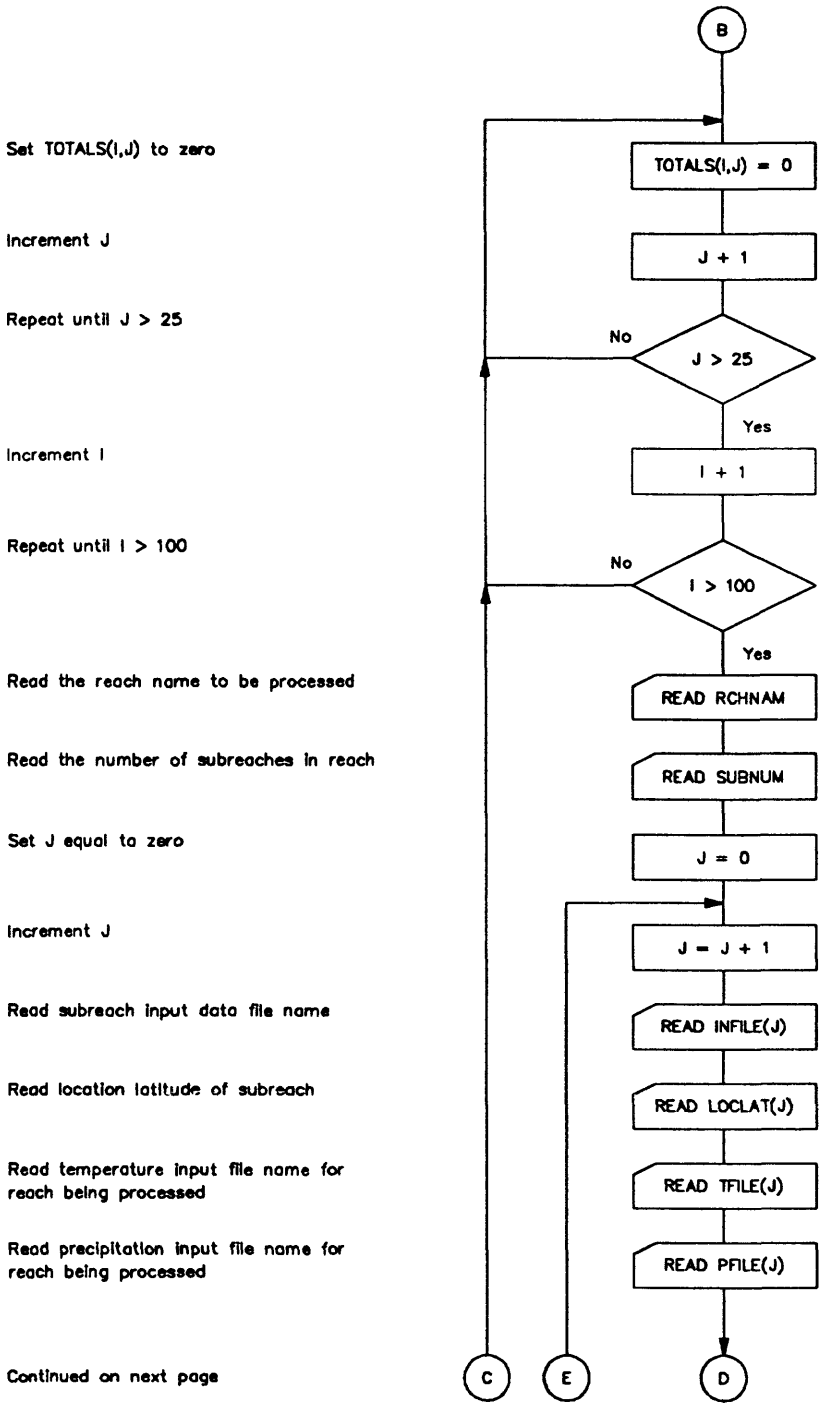
Set J equal to one

Continued on next page



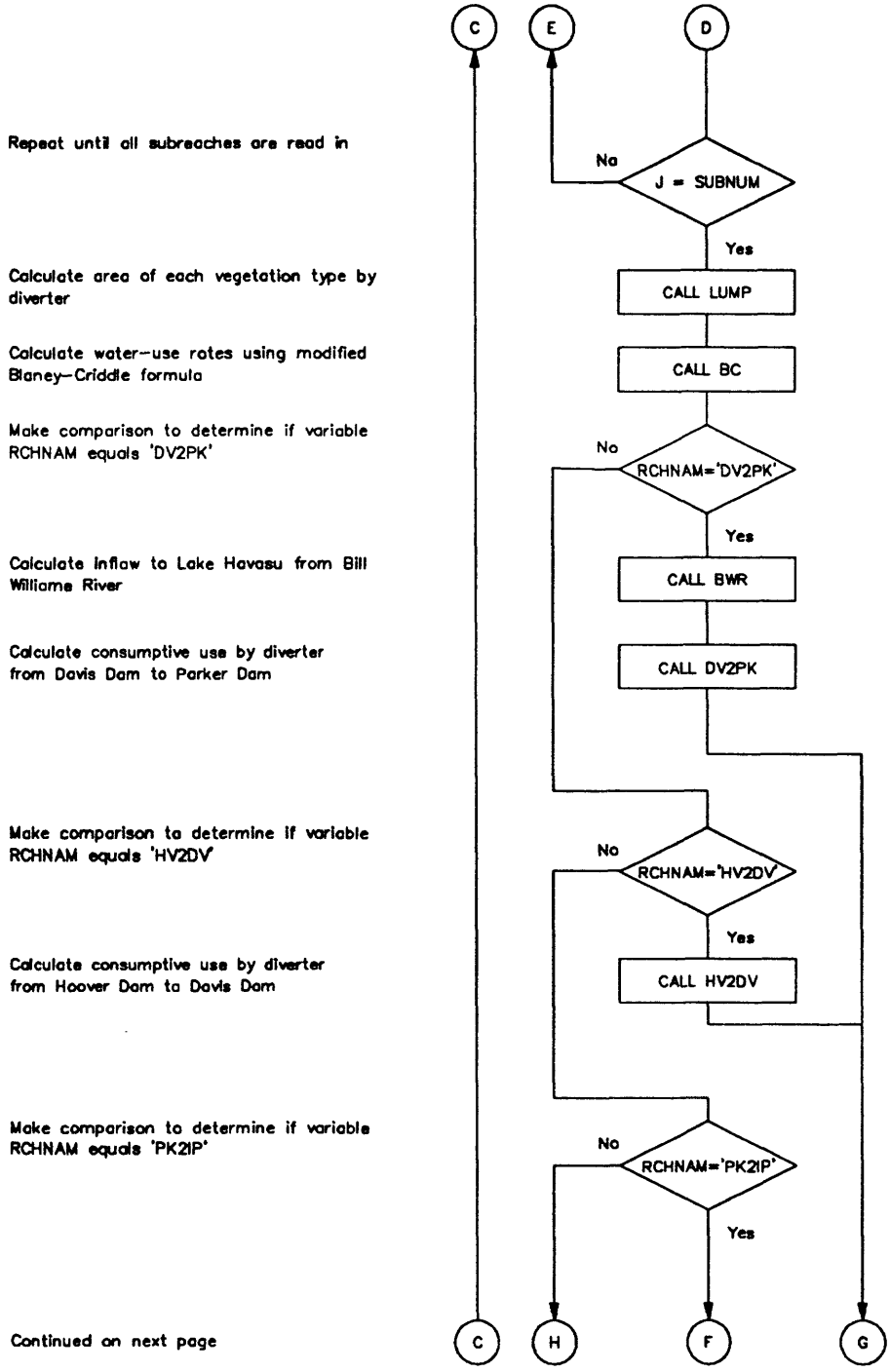
Lower Colorado River Accounting System

Main Program — Continued



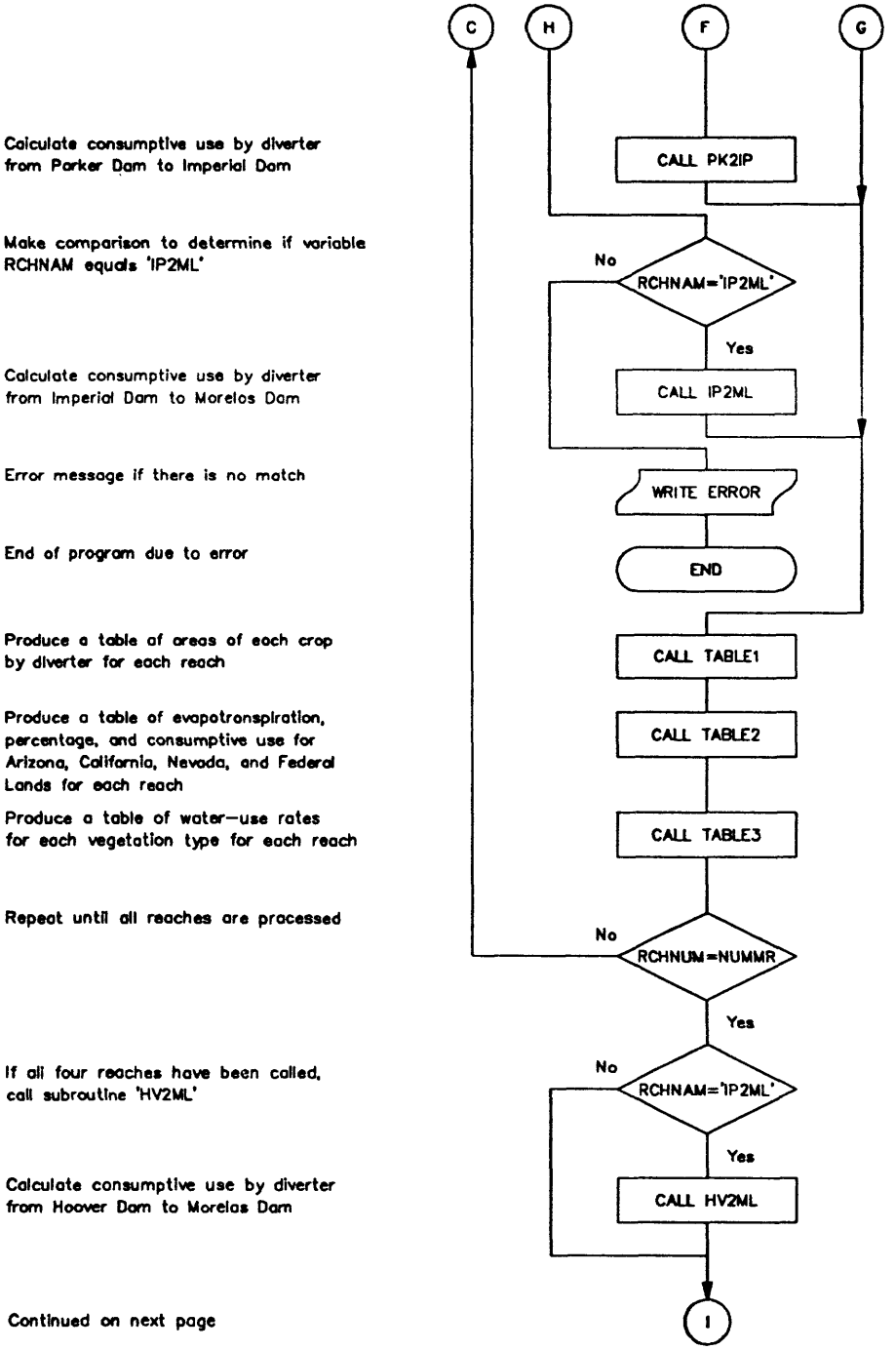
Lower Colorado River Accounting System

Main Program — Continued



Lower Colorado River Accounting System

Main Program — Continued



Lower Colorado River Accounting System

Main Program — Continued

Close general data file

Close domestic-use output file

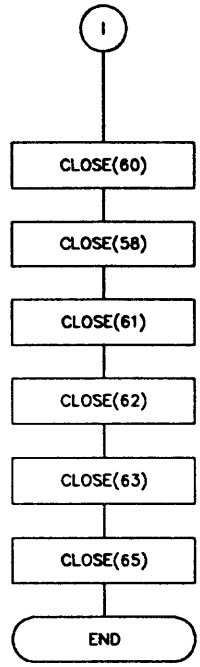
Close file containing the titles and output file names for table 1

Close file containing the titles and output file names for table 2

Close file containing the titles and output file names for table 3

Close the output file for table 3

End of program



Program Listing

```
C     MAIN PROGRAM
C
      CHARACTER*100 TITLE(10)
      CHARACTER*40  DIVNAM(100),      FDNAME(250),       RCHNAM
      CHARACTER*20  VEGNAM(50),       CRPNAM(50)
      CHARACTER*22  INFILE(10),       DATFIL(15),        TFILE(10),
     *              WUNAME,           PFILE(10),         FILENAM
      INTEGER*4     NUMDIV(10),       NUMSUB,            NUMMR,
     *              SUBNUM,           LOCLAT(10),        NUMVEG,
     *              YEAR,             RCHNUM,            YLINES,
     *              TOT,              NUMCRP,            FDNUM
      INTEGER*4     TOTALS(100,25),   MTOTAL(50),        CORVEG(10),
     *              DTOTAL(50),        ETOTAL(100),      STOTAL(50),
     *              FDETOT(250)
      REAL*8        FLOWS(30),        TRIBS(40),         AREAS(20),
     *              DUS(20),          EVAPS(20),         BILOUT,
     *              PPTS,             WUR(5,25),         MWUR(5,25,12),
     *              PRECIP(5),        RCHTS(5),          FDACR(5),
     *              CRPCOF(50,12)
C
C
      COMMON / VEGDAT / DIVNAM, VEGNAM, NUMVEG, NUMDIV, TOT
      COMMON / PHRDAT / DTOTAL, MTOTAL, STOTAL
      COMMON / INDATA / FLOWS,  TRIBS,  AREAS,  EVAPS,  DUS,   RCHTS
      COMMON / COUNTS / NUMSUB, NUMMR, SUBNUM,  RCHNUM, CORVEG
      COMMON / WRATES / MWUR,   WUR
      COMMON / BLCR1 /  LOCLAT, ETOTAL, YEAR
      COMMON / LUMP1 /  INFILE
      COMMON / SDATA /  PFILE,  TFILE
      COMMON / BOTH4 /  TOTALS
      COMMON / IDATA /  DATFIL
      COMMON / PPT1  /  PPTS,   PRECIP
      COMMON / WDATA /  CRPCOF, CRPNAM
      COMMON / VDATA /  NUMCRP
      COMMON / RDAT4 /  BILOUT
      COMMON / SUMMRY / FDNAME, FDETOT, FDNUM
      COMMON / SUM2 /   FDACR
C
C     Set the Bill Williams River number to zero (0) and the full
C     river acreage to zero (0).
C
      BILOUT = 0
      FDNUM  = 0
C
C     Print the title to the screen and ask the user for the name of
C     the primary data file.
C
      WRITE  (*,1)
    1 FORMAT (////////////////////,10X,'LOWER COLORADO RIVER'
     .        ' ACCOUNTING SYSTEM',////)
      WRITE  (*,2)
    2 FORMAT (2X,'What is the profile data file name ?')
      READ   (*,'(A22)') FILENAM
      WRITE  (*,3)
    3 FORMAT (///,2X,'Please Wait - Processing')
C
C     Open the primary data file to read data and the names of other
C     data files required.
```

```
C
      OPEN  (60,FILE=FILENAM, STATUS='OLD', ERR=203)
C
C     Read in the names of the input files that contain data on flow, tributary
C     inflow, domestic use, open-water surface area, vegetation coefficients,
C     daylight, and the titles for the output tables.
C
      DO 5 K = 1, 10
        READ (60,'(A22)',ERR=210) DATFIL(K)
    5 CONTINUE
C
C     Read in the output file name for the domestic-use table.
C
      READ (60,'(A22)',ERR=210) FILENAM
C
C     Open the files that contain the titles and the output file names
C     for each output table.
C
      OPEN (62,FILE=DATFIL(8),  STATUS='OLD', ERR=201)
      OPEN (58,FILE=FILENAM, ERR=200)
      OPEN (63,FILE=DATFIL(9),  STATUS='OLD', ERR=202)
C
C     Read the number of lines in the title and output file name for
C     the water-use table, open the output file, and write the title.
C
      READ (63,'(I2,A22)',ERR=212) YLINES, WUNAME
      OPEN (65, FILE=WUNAME, ERR=204)
      DO 45 I=1, YLINES
        READ (63,'(A100)',ERR=214) TITLE(I)
        WRITE (65,'(3X,A100)',ERR=220) TITLE(I)
   45 CONTINUE
      WRITE (65,115,ERR=220)
      WRITE (65,115,ERR=220)
  115 FORMAT (2X)
      WRITE (65,35,ERR=220)
   35 FORMAT ('Vegetation type',4X,' Jan',2X,' Feb',2X,' Mar',2X,
     *        ' Apr',2X,' May',2X, ' Jun',2X,' Jul',2X,' Aug',2X,
     *        ' Sep',2X,' Oct',2X, ' Nov',2X,' Dec',3X,'Total')
C
C     Call the subroutines that read and store the input data.
C
      CALL FLOWIN
      CALL TRIBIN
      CALL DUIN
      CALL AREAIN
C
C     Read the year and the number of reaches to be processed.
C
      READ  (60,'(I4)',ERR=230) YEAR
      READ  (60,'(I2)',ERR=231) NUMMR
C
C     Loop through each reach, calculating the acreage and consumptive
C     use for each diverter along the reach.
C
      DO 10 RCHNUM=1, NUMMR
C
C       Set the acreage of each reach per diverter to zero (0).
C
        DO 100 I=1,100
          DO 110 J=1,25
            TOTALS(I,J) = 0
  110     CONTINUE
  100   CONTINUE
```

```
C
C       Read the subreach file name, latitude, temperature file
C       name, and precipitation file name associated with each
C       subreach file.
C
        READ  (60,'(A40)',ERR=232) RCHNAM
        WRITE (*,66) RCHNAM
   66   FORMAT (//,2X,'Processing Reach - ',A40)
C
C       If reach DV2PK is to be calculated, then subroutine BWR is run
C       first to calculate BILOUT.
C
        IF (RCHNAM .EQ. 'DV2PK') THEN
          WRITE (*,61)
   61     FORMAT (//,4X,'Processing BWR for DV2PK')
C
C         Read the number of subreaches in the reach and loop through
C         each one, reading and storing the image-processing data file name,
C         latitude of the subreach, temperature data file name, and
C         precipitation data file name.
C
          READ  (60,'(I2)',ERR=233) SUBNUM
          DO 57 J= 1, SUBNUM
            READ  (60,'(A22)',ERR=240) INFILE(J)
            READ  (60,'(I2)', ERR=241) LOCLAT(J)
            READ  (60,'(A22)',ERR=242) TFILE(J)
            READ  (60,'(A22)',ERR=243) PFILE(J)
   57     CONTINUE
C
C         Call subroutine LUMP to consolidate the image-processing data
C         file and call subroutine BC to apply the Blaney-Criddle
C         formula to the vegetation data.  Save the precipitation
C         value for DV2PK.
C
          CALL LUMP
          TEMP = PRECIP(RCHNUM)
          CALL BC
          PRECIP(RCHNUM) = TEMP
          CALL BWR
          RCHTS(RCHNUM) = BILOUT
          CALL TABLE1
          CALL TABLE4
          CALL TABLE3
          WRITE (*,74) BILOUT
   74     FORMAT (6X,'Outflow from Bill Williams River is ',F15.0)
          WRITE (*,73)
   73     FORMAT (/,4X,'Continue with processing DV2PK')
C
C         Reset the acreage in each reach by diverter to zero (0).
C
          DO 112 I=1,100
            DO 111 J=1,25
              TOTALS(I,J) = 0
  111       CONTINUE
  112     CONTINUE
        END IF
C
C       Read the number of subreaches in the reach and loop through
C       each one, reading and storing the image-processing data file name,
C       latitude of the subreach, temperature data file name, and
C       precipitation data file name.
C
        READ  (60,'(I2)',ERR=233) SUBNUM
```

```
      DO 50 J= 1, SUBNUM
        READ  (60,'(A22)',ERR=240) INFILE(J)
        READ  (60,'(I2)', ERR=241) LOCLAT(J)
        READ  (60,'(A22)',ERR=242) TFILE(J)
        READ  (60,'(A22)',ERR=243) PFILE(J)
 50   CONTINUE
C
C     Call subroutine LUMP to consolidate the image-processing data
C     file and call subroutine BC to apply the Blaney-Criddle
C     formula to the vegetation data.
C
      CALL LUMP
      CALL BC
      WRITE  (*,51)
 51   FORMAT (8X,'Applying Water Budget Formula')
C
C     Call the appropriate water-budget subroutine for the reach
C     that is being calculated.  If the reach name does not match,
C     an error is produced.
C
      IF (RCHNAM .EQ. 'HV2DV') CALL HV2DV(*72)
      IF (RCHNAM .EQ. 'DV2PK') CALL DV2PK(*72)
      IF (RCHNAM .EQ. 'PK2IP') CALL PK2IP(*72)
      IF (RCHNAM .EQ. 'IP2ML') CALL IP2ML(*72)
C
 79   WRITE (*,80) RCHNAM
 80   FORMAT (//,20X,'ERROR  - ',A5,' CHOSEN NOT FOUND ')
      STOP
C
 72   CALL TABLE1
      CALL TABLE2
      CALL TABLE3
 10   CONTINUE
C
C     If all four reaches have been calculated, call the water-
C     budget subroutine for the Hoover Dam to Morelos Dam reach
C     of the lower Colorado River.
C
      IF (NUMMR .EQ. 4) CALL HV2ML
C
C     Close all the open files.
C
      CLOSE (60)
      CLOSE (58)
      CLOSE (62)
      CLOSE (63)
      CLOSE (65)
      WRITE (*,49)
 49   FORMAT (//,2X,'PROCESSING COMPLETE',///)
      RETURN
C
C     Error messages.
C
200   WRITE (*,209) DATFIL(6)
      STOP
201   WRITE (*,209) DATFIL(7)
      STOP
202   WRITE (*,209) DATFIL(8)
      STOP
203   WRITE (*,209) 'FILE.DAT'
      STOP
204   WRITE (*,209) WUNAME
      STOP
```

```
  209 FORMAT (//,20X,'ERROR - Opening ',A22)
C
  210 WRITE (*,211) K
  211 FORMAT (//,20X,'ERROR - Reading FILE.DAT, DATFIL(',I2,')')
      STOP
  212 WRITE (*,213) DATFIL(9)
  213 FORMAT (//,20X,'ERROR - Reading ',A22,', YLINES and WUNAME')
      STOP
  214 WRITE (*,215) DATFIL(9), I
  215 FORMAT (//,20X,'ERROR - Reading ',A22,', title string',I2)
      STOP
C
  220 WRITE (*,221) WUNAME
  221 FORMAT (//,20X,'ERROR - Writing to ',A22)
      STOP
C
  230 WRITE (*,239) 'YEAR'
      STOP
  231 WRITE (*,239) 'NUMMR'
      STOP
  232 WRITE (*,239) 'RCHNAM'
      STOP
  233 WRITE (*,239) 'SUBNUM'
      STOP
  239 FORMAT (//,20X,'ERROR - Reading FILE.DAT - ',A10)
C
  240 WRITE (*,249) 'INFILE',J
      STOP
  241 WRITE (*,249) 'LOCLAT',J
      STOP
  242 WRITE (*,249) 'TFILE',J
      STOP
  243 WRITE (*,249) 'PFILE',J
      STOP
  249 FORMAT (//,20X,'ERROR-Reading ',A22,' # ',I2)
C
      END
```

SUBROUTINE FLOWIN

Narrative

Subroutine FLOWIN reads the annual flow measured at gaging stations along the lower Colorado River from Hoover Dam to the SIB. The quantities are in acre-feet. The data file is designed to be human readable; much of the information is skipped and only the actual data values are stored as variables. The format for the data is shown in attachment B. Note that the data are separated into four groups, each of which corresponds to one of the reaches along the river. Also note that the flow quantities in the data files are the only items that should be changed unless there is a modification in the way the consumptive-use estimates are calculated.

Variable List

Name	Common	Description
DATFIL(1)	[IDATA]	ASCII input data file that consists of the annual-flow quantities measured at gaging stations along the lower Colorado River.
FLOWS(20)	[INDATA]	Array that contains the annual-flow quantities measured at gaging stations along the lower Colorado River.

Flow chart

Lower Colorado River Accounting System

Subroutine FLOWIN

Begin subroutine FLOWIN

Open the input file containing the inflow data

Read the first eight lines in the data file

Set I equal to zero

Increment I

Read inflow values 1–2

Repeat until I > 2

Read two blank lines in the data file

Increment I

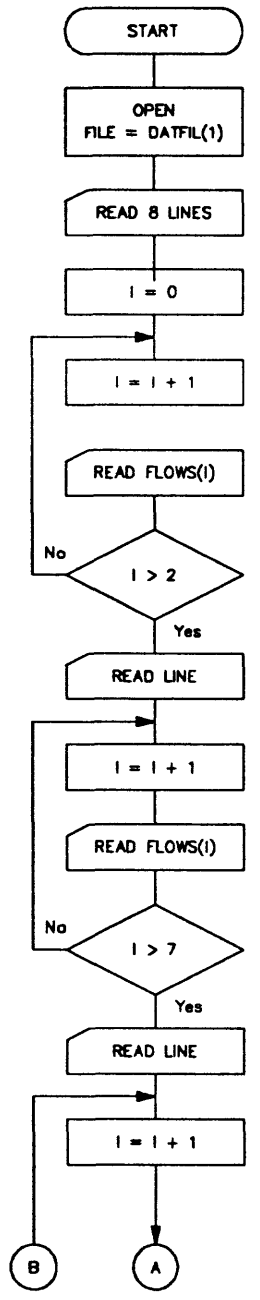
Read inflow values 3–7

Repeat until I > 7

Read two blank lines in the data file

Increment I

Continued on next page



Lower Colorado River Accounting System

Subroutine FLOWIN — Continued

Read inflow values 8–10

Repeat until I > 10

Read two blank lines in the data file

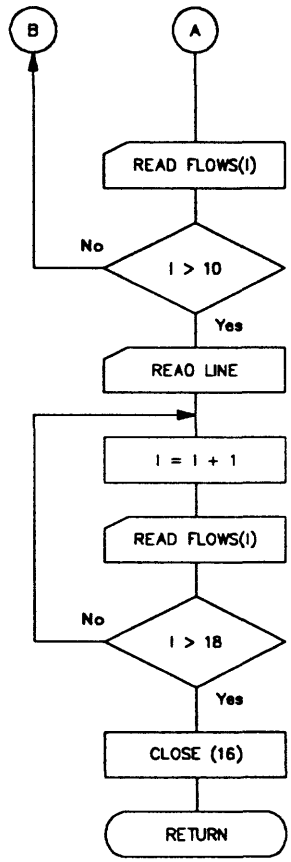
Increment I

Read inflow values 11–18

Repeat until I > 18

Close inflow data file

Return to main program



Program Listing

```
      SUBROUTINE FLOWIN
C
C     This subroutine reads the inflow data from the DATFIL(1)
C     file and stores the values in the variable FLOW(x).
C
      CHARACTER*22  DATFIL(15)
      REAL*8        TRIBS(40), DUS(20),  FLOWS(30),  AREAS(20),
     *              RCHTS(5),  EVAPS(20)
C
      COMMON / INDATA / FLOWS, TRIBS, AREAS, EVAPS, DUS, RCHTS
      COMMON / IDATA /  DATFIL
C
C     Open the inflow data file for input.
C
      OPEN  (16,FILE=DATFIL(1), STATUS='OLD', ERR=200)
C
C     Read and store the inflow data.
C
      READ  (16,'(///////)',ERR=210)
      DO 10 I=1,2
          READ  (16,'(40X,F13.0)',ERR=210) FLOWS(I)
   10 CONTINUE
      READ  (16,'(/)',ERR=210)
      DO 20 I=3,7
          READ  (16,'(40X,F13.0)',ERR=210) FLOWS(I)
   20 CONTINUE
      READ  (16,'(/)',ERR=210)
      DO 30 I=8,10
          READ  (16,'(40X,F13.0)',ERR=210) FLOWS(I)
   30 CONTINUE
      READ  (16,'(/)',ERR=210)
      DO 40 I=11,24
          READ  (16,'(40X,F13.0)',ERR=210) FLOWS(I)
   40 CONTINUE
C
C     Close DATFIL(1) and return.
C
      CLOSE (16)
      RETURN
C
C     Error messages.
C
  200 WRITE (*,201) DATFIL(1)
  201 FORMAT (//,20X,'ERROR - Opening ',A22)
      STOP
  210 WRITE (*,211) DATFIL(1)
  211 FORMAT (//,20X,'ERROR - Reading ',A22)
      STOP
      END
```

SUBROUTINE TRIBIN

Narrative

Subroutine TRIBIN reads the estimates of unmeasured tributary inflow along the lower Colorado River from Hoover Dam to the NIB. The quantities are in acre-feet. The data file is designed to be human readable; much of the information is skipped and only the actual data values are stored as variables. The format for the tributary input data file is shown in attachment C. Note that the data is divided into groups separated by one blank line.

Variable List

Name	Common	Description
DATFILE(2)	[IDATA]	ASCII input data file that consists of the annual tributary-inflow estimates from various tributary streams along the lower Colorado River.
TRIBS(40)	[INDATA]	Array that contains tributary-inflow estimates along the lower Colorado River.

Flow chart

Lower Colorado River Accounting System

Subroutine TRIBIN

Begin subroutine TRIBIN

Open the file containing the tributary data

Read the first five blank lines in the data file

Set I equal to 1

Increment I

Read the tributary values 1–4

Repeat until I > 4

Set J equal to 1

Increment J

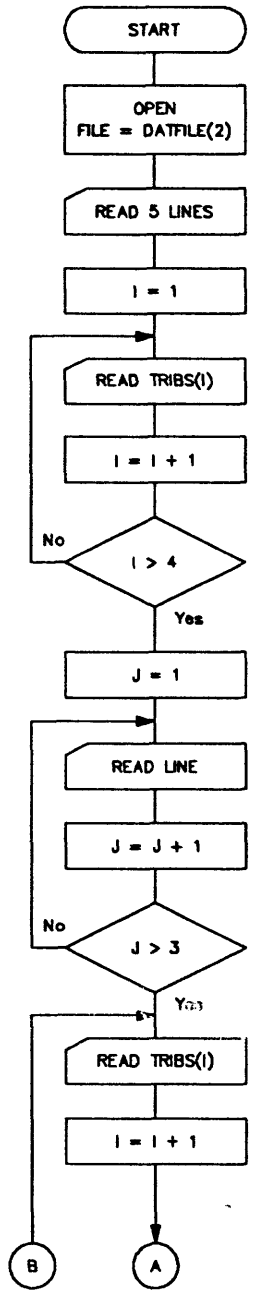
Read one blank line

Repeat until J > 3

Read tributary values 5–7

Increment I

Continued on next page



Lower Colorado River Accounting System

Subroutine TRIBIN — Continued

Repeat until I > 7

Read one blank line in the data file

Read tributary values 8–10

Increment I

Repeat until I > 10

Read one blank line in the data file

Read tributary values 11–16

Increment I

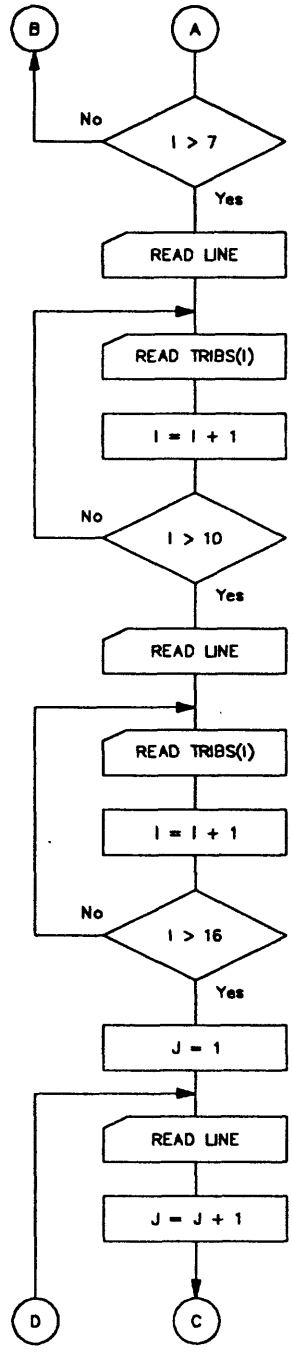
Repeat until I > 16

Set J equal to one

Read one blank line in the data file

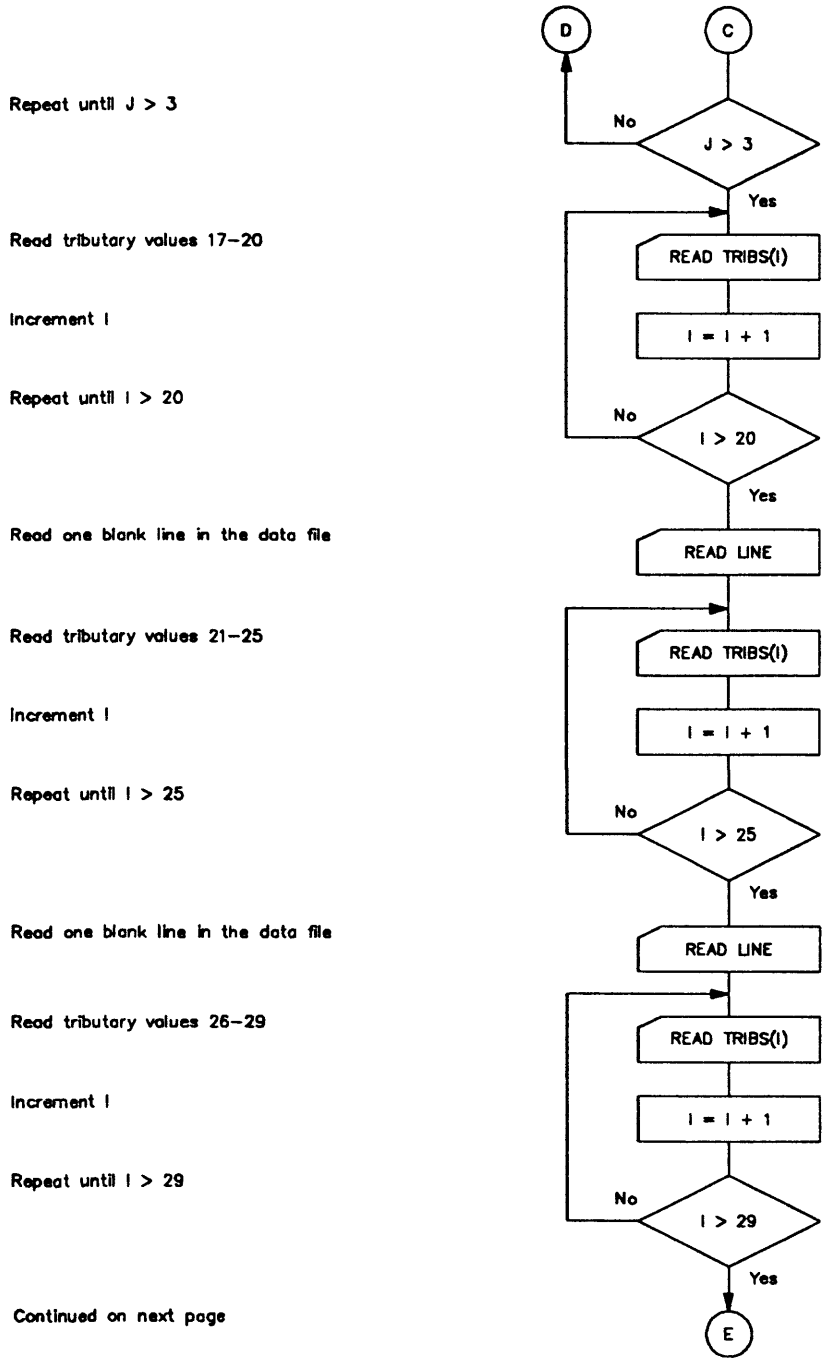
Increment J

Continued on next page



Lower Colorado River Accounting System

Subroutine TRIBIN — Continued



Lower Colorado River Accounting System

Subroutine TRIBIN — Continued

Set J equal to one

Read one blank line in the data file

Increment J

Repeat until J > 3

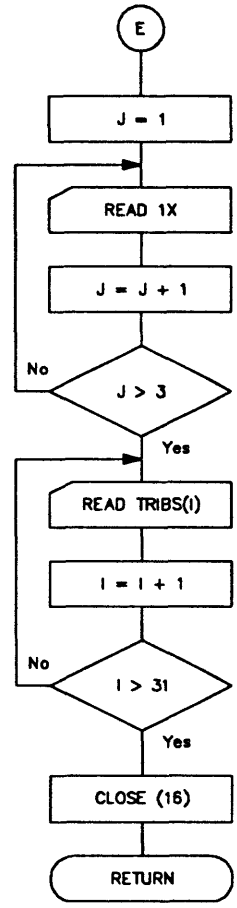
Read tributary values 30–31

Increment I

Repeat until I > 31

Close tributary data file

Return to main program



Program Listing

```
      SUBROUTINE TRIBIN
C
C     This subroutine reads the tributary data from the DATFIL(2)
C     file and stores the values in the variable TRIB(x).
C
      CHARACTER*22  DATFIL(15)
      REAL*8        TRIBS(40),  DUS(20),  FLOWS(30),
     *              EVAPS(20),  RCHTS(5), AREAS(20)
C
      COMMON / INDATA / FLOWS, TRIBS, AREAS, EVAPS, DUS, RCHTS
      COMMON / IDATA /  DATFIL
C
C     Open the tributary data file for input.
C
      OPEN  (16,FILE=DATFIL(2), STATUS='OLD', ERR=200)
C
C     Read and store the tributary data.
C
      READ  (16,'(////)',ERR=210)
      DO 10 I=1,4
         READ  (16,'(45X,F5.0)',ERR=210) TRIBS(I)
   10 CONTINUE
      DO 20 I=1,3
         READ  (16,'(1X)',ERR=210)
   20 CONTINUE
      DO 30 I=5,7
         READ  (16,'(45X,F5.0)',ERR=210) TRIBS(I)
   30 CONTINUE
      READ  (16,'(1X)',ERR=210)
      DO 40 I=8,10
         READ  (16,'(45X,F5.0)',ERR=210) TRIBS(I)
   40 CONTINUE
      READ  (16,'(1X)',ERR=210)
      DO 50 I=11,16
         READ  (16,'(45X,F5.0)',ERR=210) TRIBS(I)
   50 CONTINUE
      DO 60 I=1,3
         READ  (16,'(1X)',ERR=210)
   60 CONTINUE
      DO 70 I=17,20
         READ  (16,'(45X,F5.0)',ERR=210) TRIBS(I)
   70 CONTINUE
      READ  (16,'(1X)',ERR=210)
      DO 80 I=21,25
         READ  (16,'(45X,F5.0)',ERR=210) TRIBS(I)
   80 CONTINUE
      READ  (16,'(1X)',ERR=210)
      DO 90 I=26,29
         READ  (16,'(45X,F5.0)',ERR=210) TRIBS(I)
   90 CONTINUE
      DO 100 I=1,3
         READ  (16,'(1X)',ERR=210)
  100 CONTINUE
      DO 110 I=30,31
         READ  (16,'(45X,F5.0)',ERR=210) TRIBS(I)
  110 CONTINUE
C
C     Close DATFIL(2) and return.
C
```

```
      CLOSE (16)
      RETURN
C
C     Error messages.
C
  200 WRITE (*,201) DATFIL(2)
  201 FORMAT (//,20X,'ERROR - Opening ',A22)
      STOP
  210 WRITE (*,211) DATFIL(2)
  211 FORMAT (//,20X,'ERROR - Reading ',A22)
      STOP
      END
```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FOLLOWS

SUBROUTINE DUIN

Narrative

Subroutine DUIN reads and calculates domestic consumptive use along the lower Colorado River. The data are taken from Hoover Dam to the NIB. The data file is designed to be human readable; much of the information is skipped and only the actual data values are stored as variables. If a non-zero value for pumpage is read, then this value is used; if a zero value is read, then the pumpage is set to the resident population multiplied by the resident per capita consumptive use. The estimates of domestic use by user are then written to an output file and summed by State (attachment P). The format for the input data is shown in attachment D. The pumpage with no returns and the resident per capita water-use quantities are in acre-feet.

Variable List

Name	Common	Description
AZDU		Arizona total domestic consumptive use along the lower Colorado River.
CADU		California total domestic consumptive use along the lower Colorado River.
CWPP		Resident per capita consumptive use.
DATFIL(3)	[IDATA]	ASCII input data file that consists of pumpage with no returns, the resident population, the resident per capita water use, and the State abbreviation.
DATFIL(10)	[IDATA]	ASCII output file that consists of domestic consumptive use by water user and total domestic consumptive use for Arizona, California, and Nevada.
DNAME		Diverter name.
DOM		Temporary variable for domestic consumptive use.
DUS(20)	[INDATA]	Domestic consumptive use for each reach along the lower Colorado River.
NVDU		Nevada total domestic consumptive use along the lower Colorado River.
POP		Resident population for each area where the domestic consumptive use is to be calculated.
STATE		Two character State code in capital letters.
VARNAM		State initials.

Flow chart

Lower Colorado River Accounting System

Subroutine DUIN

Begin subroutine DUIN

Open file containing the domestic-use data

Open the output file for the final domestic-use values

Set the Arizona domestic-use values to zero

Set the California domestic-use values to zero

Set the Nevada domestic-use values to zero

Read the first two characters in the data file

Sets I = 1

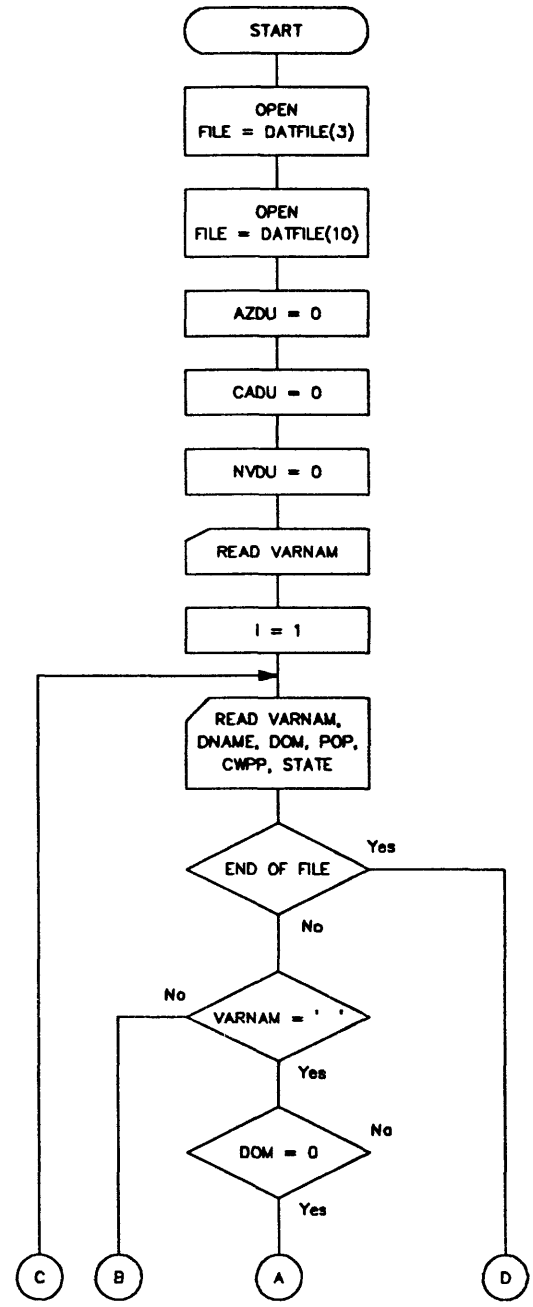
Read the first two characters, diverter name, domestic use, population, per capita rate, and State the diverter is in from the data file

Determine if it is the end of the data file

Determine if the first two characters are blank, same reach, or contain letters, new reach

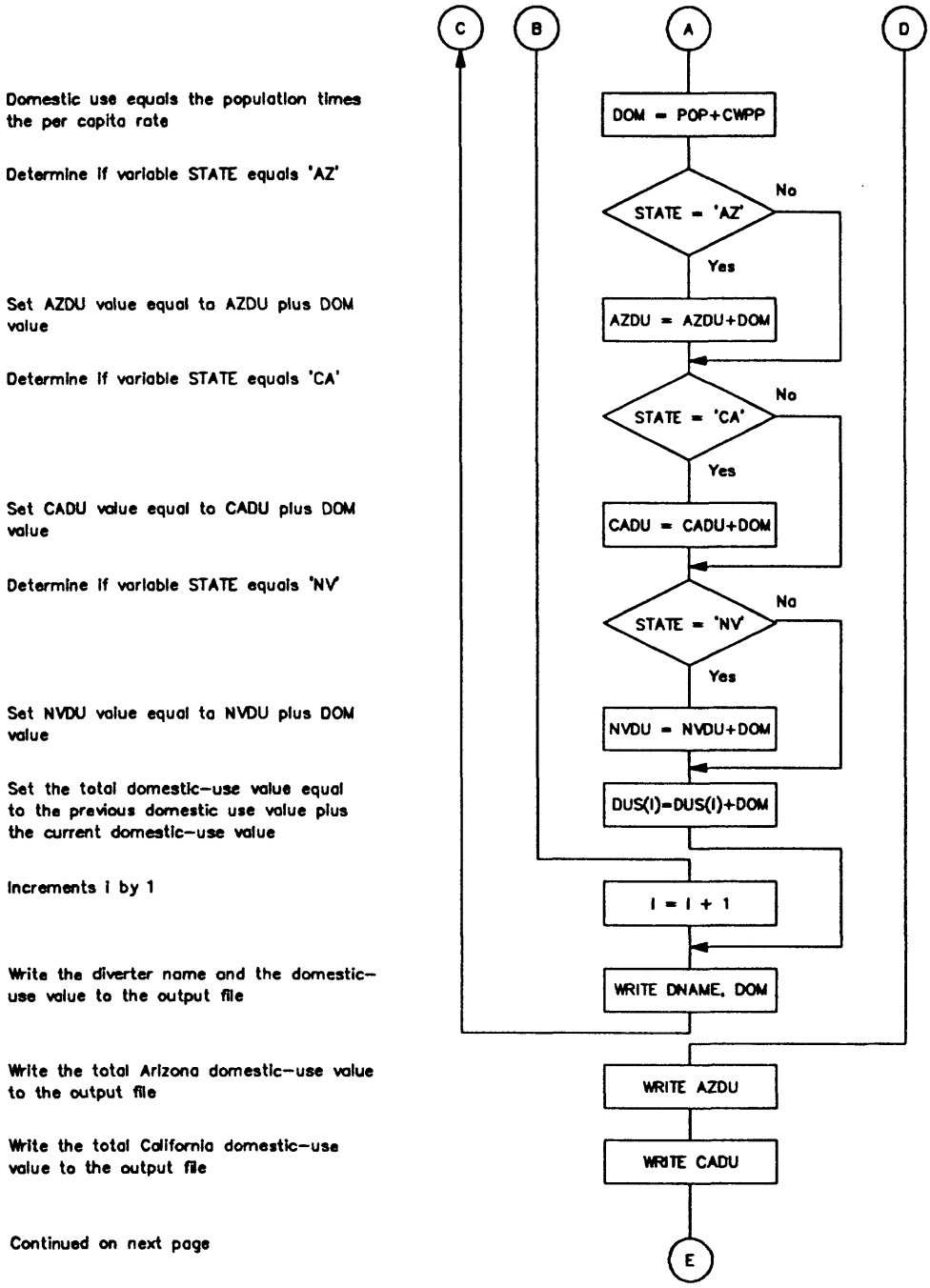
Determine if the domestic-use value is zero

Continued on next page



Lower Colorado River Accounting System

Subroutine DUIN — Continued



Domestic use equals the population times the per capita rate

Determine if variable STATE equals 'AZ'

Set AZDU value equal to AZDU plus DOM value

Determine if variable STATE equals 'CA'

Set CADU value equal to CADU plus DOM value

Determine if variable STATE equals 'NV'

Set NVDU value equal to NVDU plus DOM value

Set the total domestic-use value equal to the previous domestic use value plus the current domestic-use value

Increments i by 1

Write the diverter name and the domestic-use value to the output file

Write the total Arizona domestic-use value to the output file

Write the total California domestic-use value to the output file

Continued on next page

Lower Colorado River Accounting System

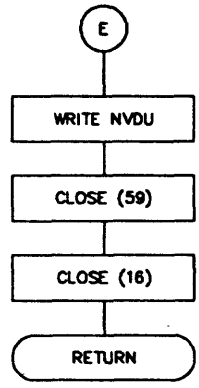
Subroutine DUIN — Continued

Write the total Nevada domestic-use value to the output file

Close the output file for the domestic-use data

Close the file containing the domestic-use data

Return to the main program



Program Listing

```
      SUBROUTINE DUIN
C
C     This subroutine reads the domestic-use data from the
C     DATFIL(3) file and stores the values in the variable DUS(x).
C
      CHARACTER*50  DATFIL(15)
      CHARACTER*20  DNAME
      CHARACTER*2   VARNAM, STATE
      REAL*8        FLOWS(30), AREAS(20), RCHTS(5),  POP,  CWPP, DOM,
     *              TRIBS(40), DUS(20),   EVAPS(20), AZDU, CADU, NVDU
C
      COMMON / INDATA / FLOWS, TRIBS, AREAS, EVAPS, DUS, RCHTS
      COMMON / IDATA /  DATFIL
C
C     Open the domestic-use input data file and the domestic-use output
C     table file.
C
      OPEN  (16,FILE=DATFIL(3), STATUS='OLD', ERR=200)
      OPEN  (59,FILE=DATFIL(10), ERR=210)
C
C     Set the States domestic-use variable to zero (0).
C
      AZDU = 0
      CADU = 0
      NVDU = 0
C
C     Read the first two characters from DATFIL(3).
C
      READ  (16,'(///)')
      READ  (16,'(A2)',ERR=210) VARNAM
      I = 1
C
C     Read the code, diverter name, pumpage with no returns, resident
C     population, resident per capita consumptive use, and State the
C     diverter is located in.
C
   10 READ (16,'(A2,A20,3X,F6.0,6X,F6.0,4X,F3.2,6X,A2)',END=20,ERR=210)
     *      VARNAM, DNAME, DOM, POP, CWPP, STATE
C
C       If the code is blank, continue because the diverter is in the
C       current reach.  If the code is not blank, complete calculations for
C       this reach and continue with the next reach.
C
        IF (VARNAM .EQ. '  ') THEN
C
C          If the pumpage equals zero (0), then calculate the domestic use
C          as the product of resident population and resident per capita
C          consumptive use.
C
           IF (DOM .EQ. 0) DOM = POP * CWPP
C
C          Sum each State's domestic use and the total domestic use for
C          the reach.
C
           IF (STATE .EQ. 'AZ') AZDU = AZDU + DOM
           IF (STATE .EQ. 'CA') CADU = CADU + DOM
           IF (STATE .EQ. 'NV') NVDU = NVDU + DOM
           DUS(I) = DUS(I) + DOM
         ELSE
```

```
          I = I+1
        END IF
C
C       Write the diverter names, domestic use for that diverter, and each
C       State's total domestic use to the domestic-use output table.
C
        WRITE (59, 40, ERR=210) DNAME, DOM
   40   FORMAT (2X,A20,6X,F6.0)
        GOTO 10
   20 WRITE (59,50, ERR=210) AZDU
   50 FORMAT (2X,'ARIZONA DOMESTIC USE',6X,F6.0)
        WRITE (59,60, ERR=210) CADU
   60 FORMAT (2X,'CALIFORNIA DOMESTIC USE',3X,F6.0)
        WRITE (59,70, ERR=210) NVDU
   70 FORMAT (2X,'NEVADA DOMESTIC USE',7X,F6.0)
C
C       Close the files and return.
C
        CLOSE (59)
        CLOSE (16)
        RETURN
C
C       Error messages.
C
  200 WRITE (*,201) DATFIL(3)
  201 FORMAT (//,20X,'ERROR - Opening ',A22)
        STOP
  210 WRITE (*,211) DATFIL(3)
  211 FORMAT (//,20X,'ERROR - Reading ',A22)
        STOP
        END
```


PAGE 9-1 FOLLOWS

SUBROUTINE AREAIN

Narrative

Subroutine AREAIN reads the open-water surface area and the evaporation rate for each reach along the lower Colorado River. The data file is designed to be human readable; much of the information is skipped and only the actual data values are stored as variables. The format for the data is shown in attachment E.

Variable List

Name	Common	Description
AREAS(20)	[INDATA]	Open-water surface area for each reach along the lower Colorado River.
EVAPS(20)	[INDATA]	Evaporation rate for each reach along the lower Colorado River.
DATFIL(4)	[IDATA]	ASCII file that contains the open-water surface area and the evaporation rate for each reach along the lower Colorado River.

Flow chart

Lower Colorado River Accounting System

Subroutine AREAIN

Begin subroutine AREAIN

Open the file containing the open-water surface areas and the evaporation rates

Read the first five blank lines in the data file

Read open-water surface area values 1-6

Repeat until I > 6

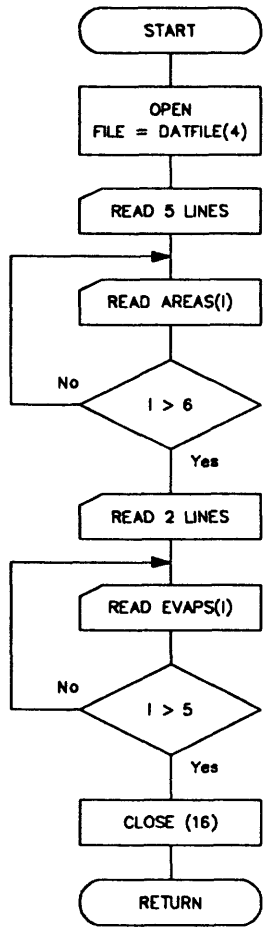
Read one blank line from the data file

Read evaporation rate values 1-5

Repeat until I > 5

Close the file containing the open-water surface areas and the evaporation rates

Return to main program



Program Listing

```
      SUBROUTINE AREAIN
C
C     This subroutine reads the open-water surface areas and the evaporation
C     rates from the AREA.DATA input file and stores that data in the variables
C     AREA(x) and EVAPS(x).
C
      CHARACTER*22  DATFIL(15)
      REAL*8        TRIBS(40), DUS(20), FLOWS(25), EVAPS(20), RCHTS(5),
     *              AREAS(20)
C
      COMMON / INDATA / FLOWS, TRIBS, AREAS, EVAPS, DUS, RCHTS
      COMMON / IDATA / DATFIL
C
C
      OPEN  (16,FILE=DATFIL(4), STATUS='OLD', ERR=200)
      READ  (16,'(////)',ERR=210)
      DO 10 I=1,6
          READ  (16,'(40X,F13.2)',ERR=210) AREAS(I)
   10 CONTINUE
      READ  (16,'(/)',ERR=210)
      DO 20 I=1,5
          READ  (16,'(40X,F13.2)',ERR=210) EVAPS(I)
   20 CONTINUE
      CLOSE (16)
      RETURN
C
C
  200 WRITE (*,201) DATFIL(4)
  201 FORMAT (//,20X,'ERROR - Opening ',A22)
      STOP
  210 WRITE (*,211) DATFIL(4)
  211 FORMAT (//,20X,'ERROR - Writing ',A22)
      STOP
      END
```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SUBROUTINE LUMP

Narrative

Subroutine LUMP reads and processes the image-processing input data file for the lower Colorado River. Header data in the file include the number of vegetation classes, number of vegetation types, and vegetation class numbers. The data include the vegetation classes by vegetation types, vegetation names, diverter names, and acreage associated with each vegetation class for each diverter along a given reach. After the data are read and stored, the subroutine sums the acreages by vegetation type for each diverter along the reach. The image data are from Hoover Dam to the SIB. The format for the image-processing input data file is shown and explained in attachment F. Each reach may be divided into more than one section called a subreach and each subreach may contain up to 100 diverters. Each subreach may contain a different number of vegetation classes but must have the same number of vegetation types.

Variable List

Name	Common	Description
ACRAGE		Acreage value in the image-processing data file.
CORVEG(10)	[COUNTS]	Vegetation acreage less double-cropped area for each reach.
DIVNAM(100)	[VEGDAT]	Name of each diverter in a subreach.
FLAG(60)		Flag that is set when two classification numbers occur in a subreach, used as a part of the net acreage calculation.
INFILE(10)	[LUMP1]	Name of the ASCII input data file that contains the image-processing data for each subreach.
NUMCDE(25)		Number of vegetation classes associated with each crop or phreatophyte-density type.
NUMCLS		Number of classification numbers output by image processing for each subreach.
NUMDIV(10)	[VEGDAT]	Number of diverters within each subreach.

Name	Common	Description
NUMMR	[COUNTS]	Number of reaches the user chooses to be processed by the accounting system.
NUMSUB	[COUNTS]	Number of the subreach currently being processed.
NUMVEG	[VEGDAT]	Number of crop and phreatophyte-density types related to each subreach.
RCHNUM	[COUNTS]	Number of the reach that is currently being processed.
SUBNAM		Name given to each subreach along a single reach.
SUBNUM	[COUNTS]	Total number of subreaches in each reach.
TOT	[VEGDAT]	Total number of diverters along the reach being processed.
TOTALS(100,25)	[BOTH4]	Total acreage for each crop and phreatophyte-density type by diverter.
TTOTAL(25)		REAL variable that contains the total acreage by crop and phreatophyte-density type for each reach.
VEGCDE(20,20)		Vegetation codes related to each respective vegetation type.
VEGNAM(50)	[VEGDAT]	Name of each vegetation type associated with each reach.

Flow chart

Lower Colorado River Accounting System

Subroutine LUMP

Begin subroutine LUMP

Set the total number of diverters to zero

Open the input data file containing the diverter names, vegetation types, and the acreage of each vegetation type

Read the subreach name from the data file

Read the number of classes in data file

Read in the number of vegetation types in the data file

Read the vegetation name and the number of vegetation codes

Read each vegetation code

Repeat until J > number of vegetation codes

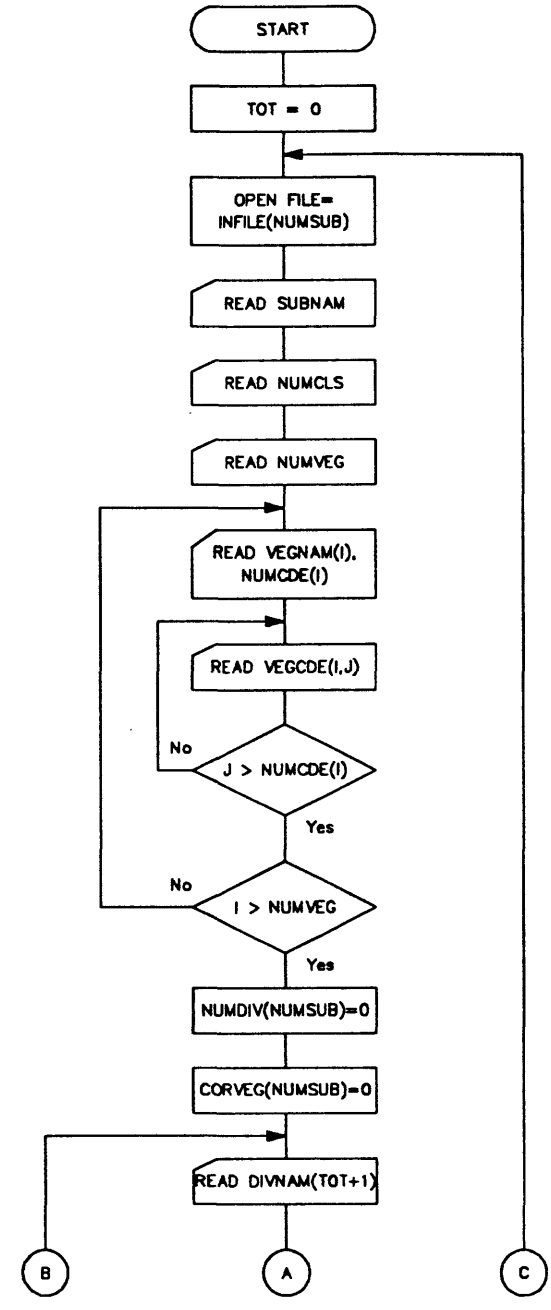
Repeat until I > number of vegetation types

Set the number of diverters equal to zero

Set the correct vegetation acreage to zero

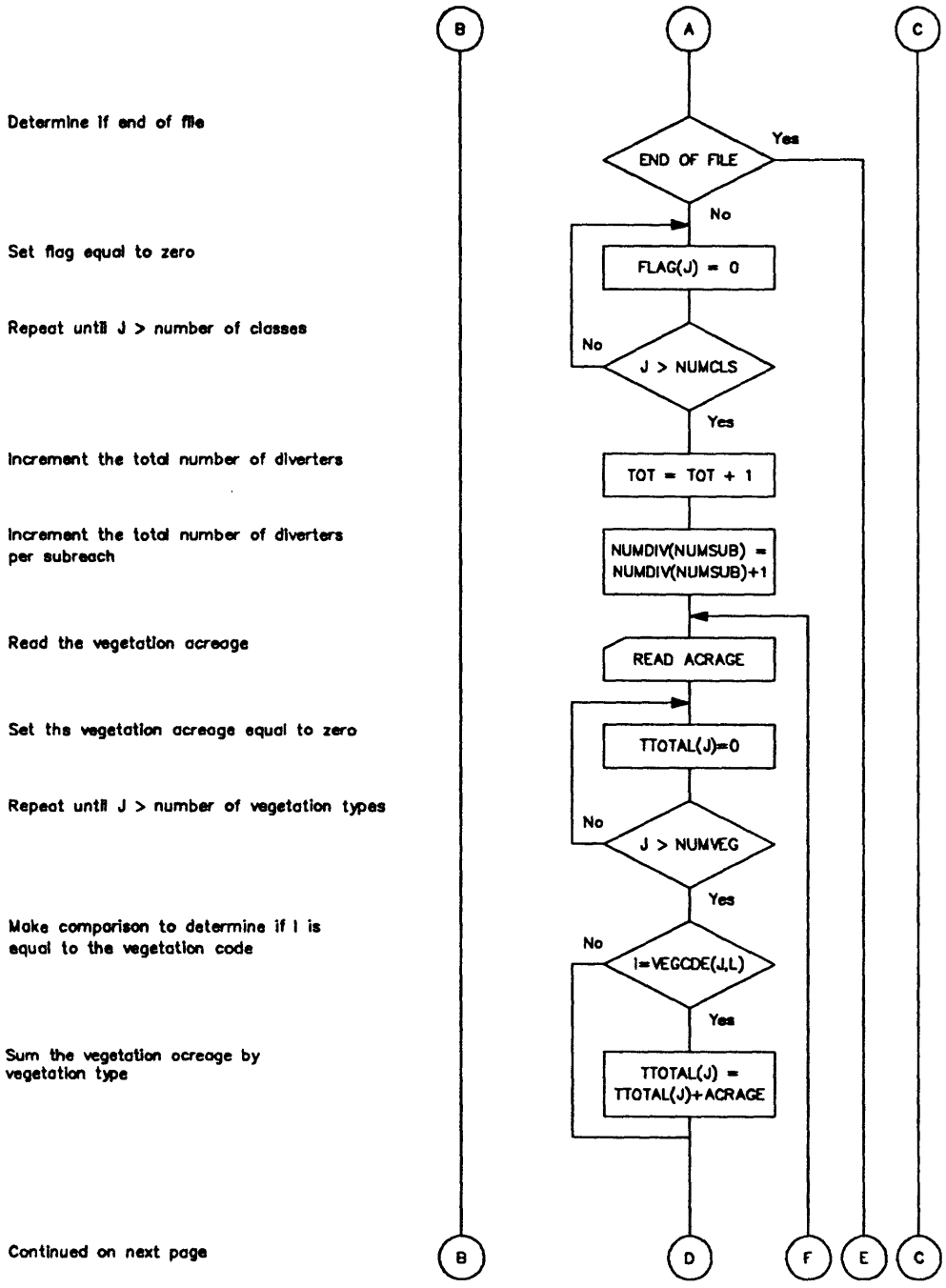
Read the diverter name

Continued on next page



Lower Colorado River Accounting System

Subroutine LUMP — Continued



Lower Colorado River Accounting System

Subroutine LUMP — Continued

Make comparison to determine if the flag is less than one

Sum the vegetation acreage less the double-cropped area

Set the flag equal to 1 if statement true

Repeat until L > the number of vegetation codes

Repeat until J > the number of vegetation names

Sum the acreage for each vegetation type per diverter

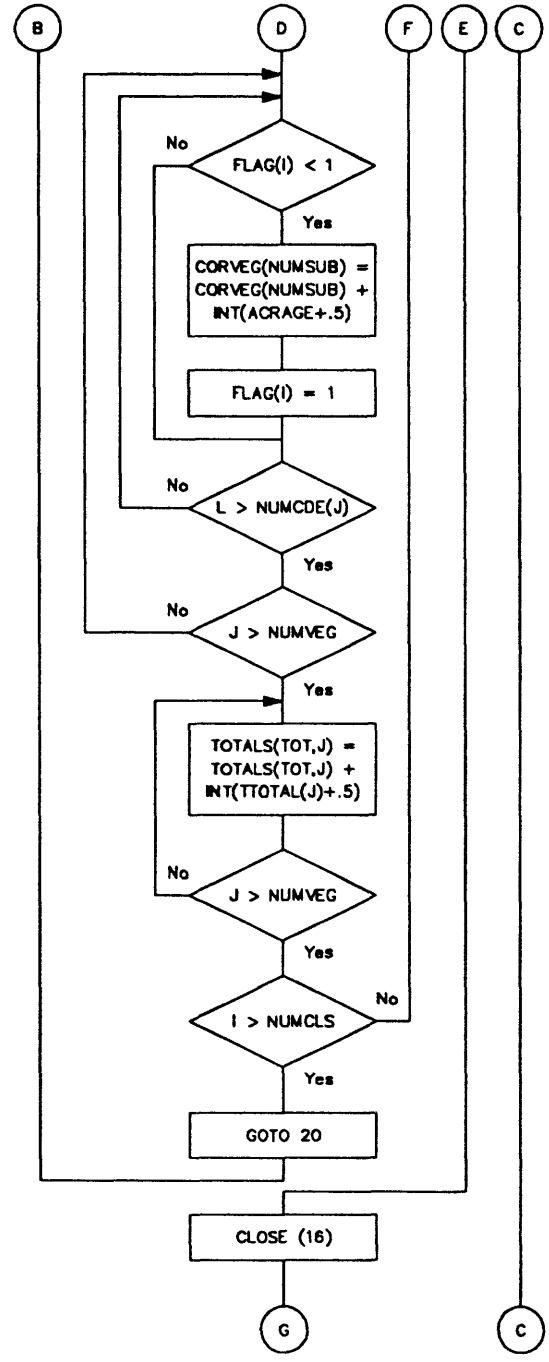
Repeat until J > number of vegetation names

Repeat until I > the number of classification numbers

Go back to line 20

Close the input data file

Continued on next page

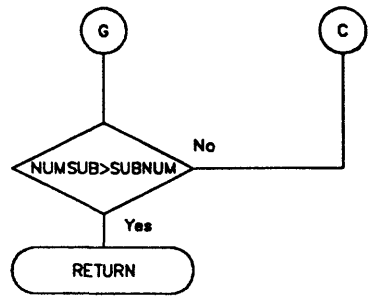


Lower Colorado River Accounting System

Subroutine LUMP — Continued

Repeat until the number of subreaches is greater than the subreach number

Return to main program



Program Listing

```
      SUBROUTINE LUMP
C
C     This subroutine reads the data from the image-processing
C     data file and compiles the acres of each crop and
C     phreatophyte-density type for each diverter in the reach.
C
      CHARACTER*40  SUBNAM,      DIVNAM(100)
      CHARACTER*20  VEGNAM(50)
      CHARACTER*22  INFILE(10)
      INTEGER*4     NUMCLS, NUMVEG,          NUMDIV(10), NUMCDE(25),
     *              NUMMR,  VEGCDE(20,20), TOT,        TOTALS(100,25),
     *              NUMSUB, SUBNUM,          RCHNUM,     CORVEG(10)
      REAL*8        ACRAGE, FLAG(60),        TTOTAL(25)
C
      COMMON / VEGDAT / DIVNAM, VEGNAM, NUMVEG, NUMDIV, TOT
      COMMON / COUNTS / NUMSUB, NUMMR,  SUBNUM, RCHNUM, CORVEG
      COMMON / LUMP1  / INFILE
      COMMON / BOTH4  / TOTALS
C
C     Set the total number of diverters to zero (0).
C
      TOT = 0
C
C     For each subreach, read the data from the image-processing
C     data file.
C
      DO 75 NUMSUB=1,SUBNUM
        WRITE (*,61) NUMSUB
   61   FORMAT (8X,'Processing Satellite data for subreach - ',I2)
        OPEN  (16, FILE=INFILE(NUMSUB), STATUS='OLD', ERR=80)
        READ  (16,'(20X,A40)', ERR=90)  SUBNAM
        READ  (16,'(20X,I2)' , ERR=100) NUMCLS
        READ  (16,'(20X,I2)' , ERR=110) NUMVEG
        CORVEG(NUMSUB) = 0
        DO 10 I=1,NUMVEG
          READ  (16,'(A20,I2)', ERR=120) VEGNAM(I), NUMCDE(I)
          READ  (16,*, ERR=130) (VEGCDE(I,J), J=1,NUMCDE(I))
   10   CONTINUE
C
C     Read the diverter name, vegetation type, and the classes
C     corresponding to each diverter/vegetation type.
C
        NUMDIV(NUMSUB) = 0
   20   READ  (16,'(//,A40,//)', ERR=140, END=70) DIVNAM(TOT+1)
          DO 6 J = 1, NUMCLS
            FLAG(J)   = 0
            TTOTAL(J) = 0
    6     CONTINUE
          TOT=TOT+1
          NUMDIV(NUMSUB) = NUMDIV(NUMSUB)+1
          DO 60 I=1,NUMCLS
            READ  (16,'(20X,F8.2)', ERR=150, END=70) ACRAGE
            DO 40 J=1,NUMVEG
              DO 30 L=1,NUMCDE(J)
C
C               Sum the vegetation acreage for each diverter/vegetation
C               type.
C
```

```
                IF (I .EQ. VEGCDE(J,L)) THEN
                  TTOTAL(J)= TTOTAL(J) + ACRAGE
C
C                 Sum the vegetation acreage less the double-cropped area
C                 for each diverter/vegetation type.
C
                  IF (FLAG(I) .LT. 1) THEN
                    CORVEG(NUMSUB)=CORVEG(NUMSUB)+INT(ACRAGE+.5)
                    FLAG(I) = 1
                  END IF
                END IF
   30         CONTINUE
   40       CONTINUE
C
C          Sum the integer of the total acreage for output.
C
   60     CONTINUE
          DO 45 J = 1,NUMVEG
            TOTALS(TOT,J)= INT(TTOTAL(J)+.5)
   45     CONTINUE
        GOTO 20
C
C     Close the open data files and return.
C
   70 CLOSE (16)
   75 CONTINUE
      RETURN
C
C     Error messages.
C
   80 WRITE (*,81)
   81 FORMAT (//,20X,'ERROR - Opening INFILE(SUBNUM)')
      STOP
   90 WRITE (*,91)
   91 FORMAT (//,20X,'ERROR - Reading SUBNAM')
      STOP
  100 WRITE (*,101)
  101 FORMAT (//,20X,'ERROR - Reading NUMCLS')
      STOP
  110 WRITE (*,111)
  111 FORMAT (//,20X,'ERROR - Reading NUMVEG(RCHNUM)')
      STOP
  120 WRITE (*,121)
  121 FORMAT (//,20X,'ERROR - Reading VEGNAM(RCHNUM,I,)')
      STOP
  130 WRITE (*,131)
  131 FORMAT (//,20X,'ERROR - Reading VEGCDE(I,J)')
      STOP
  140 WRITE (*,141)
  141 FORMAT (//,20X,'ERROR - Reading DIVNAM(RCHNUM,K)')
      STOP
  150 WRITE (*,151)
  151 FORMAT (//,20X,'ERROR - Reading ACRAGE')
      STOP
      END
```

SUBROUTINE BC

Narrative

Subroutine BC uses a modified Blaney-Criddle formula (equation 10) to calculate the monthly water-use rates, sum the annual water-use rate for each vegetation type, and compute the evapotranspiration for each vegetation type. Data required are read from four ASCII data files: temperature (attachment G), precipitation (attachment H), empirical water-use coefficients (attachment I), and monthly percentage of total daylight hours of the year (attachment J). These input data files are opened and read, and data are stored within the subroutine. The temperature and precipitation files must be updated each year.

Temperature Data

The temperature input data files contain multiple years of data that consist of the year the data were collected and the mean monthly temperatures for selected stations along the lower Colorado River. Because this subroutine is executed once for every reach, a different temperature file should be used for each reach. The format of the data file is similar to the one produced by the National Climatic Data Center. In order to reduce the width of the table and still contain all the data, decimal points are assumed and not included; therefore, each value must be divided by ten to obtain degrees Fahrenheit.

Precipitation Data

The precipitation input data files contain multiple years of data and consist of monthly precipitation for selected stations along the lower Colorado River. As with the temperature data file, every reach should have a unique precipitation data file. Precipitation data are in hundredths of inches (decimal points are not included) and must be converted to feet by dividing by 1,200.

Water-Use Coefficients

The empirical water-use coefficients input data file consists of the vegetation name and monthly vegetation water-use coefficients. The vegetation name is compared to the names in the image-processing data files. All vegetation names must match exactly including case and space location.

Monthly Daylight Data

The monthly percentage of total daylight hours of the year input data file consists of latitude (LAT) and the monthly percentages of daylight hours for each latitude. As each line is read, the latitude value is compared to the value from the general data file. Once a match is made, the monthly values are read and stored.

Upon collection of the appropriate values for the formula, the numbers are then inserted into the modified Blaney-Criddle formula (equation 10) for computation of monthly water-use rates. The monthly rates are then summed into an annual water-use rate. Multiplying the annual water-use rate by the area of each vegetation type gives the annual evapotranspiration for each crop and phreatophyte-density type. All calculations in this subroutine are performed on real numbers, but because of round-off errors that may occur later in the program, estimates of evapotranspiration are returned to the main program as rounded integers. Finally, total precipitation is summed and stored.

Variable List

Name	Common	Description
CRPCOF(50,12)	[WDATA]	Monthly vegetation water-use coefficients.
CRPNAM(50)	[WDATA]	Vegetation names read from the vegetation water-use coefficient input data file and used to compare the vegetation names for each reach read from the image-processing input data file.
DATFIL(5)	[IDATA]	ASCII input data file that consists of the monthly vegetation water-use coefficients for each vegetation type.
DATFIL(6)	[IDATA]	ASCII input data file that contains the latitude and the monthly percentages of total daylight hours of the year.
DAYLIG(12)		Monthly percentages of total daylight hours of the year associated with each selected latitude.
DELTA		Offset used in loop counters to account for subreaches.
DIVNAM(100)	[VEGDAT]	Diverter names for each reach along the lower Colorado River.
DTOTAL(50)	[PHRDAT]	INTEGER value for total evapotranspiration for dense phreatophytes.
ETOTAL(100)	[BLCR1]	INTEGER value for total evapotranspiration by crops for each of the reaches.

Name	Common	Description
ETUSED(100,25)		INTEGER value for total evapotranspiration per diverter for each of the reaches.
LATITU		Latitude read from the monthly percentage of total daylight hours input data file and used to compare to the location latitude of the subreach, read from the primary input data file.
LOCLAT(10)	[BLCR1]	Location latitude, read from the primary input data file and used to compare to the latitude, read from the monthly percentage of total daylight hours input data file.
MTOTAL(50)	[PHRDAT]	INTEGER value for total evapotranspiration for medium phreatophytes.
MWUR(5,25,12)	[WRATES]	Monthly water-use rates calculated for vegetation types for each reach along the lower Colorado River.
NUMCRP	[VDATA]	Number of vegetation types read from the vegetation water-use coefficients input data file.
NUMDIV(10)	[VEGDAT]	Number of diverters associated with each subreach.
NUMSUB	[COUNTS]	Number of subreaches read from the primary input data file.
NUMVEG	[VEGDAT]	Number of vegetation types read from the image-processing input data files.
PFILE(10)	[SDATA]	ASCII input data file that contains the precipitation data for selected stations along the lower Colorado River.
PPTS	[PPT1]	Monthly precipitation values from selected weather stations.
PRECPS(12)		Monthly precipitation values taken from selected stations associated with each subreach.
RCHNUM	[COUNTS]	Number of reaches currently being processed.
STOTAL(50)	[PHRDAT]	INTEGER value for total evapotranspiration for sparse phreatophytes.

Name	Common	Description
SUBNUM	[COUNTS]	Number of subreaches per reach.
TDTOTA		REAL value for total evapotranspiration for dense phreatophytes.
TEMPER(12)		Monthly temperature values from selected weather stations.
TETOTA		Total crop evapotranspiration for each reach.
TETUSE		Temporary evapotranspiration value.
TFILE(10)	[SDATA]	ASCII input data file that contains the temperature values for selected stations along the lower Colorado River.
TMTOTA		REAL value for total evapotranspiration for medium phreatophytes.
TOTALS(100,25)	[BOTH4]	Acreage for each crop and phreatophyte-density type by diverter.
TSTOTA		REAL value for total evapotranspiration for sparse phreatophytes.
TYEAR		Temporary year, read from the temperature and precipitation input data files and compared with the year to be processed, which is read from the primary input data file.
VEGNAM(50)	[VEGDAT]	Vegetation names read from the image-processing input data files used to compare the vegetation type names read from the vegetation water-use coefficient input data file.
WUR(5,25)	[WRATES]	Annual water-use rates summed for each vegetation type by reach along the lower Colorado River.
YEAR	[BLCR1]	Year to be processed, which is read from the primary input data file and compared with the temporary year, read from the temperature and precipitation input data files.

Flow chart

Lower Colorado River Accounting System

Subroutine BC

Begin subroutine BC

Open the input data file containing the empirical water-use coefficients

Read the first three blank lines in the data file

Set K equal to zero

Read the vegetation name

Read the vegetation coefficients

Repeat until J > 12

Repeat until end of file

Increment K

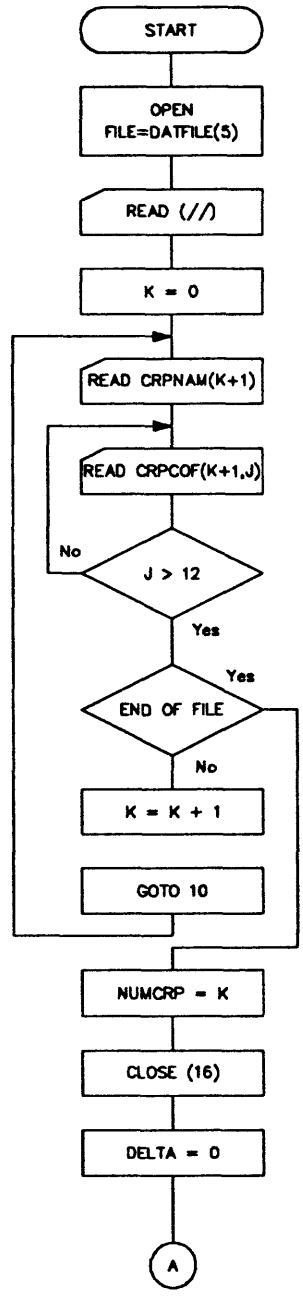
Go back to line 10

Set the variable NUMCRP equal to K

Close the empirical water-use coefficients input data file

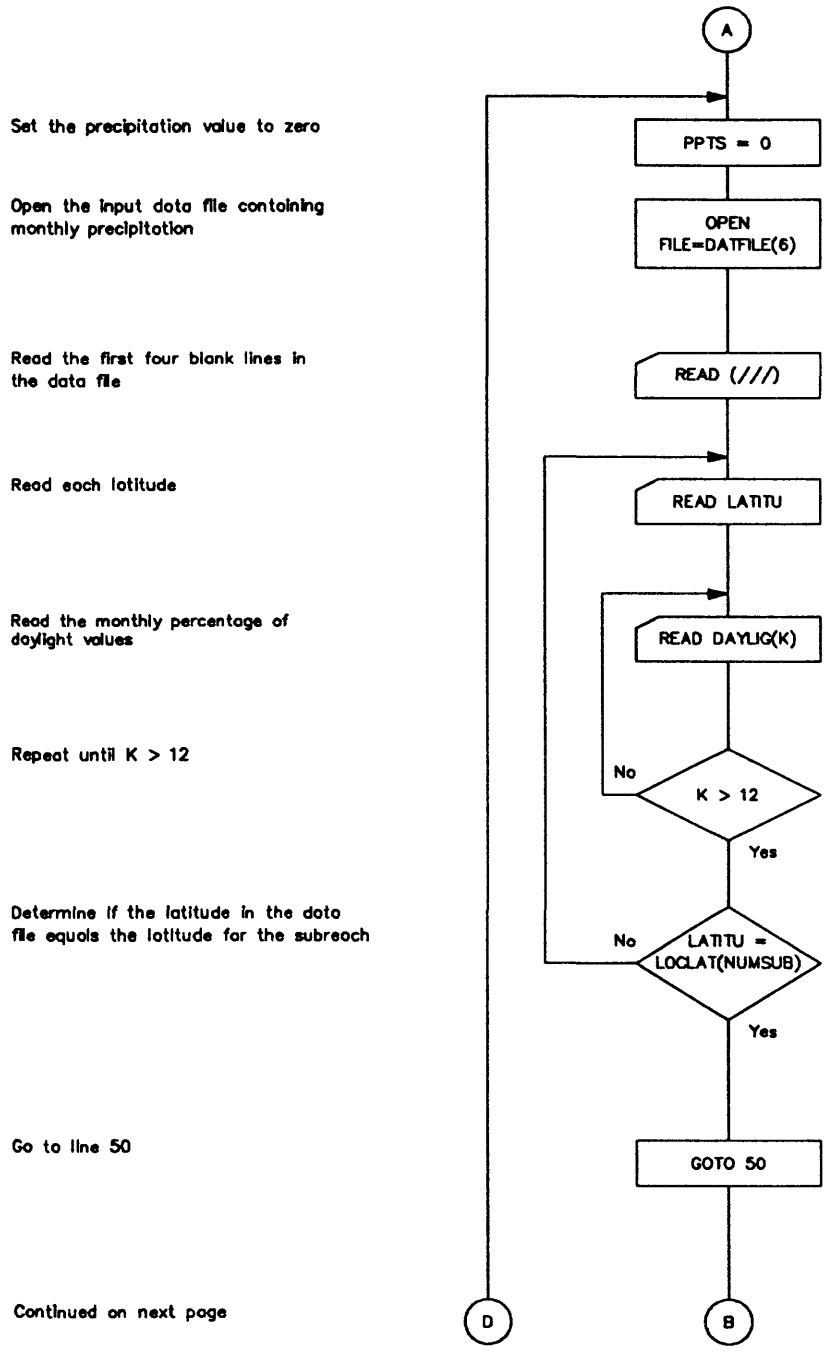
Set counter equal to zero

Continued on next page



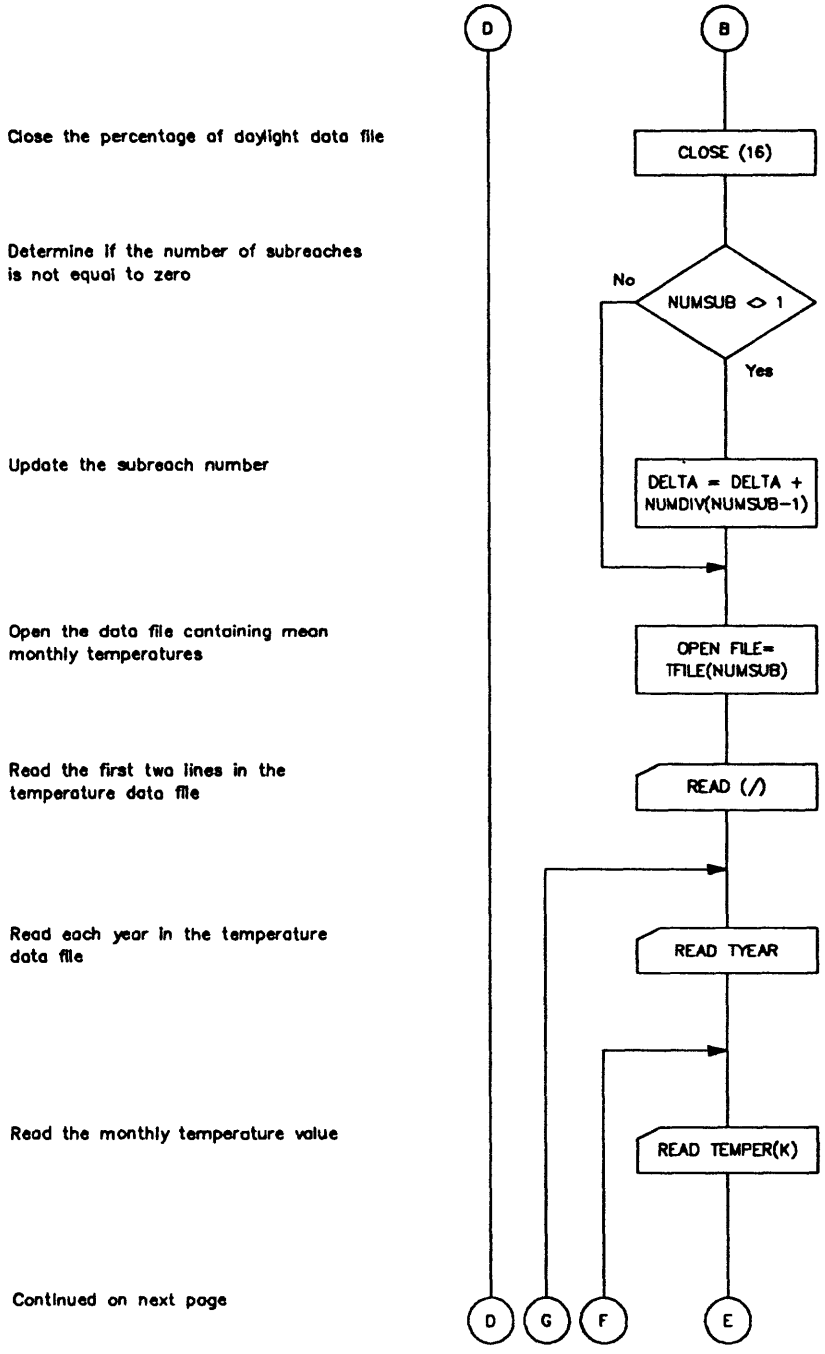
Lower Colorado River Accounting System

Subroutine BC — Continued



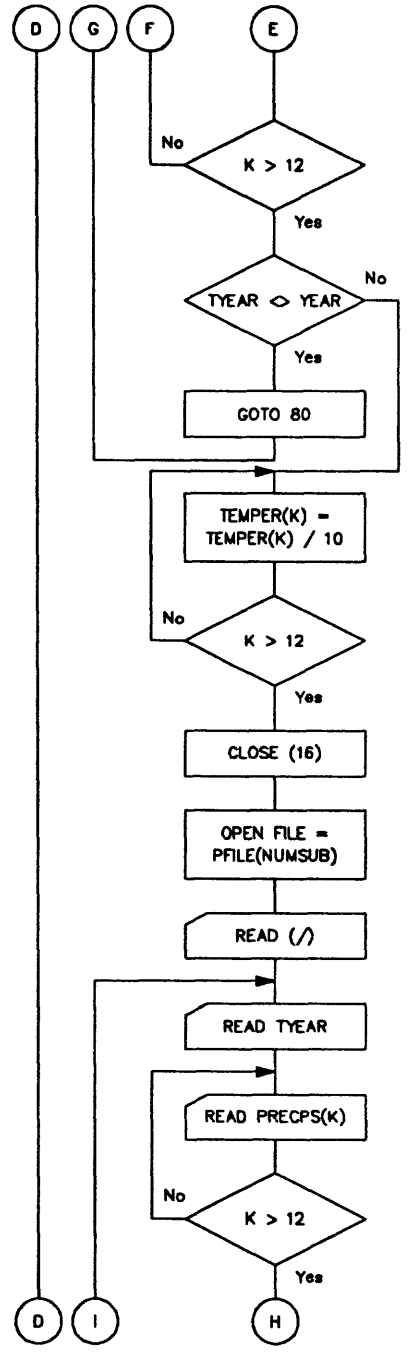
Lower Colorado River Accounting System

Subroutine BC — Continued



Lower Colorado River Accounting System

Subroutine BC — Continued



Repeat until K > 12

Determine if the year to be processed is not equal to the year read in the temperature data file

Go back to line 80

Divide the temperature value by 10 to get the units to degrees Fahrenheit

Repeat until K > 12

Close the temperature data file

Open the input data file containing monthly precipitation

Read the first two lines in the precipitation data file

Read the year in the precipitation data file

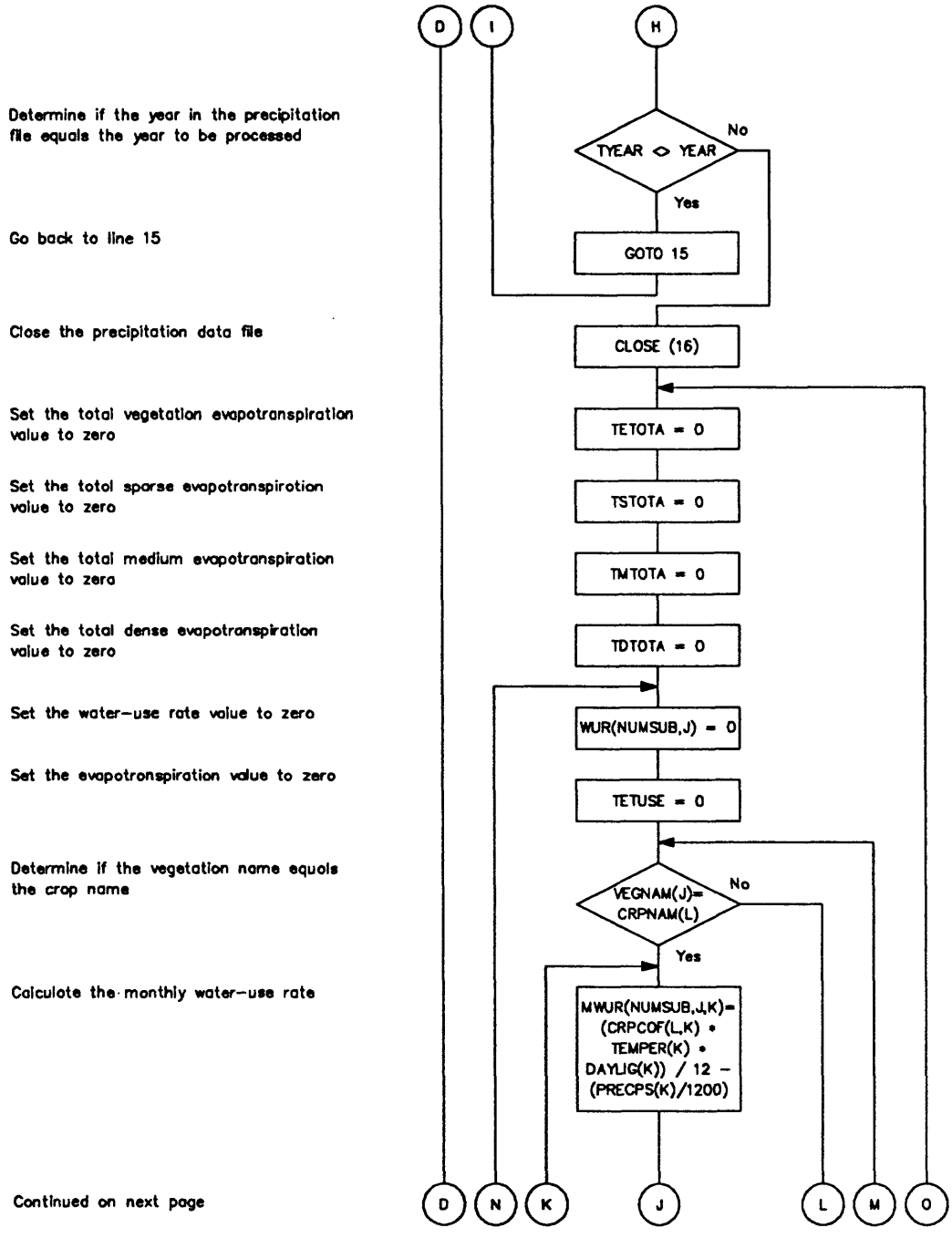
Read the precipitation

Repeat until K > 12

Continued on next page

Lower Colorado River Accounting System

Subroutine BC — Continued



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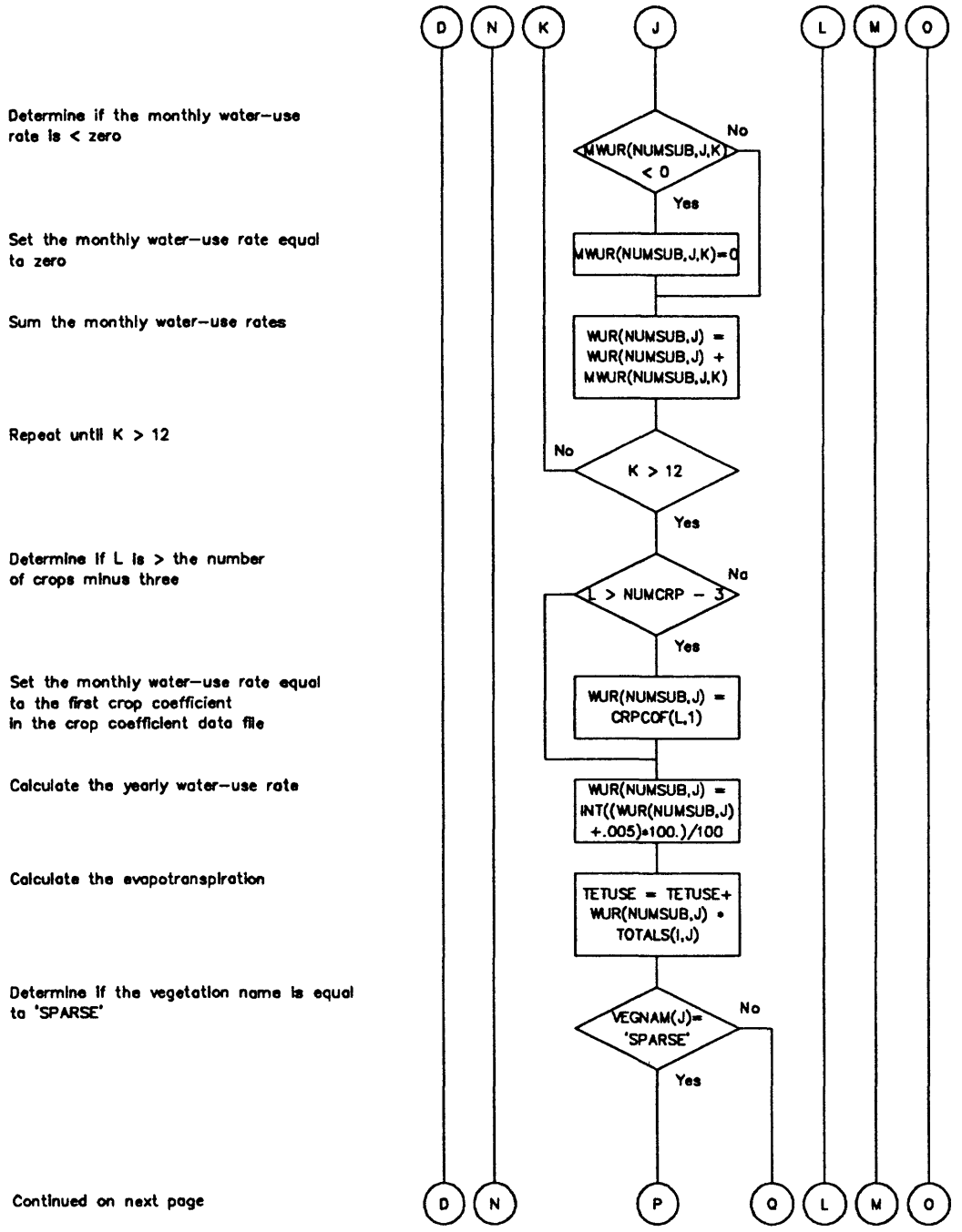
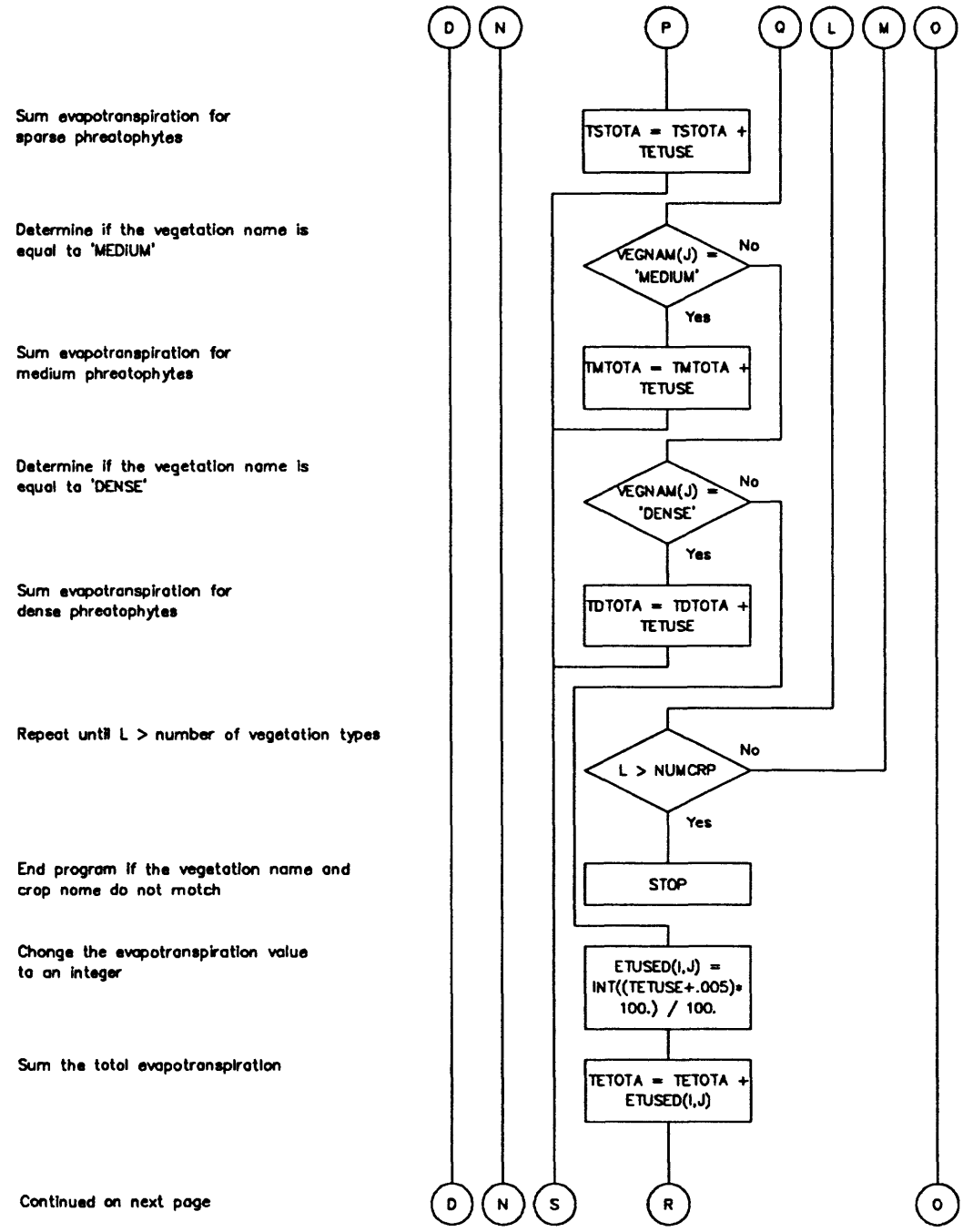
Lower Colorado River Accounting System

Subroutine BC — Continued



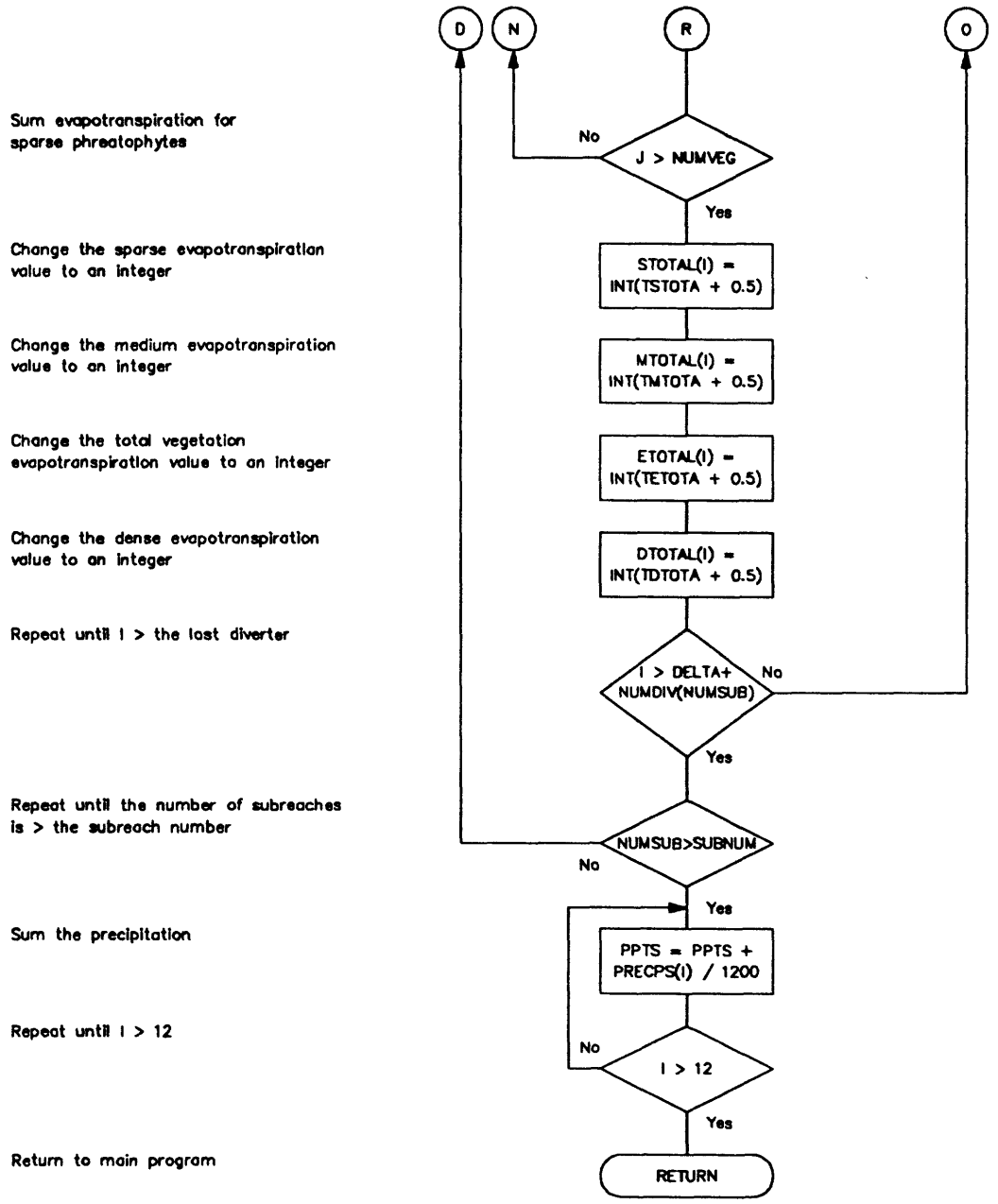
Lower Colorado River Accounting System

Subroutine BC — Continued



Lower Colorado River Accounting System

Subroutine BC — Continued



Program Listing

```
      SUBROUTINE BC
C
C     This subroutine calculates the monthly water-use rates and
C     the annual water-use rate for each vegetation type using the
C     Blaney-Criddle formula.  The following input files must be
C     in a specific format:  DATFIL(5), DATFIL(6), TFILE, and PFILE.
C
      CHARACTER*40  DIVNAM(100)
      CHARACTER*22  DATFIL(15), TFILE(10),    PFILE(10)
      CHARACTER*20  VEGNAM(50), CRPNAM(50)
      INTEGER*4     NUMVEG,     NUMDIV(10),   NUMSUB,          TYEAR,
     *              YEAR,       DELTA,        TOTALS(100,25), MTOTAL(50),
     *              LOCLAT(10), LATITU,       NUMMR,          SUBNUM,
     *              DTOTAL(50), ETOTAL(100),  NUMCRP,         TOT,
     *              RCHNUM,     STOTAL(50),   ETUSED(100,25), CORVEG(10)
      REAL*8        TMTOTA,     TETOTA,       CRPCOF(50,12),  TETUSE,
     *              DAYLIG(12), TEMPER(12),   PRECPS(12),     TDTOTA,
     *              PPTS,       TPRECP,       MWUR(5,25,12),  WUR(5,25),
     *              PRECIP(5)
C
      COMMON / COUNTS / NUMSUB, NUMMR,  SUBNUM, RCHNUM, CORVEG
      COMMON / VEGDAT / DIVNAM, VEGNAM, NUMVEG, NUMDIV, TOT
      COMMON / BOTH4  / TOTALS
      COMMON / PPT1   / PPTS,   PRECIP
      COMMON / PHRDAT / DTOTAL, MTOTAL, STOTAL
      COMMON / BLCR1  / LOCLAT, ETOTAL, YEAR
      COMMON / WDATA  / CRPCOF, CRPNAM
      COMMON / WRATES / MWUR,   WUR
      COMMON / VDATA  / NUMCRP
      COMMON / SDATA  / PFILE,  TFILE
      COMMON / IDATA  / DATFIL
C
C
C     Read the data from DATFIL(6).
C
      OPEN (16, FILE=DATFIL(5), STATUS='OLD', ERR = 240)
      READ (16,'(//)', ERR = 90)
      K=0
   10 READ (16,'(A20,12F6.2)', ERR=250, END=20) CRPNAM(K+1),
     *     (CRPCOF(K+1,J),J=1,12)
      K=K+1
      GOTO 10
   20 NUMCRP = K
      CLOSE (16)
C
C
      DELTA = 0
      PPTS  = 0
      DO 199 NUMSUB=1,SUBNUM
        WRITE  (*,21) NUMSUB
   21   FORMAT (8X,'Applying Blaney-Criddle formula to subreach -',I2)
C
C       Read the input data from DATFIL(6).
C
        OPEN (16, FILE=DATFIL(6), STATUS='OLD', ERR=210)
        READ (16,'(///)', ERR=90)
   30   READ (16,'(I2,2X,12F6.2)',ERR=260, END=90) LATITU,
     *       (DAYLIG(K),K=1,12)
          IF (LATITU .EQ. LOCLAT(NUMSUB)) GOTO 50
```

```
      GOTO 30

   50 CLOSE (16)
C
C     Read the data from the temperature input files and convert
C     from tenths of degrees Fahrenheit to degrees Fahrenheit.
C
      IF (NUMSUB .NE. 1) DELTA = DELTA + NUMDIV(NUMSUB-1)
C
      OPEN (16, FILE=TFILE(NUMSUB), STATUS='OLD', ERR=220)
      READ (16,'(/)', ERR=90)
   80 READ (16,'(I4,12F5.0)',ERR=90,END=270) TYEAR, (TEMPER(K),K=1,12)
      IF (TYEAR .NE. YEAR) GOTO 80
      DO 85 K=1,12
   85   TEMPER(K) = TEMPER(K)/10.
      CLOSE (16)
C
C     Read the data from the precipitation input files and convert
C     precipitation from hundredths of inches to feet.
C
      OPEN (16, FILE=PFILE(NUMSUB), STATUS='OLD', ERR=230)
      READ (16,'(/)', ERR=290)
   15 READ (16,'(I4,12F5.0)',ERR=280,END=90) TYEAR, (PRECPS(K),K=1,12)
      IF (TYEAR .NE. YEAR) GOTO 15
      CLOSE (16)
C
      DO 140 I=DELTA+1, DELTA+NUMDIV(NUMSUB)
        TETOTA = 0
        TSTOTA = 0
        TMTOTA = 0
        TDTOTA = 0
        DO 130 J=1, NUMVEG
          WUR(NUMSUB,J) = 0
          TETUSE        = 0
C
C         Compute the water-use rate, in feet, for each crop and
C         phreatophyte-density type in each reach.
C
          DO 120 L=1,NUMCRP
            IF (VEGNAM(J) .EQ. CRPNAM(L)) THEN
              DO 100 K=1,12
                TPRECIP = PRECPS(K)
                IF (L .GT. NUMCRP-3) TPRECIP = 0.0
                MWUR(NUMSUB,J,K) = (CRPCOF(L,K)*TEMPER(K)*DAYLIG(K))
     *                             /12. - (TPRECIP/1200.)
                IF (MWUR(NUMSUB,J,K) .LE. 0) MWUR(NUMSUB,J,K) = 0
                MWUR(NUMSUB,J,K)=INT(MWUR(NUMSUB,J,K)*100.+0.5)/100.
                WUR(NUMSUB,J) = WUR(NUMSUB,J) + MWUR(NUMSUB,J,K)
  100         CONTINUE
C
C             Compute the evapotranspiration, in acre-feet, for each
C             crop and phreatophyte-density type for each
C             diverter in each reach.
C
              TETUSE = TETUSE + WUR(NUMSUB,J)*TOTALS(I,J)
              IF (VEGNAM(J)(:6).EQ.'SPARSE') THEN
                TSTOTA = TSTOTA + TETUSE
                GOTO 130
              END IF
              IF (VEGNAM(J)(:6).EQ.'MEDIUM') THEN
                TMTOTA = TMTOTA + TETUSE
                GOTO 130
              END IF
```

```
                IF (VEGNAM(J)(:5).EQ.'DENSE') THEN
                  TDTOTA = TDTOTA + TETUSE
                  GOTO 130
                END IF
                GOTO 125
              END IF
  120       CONTINUE
            STOP
  125       ETUSED(I,J) = INT((TETUSE+.005)*100.)/100.
            TETOTA = TETOTA + TETUSE
  130     CONTINUE
          STOTAL(I) = INT(TSTOTA+0.5)
          MTOTAL(I) = INT(TMTOTA+0.5)
          ETOTAL(I) = INT(TETOTA+0.5)
          DTOTAL(I) = INT(TDTOTA+0.5)
  140   CONTINUE
        DO 40 I =1,12
          PPTS = PPTS + PRECPS(I)/1200
   40   CONTINUE
  199 CONTINUE
      PPTS = INT((PPTS / SUBNUM) * 100 + .5) / 100.
      PRECIP(RCHNUM) = PPTS
      RETURN
C
C     Error messages
C
   90 WRITE (*,201)
  201 FORMAT (//,20X,'ERROR - DATA READING')
      STOP
  240 WRITE (*,241)
  241 FORMAT (//,20X,'ERROR - READING KC.DATA')
      STOP
  210 WRITE (*,211)
  211 FORMAT (//,20X,'ERROR - READING LIGHT.DATA')
      STOP
  220 WRITE (*,221)
  221 FORMAT (//,20X,'ERROR - READING TEMPERATURE FILE')
      STOP
  230 WRITE (*,231)
  231 FORMAT (//,20X,'ERROR - READING PRECIPITATION FILE')
      STOP
  250 WRITE (*,251)
  251 FORMAT (//,20X,'ERROR - READING CRPNAM')
      STOP
  260 WRITE (*,261)
  261 FORMAT (//,20X,'ERROR - READING LATITUDE')
      STOP
  270 WRITE (*,271)
  271 FORMAT (//,20X,'ERROR - READING TEMPERATURE')
      STOP
  280 WRITE (*,281)
  281 FORMAT (//,20X,'ERROR - READING PRECIPITATION')
      STOP
  290 WRITE (*,291)
  291 FORMAT (//,20X,'ERROR - READING FIRST LINE')
      STOP
      END
```


PAGE 12-1 FOLLOWS

SUBROUTINE BWR

Narrative

Subroutine BWR, by using equation 12, computes the streamflow in the Bill Williams River that reaches the Colorado River. This inflow is one of the components in the water budget for the Davis Dam to Parker Dam reach. Evapotranspiration from vegetation along the river, as well as the net vegetated acreage, are summed. Once flow into the Colorado River is calculated, each quantity in the water budget is written to an output file.

Variable List

Name	Common	Description
AREAS(5)	[INDATA]	Open-water surface area along the Bill Williams River below Alamo Dam.
BILOUT	[RDAT4]	Streamflow from the Bill Williams River to the Davis Dam to Parker Dam reach.
BWRET		Total evapotranspiration by crops and phreatophytes along the Bill Williams River.
CORVEG(NUMSUB)	[COUNTS]	Total net vegetated area for the Bill Williams River.
DTOTAL(K)	[PHRDAT]	Total evapotranspiration for dense phreatophytes along the Bill Williams River.
ETOTAL(100)	[BLCR1]	Integer value for total evapotranspiration for crops.
EVAPS(5)	[INDATA]	Evaporation rate for the open-water surface area along the Bill Williams River.
FLOWS(5)	[INDATA]	Flow in the Bill Williams River below Alamo Dam.

Name	Common	Description
MTOTAL(K)	[PHRDAT]	Total evapotranspiration for the medium phreatophytes along the Bill Williams River.
NETACR		Total net vegetated area along the Bill Williams River.
NUMSUB	[COUNTS]	Number of subreaches in the Bill Williams River reach.
NUMVEG	[VEGDAT]	Number of vegetation types read from the image-processing input data files.
PPTS	[PPT1]	Total precipitation for the Bill Williams River reach.
STOTAL(K)		Total evapotranspiration for sparse phreatophytes along the Bill Williams River.
SUBNUM	[COUNTS]	Subreach number currently being processed.
TRIBS(10)	[INDATA]	Unmeasured average annual runoff to the Bill Williams River.
TRIBS(16)	[INDATA]	Ground-water discharge to the Bill Williams River.

Flow chart

Lower Colorado River Accounting System

Subroutine BWR

Begin subroutine BWR

Set the net acreage equal to zero

Set K equal to zero

Increment K

Calculate the Bill Williams River evapotranspiration

Determine if K equals the number of vegetation types

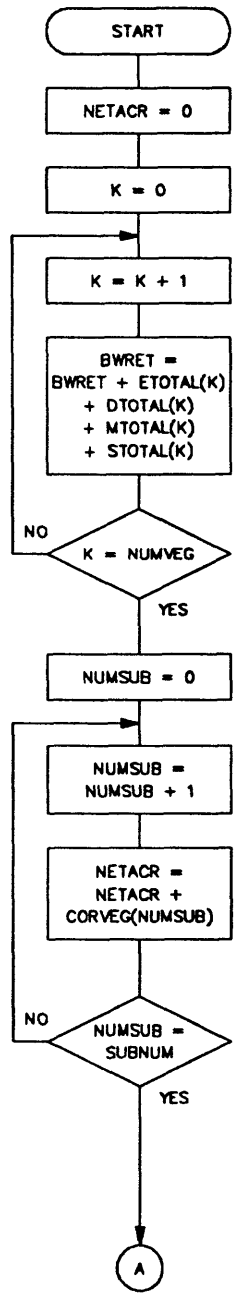
Set the Bill Williams River inflow value equal to zero

Increment NUMSUB

Sum the net acreage

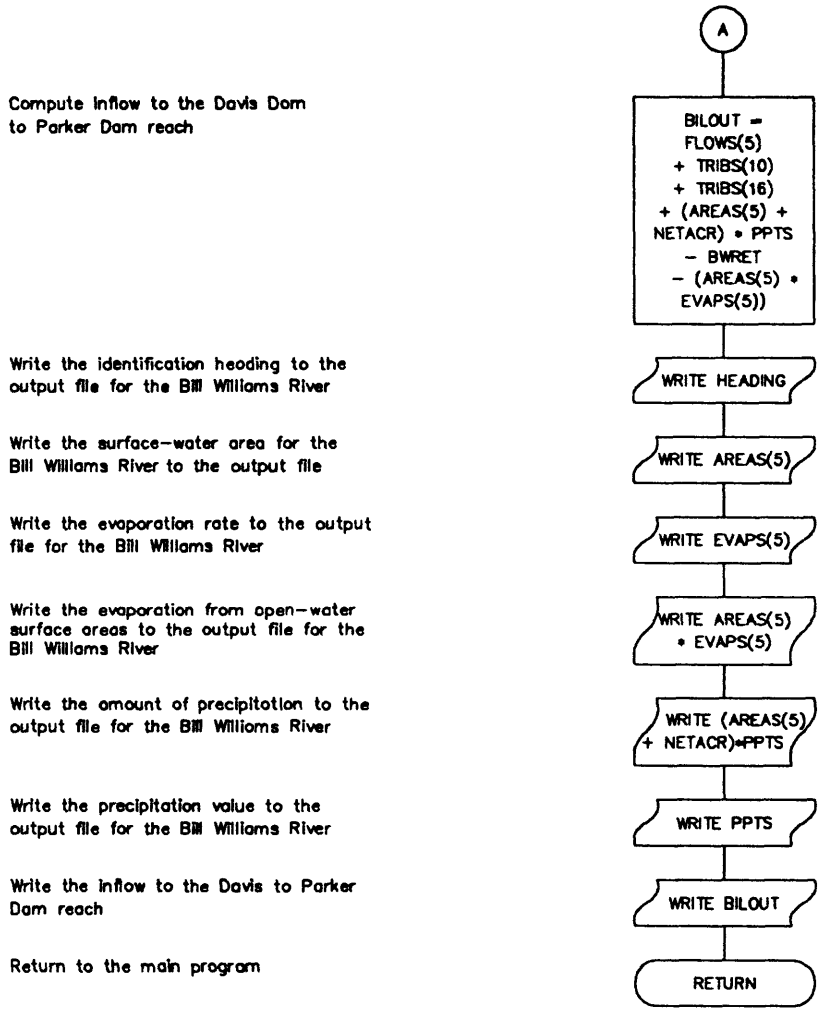
Determine if the number of subreaches equals the subreach number

Continued on next page



Lower Colorado River Accounting System

Subroutine BWR — Continued



Program Listing

```
      SUBROUTINE BWR
C
C     This subroutine calculates the streamflow in the
C     Bill Williams River that enters the Colorado River.
C
      CHARACTER*40  DIVNAM(100)
      CHARACTER*20  VEGNAM(50)
      INTEGER*4     LOCLAT(10),  RCHNUM,      NUMSUB,      SUBNUM,
     *              NUMMR,       TOT,         NUMDIV(10),  YEAR,
     *              NUMVEG,      DTOTAL(50),  MTOTAL(50),  STOTAL(50),
     *              ETOTAL(100), CORVEG(10)
      REAL*8        FLOWS(30),   DUS(20),     TRIBS(40),   PPTS,
     *              AREAS(20),   EVAPS(20),   RCHTS(5),    BILOUT,
     *              BWRET,       NETACR,      PRECIP(5)
C
      COMMON / RDAT4  / BILOUT
      COMMON / BLCR1  / LOCLAT, ETOTAL, YEAR
      COMMON / INDATA / FLOWS,  TRIBS,  AREAS,  EVAPS,  DUS,   RCHTS
      COMMON / PPT1   / PPTS, PRECIP
      COMMON / VEGDAT / DIVNAM, VEGNAM, NUMVEG, NUMDIV, TOT
      COMMON / PHRDAT / DTOTAL, MTOTAL, STOTAL
      COMMON / COUNTS / NUMSUB, NUMMR,  SUBNUM, RCHNUM, CORVEG
C
      NETACR = 0
C
C     Calculate the total crop and phreatophyte evapotranspiration.
C
      DO 30 K = 1, NUMVEG
        BWRET = BWRET + ETOTAL(K) + DTOTAL(K) + MTOTAL(K) + STOTAL(K)
   30 CONTINUE
C
C     Calculate the total acreage minus the double-cropped area.
C
      DO 50 NUMSUB = 1,SUBNUM
        NETACR = NETACR + CORVEG(NUMSUB)
   50 CONTINUE
C
C     Calculate the streamflow in the Bill Williams River that
C     enters the Colorado River.
C
  120 BILOUT = FLOWS(5) + TRIBS(10) + TRIBS(16) - BWRET -
     *          (AREAS(5)*EVAPS(5)) + (AREAS(5)+NETACR)*PPTS
C
C     Write the open-water surface area, evaporation rate, area times
C     evaporation rate, precipitation, precipitation rate, and flow to
C     the Colorado River from the Bill Williams River to the output file.
C
      WRITE (58,60,ERR=250)
   60 FORMAT (2X,'BILL WILLIAMS REACH')
      WRITE (58,65,ERR=250) AREAS(5)
      WRITE (58,66,ERR=250) EVAPS(5)
      WRITE (58,67,ERR=250) AREAS(5)*EVAPS(5)
      WRITE (58,69,ERR=250) (AREAS(5)+NETACR)*PPTS
      WRITE (58,70,ERR=250) PPTS
      WRITE (58,71,ERR=250) BILOUT
   65 FORMAT (4X,'AREAS(5)'18X,F9.2)
   66 FORMAT (4X,'EVAPS(5)'18X,F9.2)
```

```
   67 FORMAT (4X,'AREAS(5)*EVAPS(5)'9X,F9.2)
   69 FORMAT (4X,'(AREAS(5)+NETACR)*PPTS'4X,F9.2)
   70 FORMAT (4X,'PRECIPITATION'13X,F9.2)
   71 FORMAT (4X,'FLOW TO COLORADO RIVER'1X,F12.2)
      RETURN
C
C     Error messages.
C
  250 WRITE (*,251)
  251 FORMAT (//,20X,'ERROR - WRITING TO FILE 58')
      STOP
      END
C
```

SUBROUTINE HV2ML

Narrative

Subroutine HV2ML calculates consumptive use by vegetation along the Colorado River between Hoover Dam and Morelos Dam by using equation 8. This subroutine also produces a table for the Hoover Dam to Morelos Dam reach that lists evapotranspiration, percentage of evapotranspiration, and consumptive use by vegetation for each diverter (attachment O).

Variable List

Name	Common	Description
AREAS(1)	[INDATA]	Open-water surface area in the reach between Hoover Dam and Davis Dam.
AREAS(2)	[INDATA]	Open-water surface area in the reach between Davis Dam and Parker Dam.
AREAS(3)	[INDATA]	Open-water surface area in the reach between Parker Dam and Imperial Dam.
AREAS(4)	[INDATA]	Open-water surface area in the reach between Imperial Dam and Morelos Dam.
BILOUT	[RDATA4]	Inflow from the Bill Williams River, calculated with the BWR subroutine.
DUS(1)	[INDATA]	Domestic water use along the reach between Hoover Dam and Davis Dam.
DUS(2)	[INDATA]	Domestic water use along the reach between Davis Dam and Parker Dam.
DUS(3)	[INDATA]	Domestic water use along the reach between Parker Dam and Imperial Dam.

Name	Common	Description
DUS(4)	[INDATA]	Domestic water use along the reach between Imperial Dam and Morelos Dam.
EVAPS(1)	[INDATA]	Evaporation rate for the reach between Hoover Dam and Davis Dam.
EVAPS(2)	[INDATA]	Evaporation rate for the reach between Davis Dam and Parker Dam.
EVAPS(3)	[INDATA]	Evaporation rate for the reach between Parker Dam and Imperial Dam.
EVAPS(4)	[INDATA]	Evaporation rate for the reach between Imperial Dam and Morelos Dam.
FLOWS(1)	[INDATA]	Measured discharge below Hoover Dam.
FLOWS(2)	[INDATA]	Change in storage in Lake Mohave.
FLOWS(3)	[INDATA]	Measured discharge below Davis Dam.
FLOWS(4)	[INDATA]	Outflow in the Colorado River Aqueduct.
FLOWS(6)	[INDATA]	Outflow in the Central Arizona Project Canal.
FLOWS(7)	[INDATA]	Change in storage in Lake Havasu.
FLOWS(8)	[INDATA]	Measured discharge below Parker Dam.
FLOWS(9)	[INDATA]	Change in storage in Senator Wash Reservoir.
FLOWS(10)	[INDATA]	Measured flow above Imperial Dam.
FLOWS(13)	[INDATA]	Outflow in the All American Canal below Pilot Knob.
FLOWS(15)	[INDATA]	Outflow in the Wellton-Mohawk Canal.
FLOWS(17)	[INDATA]	Inflow from the Gila River near Dome.

Name	Common	Description
FLOWS(18)	[INDATA]	Measured outflow at the Northerly International Boundary.
FLOWS(19)	[INDATA]	Surface-water return flow from Eleven Mile wasteway.
FLOWS(20)	[INDATA]	Surface-water return flow from Cooper wasteway.
FLOWS(21)	[INDATA]	Surface-water return flow from Twenty-One Mile wasteway.
FLOWS(22)	[INDATA]	Surface-water return flow from Main Drain.
FLOWS(23)	[INDATA]	Surface-water return flow from West Main Canal wasteway.
FLOWS(22)	[INDATA]	Surface-water return flow from East Main Canal wasteway.
NETACR		Net acreage of crops along the reach.
PRECIP(1)	[PPT1]	Precipitation for each area in the reach between Hoover Dam and Davis Dam.
PRECIP(2)	[PPT1]	Precipitation for each area in the reach between Davis Dam and Parker Dam.
PRECIP(3)	[PPT1]	Precipitation for each area in the reach between Parker Dam and Imperial Dam.
PRECIP(4)	[PPT1]	Precipitation for each area in the reach between Imperial Dam and Morelos Dam.
TRIBS(1)	[INDATA]	Ground-water discharge from springs downstream from Hoover Dam.
TRIBS(2)	[INDATA]	Unmeasured average annual runoff along the reach.

Name	Common	Description
TRIBS(3)	[INDATA]	Ground-water discharge from the Colorado River valley.
TRIBS(4)	[INDATA]	Ground-water discharge from Eldorado Valley.
TRIBS(5)	[INDATA]	Unmeasured average annual runoff from Davis Dam to Topock.
TRIBS(6)	[INDATA]	Unmeasured average annual runoff from Topock to Parker Dam.
TRIBS(7)	[INDATA]	Unmeasured average annual runoff from the Whipple Mountains.
TRIBS(8)	[INDATA]	Unmeasured tributary inflow from Piute Wash.
TRIBS(9)	[INDATA]	Unmeasured tributary inflow from Sacramento Wash.
TRIBS(11)	[INDATA]	Ground-water discharge from Davis Dam to Topock.
TRIBS(12)	[INDATA]	Ground-water discharge from Topock to Parker Dam.
TRIBS(13)	[INDATA]	Ground-water discharge from Piute Valley.
TRIBS(14)	[INDATA]	Ground-water discharge from Sacramento Valley.
TRIBS(15)	[INDATA]	Ground-water discharge from Chemehuevi Valley.
TRIBS(17)	[INDATA]	Unmeasured average annual runoff from the Whipple Mountains.
TRIBS(18)	[INDATA]	Unmeasured average annual runoff from the Big Maria Mountains.

Name	Common	Description
TRIBS(19)	[INDATA]	Unmeasured average annual runoff from the Palo Verde-Mule Mountains.
TRIBS(20)	[INDATA]	Unmeasured average annual runoff from Dome Rock-Trigo-Chocolate Mountains.
TRIBS(21)	[INDATA]	Unmeasured tributary inflow from Vidal Wash.
TRIBS(22)	[INDATA]	Unmeasured tributary inflow from Bouse Wash.
TRIBS(23)	[INDATA]	Unmeasured tributary inflow from Tyson Wash.
TRIBS(24)	[INDATA]	Unmeasured tributary inflow from McCoy Wash.
TRIBS(25)	[INDATA]	Unmeasured tributary inflow from Milpitas Wash.
TRIBS(26)	[INDATA]	Ground-water discharge from Vidal Wash.
TRIBS(27)	[INDATA]	Ground-water discharge from Bouse Wash.
TRIBS(28)	[INDATA]	Ground-water discharge from Tyson Wash.
TRIBS(29)	[INDATA]	Ground-water discharge from Chuckwalla Valley.
TRIBS(30)	[INDATA]	Unmeasured average annual runoff along the reach.
TRIBS(31)	[INDATA]	Ground-water discharge near Dome.

Flow chart

Lower Colorado River Accounting System

Subroutine HV2ML

Begin subroutine HV2ML

Set the FDTOT (flow into the river) to include FLOWS(1), BILOUT, and FLOWS(17)

Set I equal to zero for use as a counter

Increment I

Add total precipitation falling on the vegetated area to the total flow

Determine if all the subreaches have been added

Set I equal to zero for use as a counter

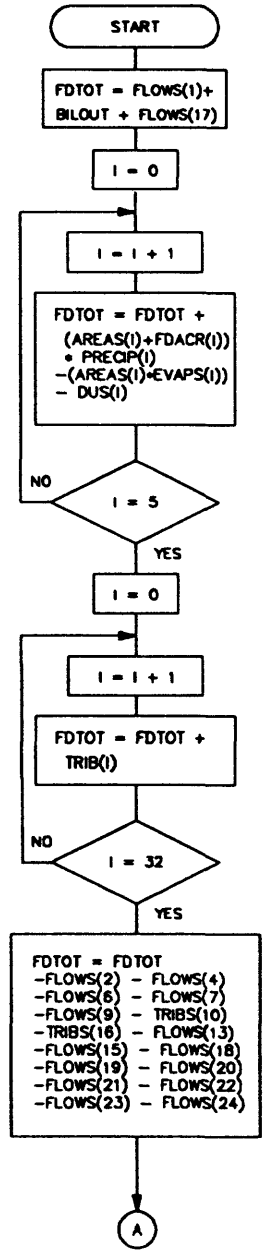
Increment I

Add all the tributary values in the data file to the total flow

Determine if all the tributaries have been added

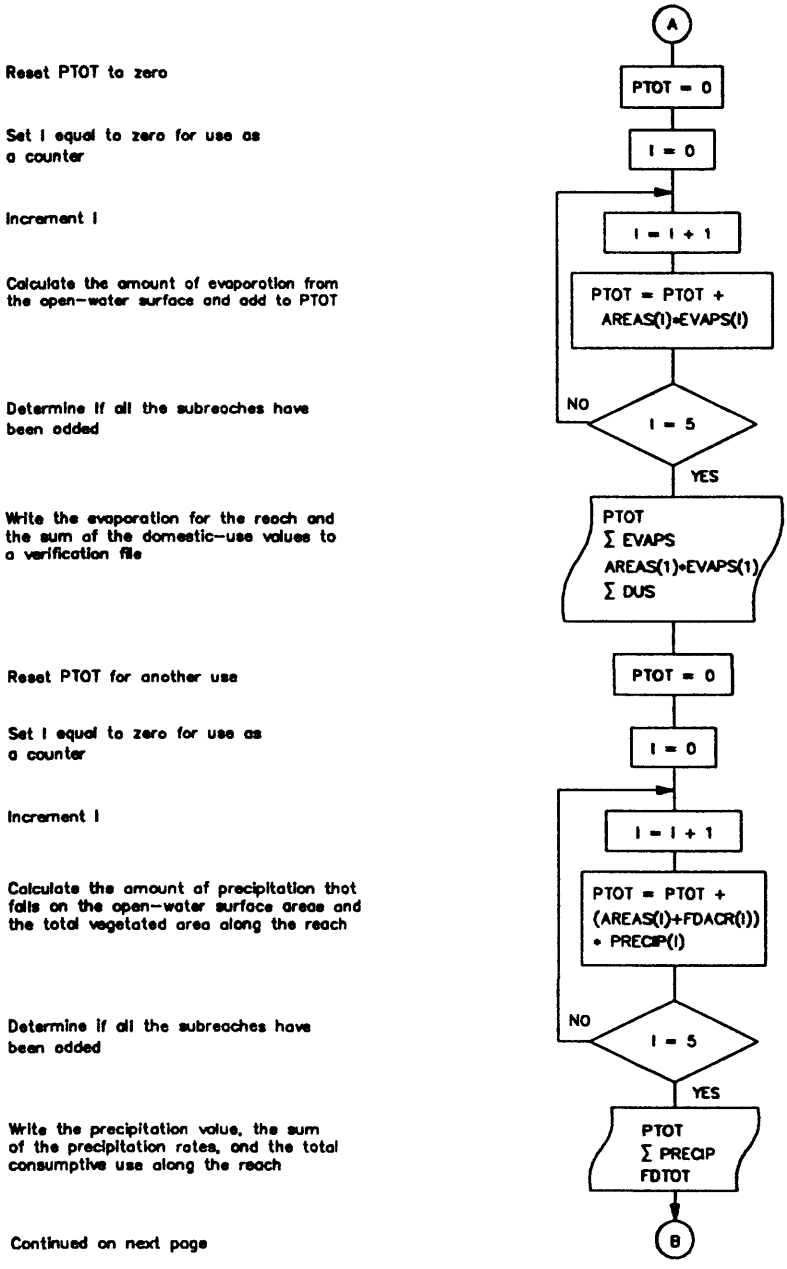
Subtract all tributary inflows used for Bill Williams River and subtract all exported flows from the total flow in the reach

Continued on next page



Lower Colorado River Accounting System

Subroutine HV2ML — Continued



Lower Colorado River Accounting System

Subroutine HV2ML — Continued

Set I equal to zero for use as a counter

Increment I

Check to see if the diverter is flagged to be skipped with an '*'

Reduce the number of diverters by one

Set J equal to I-1 for use as a counter

Increment J

Move the diverter name and the diverter ET total up in the array to fill the slot left by removing the flagged diverter

Repeat for all the diverters

Repeat for all the diverters

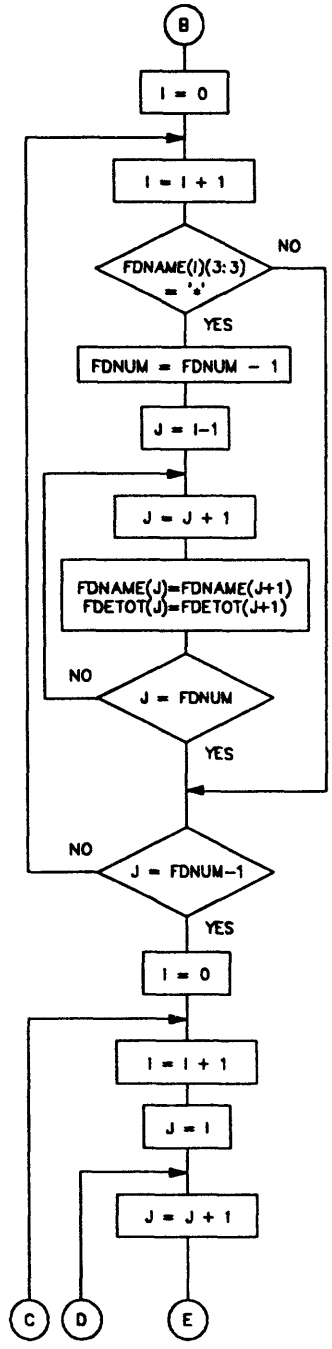
Set I equal to zero for use as a counter

Increment I

Set J equal to zero for use as a counter

Increment J

Continued on next page



Lower Colorado River Accounting System

Subroutine HV2ML — Continued

Check to see if the diverter name appears in the array

Add the ET totals for the diverter that appears twice

Decrease the number of diverters by one

Set K equal to J–1 for use as a counter

Increment K by one

Move the diverter names and ET totals down in the matrix to replace the duplicate diverter name

Repeat for all the remaining diverters

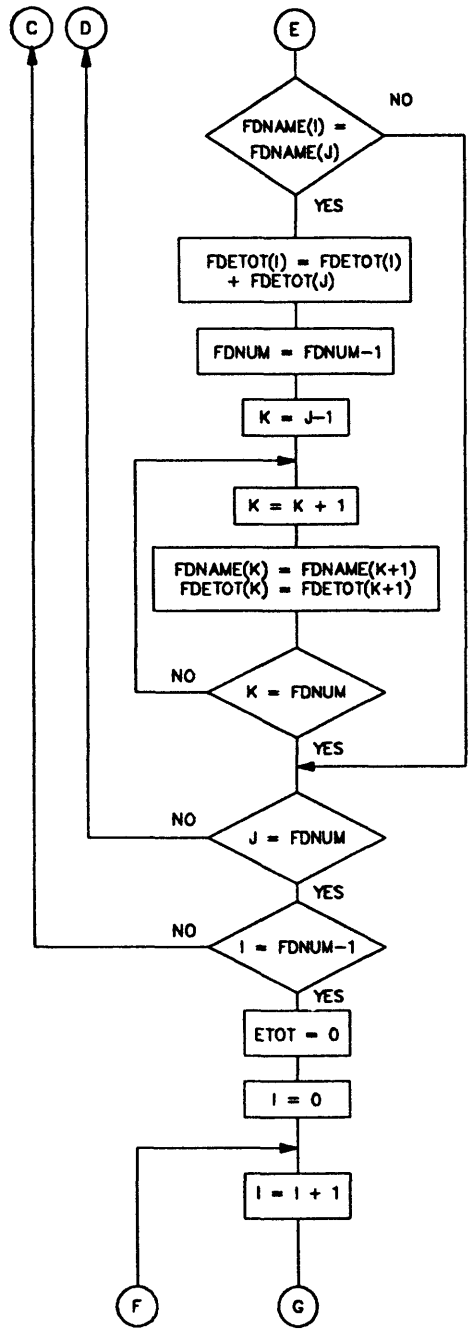
Repeat for all the diverters

Repeat for all the diverters minus one

Reset ETOT to zero

Reset I to zero for use as a counter

Increment I by one



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Lower Colorado River Accounting System

Subroutine HV2ML — Continued

Check to see if the diverter name starts with PHRE

Change the name of the diverter to ZZZZ so it is sorted last

Repeat for all diverters

Reset I to zero for use as a counter

Increment I by one

Reset J to zero for use as a counter

Increment J by one

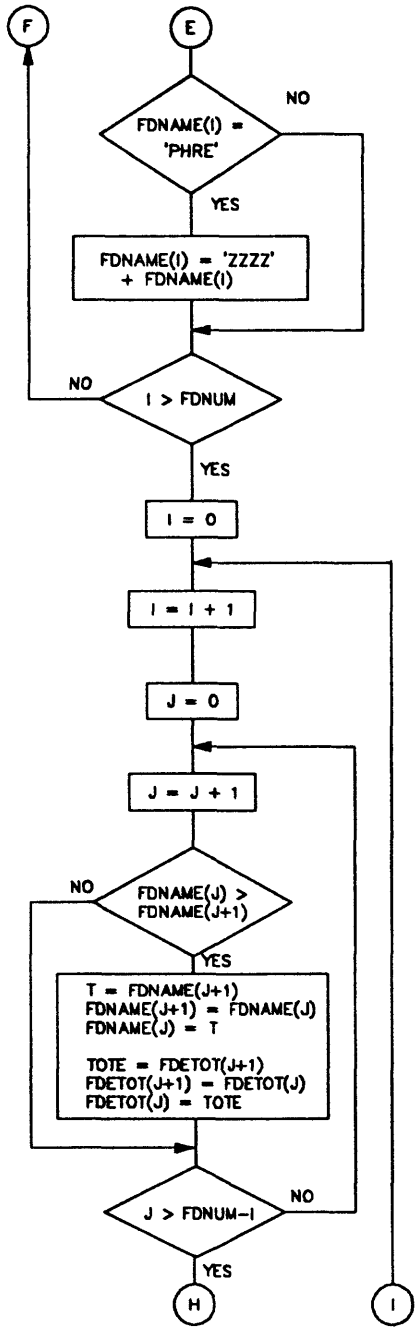
Check to see if the diverter names are in alphanumeric order

Switch the diverter name with the one after it to put them in order

Switch the evapotranspiration total to match the switch of the diverter names

Check if J is greater than the total number of diverters minus 1

Continued on next page



Lower Colorado River Accounting System

Subroutine HV2ML — Continued

Check to see if I is greater than the total number of diverters minus one

Read in the number of lines in the title and the name of the output file

Open the file TNAME for output to print the complete table

Reset I to zero for use as a counter

Increment I by one

Read a line for the table title from the title data file

Write the table title line to the output file

Continue reading and writing the title for XLINES of lines

Write the headings for the table, these are hard coded in the program

Set CK to the State code for the first diverter to be used to separate the States on the table

Write the first State name, 'ARIZONA'

Set all of the total variables to zero for calculation during the printing processes

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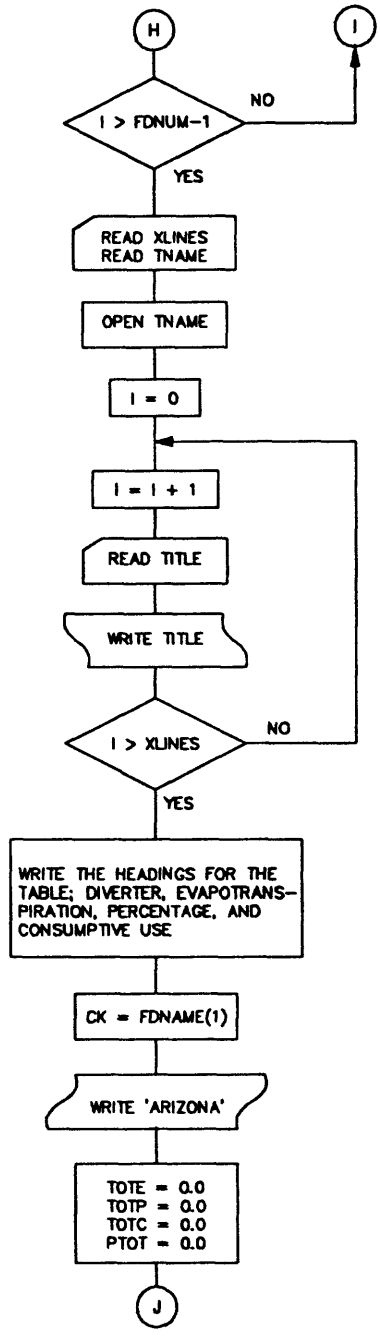

Lower Colorado River Accounting System

Subroutine HV2ML — Continued

Reset I to zero for use as a counter

Increment I by one

Add the evapotranspiration, percentage, consumptive use, and total percentage to their respective total variables

Check if a diverter in a new state is next and branch to print totals

Check to see if the current State is Arizona

Print out the totals for the State of Arizona

Check to see if the current State is California

Print out the totals for the State of California

Check to see if the current State is Nevada

Print out the totals for the State of Nevada

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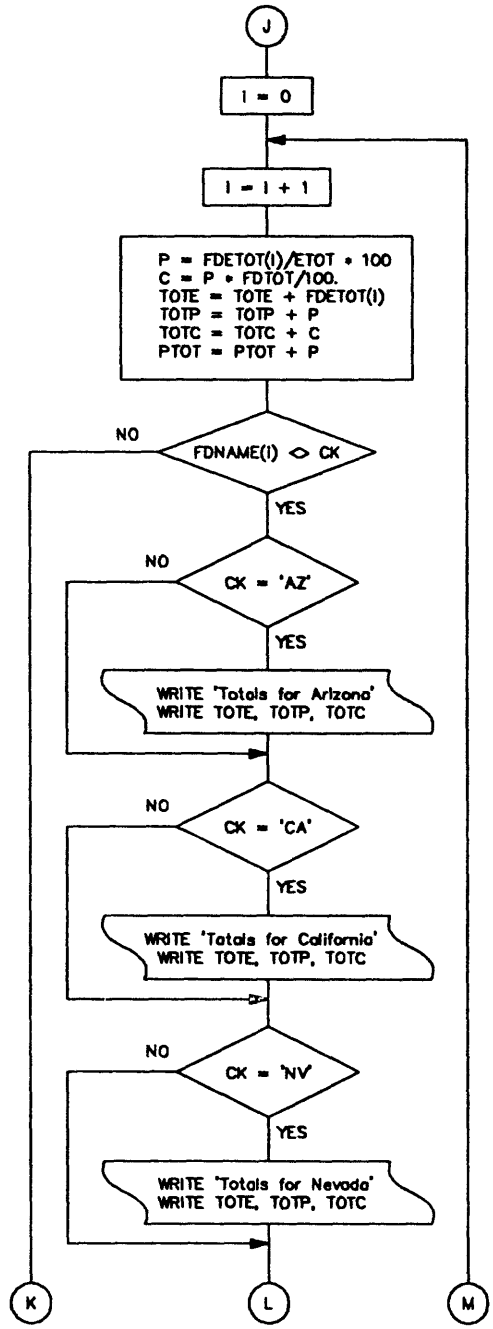

Lower Colorado River Accounting System

Subroutine HV2ML — Continued

Reset the State total counters for the evapotranspiration, percentage, and consumptive use

Set CK to the State code for the next set of diverters

Check to see if the new State is California

Print out the heading for the State of California

Check to see if the new State is Nevada

Print out the heading for the State of Nevada

Check to see if the new State is Federal Lands

Print out the heading for the State of Federal Lands

Check to see if the diverter name has been changed to 'ZZZZ'

Change the diverter name back from 'ZZZZ' to 'Phreatophytes'

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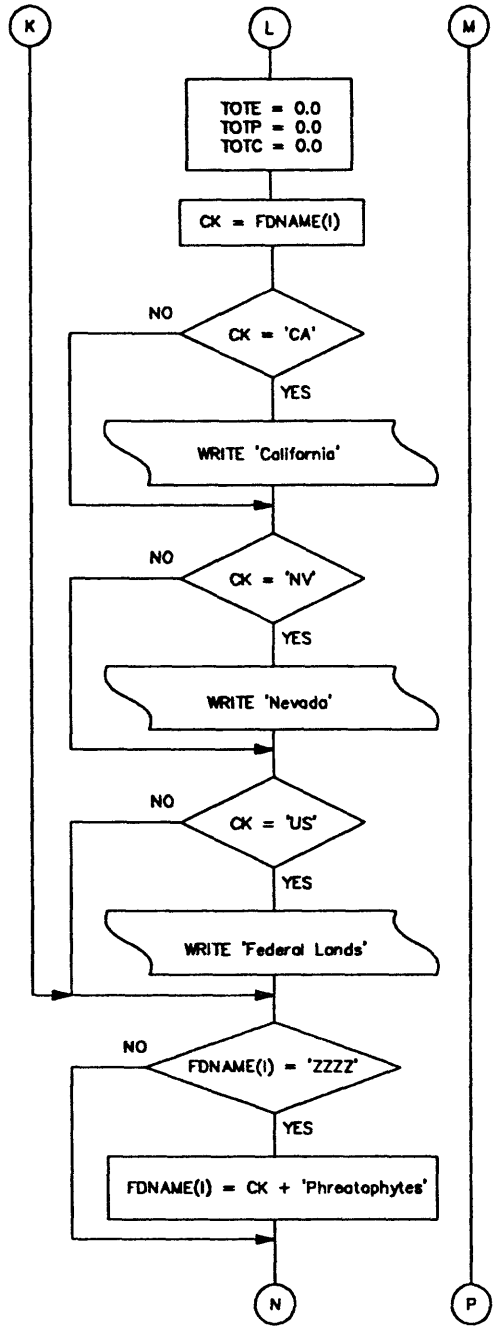


Lower Colorado River Accounting System

Subroutine HV2ML — Continued

Write the diverter name, total evapotranspiration, percentage, and estimated consumptive use

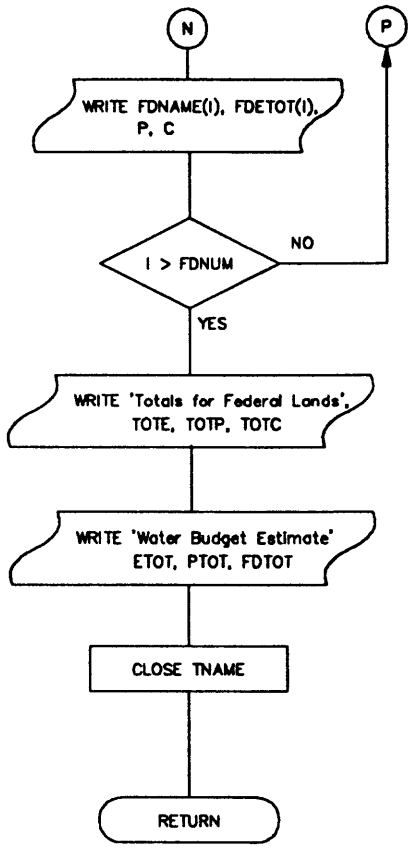
Repeat loop for all diverters

Write the total line for the Federal Lands

Write the total line for the reach from Hoover Dam to Morelos Dam

Close output file 69

Return to main program



Program Listing

```
      SUBROUTINE HV2ML
C
C     This subroutine calculates consumptive use by vegetation for
C     the Colorado River between Hoover Dam and NIB.
C
      CHARACTER*100 TITLE
      CHARACTER*40  FDNAME(250), T
      CHARACTER*22  TNAME
      CHARACTER*2   CK
      INTEGER*4     RCHNUM,       NUMSUB,    SUBNUM,    NUMMR,     FDNUM
     *              XLINES,    CORVEG(10)
      REAL*8        FLOWS(30),    DUS(20),   TRIBS(40), AREAS(20),
     *              EVAPS(20),    RCHTS(5),  NETACR,    PPTS,
     *              FDETOT(250), FDTOT,      FDACR(5),  BILOUT,
     *              ETOT,         TOTE,      TOTC,      TOTP,
     *              P,            C,         PTOT,      PRECIP(5)
C
      COMMON / INDATA / FLOWS,  TRIBS,  AREAS,  EVAPS,  DUS,  RCHTS
      COMMON / PPT1   / PPTS, PRECIP
      COMMON / COUNTS / NUMSUB, NUMMR,  SUBNUM, RCHNUM, CORVEG
      COMMON / SUMMRY / FDNAME, FDETOT, FDNUM
      COMMON / SUM2   / FDACR
      COMMON / RDAT4  / BILOUT
C
C     Calculate consumptive use by vegetation between Hoover Dam
C     and Morelos Dam.
C
      WRITE (*,49)
   49 FORMAT (//,2X,'Processing the entire river - HV2ML')
      FDTOT = FLOWS(1) + BILOUT + FLOWS(17)
      DO 51 I=1,4
        FDTOT = FDTOT + (AREAS(I)+FDACR(I))*PRECIP(I)
        FDTOT = FDTOT - (AREAS(I)*EVAPS(I))
        FDTOT = FDTOT - DUS(I)
   51 CONTINUE
      DO 52 I=1,31
        FDTOT = FDTOT + TRIBS(I)
   52 CONTINUE
      FDTOT = FDTOT-FLOWS(2)-FLOWS(4)-FLOWS(6)-FLOWS(7)-FLOWS(9)-
     *        TRIBS(10)-TRIBS(16)-FLOWS(13)-FLOWS(15)
      DO 53 I=18,24
        FDTOT = FDTOT - FLOWS(I)
   53 CONTINUE
C
C     Write the results to the output file.
C
      WRITE (58,60,ERR=250)
   60 FORMAT (/,2X,'HV2ML')
      PTOT = 0.
      DO 501 I=1,4
        PTOT = PTOT + AREAS(I)*EVAPS(I)
  501 CONTINUE
      WRITE (58,65,ERR=250) PTOT
C     WRITE (58,66,ERR=250) EVAPS(1)+EVAPS(2)+EVAPS(3)+EVAPS(4)
C     WRITE (58,67,ERR=250) AREAS(1)*EVAPS(1)
      WRITE (58,68,ERR=250) DUS(1)+DUS(2)+DUS(3)+DUS(4)
      PTOT = 0.
      DO 54 I=1,4
        PTOT = PTOT + (AREAS(I)+FDACR(I))*PRECIP(I)
```

```
   54 CONTINUE
      WRITE (58,69,ERR=250) PTOT
      WRITE (58,70,ERR=250) PRECIP(1)+PRECIP(2)+PRECIP(3)+PRECIP(4)
      WRITE (58,71,ERR=250) FDTOT
   65 FORMAT (4X,'SUM(AREAS*EVAPS)'10X,F9.2)
   66 FORMAT (4X,'EVAPS(1)'18X,F9.2)
   67 FORMAT (4X,'AREAS(1)*EVAPS(1)'9X,F9.2)
   68 FORMAT (4X,'DUS(SUM)'18X,F9.2)
   69 FORMAT (4X,'SUM(AREAS+NETACR)*PPTS'4X,F9.2)
   70 FORMAT (4X,'SUM PRECIPITATION'9X,F9.2)
   71 FORMAT (4X,'CONSUMPTIVE USE'8X,F12.2)
      WRITE  (*,72) FDTOT
   72 FORMAT (10X,'Consumptive use for the entire river is ',F12.2)
C
C     Remove any diverters flagged with a '*' in the third column.
C
      DO 666 I=1, FDNUM
        IF (FDNAME(I)(3:3) .EQ. '*') THEN
          FDNUM = FDNUM-1
          DO 667 J=I,FDNUM
            FDNAME(J) = FDNAME(J+1)
            FDETOT(J) = FDETOT(J+1)
  667     CONTINUE
        END IF
  666 CONTINUE
C
C     Remove any diverter that may appear twice.
C
      DO 101 I=1, FDNUM-1
        DO 102 J=I+1,FDNUM
          IF (FDNAME(I) .EQ. FDNAME(J)) THEN
            FDETOT(I) = FDETOT(I) + FDETOT(J)
            FDNUM = FDNUM -1
            DO 103 K=J,FDNUM
              FDNAME(K) = FDNAME(K+1)
              FDETOT(K) = FDETOT(K+1)
  103       CONTINUE
          END IF
  102   CONTINUE
  101 CONTINUE
C
C     Change the name of the phreatophyte-density types to place
C     them last when the diverters are sorted.
C
      ETOT = 0
      DO 111 I=1,FDNUM
        IF (FDNAME(I)(4:7) .EQ. 'PHRE') THEN
          FDNAME(I) = FDNAME(I)(:3) // 'ZZZZ'
        END IF
        ETOT = ETOT + FDETOT(I)
  111 CONTINUE
C
C     Sort the remaining diverters by State and name.
C
      DO 121 I=1,FDNUM
        DO 122 J=1,FDNUM-1
          IF (FDNAME(J) .GT. FDNAME(J+1)) THEN
            T = FDNAME(J+1)
            FDNAME(J+1) = FDNAME(J)
            FDNAME(J) = T
            TOTE = FDETOT(J+1)
            FDETOT(J+1) = FDETOT(J)
            FDETOT(J) = TOTE
```

```
          END IF
  122   CONTINUE
  121 CONTINUE
C
C     Open the output file and print the title.
C
      READ (62, '(I2,A22)', ERR=260) XLINES, TNAME
      OPEN (69, FILE=TNAME, ERR=260)
      DO 126 I=1, XLINES
        READ (62,'(A100)', ERR=260) TITLE
        WRITE (69,'(5X,A100)',ERR=260) TITLE
  126 CONTINUE
      WRITE (69,'(/)')
      WRITE (69,100,ERR=260)
  100 FORMAT ('Diverter',21x,'Evapotranspiration',7X,
     *        'Percentage',4x,'Consumptive use')
      WRITE (69,'(2X)')
C
C     Write the data to the output file.  Keep track of the State and
C     when it changes, write the subtotals for each State.
C
      CK = FDNAME(1)(:2)
      WRITE (69,301)
  301 FORMAT (2X,'ARIZONA')
      WRITE (69,'(2X)')
      TOTE = 0.
      TOTP = 0.
      TOTC = 0.
      PTOT = 0.
      DO 131 I=1, FDNUM
        P = FDETOT(I)/ETOT * 100.
        C = P*FDTOT /100.
        TOTE = TOTE + FDETOT(I)
        TOTP = TOTP + P
        PTOT = PTOT + P
        TOTC = TOTC + C
        IF (FDNAME(I)(:2) .NE. CK) THEN
          WRITE (69,'(2X)')
          IF (CK .EQ. 'AZ') WRITE (69,302) TOTE, TOTP, TOTC
          IF (CK .EQ. 'CA') WRITE (69,303) TOTE, TOTP, TOTC
          IF (CK .EQ. 'NV') WRITE (69,304) TOTE, TOTP, TOTC
  302     FORMAT (2X,'Totals for Arizona      ',3X,F16.0,F17.2,F16.0,//)
  303     FORMAT (2X,'Totals for California   ',3X,F16.0,F17.2,F16.0,//)
  304     FORMAT (2X,'Totals for Nevada       ',3X,F16.0,F17.2,F16.0,//)
          TOTE = 0.
          TOTP = 0.
          TOTC = 0.
          CK = FDNAME(I)(:2)
          IF (CK .EQ. 'CA' ) WRITE (69,306)
          IF (CK .EQ. 'NV' ) WRITE (69,307)
          IF (CK .EQ. 'US' ) WRITE (69,308)
  306     FORMAT (2X,'California',///)
  307     FORMAT (2X,'Nevada',///)
  308     FORMAT (2X,'Federal Lands',///)
        END IF
        IF (FDNAME(I)(4:7) .EQ. 'ZZZZ') THEN
          FDNAME(I) = CK // ' PHREATOPHYTES'
        END IF
        WRITE (69,309) FDNAME(I), FDETOT(I), P, C
  309   FORMAT (4X,A20,9X,F12.0,9X,F8.2,4X,F12.0)
  131 CONTINUE
      WRITE (69,305) TOTE, TOTP, TOTC
  305 FORMAT (2X,'Totals for Federal Lands',3X,F16.0,F17.2,F16.0,//)
```

```
      WRITE (69,133) ETOT,PTOT,FDTOT
  133 FORMAT (2X,'Water-Budget Estimate',10X,F12.0,11X,F6.2,4X,F12.0)
      CLOSE (69)
      RETURN
C
C     Error messages
C
  250 WRITE (*,251)
  251 FORMAT (//,20X,'ERROR - WRITING TO FILE 58')
      STOP
  260 WRITE (*,261)
  261 FORMAT (//,20X,'ERROR - READING TITLE')
      STOP
      END
```

SUBROUTINE HV2DV

Narrative

Subroutine HV2DV calculates consumptive use by vegetation along the Colorado River between Hoover Dam and Davis Dam by using equation 8. This subroutine appends open-water surface area, evaporation rate, evaporated water, domestic use, total precipitation that falls on the vegetated area, yearly precipitation, and the total consumptive use for the reach to the summary table (attachment Q).

Variable List

Name	Common	Description
AREAS(1)	[INDATA]	Open-water surface area within the reach.
DUS(1)	[INDATA]	Domestic water use along the reach.
EVAPS(1)	[INDATA]	Evaporation rate for the reach.
FLOWS(1)	[INDATA]	Measured discharge below Hoover Dam.
FLOWS(2)	[INDATA]	Change in storage in Lake Mohave.
FLOWS(3)	[INDATA]	Measured discharge below Davis Dam.
NETACR		Net acreage of crops along the reach.
PPTS	[PPT1]	Precipitation for each area in the reach.
RCHTS(1)	[INDATA]	Consumptive use by vegetation along the reach.
TRIBS(1)	[INDATA]	Ground-water discharge from springs downstream from Hoover Dam.

Name	Common	Description
TRIBS(2)	[INDATA]	Unmeasured average annual runoff along the reach.
TRIBS(3)	[INDATA]	Ground-water discharge from the Colorado River valley.
TRIBS(4)	[INDATA]	Ground-water discharge from Eldorado Valley.

Flow Chart

Lower Colorado River Accounting System

Subroutine HV2DV

Begin subroutine HV2DV

Set the net acreage equal to zero

Set NUMSUB equal to zero for use as a counter

Increment NUMSUB

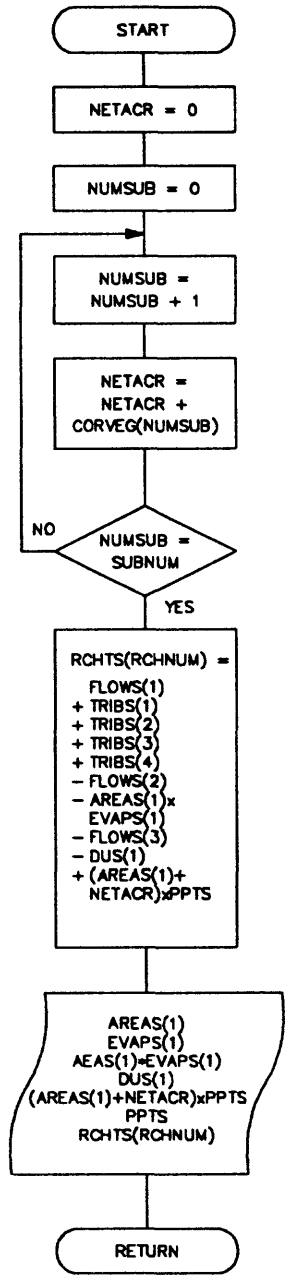
Calculate the net acreage by adding the corrected vegetation areas for each subreach

Determine if the number of subreaches equals the subreach number

Calculate consumptive use by vegetation for the reach from Hoover Dam to Davis Dam by using the water budget. The exact meanings for the variables are listed in the data file in the attachments

Write the area, evaporation rate, evaporated water, domestic use, precipitation, and the yearly precipitation for the reach. This data is written to the general output file

Return to the main program



Program Listing

```
      SUBROUTINE HV2DV(*)
C
C     This subroutine calculates consumptive use by vegetation for the
C     Colorado River between Hoover Dam and Davis Dam.
C
      INTEGER*4      RCHNUM,     NUMSUB,   SUBNUM,    NUMMR,
     *               CORVEG(10)
      REAL*8         FLOWS(30),  DUS(20),  TRIBS(40), AREAS(20),
     *               EVAPS(20),  RCHTS(5), NETACR,    PPTS,
     *               FDACR(5),   PRECIP(5)
C
      COMMON / INDATA / FLOWS,  TRIBS, AREAS,  EVAPS,  DUS,   RCHTS
      COMMON / PPT1   / PPTS,   PRECIP
      COMMON / COUNTS / NUMSUB, NUMMR, SUBNUM, RCHNUM, CORVEG
      COMMON / SUM2   / FDACR
C
C     Sum the acreage without double-cropped areas.
C
      NETACR = 0
C
      DO 50 NUMSUB = 1,SUBNUM
        NETACR = NETACR + CORVEG(NUMSUB)
   50 CONTINUE
      FDACR(RCHNUM) = NETACR
C
C     Calculate consumptive use by vegetation for the Hoover Dam
C     to Davis Dam reach.
C
      RCHTS(RCHNUM) = FLOWS(1)+TRIBS(1)+TRIBS(2)+TRIBS(3)+TRIBS(4)-
     *                FLOWS(2)-(AREAS(1)*EVAPS(1))-FLOWS(3)-DUS(1)+
     *                (AREAS(1)+NETACR)*PPTS
C
C     Write the open-water surface area, evaporation rate, area times
C     evaporation rate, domestic use, precipitation, precipitation rate,
C     and consumptive use by vegetation for the Hoover Dam to Davis Dam
C     reach to the output file.
C
      WRITE (58,60,ERR=250)
   60 FORMAT (2X,'HOOVER TO DAVIS REACH')
      WRITE (58,65,ERR=250) AREAS(1)
      WRITE (58,66,ERR=250) EVAPS(1)
      WRITE (58,67,ERR=250) AREAS(1)*EVAPS(1)
      WRITE (58,68,ERR=250) DUS(1)
      WRITE (58,69,ERR=250) (AREAS(1)+NETACR)*PPTS
      WRITE (58,70,ERR=250) PPTS
      WRITE (58,71,ERR=250) RCHTS(RCHNUM)
   65 FORMAT (4X,'AREAS(1)'18X,F9.2)
   66 FORMAT (4X,'EVAPS(1)'18X,F9.2)
   67 FORMAT (4X,'AREAS(1)*EVAPS(1)'9X,F9.2)
   68 FORMAT (4X,'DUS(1)'20X,F9.2)
   69 FORMAT (4X,'(AREAS(1)+NETACR)*PPTS'4X,F9.2)
   70 FORMAT (4X,'PRECIPITATION'13X,F9.2)
   71 FORMAT (4X,'CONSUMPTIVE USE'8X,F12.2)
      WRITE  (*,72) RCHTS(RCHNUM)
   72 FORMAT (10X,'Consumptive use for Hoover to Davis is ',F12.2)
      RETURN 1
```

```
C
C     Error messages
C
  250 WRITE (*,251)
  251 FORMAT (//,20X,'ERROR - WRITING TO FILE 58')
      STOP
      END
```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FOLLOWS

SUBROUTINE DV2PK

Narrative

Subroutine DV2PK calculates consumptive use by vegetation along the Colorado River between Davis Dam and Parker Dam by using equation 8. This subroutine appends open-water surface area, evaporation rate, evaporated water, domestic use, total precipitation that falls on the vegetated area, yearly precipitation, and the total consumptive use for the reach to the summary table (attachment Q).

Variable List

Name	Common	Description
AREAS(2)	[INDATA]	Open-water surface area within the reach.
BILOUT	[RDATA4]	Inflow from the Bill Williams River, calculated in the BWR subroutine.
DUS(2)	[INDATA]	Domestic water use along the reach.
EVAPS(2)	[INDATA]	Evaporation rate for the reach.
FLOWS(3)	[INDATA]	Measured discharge below Davis Dam.
FLOWS(4)	[INDATA]	Outflow in the Colorado River Aqueduct.
FLOWS(6)	[INDATA]	Outflow in the Central Arizona Project Canal.
FLOWS(7)	[INDATA]	Change in storage in Lake Havasu.
FLOWS(8)	[INDATA]	Measured discharge below Parker Dam.
NETACR		Net acreage of crops along the reach.
PPTS	[PPT1]	Precipitation for each area in the reach.

Name	Common	Description
RCHTS(2)	[INDATA]	Consumptive use by vegetation along the reach.
TRIBS(5)	[INDATA]	Unmeasured average annual runoff from Davis Dam to Topock.
TRIBS(6)	[INDATA]	Unmeasured average annual runoff from Topock to Parker Dam.
TRIBS(7)	[INDATA]	Unmeasured average annual runoff from the Whipple Mountains.
TRIBS(8)	[INDATA]	Unmeasured tributary inflow from Piute Wash.
TRIBS(9)	[INDATA]	Unmeasured tributary inflow from Sacramento Wash.
TRIBS(11)	[INDATA]	Ground-water discharge from Davis Dam to Topock.
TRIBS(12)	[INDATA]	Ground-water discharge from Topock to Parker Dam.
TRIBS(13)	[INDATA]	Ground-water discharge from Piute Valley.
TRIBS(14)	[INDATA]	Ground-water discharge from Sacramento Valley.
TRIBS(15)	[INDATA]	Ground-water discharge from Chemehuevi Valley.

Flow chart

Lower Colorado River Accounting System

Subroutine DV2PK

Begin subroutine DV2PK

Set the net acreage equal to zero

Set NUMSUB equal to zero for use as a counter

Increment NUMSUB

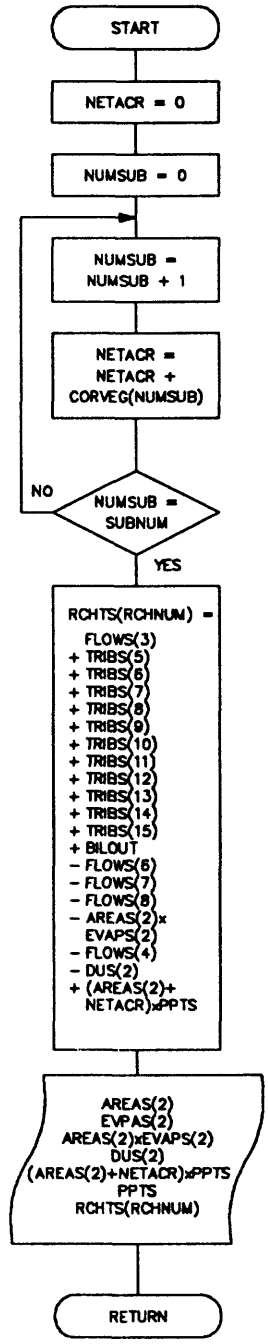
Calculate the net acreage by adding the corrected vegetation areas for each subreach

Determine if the number of subreaches equals the subreach number

Calculate consumptive use by vegetation for the reach from Davis Dam to Parker Dam by using the water budget. The exact meanings for the variables are listed in the data file in the attachments

Write the area, evaporation rate, evaporated water, domestic use, precipitation, and the yearly precipitation for the reach. This data is written to the general output file

Return to the main program



Program Listing

```
      SUBROUTINE DV2PK(*)
C
C     This subroutine calculates consumptive use by vegetation
C     for the Colorado River between Davis Dam and Parker Dam.
C
      INTEGER*4      RCHNUM,       NUMSUB,      SUBNUM,      NUMMR,
     *               CORVEG(10)
      REAL*8         FLOWS(30),    DUS(20),     TRIBS(40),   AREAS(20),
     *               EVAPS(20),    RCHTS(5),    PPTS,        BILOUT,
     *               NETACR,       FDACR(5),    PRECIP(5)
C
      COMMON / INDATA / FLOWS,  TRIBS,  AREAS,  EVAPS,  DUS,   RCHTS
      COMMON / COUNTS / NUMSUB, NUMMR,  SUBNUM, RCHNUM, CORVEG
      COMMON / PPT1   / PPTS,   PRECIP
      COMMON / RDAT4  / BILOUT
      COMMON / SUM2   / FDACR
C
C     Sum the acreage without double-cropped areas.
C
      NETACR = 0
C
      DO 50 NUMSUB = 1,SUBNUM
        NETACR = NETACR + CORVEG(NUMSUB)
   50 CONTINUE
      FDACR(RCHNUM) = NETACR
C
C     Calculate consumptive use by vegetation for the Davis Dam
C     to Parker Dam reach.
C
      RCHTS(RCHNUM) = FLOWS(3)+TRIBS(5)+TRIBS(6)+TRIBS(7)+TRIBS(8)+
     *                TRIBS(9)+TRIBS(11)+TRIBS(12)+TRIBS(13)+TRIBS(14)+
     *                TRIBS(15)-FLOWS(4)-FLOWS(6)-FLOWS(7)-FLOWS(8)-
     *                (AREAS(2)*EVAPS(2))-DUS(2)+BILOUT+
     *                (AREAS(2)+NETACR)*PPTS
C
C     Write the open-water surface area, evaporation rate, area times
C     evaporation rate, domestic use, precipitation, precipitation rate,
C     and consumptive use by vegetation for the Davis Dam to Parker Dam
C     reach to the output file.
C
      WRITE (58,60,ERR=250)
   60 FORMAT (2X,'DAVIS TO PARKER REACH')
      WRITE (58,65,ERR=250) AREAS(2)
      WRITE (58,66,ERR=250) EVAPS(2)
      WRITE (58,67,ERR=250) AREAS(2)*EVAPS(2)
      WRITE (58,68,ERR=250) DUS(2)
      WRITE (58,69,ERR=250) (AREAS(2)+NETACR)*PPTS
      WRITE (58,70,ERR=250) PPTS
      WRITE (58,71,ERR=250) RCHTS(RCHNUM)
   65 FORMAT (4X,'AREAS(2)'18X,F9.2)
   66 FORMAT (4X,'EVAPS(2)'18X,F9.2)
   67 FORMAT (4X,'AREAS(2)*EVAPS(2)'9X,F9.2)
   68 FORMAT (4X,'DUS(2)'20X,F9.2)
   69 FORMAT (4X,'(AREAS(2)+NETACR)*PPTS'4X,F9.2)
   70 FORMAT (4X,'PRECIPITATION'13X,F9.2)
   71 FORMAT (4X,'CONSUMPTIVE USE'8X,F12.2)
      WRITE  (*,72) RCHTS(RCHNUM)
```

```
   72 FORMAT (10X,'Consumptive use for Davis to Parker is ',F12.2)
C
      RETURN 1
  250 WRITE (*,251)
  251 FORMAT (//,20X,'ERROR - WRITING TO FILE 58')
      STOP
C
  233 WRITE (*,239) 'SUBNUM'
  239 FORMAT (//,20X,'ERROR - Reading FILE.DAT - ',A10)
      STOP
  240 WRITE (*,249) 'INFILE',J
      STOP
  241 WRITE (*,249) 'LOCLAT',J
      STOP
  242 WRITE (*,249) 'TFILE',J
      STOP
  243 WRITE (*,249) 'PFILE',J
      STOP
  249 FORMAT (//,20X,'ERROR-Reading ',A22,' # ',I2)
C
      END
```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SUBROUTINE PK2IP

Narrative

Subroutine PK2IP calculates consumptive use by vegetation along the Colorado River between Parker Dam and Imperial Dam by using equation 8. This subroutine appends open-water surface area, evaporation rate, evaporated water, domestic use, total precipitation that falls on the vegetated area, yearly precipitation, and the total consumptive use for the reach to the summary table (attachment Q).

Variable List

Name	Common	Description
AREAS(3)	[INDATA]	Open-water surface area within the reach.
DUS(3)	[INDATA]	Domestic water use along the reach.
EVAPS(3)	[INDATA]	Evaporation rate for the reach.
FLOWS(8)	[INDATA]	Measured discharge below Parker Dam.
FLOWS(9)	[INDATA]	Change in storage in Senator Wash Reservoir.
FLOWS(10)	[INDATA]	Measured flow above Imperial Dam.
NETACR		Net acreage of crops along the reach.
PPTS	[PPT1]	Precipitation for each area in the reach.
RCHTS(3)	[INDATA]	Consumptive use by vegetation along the reach.
TRIBS(17)	[INDATA]	Unmeasured average annual runoff from the Whipple Mountains.
TRIBS(18)	[INDATA]	Unmeasured average annual runoff from the Big Maria Mountains.

Name	Common	Description
TRIBS(19)	[INDATA]	Unmeasured average annual runoff from the Palo Verde-Mule Mountains.
TRIBS(20)	[INDATA]	Unmeasured average annual runoff from Dome Rock-Trigo-Chocolate Mountains.
TRIBS(21)	[INDATA]	Unmeasured tributary inflow from Vidal Wash.
TRIBS(22)	[INDATA]	Unmeasured tributary inflow from Bouse Wash.
TRIBS(23)	[INDATA]	Unmeasured tributary inflow from Tyson Wash.
TRIBS(24)	[INDATA]	Unmeasured tributary inflow from McCoy Wash.
TRIBS(25)	[INDATA]	Unmeasured tributary inflow from Milpitas Wash.
TRIBS(26)	[INDATA]	Ground-water discharge from Vidal Wash.
TRIBS(27)	[INDATA]	Ground-water discharge from Bouse Wash.
TRIBS(28)	[INDATA]	Ground-water discharge from Tyson Wash.
TRIBS(29)	[INDATA]	Ground-water discharge from the Chuckwalla Valley.

Flow Chart

Lower Colorado River Accounting System

Subroutine PK2IP

Begin subroutine PK2IP

Set the net acreage equal to zero

Set NUMSUB equal to zero for use as a counter

Increment NUMSUB

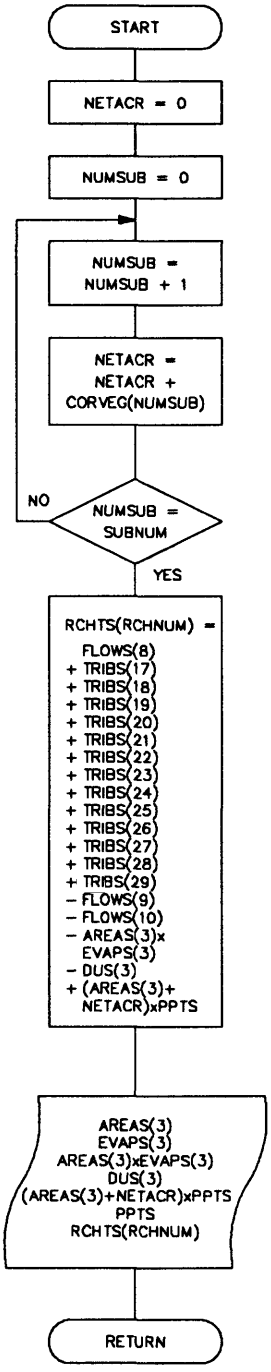
Calculate the net acreage by adding the corrected vegetation areas for each subreach

Determine if the number of subreaches equals the subreach number

Calculate consumptive use by vegetation for the reach from Parker Dam to Imperial Dam by using the water budget. The exact meanings for the variables are listed in the data file in the attachments

Write the area, evaporation rate, evaporated water, domestic use, precipitation, and the yearly precipitation for the reach. This data is written to the general output file

Return to the main program



Program Listing

```
      SUBROUTINE PK2IP(*)
C
C     This subroutine calculates consumptive use for the
C     Colorado River between Parker Dam and Imperial Dam.
C
      INTEGER*4      RCHNUM,     NUMSUB,    SUBNUM,     NUMMR,
     *               CORVEG(10)
      REAL*8         FLOWS(30),  DUS(20),   TRIBS(40),  AREAS(20),
     *               EVAPS(20),  RCHTS(5),  NETACR,     PPTS,
     *               FDACR(5),   PRECIP(5)
C
      COMMON / INDATA / FLOWS,  TRIBS, AREAS,  EVAPS,  DUS,   RCHTS
      COMMON / PPT1   / PPTS,   PRECIP
      COMMON / COUNTS / NUMSUB, NUMMR, SUBNUM, RCHNUM, CORVEG
      COMMON / SUM2   / FDACR
C
C     Sum the acreage without double-cropped areas.
C
      NETACR = 0
C
      DO 50 NUMSUB = 1,SUBNUM
        NETACR = NETACR + CORVEG(NUMSUB)
   50 CONTINUE
      FDACR(RCHNUM) = NETACR
C
C     Calculate consumptive use by vegetation for the Parker Dam
C     to Imperial Dam reach.
C
      RCHTS(RCHNUM) = FLOWS(8)+TRIBS(17)+TRIBS(18)+TRIBS(21)+TRIBS(22)+
     *           TRIBS(23)+TRIBS(26)+TRIBS(27)+TRIBS(28)+TRIBS(19)+
     *           TRIBS(20)+TRIBS(24)+TRIBS(25)+TRIBS(29)-(AREAS(3)*
     *           EVAPS(3))-FLOWS(9)-FLOWS(10)-
     *           DUS(3)+(AREAS(3)+NETACR)*PPTS
C
C     Write the open-water surface area, evaporation rate, area times
C     evaporation rate, domestic use, precipitation, precipitation rate,
C     and consumptive use for the Parker Dam to Imperial Dam reach to the
C     output file.
C
      WRITE (58,60,ERR=250)
   60 FORMAT (2X,'PARKER TO IMPERIAL REACH')
      WRITE (58,65,ERR=250) AREAS(3)
      WRITE (58,66,ERR=250) EVAPS(3)
      WRITE (58,67,ERR=250) AREAS(3)*EVAPS(3)
      WRITE (58,68,ERR=250) DUS(3)
      WRITE (58,69,ERR=250) (AREAS(3)+NETACR)*PPTS
      WRITE (58,70,ERR=250) PPTS
      WRITE (58,71,ERR=250) RCHTS(RCHNUM)
   65 FORMAT (4X,'AREAS(3)'18X,F9.2)
   66 FORMAT (4X,'EVAPS(3)'18X,F9.2)
   67 FORMAT (4X,'AREAS(3)*EVAPS(3)',9X,F9.2)
   68 FORMAT (4X,'DUS(3)'20X,F9.2)
   69 FORMAT (4X,'(AREAS(3)+NETACR)*PPTS'4X,F9.2)
   70 FORMAT (4X,'PRECIPITATION'13X,F9.2)
   71 FORMAT (4X,'CONSUMPTIVE USE'8X,F12.2)
      WRITE  (*,72) RCHTS(RCHNUM)
   72 FORMAT (10X,'Consumptive use for Parker to Imperial is ',F12.2)
      RETURN 1
```

```
C
C     Error messages.
C
  250 WRITE (*,251)
  251 FORMAT (//,20X,'ERROR - WRITING TO FILE 58')
      STOP
      END
```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SUBROUTINE IP2ML

Narrative

Subroutine IP2ML calculates consumptive use by vegetation along the Colorado River between Imperial Dam and Morelos Dam by using equation 8. This subroutine appends open-water surface area, evaporation rate, evaporated water, domestic use, total precipitation that falls on the vegetated area, yearly precipitation, and the total consumptive use for the reach to the summary table (attachment Q).

Variable List

Name	Common	Description
AREAS(4)	[INDATA]	Open-water surface area within the reach.
DUS(4)	[INDATA]	Domestic water use along the reach.
EVAPS(4)	[INDATA]	Evaporation rate for the reach.
FLOWS(10)	[INDATA]	Measured flow above Imperial Dam.
FLOWS(13)	[INDATA]	Outflow in the All American Canal below Pilot Knob.
FLOWS(15)	[INDATA]	Outflow in the Wellton-Mohawk Canal.
FLOWS(17)	[INDATA]	Inflow from the Gila River near Dome.
FLOWS(18)	[INDATA]	Measured outflow at the Northerly International Boundary.
FLOWS(19)	[INDATA]	Surface-water return flow from Eleven Mile wasteway.
FLOWS(20)	[INDATA]	Surface-water return flow from Cooper wasteway.

Name	Common	Description
FLOWS(21)	[INDATA]	Surface-water return flow from Twenty-One Mile wasteway.
FLOWS(22)	[INDATA]	Surface-water return flow from Main Drain.
FLOWS(23)	[INDATA]	Surface-water return flow from West Main Canal wasteway.
FLOWS(22)	[INDATA]	Surface-water return flow from East Main Canal wasteway.
NETACR		Net acreage of crops along the reach.
PPTS	[PPT1]	Precipitation for each area in the reach.
RCHTS(4)	[INDATA]	Consumptive use by vegetation along the reach.
TRIBS(30)	[INDATA]	Unmeasured average annual runoff along the reach.
TRIBS(31)	[INDATA]	Ground-water discharge near Dome.

Flow chart

Lower Colorado River Accounting System

Subroutine IP2ML

Begin subroutine IP2ML

Set the net acreage equal to zero

Set NUMSUB equal to zero for use as a counter

Increment NUMSUB

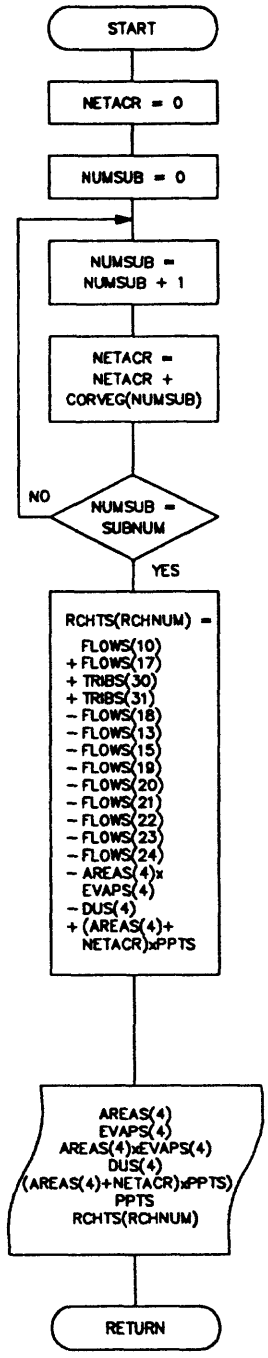
Calculate the net acreage by adding the corrected vegetation areas for each subreach

Determine if the number of subreaches equals the subreach number

Calculate consumptive use by vegetation for the reach from Imperial Dam to Morelos Dam by using the water budget. The exact meanings for the variables are listed in the data file in the attachments

Write the area, evaporation rate, evaporated water, domestic use, precipitation, and the yearly precipitation for the reach. This data is written to the general output file

Return to the main program



Program Listing

```
      SUBROUTINE IP2ML(*)
C
C     This subroutine calculates the consumptive use by vegetation
C     for the Colorado River between Imperial Dam and Morelos Dam.
C
      INTEGER*4     RCHNUM,     NUMSUB,  SUBNUM,    NUMMR,      CORVEG(10)
      REAL*8        FLOWS(30),  DUS(20), TRIBS(40), AREAS(20),  EVAPS(20),
     *              RCHTS(5),   PPTS,    NETACR,    FDACR(5),   PRECIP(5)
C
      COMMON / INDATA / FLOWS,  TRIBS, AREAS,  EVAPS,  DUS,   RCHTS
      COMMON / COUNTS / NUMSUB, NUMMR, SUBNUM, RCHNUM, CORVEG
      COMMON / PPT1   / PPTS,   PRECIP
      COMMON / SUM2   / FDACR
C
C     Sum the acreage without double-cropped areas.
C
      NETACR = 0
C
      DO 50 NUMSUB = 1,SUBNUM
        NETACR = NETACR + CORVEG(NUMSUB)
   50 CONTINUE
      FDACR(RCHNUM) = NETACR
C
C     Calculate consumptive use by vegetation for the Imperial Dam
C     to Morelos Dam reach.
C
      RCHTS(RCHNUM) = FLOWS(10)+FLOWS(17)+TRIBS(31)+TRIBS(30)-
     *                FLOWS(13)-(AREAS(4)*EVAPS(4))-FLOWS(18)-DUS(4)-
     *                FLOWS(19)-FLOWS(20)-FLOWS(21)-FLOWS(22)-
     *                FLOWS(23)-FLOWS(24)-FLOWS(15)+
     *                (AREAS(4)+NETACR)*PPTS
C
C     Write the open-water surface area, evaporation rate, area times
C     evaporation rate, domestic use, precipitation, precipitation rate,
C     and consumptive use by vegetation for the Imperial Dam to Morelos
C     Dam reach to the output file.
C
C
      WRITE (58,60,ERR=250)
   60 FORMAT (2X,'IMPERIAL TO MORELOS REACH')
      WRITE (58,65,ERR=250) AREAS(4)
      WRITE (58,66,ERR=250) EVAPS(4)
      WRITE (58,67,ERR=250) AREAS(4)*EVAPS(4)
      WRITE (58,68,ERR=250) DUS(4)
      WRITE (58,69,ERR=250) (AREAS(4)+NETACR)*PPTS
      WRITE (58,70,ERR=250) PPTS
      WRITE (58,71,ERR=250) RCHTS(RCHNUM)
   65 FORMAT (4X,'AREAS(4)'18X,F9.2)
   66 FORMAT (4X,'EVAPS(4)'18X,F9.2)
   67 FORMAT (4X,'AREAS(4)*EVAPS(4)',9X,F9.2)
   68 FORMAT (4X,'DUS(4)'20X,F9.2)
   69 FORMAT (4X,'(AREAS(4)+NETACR)*PPTS'4X,F9.2)
   70 FORMAT (4X,'PRECIPITATION'13X,F9.2)
   71 FORMAT (4X,'CONSUMPTIVE USE'8X,F12.2)
      WRITE  (*,72) RCHTS(RCHNUM)
   72 FORMAT (10X,'Consumptive use for Imperial to Morelos is ',F12.2)
      RETURN 1
```

```
C
C     Error messages.
C
  250 WRITE (*,251)
  251 FORMAT (//,20X,'ERROR - WRITING TO FILE 58')
      STOP
      END
```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FOLLOWS

SUBROUTINE SORT

Narrative

Subroutine SORT is used to alphabetize the diverter data by State and diverter name. This is done using a temporary array and bubble sort algorithm for speed and simplicity. Once the sort is completed, this subroutine checks for diverters appearing more than once in the data. In this case, the values for the diverter are summed and stored with the diverter and all other references to the diverter are removed.

Variable List

Name	Common	Description
DIVNAM(100)	[VEGDAT]	Array that contains the names of all the diverters in a reach.
DTOTAL(50)	[PHRDAT]	Array that contains the estimates of evapotranspiration for dense phreatophytes for each diverter along the reach.
ETOTAL(50)	[BLCR1]	Array that contains the estimates of evapotranspiration for crops for each diverter along the reach.
F		Flag used to indicate that a swap occurred in the bubble sort routine.
MTOTAL(50)	[PHRDAT]	Array that contains the estimates of evapotranspiration for medium phreatophytes for each diverter along the reach.
NUMDIV(10)	[VEGDAT]	Array that contains the number of diverters for each subreach that make up the main reach.
S(100)		Temporary array that is used for the external bubble sort in the linear sort routine.

Name	Common	Description
STOTAL(50)	[PHRDAT]	Array that contains the estimates of evapotranspiration for sparse phreatophytes for each diverter along the reach.
TN		Temporary character variable used in the swap routine.
TOT	[VEGDAT]	Total number of diverters along the reach.
TOTALS(100,25)	[BOTH4]	Total evapotranspiration for each crop per diverter along the reach.
TT		Temporary real variable used in the swap routine.

Flow chart

Lower Colorado River Accounting System

Subroutine SORT

Begin subroutine SORT

Set I = 0 for counter

Increment I by one

Set work array to counter

Repeat for all diverters

Set K = 0 for counter

Increment K by one

Set F = 0 for flag

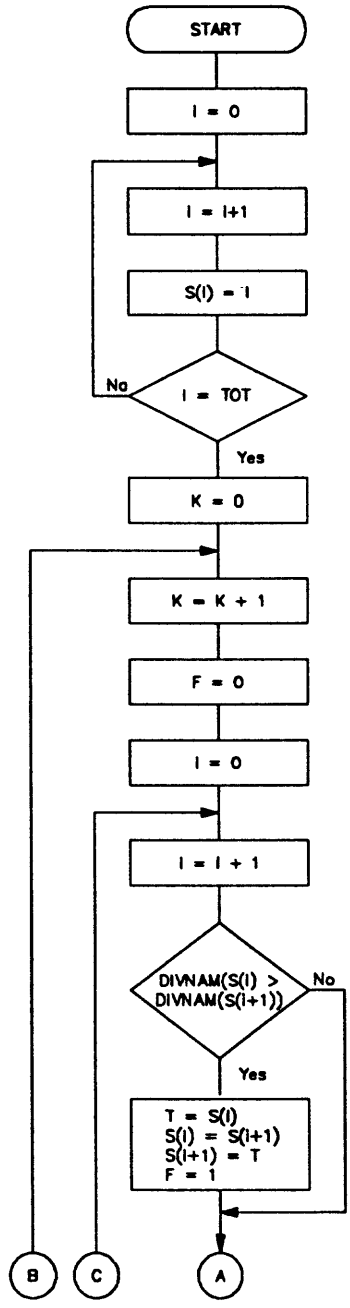
Set I = 0 for counter

Increment I by one

Check if the diverter name in position S(I) is alphanumerically greater than the next diverter name located in position S(I+1)

Swap the values in the work array to put them in order. T is a temporary variable. Turn flag on by setting F = 1

Continued on next page



Lower Colorado River Accounting System

Subroutine SORT — Continued

Repeat for all unsorted diverters

If flag is set, quit 'K' loop

Repeat for all diverters except the last one

Set K = 0 for counter

Increment K by one

Set I = 0 for counter

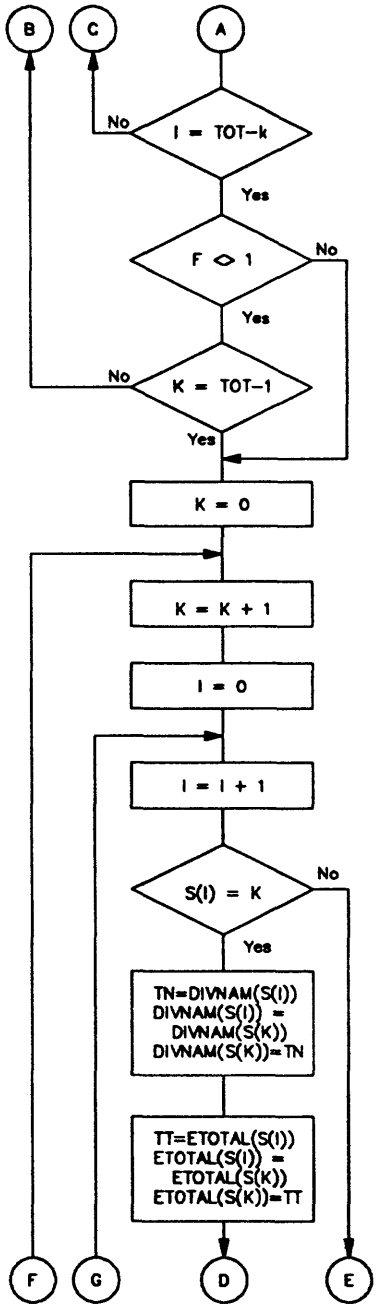
Increment I by one

Check If S(I) = K

Swap the actual diverter names in the DIVNAM array. The TN is a temporary character variable

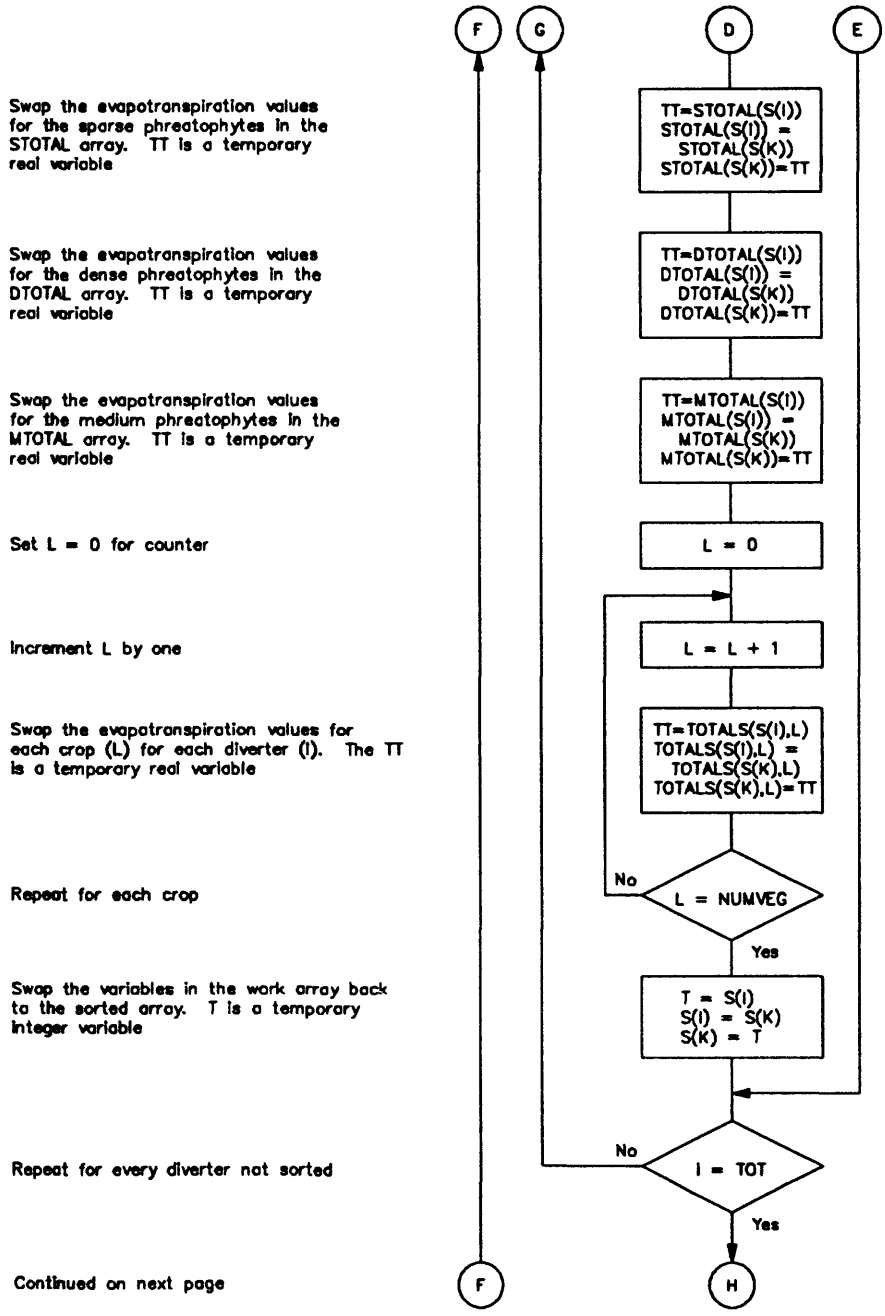
Swap the evapotranspiration values calculated from the image-processing data in the ETOTAL array. The TT is a temporary real variable

Continued on next page



Lower Colorado River Accounting System

Subroutine SORT — Continued



Swap the evapotranspiration values for the sparse phreatophytes in the STOTAL array. TT is a temporary real variable

Swap the evapotranspiration values for the dense phreatophytes in the DTOTAL array. TT is a temporary real variable

Swap the evapotranspiration values for the medium phreatophytes in the MTOTAL array. TT is a temporary real variable

Set L = 0 for counter

Increment L by one

Swap the evapotranspiration values for each crop (L) for each diverter (I). The TT is a temporary real variable

Repeat for each crop

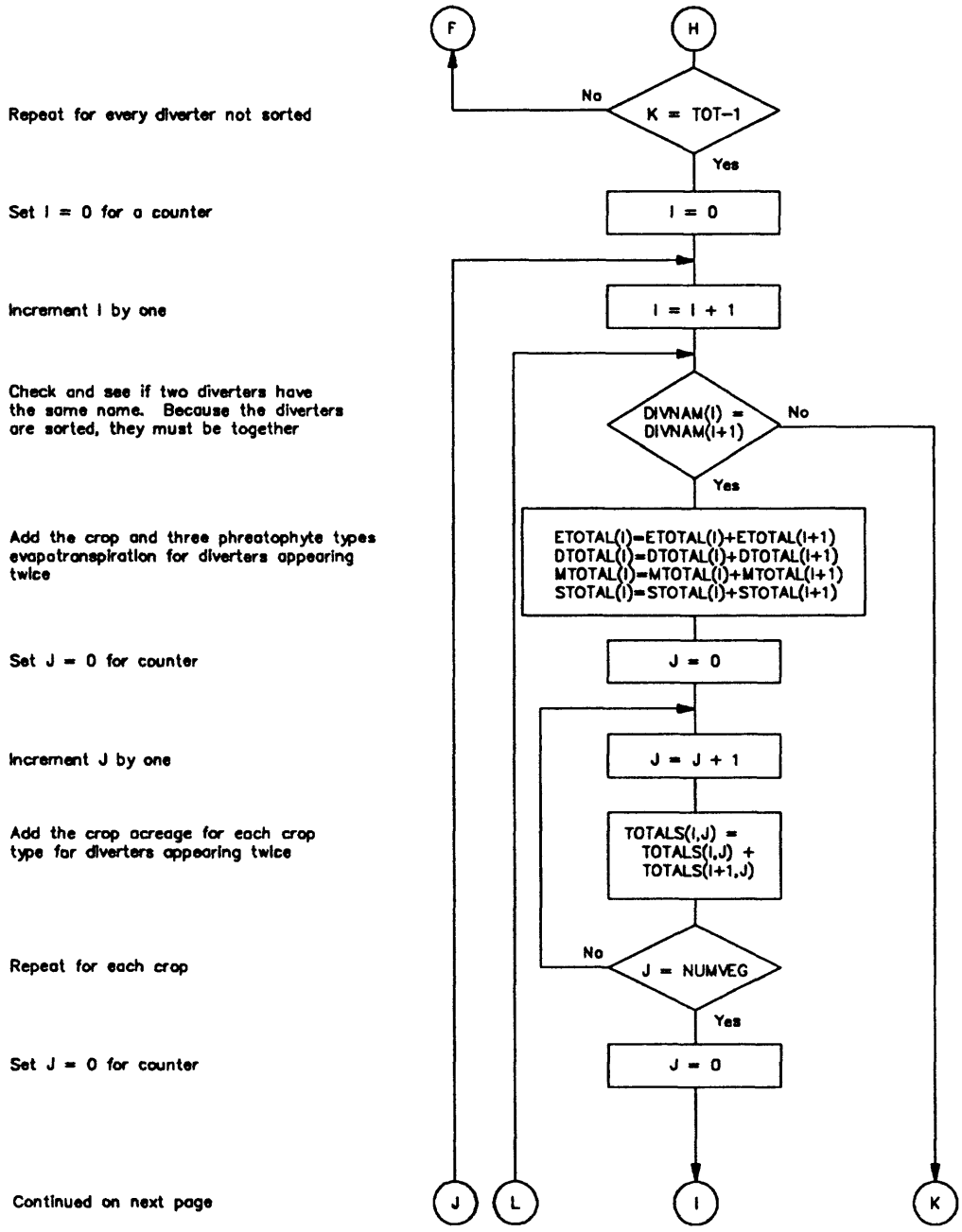
Swap the variables in the work array back to the sorted array. T is a temporary integer variable

Repeat for every diverter not sorted

Continued on next page

Lower Colorado River Accounting System

Subroutine SORT — Continued



Repeat for every diverter not sorted

Set I = 0 for a counter

Increment I by one

Check and see if two diverters have the same name. Because the diverters are sorted, they must be together

Add the crop and three phreatophyte types evapotranspiration for diverters appearing twice

Set J = 0 for counter

Increment J by one

Add the crop acreage for each crop type for diverters appearing twice

Repeat for each crop

Set J = 0 for counter

Continued on next page

Lower Colorado River Accounting System

Subroutine SORT — Continued

Increment J by one

Move each diverter name and variables associated with it one level down in the array, filling the blank left by the double-diverter entry

Set K = 0 for counter

Increment K by one

Move the crop acreage values down one slot in the array to account for the diverters that are listed twice

Repeat for each crop

Repeat for all diverters less one

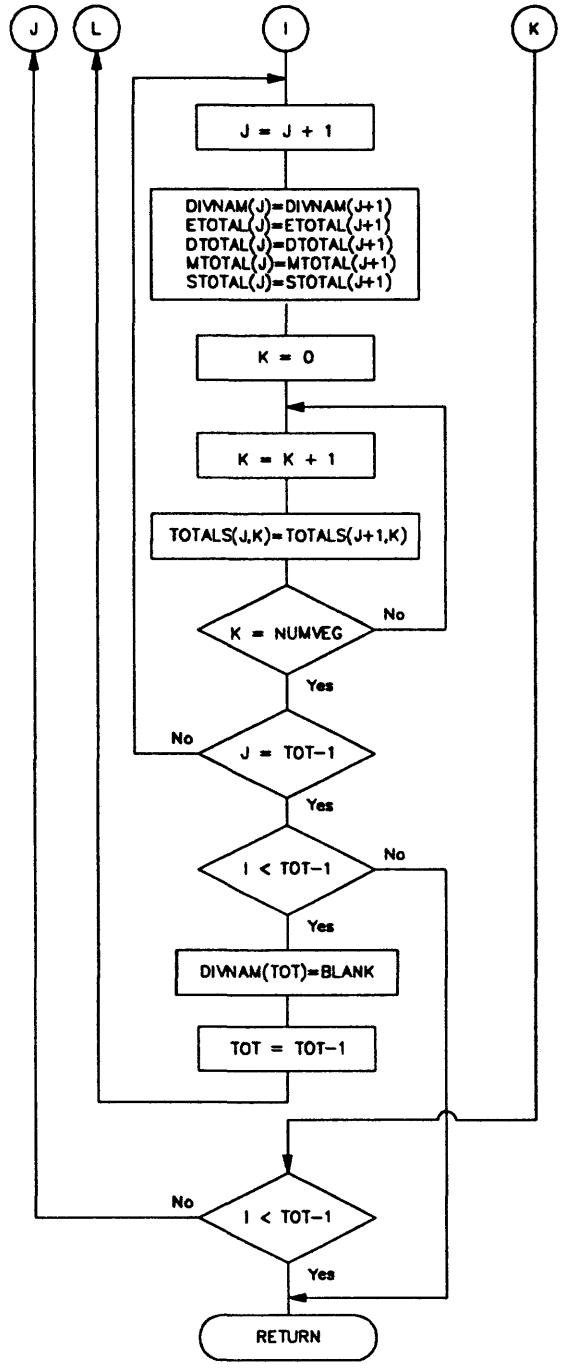
If I < TOT-1, go back and check if the diverter is listed again. If I > TOT-1, get out of the consolidation loop 'I'

Clear the last diverter name in the array because it has been reassigned to one less

Reduce the total number of diverters to account for the double listing

Repeat for all diverters less one

Return to main program



Program Listing

```
      SUBROUTINE SORT
C
C     This subroutine uses a linear sort to alphabetize the diverter names.
C     The subroutine then compresses the diverter names and data if the
C     diverter name appears more than once.
C
      CHARACTER*40  DIVNAM(100), TN
      CHARACTER*20  VEGNAM(50)
      INTEGER*4     NUMDIV(10),  NUMVEG,     TOT,              F,
     *              LOCLAT(10),  S(100),     TOTALS(100,25),   YEAR,
     *              MTOTAL(50),  STOTAL(50), ETOTAL(100),      TT,
     *              DTOTAL(50),  CORVEG(10)
C
      COMMON / VEGDAT / DIVNAM, VEGNAM, NUMVEG, NUMDIV, TOT
      COMMON / BOTH4  / TOTALS
      COMMON / PHRDAT / DTOTAL, MTOTAL, STOTAL
      COMMON / BLCR1  / LOCLAT, ETOTAL, YEAR
C
C     Set up the dummy array.
C
      DO 400 I=1, TOT
          S(I) = I
  400 CONTINUE
C
C     Sort the dummy array according to the diverter names.
C
      DO 130 K=1,TOT-1
      F = 0
        DO 140 I=1,TOT-K
          IF (DIVNAM(S(I)) .GT. DIVNAM(S(I+1))) THEN
            T = S(I)
            S(I) = S(I+1)
            S(I+1) = T
            F = 1
          END IF
  140   CONTINUE
        IF (F .LT. 1) GOTO 150
  130 CONTINUE
C
C     Use the dummy array to sort the data in one pass.
C
  150 DO 160 K=1,TOT-1
        DO 170 I=K+1,TOT
          IF (S(I) .EQ. K) THEN
            TN = DIVNAM(S(I))
            DIVNAM(S(I)) = DIVNAM(S(K))
            DIVNAM(S(K)) = TN
            TT = ETOTAL(S(I))
            ETOTAL(S(I)) = ETOTAL(S(K))
            ETOTAL(S(K)) = TT
            TT = STOTAL(S(I))
            STOTAL(S(I)) = STOTAL(S(K))
            STOTAL(S(K)) = TT
            TT = DTOTAL(S(I))
            DTOTAL(S(I)) = DTOTAL(S(K))
            DTOTAL(S(K)) = TT
            TT = MTOTAL(S(I))
            MTOTAL(S(I)) = MTOTAL(S(K))
```

```
            MTOTAL(S(K)) = TT
            DO 180 L=1,NUMVEG
              TT = TOTALS(S(I),L)
              TOTALS(S(I),L) = TOTALS(S(K),L)
              TOTALS(S(K),L) = TT
  180       CONTINUE
            T = S(I)
            S(I) = S(K)
            S(K) = T
          END IF
  170   CONTINUE
  160 CONTINUE
C
C     If two diverters are the same, add the values and remove
C     duplications.
C
      DO 30 I=1,TOT-1
   10   IF (DIVNAM(I) .EQ. DIVNAM(I+1)) THEN
          ETOTAL(I) = ETOTAL(I) + ETOTAL(I+1)
          DTOTAL(I) = DTOTAL(I) + DTOTAL(I+1)
          MTOTAL(I) = MTOTAL(I) + MTOTAL(I+1)
          STOTAL(I) = STOTAL(I) + STOTAL(I+1)
          DO 20 J=1,NUMVEG
            TOTALS(I,J) = TOTALS(I,J) + TOTALS(I+1,J)
   20     CONTINUE
          DO 40 J=I+1,TOT-1
            DIVNAM(J) = DIVNAM(J+1)
            ETOTAL(J) = ETOTAL(J+1)
            DTOTAL(J) = DTOTAL(J+1)
            MTOTAL(J) = MTOTAL(J+1)
            STOTAL(J) = STOTAL(J+1)
            DO 50 K=1,NUMVEG
              TOTALS(J,K) = TOTALS(J+1,K)
   50       CONTINUE
   40     CONTINUE
          IF (I .GT. TOT-1) GOTO 32
          DIVNAM(TOT) = '            '
          TOT = TOT-1
          GOTO 10
        END IF
   30 CONTINUE
   32 TOTACR = 0
      RETURN
      STOP
      END
```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FOLLOWS

SUBROUTINE TABLE1

Narrative

Subroutine TABLE1 produces a table for each reach showing total vegetation acreage by type for each diverter along the reach (an example is attachment M). The name and title for the table are read from a title data file (attachments K).

Variable List

Name	Common	Description
CORVEG(10)	[COUNTS]	Vegetation acreage less the double-cropped area for each reach.
DIVNAM(100)	[VEGDAT]	Diverter names for each reach along the lower Colorado River.
NETVEG		Total area of crops not counting double-cropped classification.
NLINES		Number of lines in the title, read from a data file and written to the output file.
NUMVEG	[VEGDAT]	Number of vegetation types read from the image-processing input data files.
SUBNUM	[COUNTS]	Number of subreaches per reach.
TEMP1		Variable used to hold the sum of all the crop areas.
TEMP2(25)		Array to hold the sum of the crop areas by diverter.
TFNAME		Character variable used to store the name of the output file.

Name	Common	Description
TITLE		Character array used to hold the title for the table.
TOT		Total number of diverters in the reach.
TOTACR		Total area covered by crops.
TOTALS(100,25)	[BOTH4]	Acreage for each crop and phreatophyte-density type by diverter.
VEGNAM(50)	[VEGDAT]	Vegetation-type names read from the image-processing input data files used to compare the vegetation-type names read from the vegetation water-use coefficient input data file.

Flow chart

Lower Colorado River Accounting System

Subroutine TABLE1

Begin Subroutine TABLE1

Open DATFIL(7) for input

Read number of title lines and title data file name

Open table data file for input

Set I to zero as counter

Increment I

Read title line from DATFIL(7)

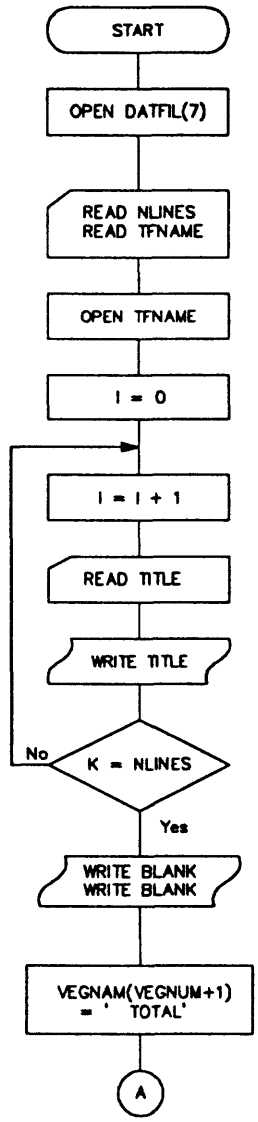
Write title to table data file

Repeat for all title lines

Write two blank lines

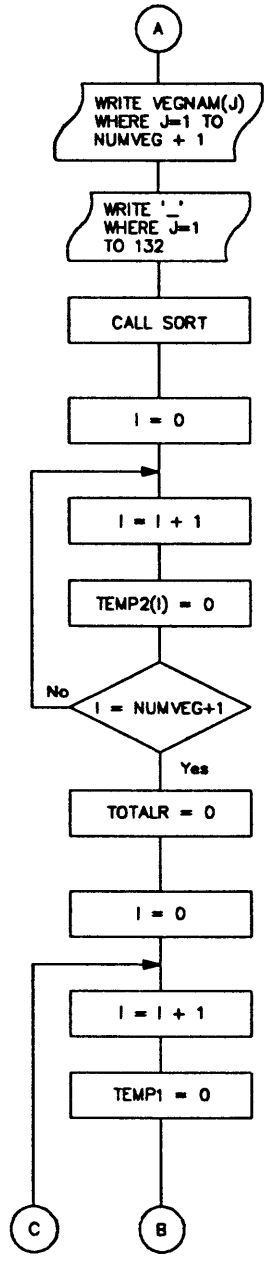
Set the next vegetation vector after the last vegetation name to ' TOTAL'

Continued on next page



Lower Colorado River Accounting System

Subroutine TABLE1 — Continued



Write all the vegetation names across the top including TOTAL

Draw a line across the page

Sort the data by state and diverter name

Set I to zero as counter

Increment I

Clear TEMP2 vector for storing totals

Repeat for all vegetations and total

Clear TOTALR variable

Set I to zero as counter

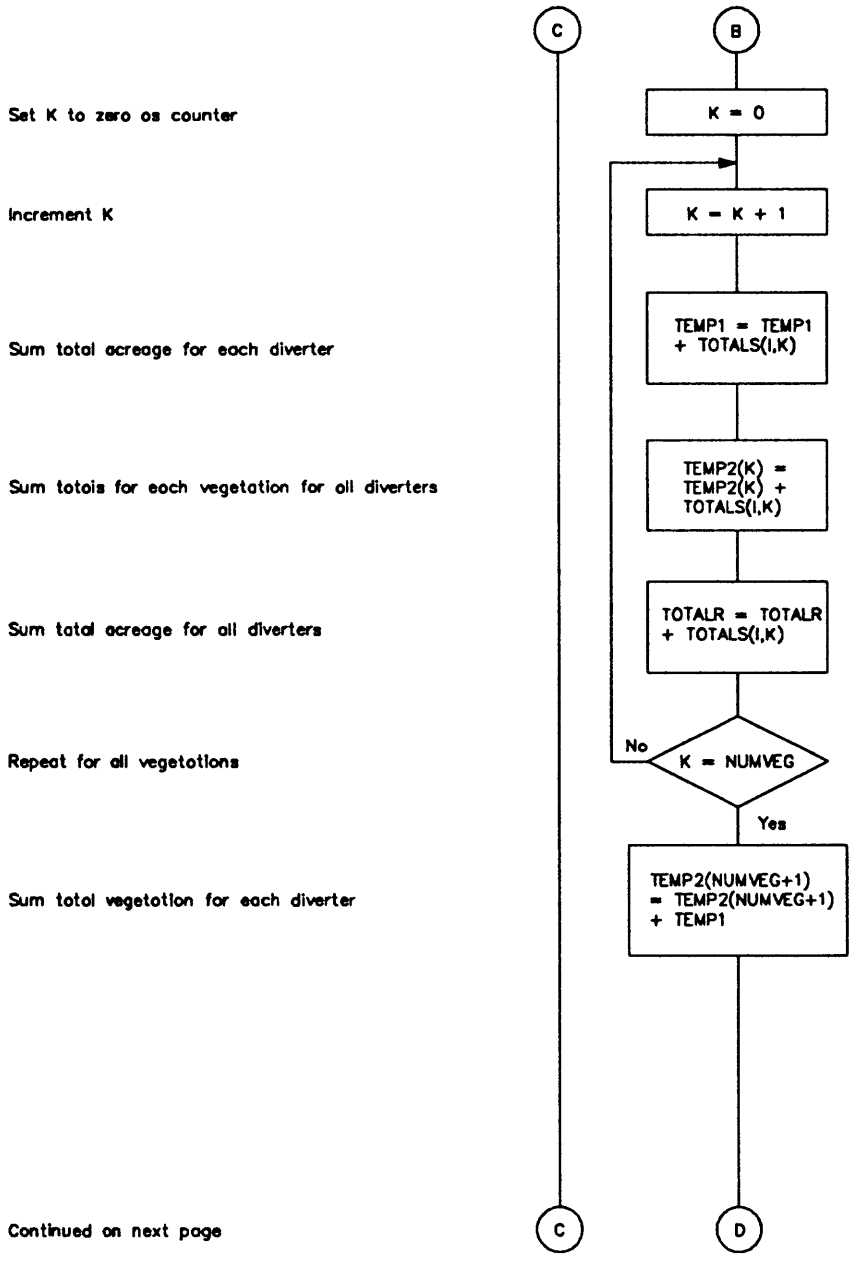
Increment I

Clear TEMP1 variable

Continued on next page

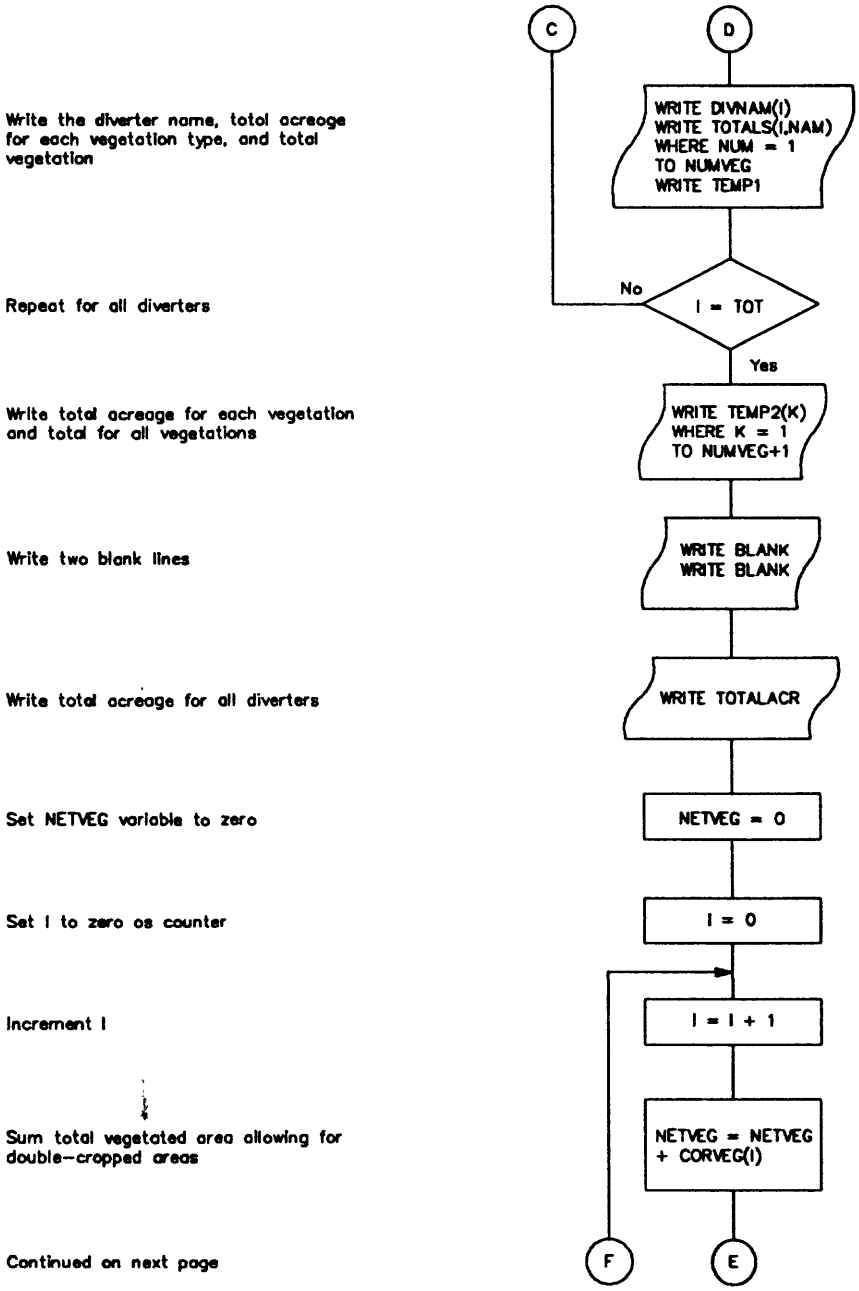
Lower Colorado River Accounting System

Subroutine TABLE1 — Continued



Lower Colorado River Accounting System

Subroutine TABLE1 — Continued



Lower Colorado River Accounting System

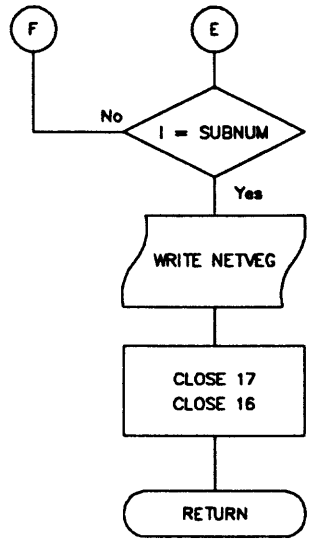
Subroutine TABLE1 — Continued

Repeat for all subreaches

Write net vegetated acreage

Close all files

Return to main program



Program Listing

```
      SUBROUTINE TABLE1
C
C     This subroutine reads the titles and the output file names from
C     the input file DATFIL(7) and produces a table with the following
C     information:  a title for the table, vegetation names, diverter
C     names, and areas of each vegetation type, in acres, per diverter
C     for each reach.
C
      CHARACTER*100 TITLE
      CHARACTER*40  DIVNAM(100)
      CHARACTER*22  TFNAME, DATFIL(15)
      CHARACTER*20  VEGNAM(50)
      INTEGER*4     NUMDIV(10), NUMVEG,      FLAG(40),   NLINES,
     *              NUMSUB,     TOT,         NUMMR,      SUBNUM,
     *              TOTACR,     NETVEG,      LOCLAT(10), YEAR,
     *              RCHNUM,     TEMP2(25),   TEMP1,      TOTALS(100,25),
     *              CORVEG(10), ETOTAL(100), STOTAL(50), DTOTAL(50),
     *              MTOTAL(50)
C
      COMMON / VEGDAT / DIVNAM, VEGNAM, NUMVEG, NUMDIV, TOT
      COMMON / COUNTS / NUMSUB, NUMMR,  SUBNUM, RCHNUM, CORVEG
      COMMON / BOTH4  / TOTALS
      COMMON / PHRDAT / DTOTAL, MTOTAL, STOTAL
      COMMON / BLCR1  / LOCLAT, ETOTAL, YEAR
      COMMON / IDATA  / DATFIL
C
C     Read in the table titles and output file names.
C
      OPEN  (61, FILE=DATFIL(7), STATUS='OLD', ERR=500)
C
      READ (61,'(I2,A22)',ERR=510) NLINES, TFNAME
      OPEN (17,FILE= TFNAME, ERR=530)
      DO 100 I = 1, NLINES
        READ (61,'(A100)',   ERR=520) TITLE
        WRITE(17,'(5X,A100)',ERR=540) TITLE
  100 CONTINUE
      WRITE (17,66,ERR=540)
      WRITE (17,66,ERR=540)
   66 FORMAT (2X)
      VEGNAM(NUMVEG+1) = '  TOTAL'
      WRITE (17,111,ERR=560)(VEGNAM(J), J=1,NUMVEG+1)
  111 FORMAT ('DIVERTER',18X,20A9)
      WRITE (17,'(132A1)',ERR=550)('_', J=1,132)
C
C     Sort the data.
C
      CALL SORT
C
C     Write the diverter name and acreage, which corresponds to the
C     respective vegetation types.
C
      DO 67 I=1,NUMVEG+1
        TEMP2(I) = 0
   67 CONTINUE
C
      TOTACR = 0
      DO 190 I=1,TOT
        TEMP1 = 0
        DO 200 K=1,NUMVEG
          TEMP1    = TEMP1+TOTALS(I,K)
          TEMP2(K) = TEMP2(K)+TOTALS(I,K)
          TOTACR   = TOTACR + TOTALS(I,K)
  200   CONTINUE
        TEMP2(NUMVEG+1) = TEMP2(NUMVEG+1)+TEMP1
        WRITE (17,112,ERR=570) DIVNAM(I),(TOTALS(I,MM), MM=1, NUMVEG),
     *                         TEMP1
  112   FORMAT(4X,A20,20I9,I12)
  190 CONTINUE
      WRITE  (17,113,ERR=570) (TEMP2(M),M=1,NUMVEG+1)
  113 FORMAT (/,4X,'TOTAL',15X,20I9)
C
C     Write total acreage and net acreage to the output file.
C
      WRITE (17,66, ERR=570)
```

```
      WRITE (17,66, ERR=570)
      WRITE (17,118,ERR=570) TOTACR
  118 FORMAT ('Total vegetated area',6X,I12)
      WRITE (17,66, ERR=570)
      NETVEG = 0
      DO 210 I=1,SUBNUM
        NETVEG = NETVEG + CORVEG(I)
  210 CONTINUE
      WRITE (17,149,ERR=570) NETVEG
  149 FORMAT ('Net vegetated area',8X,I12)
      CLOSE (17)
      CLOSE (16)
      RETURN
C
C     Error messages.
C
  500 WRITE (*,501) DATFIL(7)
  501 FORMAT (//,2X,'ERROR - OPENING ',A22)
      STOP
  510 WRITE (*,511) DATFIL(7)
  511 FORMAT (//,2X,'ERROR - READING TITLE INFO FROM ',A22)
      STOP
  520 WRITE (*,521) DATFIL(7)
  521 FORMAT (//,2X,'ERROR - READING IN TITLES FROM ',A22)
      STOP
  530 WRITE (*,531) TFNAME
  531 FORMAT (//,2X,'ERROR - OPENING ',A22)
      STOP
  540 WRITE (*,541)
  541 FORMAT (//,20X,'ERROR-READING IN DATA4')
      STOP
  550 WRITE (*,551)
  551 FORMAT (//,20X,'ERROR-READING IN DATA5')
      STOP
  560 WRITE (*,561)
  561 FORMAT (//,20X,'ERROR-READING IN DATA6')
      STOP
  570 WRITE (*,571)
  571 FORMAT (//,20X,'ERROR-WRITING IN DATA7')
      STOP
      END
```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FOLLOWS

SUBROUTINE TABLE2

Narrative

Subroutine TABLE2 produces tables that show evapotranspiration, percentage, and consumptive use by diverter and are totaled by State (attachments O). The subroutine first adds all the estimates of evapotranspiration for the reach and uses the total to calculate the percentage for each diverter. This percentage is then multiplied by consumptive use by vegetation calculated with the water budget to apportion consumptive use by vegetation among the diverters.

Variable List

Name	Common	Description
CN1(4)		Array of the State initials for comparisons.
CN2(4)		Array of the complete name of the State for output.
CN3(4)		Array of the State total label for output.
CO		Temporary integer value for consumptive use by diverter.
DIVNAM(100)	[VEGDAT]	Diverter names for each reach along the lower Colorado River.
DTOTAL(50)	[PHRDAT]	Integer value for the total evapotranspiration for dense phreatophytes.
ET		Temporary integer value of the REAL evapotranspiration value.
ETOTAL(100)	[BLCR1]	Integer value for total evapotranspiration by crops for each of the reaches.
FLG		Indicates the next diverter is in a new State.

Name	Common	Description
GCO		Grand total of consumptive use along the reach.
GET		Grand total of evapotranspiration along the reach.
MTOTAL(50)	[PHRDAT]	Integer value for total evapotranspiration for medium phreatophytes.
PCO		Temporary integer value for consumptive use by phreatophytes.
PET		Temporary integer value for percentage of evapotranspiration by phreatophytes.
PTOT(4)		Array of the total evapotranspiration for phreatophytes.
RCHNUM	[COUNTS]	Number of the reach currently being processed.
RCHTS(5)	[INDATA]	Array that contains the total consumptive use for each reach along the lower Colorado River calculated with the water budget.
RTOT		Total evapotranspiration for the reach used for percentage calculations.
STOTAL(50)	[PHRDAT]	Integer value for total evapotranspiration for sparse phreatophytes.
TANAME		Name of the output file.
TCO		Total consumptive use for each State.
TET		Total percentage of evapotranspiration for each State.

Name	Common	Description
TITLE		Character variable used to transfer the title strings from the input data file to the output table file.
TOT		Total number of diverters along the reach.
TOTAL(4)		Array that contains total evapotranspiration, including phreatophytes, for each State.
TTO		Total evapotranspiration for each State.
XLINES		Number of title strings for the table.

Flow chart

Lower Colorado River Accounting System

Subroutine TABLE2

Begin Subroutine TABLE2

Set the variables that will be used to make headings for the table

Read the number of title lines and the title lines from the title file

Set I = 0 for counter

Increment I by one

Read in a line from the input file as a title for the table

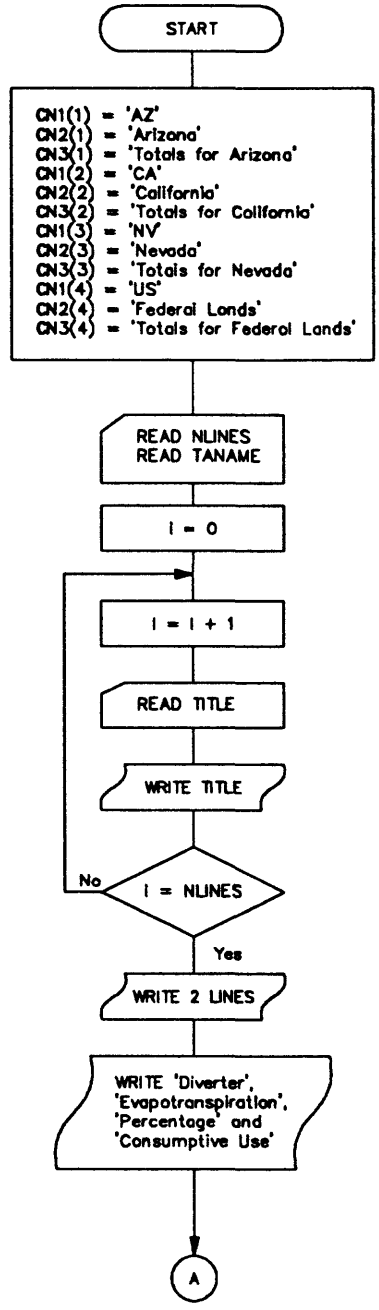
Write the title line to the output file

Repeat for all lines in the title

Leave 2 blank lines between the title and the table labels

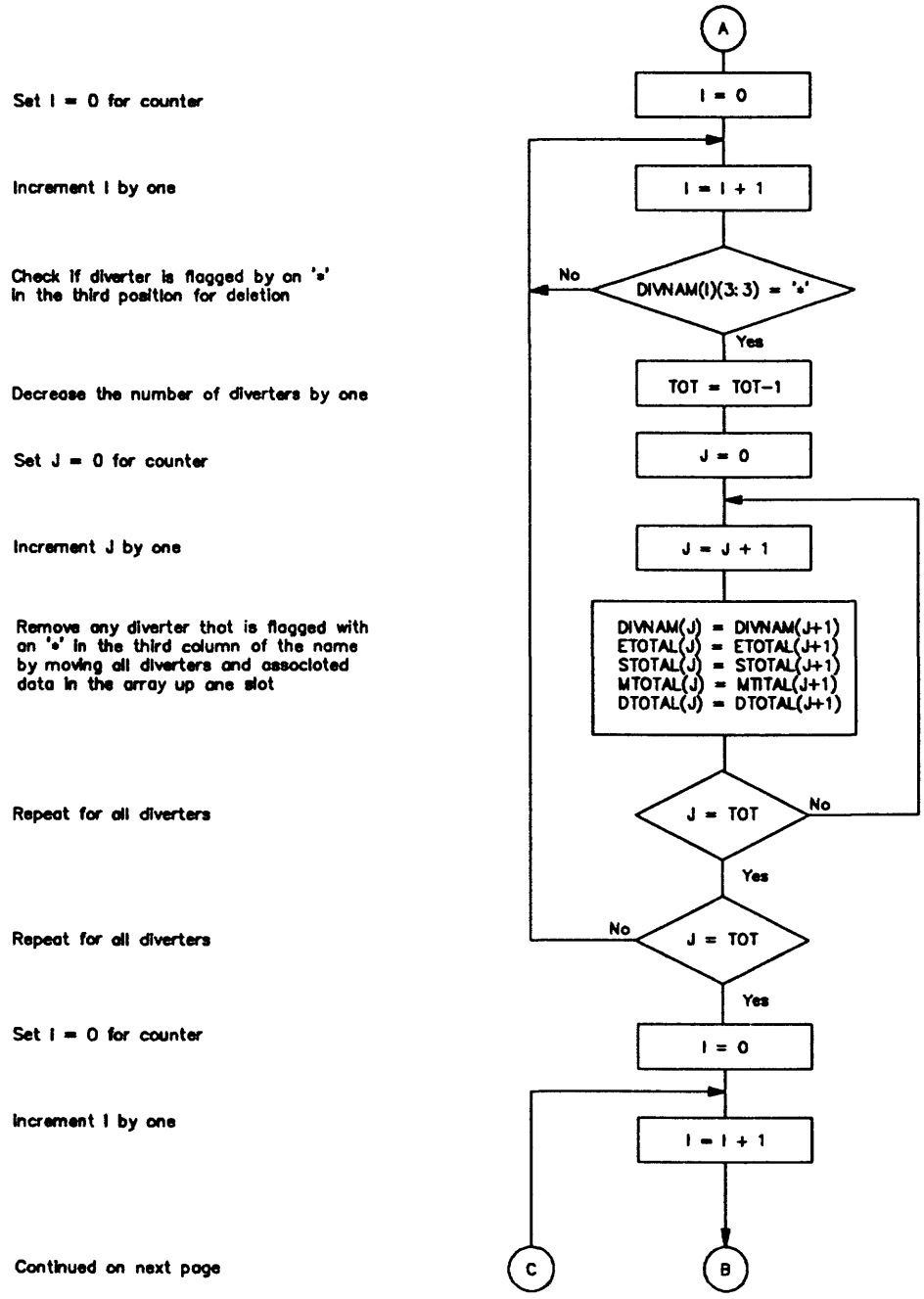
Write the column headings for the table

Continued on next page



Lower Colorado River Accounting System

Subroutine TABLE2 — Continued



Set I = 0 for counter

Increment I by one

Check if diverter is flagged by on '*' in the third position for deletion

Decrease the number of diverters by one

Set J = 0 for counter

Increment J by one

Remove any diverter that is flagged with an '*' in the third column of the name by moving all diverters and associated data in the array up one slot

Repeat for all diverters

Repeat for all diverters

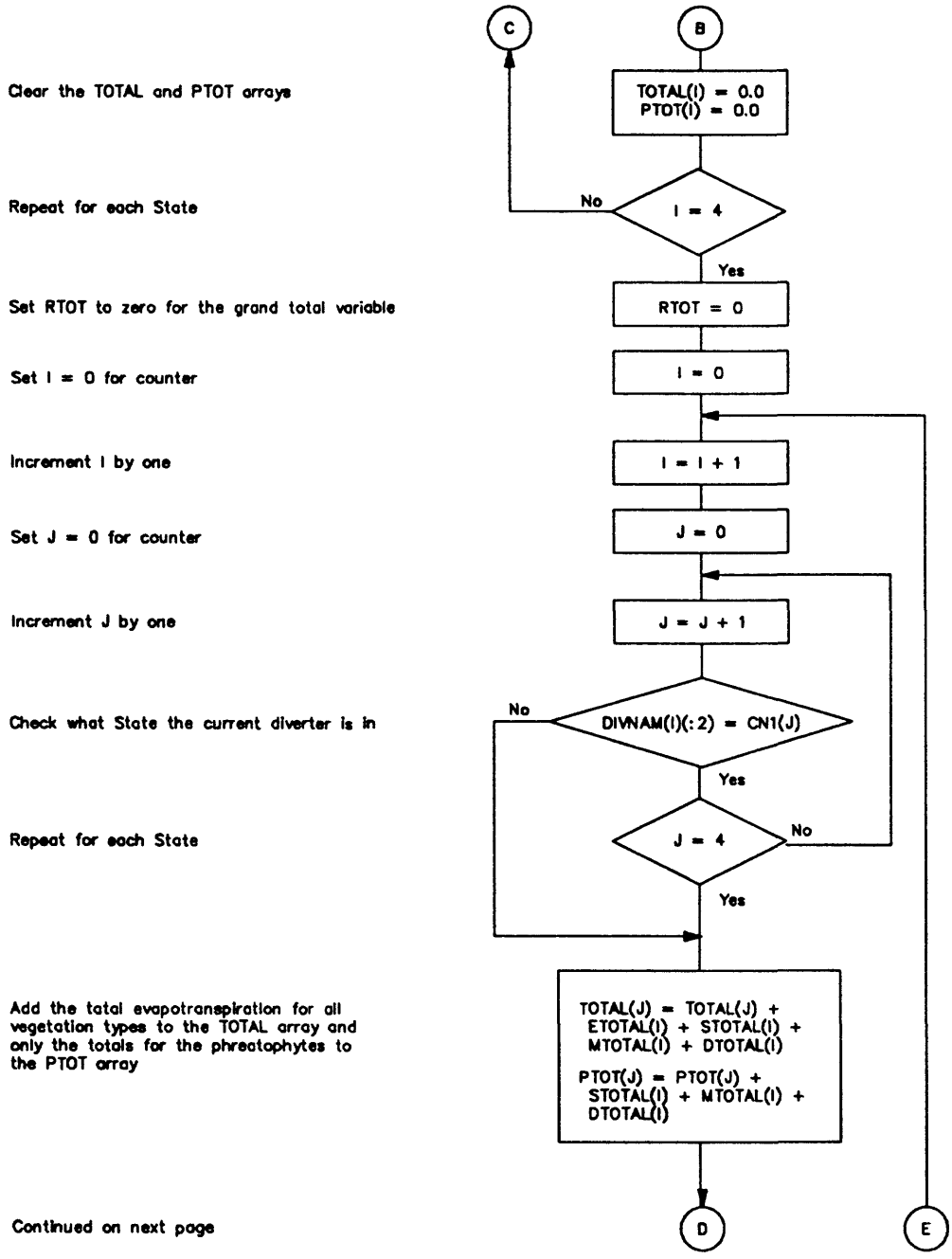
Set I = 0 for counter

Increment I by one

Continued on next page

Lower Colorado River Accounting System

Subroutine TABLE2 — Continued



Clear the TOTAL and PTOT arrays

Repeat for each State

Set RTOT to zero for the grand total variable

Set I = 0 for counter

Increment I by one

Set J = 0 for counter

Increment J by one

Check what State the current diverter is in

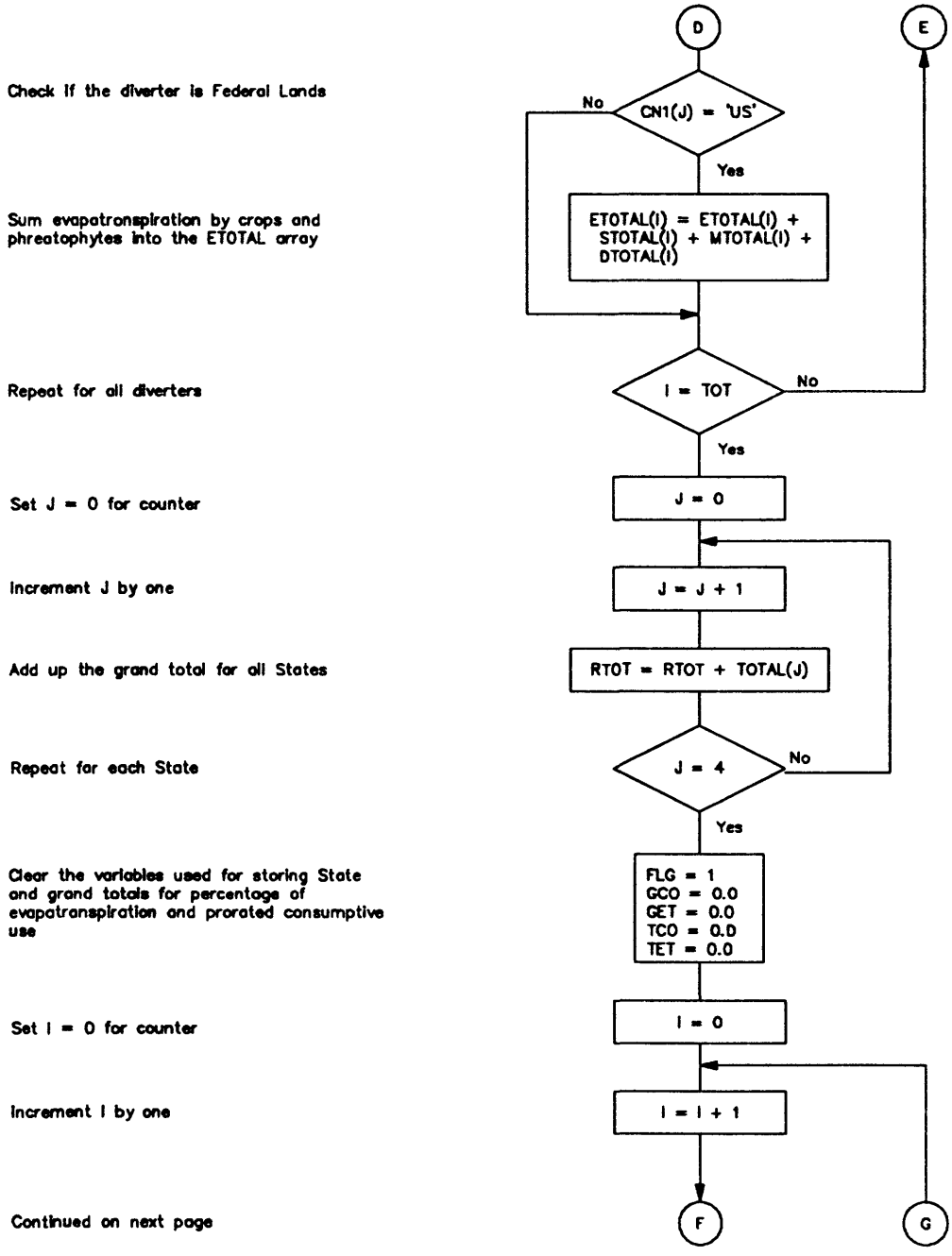
Repeat for each State

Add the total evapotranspiration for all vegetation types to the TOTAL array and only the totals for the phreatophytes to the PTOT array

Continued on next page

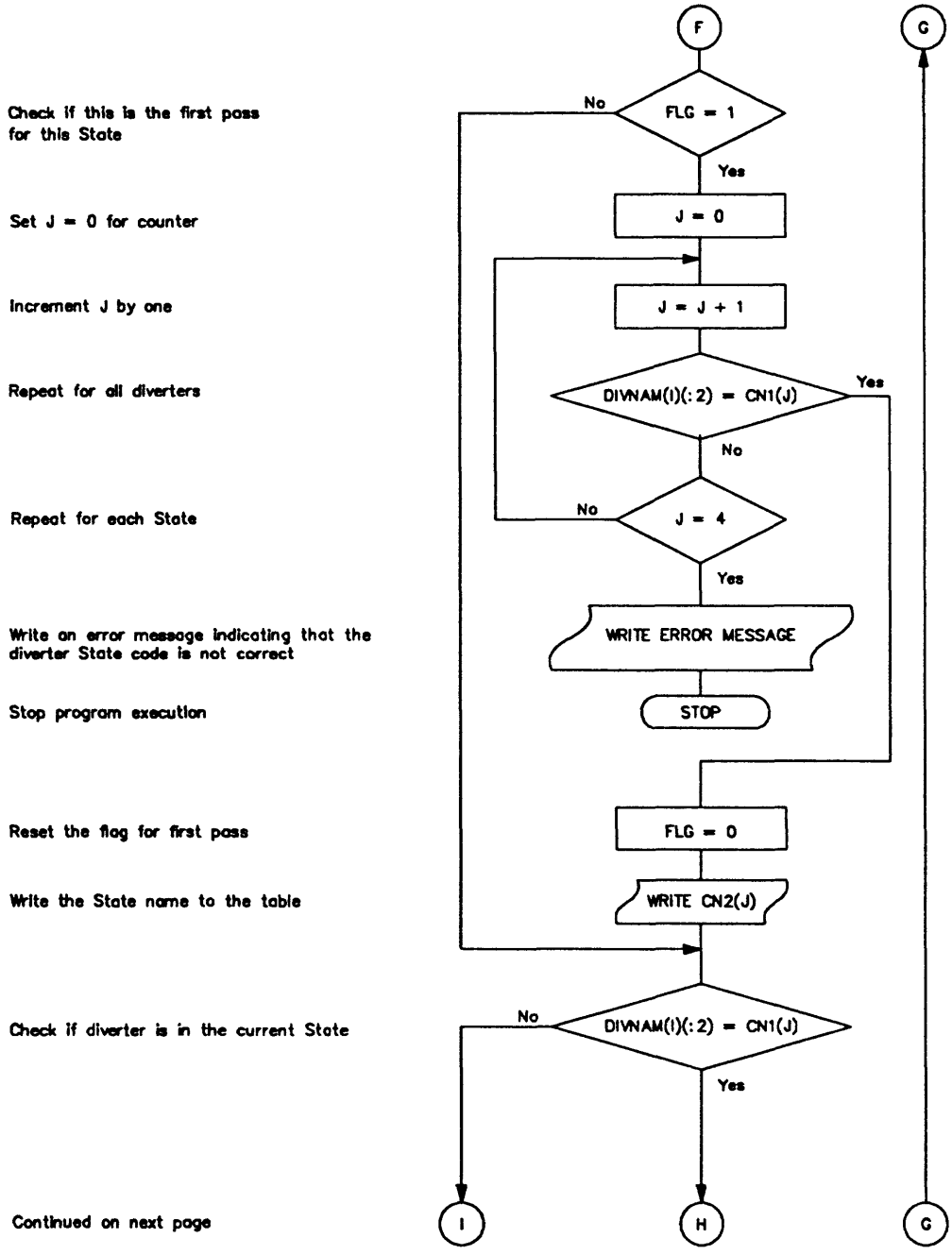
Lower Colorado River Accounting System

Subroutine TABLE2 — Continued



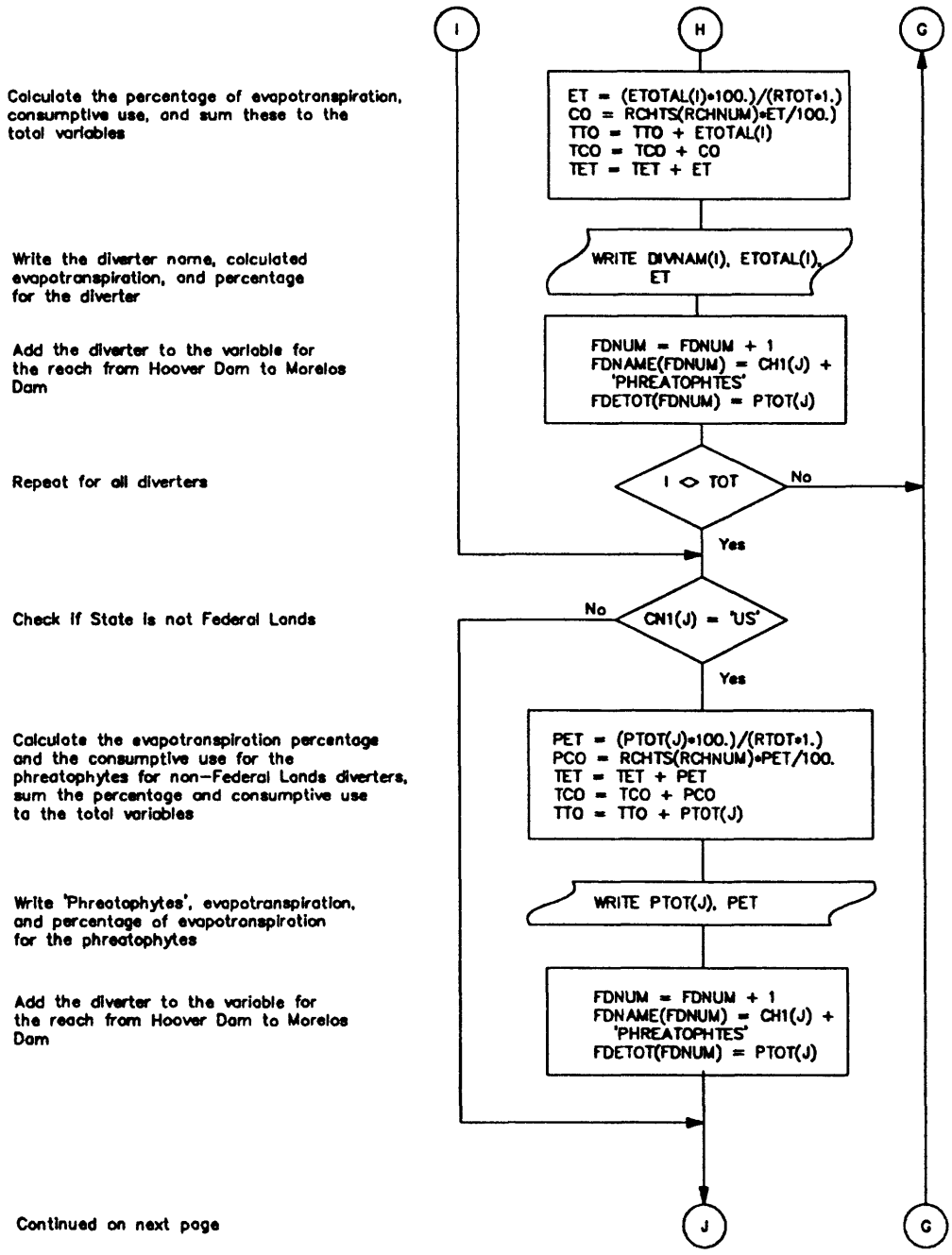
Lower Colorado River Accounting System

Subroutine TABLE2 — Continued



Lower Colorado River Accounting System

Subroutine TABLE2 — Continued



Calculate the percentage of evapotranspiration, consumptive use, and sum these to the total variables

Write the diverter name, calculated evapotranspiration, and percentage for the diverter

Add the diverter to the variable for the reach from Hoover Dam to Morelos Dam

Repeat for all diverters

Check if State is not Federal Lands

Calculate the evapotranspiration percentage and the consumptive use for the phreatophytes for non-Federal Lands diverters, sum the percentage and consumptive use to the total variables

Write 'Phreatophytes', evapotranspiration, and percentage of evapotranspiration for the phreatophytes

Add the diverter to the variable for the reach from Hoover Dam to Morelos Dam

Continued on next page

Lower Colorado River Accounting System

Subroutine TABLE2 — Continued

Write the totals heading, evapotranspiration, and percentages for the State

Sum the grand total variables and clear the State variables for the next State

Repeat if the flag is set to 2

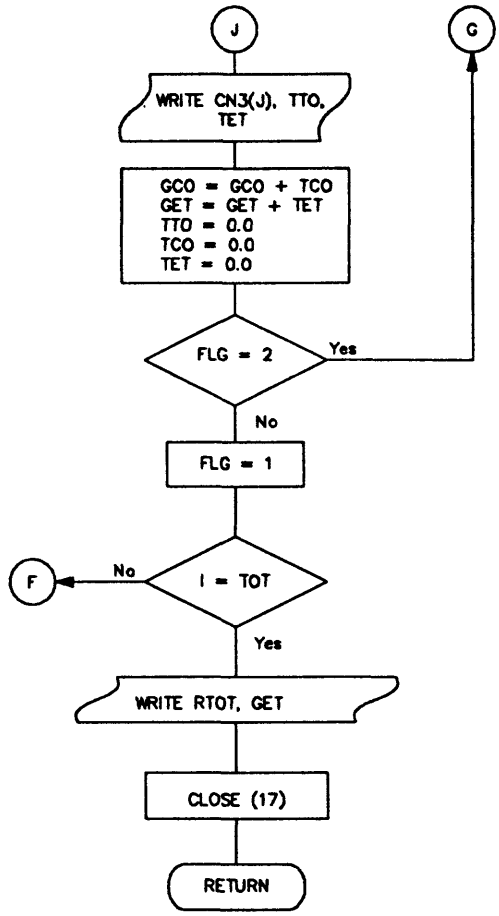
Set FLG = 1 for first pass test

Repeat for all diverters

Write the grand total label and grand totals for the evapotranspiration and percentage to the table

Close the table file

Return to the main program



Program Listing

```
      SUBROUTINE TABLE2
C
C       This subroutine reads the titles and the output file names
C       from the CONUSE.TIT file and creates an output table
C       consisting of the following:  a title, headings
C       EVAPOTRANSPIRATION, PERCENTAGE, and CONSUMPTIVE USE, and lists
C       evapotranspiration, percentage of evapotranspiration,
C       and consumptive use by diverters in Arizona, California, and
C       Nevada associated with each reach.
C
      CHARACTER*100 TITLE(10)
      CHARACTER*40  DIVNAM(100),  FDNAME(250)
      CHARACTER*22  TANAME,       INFILE(10)
      CHARACTER*20  VEGNAM(50)
      CHARACTER*24  CN2(4),       CN3(4)
      CHARACTER*2   CN1(4)
      INTEGER*4     LOCLAT(10),   XLINES,       NUMVEG,     TOT,
     *              FLG,          YEAR,         NUMDIV(10), RCHNUM,
     *              NUMSUB,       NUMMR,        SUBNUM,     FDNUM,
     *              ETOTAL(100),  CORVEG(10),   STOTAL(50), TTO,
     *              MTOTAL(50),   DTOTAL(50),   GCO,        RTOT,
     *              PTO,          CO,           TOTAL(4),   PTOT(4),
     *              PCO,          TCO,          FDETOT(250)
      REAL*8        EVAPS(20),    FLOWS(30),    TRIBS(40),  DUS(20),
     *              AREAS(20),    GET,          ET,         PET,
     *              TET,          RCHTS(5)
C
      COMMON / VEGDAT / DIVNAM, VEGNAM, NUMVEG, NUMDIV, TOT
      COMMON / INDATA / FLOWS,  TRIBS,  AREAS,  EVAPS,  DUS,  RCHTS
      COMMON / BLCR1  / LOCLAT, ETOTAL, YEAR
      COMMON / PHRDAT / DTOTAL, MTOTAL, STOTAL
      COMMON / COUNTS / NUMSUB, NUMMR,  SUBNUM, RCHNUM, CORVEG
      COMMON / LUMP1  / INFILE
      COMMON / SUMMRY / FDNAME, FDETOT, FDNUM
C
C     Calculate and sum evapotranspiration, percentage of evapotranspiration,
C     and consumptive use of each State's diverters for each reach.  Also
C     does the same for each State's phreatophytes.
C
      CN1(1) = 'AZ'
      CN2(1) = 'Arizona                '
      CN3(1) = 'Totals for Arizona     '
      CN1(2) = 'CA'
      CN2(2) = 'California             '
      CN3(2) = 'Totals for California  '
      CN1(3) = 'NV'
      CN2(3) = 'Nevada                 '
      CN3(3) = 'Totals for Nevada      '
      CN1(4) = 'US'
      CN2(4) = 'Federal Lands          '
      CN3(4) = 'Totals for Federal Lands'
C
C     Read the titles from the input file and write to the output file.
C
      READ (62,'(I2,A22)',ERR= 80) XLINES, TANAME
      OPEN (17, FILE= TANAME, ERR=400)
      DO 45 I=1, XLINES
        READ (62,'(A100)',    ERR= 80) TITLE(I)
        WRITE (17,'(5X,A100)',ERR=400) TITLE(I)
   45 CONTINUE
      WRITE (17,600)
      WRITE (17,600)
  600 FORMAT (2X)
      WRITE (17,100,ERR=80)
  100 FORMAT ('Diverter',21X,'Evapotranspiration',7X,
     *        'Percentage',4X,'Consumptive use')
      WRITE (17,600)
C
C     Remove any diverter that is flagged with an '*' in the third
C     column.
C
      DO 666 I=1,TOT
        IF (DIVNAM(I)(3:3) .EQ. '*') THEN
```

```
            TOT = TOT-1
            DO 667 J=I,TOT
              DIVNAM(J) = DIVNAM(J+1)
              ETOTAL(J) = ETOTAL(J+1)
              STOTAL(J) = STOTAL(J+1)
              MTOTAL(J) = MTOTAL(J+1)
              DTOTAL(J) = DTOTAL(J+1)
  667       CONTINUE
          END IF
  666   CONTINUE
C
C       Clear the TOTAL and PTOT arrays for calculations.
C
        DO 5 J=1,4
          TOTAL(J) = 0.0
          PTOT(J)  = 0.0
    5   CONTINUE
        RTOT = 0
C
C       Sum evapotranspiration for each diverter for each State
C       and sum a grand total for the reach.
C
        DO 10 I=1,TOT
          DO 15 J=1,4
            IF (DIVNAM(I)(:2) .EQ. CN1(J)) GOTO 16
   15     CONTINUE
   16     TOTAL(J) = TOTAL(J)+ ETOTAL(I)+ STOTAL(I)+ MTOTAL(I)+DTOTAL(I)
          PTOT(J)  = PTOT(J) + STOTAL(I) + MTOTAL(I) + DTOTAL(I)
          IF (CN1(J) .EQ. 'US') THEN
            ETOTAL(I) = ETOTAL(I) + STOTAL(I) + MTOTAL(I) + DTOTAL(I)
          END IF
   10   CONTINUE
C
        DO 20 J=1,4
          RTOT = TOTAL(J) + RTOT
   20   CONTINUE
C
        FLG = 1
        GCO = 0.0
        GET = 0.0
        TCO = 0.0
        TET = 0.0
C
        DO 250 I = 1, TOT
   24     IF (FLG .EQ. 1) THEN
            DO 25 J=1,4
              IF (DIVNAM(I)(:2) .EQ. CN1(J)) GOTO 26
   25       CONTINUE
            WRITE (*,29)
   29       FORMAT (2X,'I CAN NOT MATCH THE DIVERTER STATE')
            STOP
   26       FLG = 0
            WRITE (17,106,ERR=80) CN2(J)
  106       FORMAT (2X,A24,/)
          END IF
C
C         Calculate the percentage of evapotranspiration and consumptive use
C         for each diverter and sum for each State.
C
          IF (DIVNAM(I)(:2) .EQ. CN1(J)) THEN
            ET  = (ETOTAL(I)*100.)/(RTOT*1.)
            CO  = RCHTS(RCHNUM) * ET / 100.
            TTO = TTO + ETOTAL(I)
            TCO = TCO + CO
            TET = TET + ET
            WRITE (17, 70, ERR=80) DIVNAM(I), ETOTAL(I), ET, CO
   70       FORMAT (4X,A20,9X,I12,9X,F8.2,7X,I12)
            FDNUM = FDNUM+1
            FDNAME(FDNUM) = DIVNAM(I)
            FDETOT(FDNUM) = ETOTAL(I)
            IF (I .NE. TOT) GOTO 250
            IF (I .EQ. TOT) FLG = 2
          END IF
C
          IF (CN1(J) .NE. 'US') THEN
            PET = (PTOT(J)*100.)/(RTOT*1.)
            PCO = RCHTS(RCHNUM) * PET / 100.
            TET = TET + PET
```

```
            TCO = TCO + PCO
            TTO = TTO + PTOT(J)
            WRITE  (17,470, ERR=402) PTOT(J), PET, PCO
  470       FORMAT (4X,'PHREATOPHYTES',16X,I12,F17.2,I19)
            FDNUM = FDNUM+1
            FDNAME(FDNUM) = CN1(J) // ' ' // 'PHREATOPHYTES'
            FDETOT(FDNUM) = PTOT(J)
          END IF
          WRITE  (17,471, ERR=402) CN3(J), TTO, TET, TCO
  471     FORMAT (1X,/,2X,A24,3X,I16,F17.2,I19,//)
C
          GCO = GCO + TCO
          GET = GET + TET
          TTO = 0.0
          TCO = 0.0
          TET = 0.0
          IF (FLG .EQ. 2) GOTO 250
          FLG = 1
          GOTO 24
  250   CONTINUE
        WRITE (17,75,ERR=80) RTOT, GET, GCO
   75   FORMAT ('Reach totals',21X,I12,11X,F6.2,7X,I12)
        WRITE (17,600)
        IRCHTS = INT(RCHTS(RCHNUM))
        WRITE (17,450) IRCHTS
  450   FORMAT ('Water-Budget Estimate  ',43X,I15)
        CLOSE (17)
        RETURN
C
C       Error messages.
C
  200   WRITE (*,201)
  201   FORMAT (//,20X,'ERROR - Reading input files')
        STOP
   80   WRITE(*,81)
   81   FORMAT (//,20X,'ERROR - Reading TANAME')
        STOP
  400   WRITE(*,401)
  401   FORMAT (//,20X,'ERROR - Writing TANAME')
        STOP
  402   WRITE  (*,403)
  403   FORMAT (//,20X,'ERROR - WRITING TO TABLE 2')
        STOP
        END
```


PAGE 21-1 FOLLOWS

SUBROUTINE TABLE3

Narrative

Subroutine TABLE3 produces a table that shows the vegetation types in each reach, monthly water-use rates for each vegetation type, and the annual water-use rate for each type (attachment L). All of the values used in this subroutine are calculated in the BC subroutine.

Variable List

Name	Common	Description
INFILE(10)	[LUMP1]	Name of the image-processing input file for each subreach in a reach.
MWUR(5,25,12)	[WRATES]	Monthly water-use rates calculated for vegetation types for each reach along the lower Colorado River.
NUMSUB	[COUNTS]	Number of subreaches read from the primary input data file.
NUMVEG	[VEGDAT]	Number of vegetation types read from the image-processing input data files.
SUBNUM	[COUNTS]	Number of subreaches per reach.
TFILE(10)	[SDATA]	ASCII input data file that contains the temperature data for selected stations along the lower Colorado River.
VEGNAM(50)	[VEGDAT]	Vegetation-type names read from the image-processing input data files used to compare the vegetation-type names read from the vegetation-growth coefficient input data file.
WUR(5,25)	[WRATES]	Annual water-use rates summed for each vegetation type by reach along the lower Colorado River.

Flow chart

Lower Colorado River Accounting System

Subroutine TABLE3

Begin Subroutine TABLE3

Skip two lines in the output file

Set NUMSUB to zero as counter

Increment NUMSUB

Set FLAG variable to zero

Set I to zero as counter

Increment I

Check to see if water-use rates have been printed before

Set FLAG variable to 1

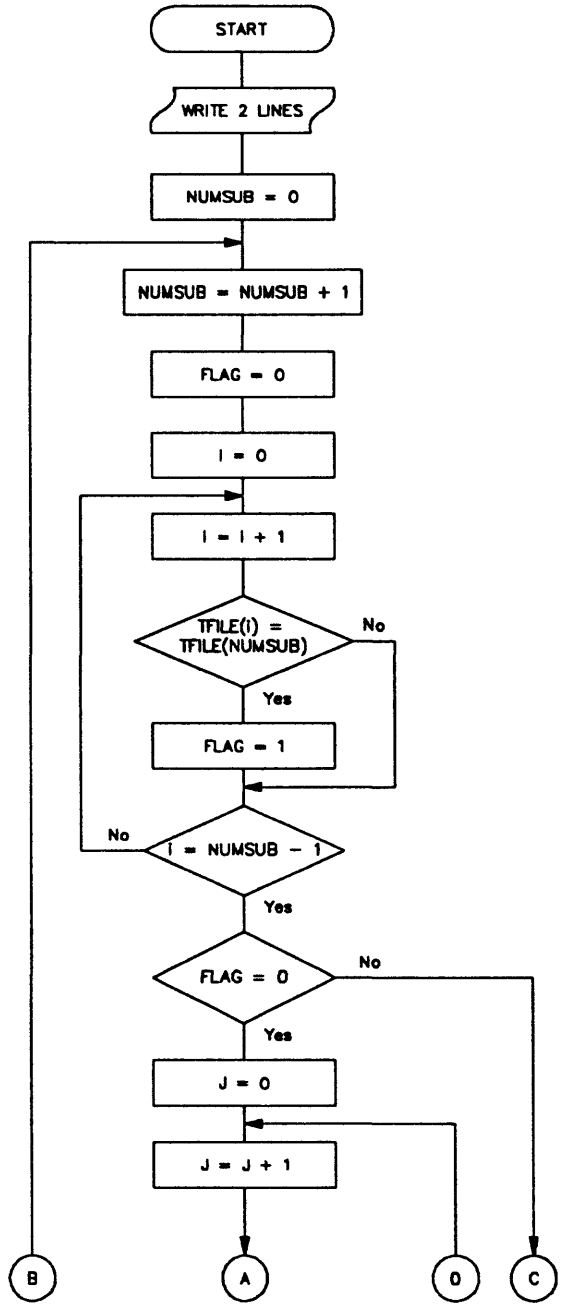
Repeat for all previous subreaches

Check to see if the subreach is flagged

Set J to zero as counter

Increment J

Continued on next page



Lower Colorado River Accounting System

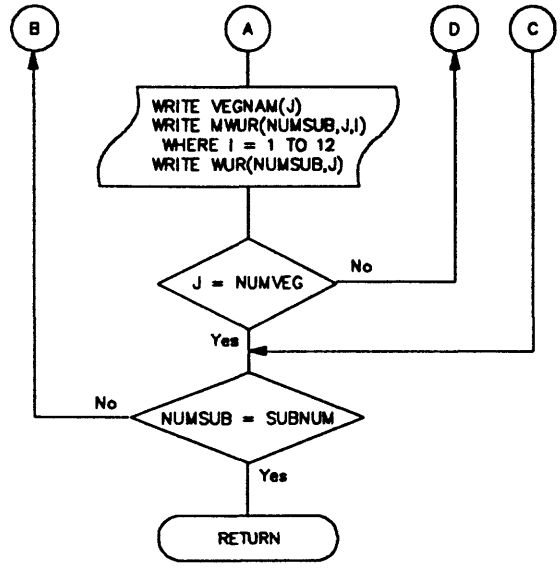
Subroutine TABLE3 — Continued

Write the vegetation name and the corresponding monthly water-use rate to the output file

Repeat for all vegetation types

Repeat for all subreaches

Return to main program



Program Listing

```
      SUBROUTINE TABLE3
C
C     This subroutine is used to read the titles from the
C     data file and produces an output file in table form
C     containing the following:  a title, a heading with a three-
C     letter abbreviation of the twelve months, a list of each
C     vegetation type, and the monthly water-use rates of each
C     vegetation type.
C
      CHARACTER*80  TITLE(10)
      CHARACTER*40  DIVNAM(100)
      CHARACTER*22  TFILE(10),  PFILE(10),      INFILE(10)
      CHARACTER*20  VEGNAM(50)
      INTEGER*4     YLINES,     NUMSUB,         RCHNUM,       NUMMR,
     *              NUMVEG,     NUMDIV(10),     SUBNUM,       NUMCRP,
     *              TOT,        CORVEG(10)
      REAL*8        WUR(5,25),  MWUR(5,25,12)
C
      COMMON / VEGDAT / DIVNAM, VEGNAM, NUMVEG, NUMDIV, TOT
      COMMON / WRATES / MWUR,   WUR
      COMMON / COUNTS / NUMSUB, NUMMR, SUBNUM, RCHNUM, CORVEG
      COMMON / LUMP1  / INFILE
      COMMON / SDATA  / TFILE,  PFILE
C
C     Skip two lines in the output file.
C
C
      WRITE (65,115,ERR=90)
      WRITE (65,115,ERR=90)
  115 FORMAT (2X)
C
C     Write the vegetation names and their corresponding monthly
C     water-use rates to the output file.
C
      DO 10 NUMSUB=1,SUBNUM
        FLAG = 0
        DO 20 I=1,NUMSUB-1
          IF (TFILE(I) .EQ. TFILE(NUMSUB)) FLAG =1
   20   CONTINUE
        IF (FLAG .EQ. 0) THEN
          WRITE (65,50,ERR=90) INFILE(NUMSUB), TFILE(NUMSUB)
   50     FORMAT (2X,A22,2X,'-',2X,A22)
          DO 30 J=1, NUMVEG
               WRITE (65,100,ERR=90) VEGNAM(J), (MWUR(NUMSUB,J,I),
     *                                I=1,12), WUR(NUMSUB,J)
  100          FORMAT (4X,A10,3X,12F6.2,2X,F6.2)
   30     CONTINUE
          WRITE (65,115,ERR=90)
        END IF
   10 CONTINUE
      RETURN
C
C     Error Messages
C
   80 WRITE (*,81)
   81 FORMAT (//,20X,'ERROR - Reading WUTITLE.DATA')
      STOP
   90 WRITE (*,91)
   91 FORMAT (//,20X,'ERROR - Writing to WUNAME')
      STOP
      END
```

SUBROUTINE TABLE4

Narrative

Subroutine TABLE4 produces a table for the Bill Williams River that shows evapotranspiration and percentage for each diverter (attachment N). The subroutine first adds all the estimates of evapotranspiration for the reach and uses the total to calculate the percentage for each diverter. This routine is different than TABLE2 in that it does not add the diverters to the master diverter list. This table includes only output from the BWR subroutine.

Variable List

Name	Common	Description
CN1(4)		Array of the State initials for comparisons.
CN2(4)		Array of the complete name of the State for output.
CN3(4)		Array of the State total line for output.
CO		Temporary integer value for consumptive use for a diverter.
DIVNAM(100)	[VEGDAT]	Diverter names for each reach along the lower Colorado River.
DTOTAL(50)	[PHRDAT]	Integer value for the total evapotranspiration for dense phreatophytes.
ET		Temporary integer value of the REAL evapotranspiration value.
ETOTAL(100)	[BLCR1]	Integer value for the total evapotranspiration by crops for each of the reaches.
FLG		Indicates the next diverter is in a new State.

Name	Common	Description
GCO		Grand total of consumptive use along the reach.
GET		Grand total of evapotranspiration along the reach.
MTOTAL(50)	[PHRDAT]	Integer value for total evapotranspiration for medium phreatophytes.
PCO		Temporary integer value for consumptive use by phreatophytes.
PET		Temporary integer value for percentage of evapotranspiration by phreatophytes.
PTOT(4)		Array of total evapotranspiration for phreatophytes.
RCHNUM	[COUNTS]	Number of the reach currently being processed.
RCHTS(5)	[INDATA]	Array that contains the total consumptive use for each reach along the lower Colorado River calculated with the water budget.
RTOT		Total evapotranspiration for reach used for percentage calculations.
STOTAL(50)	[PHRDAT]	Integer value for total evapotranspiration for sparse phreatophytes.
TANAME		Name of the output file.
TCO		Total consumptive use for each State.
TET		Total percentage of evapotranspiration for each State.
TITLE		Character variable used to transfer the title strings from the input data file to the output table file.

Name	Common	Description
TOT		Total number of diverters along the reach.
TOTAL(4)		Array that contains total evapotranspiration, including phreatophytes, for each State.
TTO		Total evapotranspiration for each State.
XLINES		Number of title strings for the table.

Flow chart

Lower Colorado River Accounting System

Subroutine TABLE4

Begin Subroutine TABLE4

Set the variables that will be used to make headings for the table

Read the number of title lines and the title lines from the title file

Set I to zero as counter

Increment I

Read in a line from the input file as a title for the table.

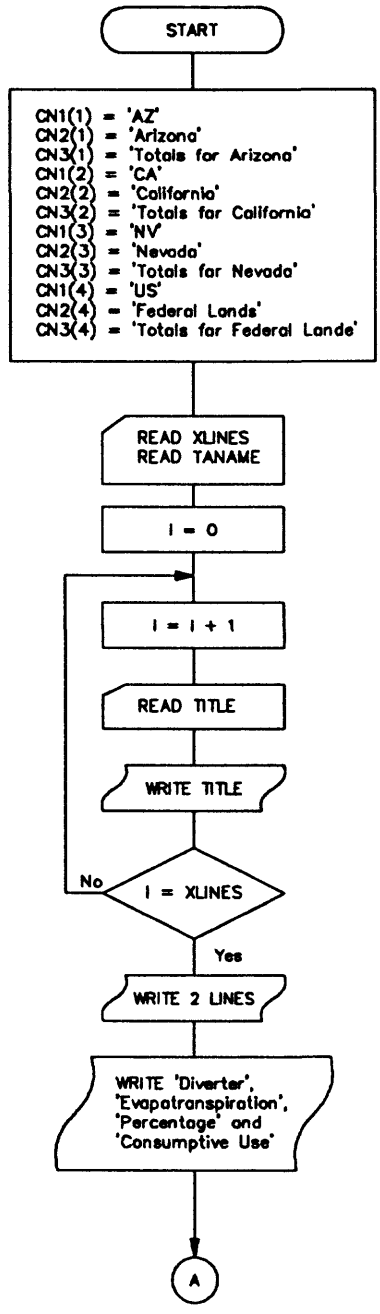
Write the title line to the output file

Repeat for all lines in the title

Leave 2 blank lines between the title and the table labels

Write the column headings for the table

Continued on next page



Lower Colorado River Accounting System

Subroutine TABLE4 — Continued

Set I = 0 for counter

Increment I by one

Check if diverter is flagged by an '*' in the third position for deletion

Decrease the number of diverters by one

Set J = 0 for counter

Increment J by one

Remove any diverter that is flagged with an '*' in the third column of the name by moving all diverters and associated data in the array up one slot

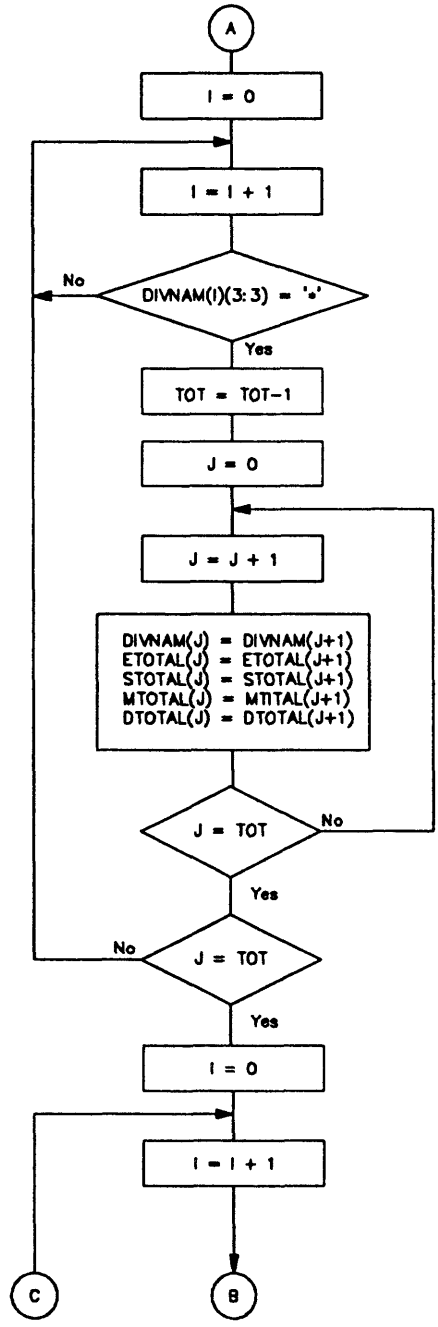
Repeat for all diverters

Repeat for all diverters

Set I = 0 for counter

Increment I by one

Continued on next page



Lower Colorado River Accounting System

Subroutine TABLE4 — Continued

Clear the TOTAL and PTOT arrays

Repeat for each State

Set RTOT to zero for the grand total variable

Set I = 0 for counter

Increment I by one

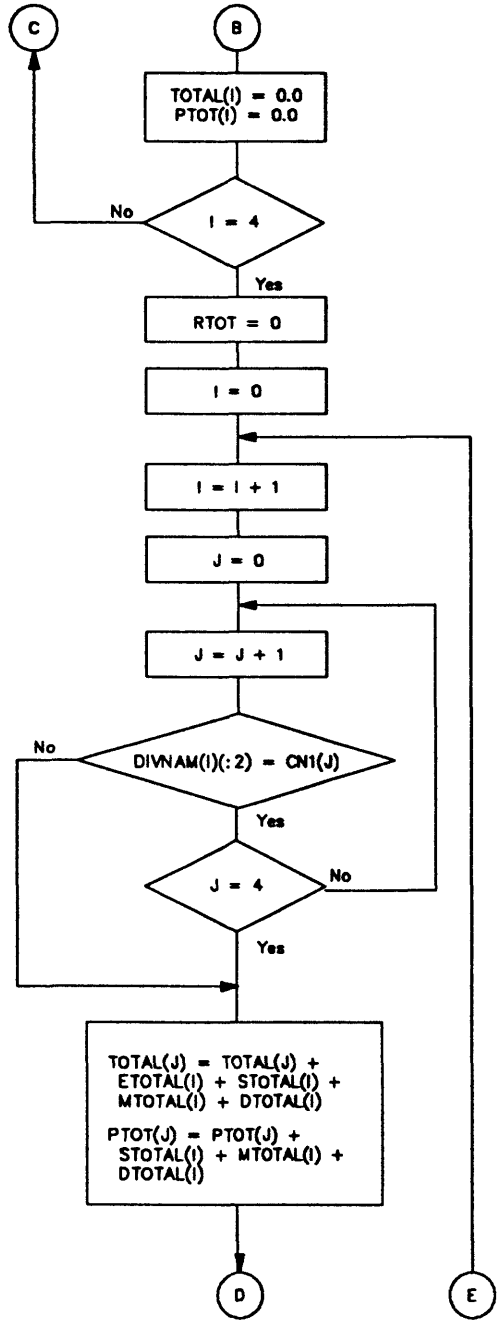
Set J = 0 for counter

Increment J by one

Check what State the current diverter is in

Repeat for each State

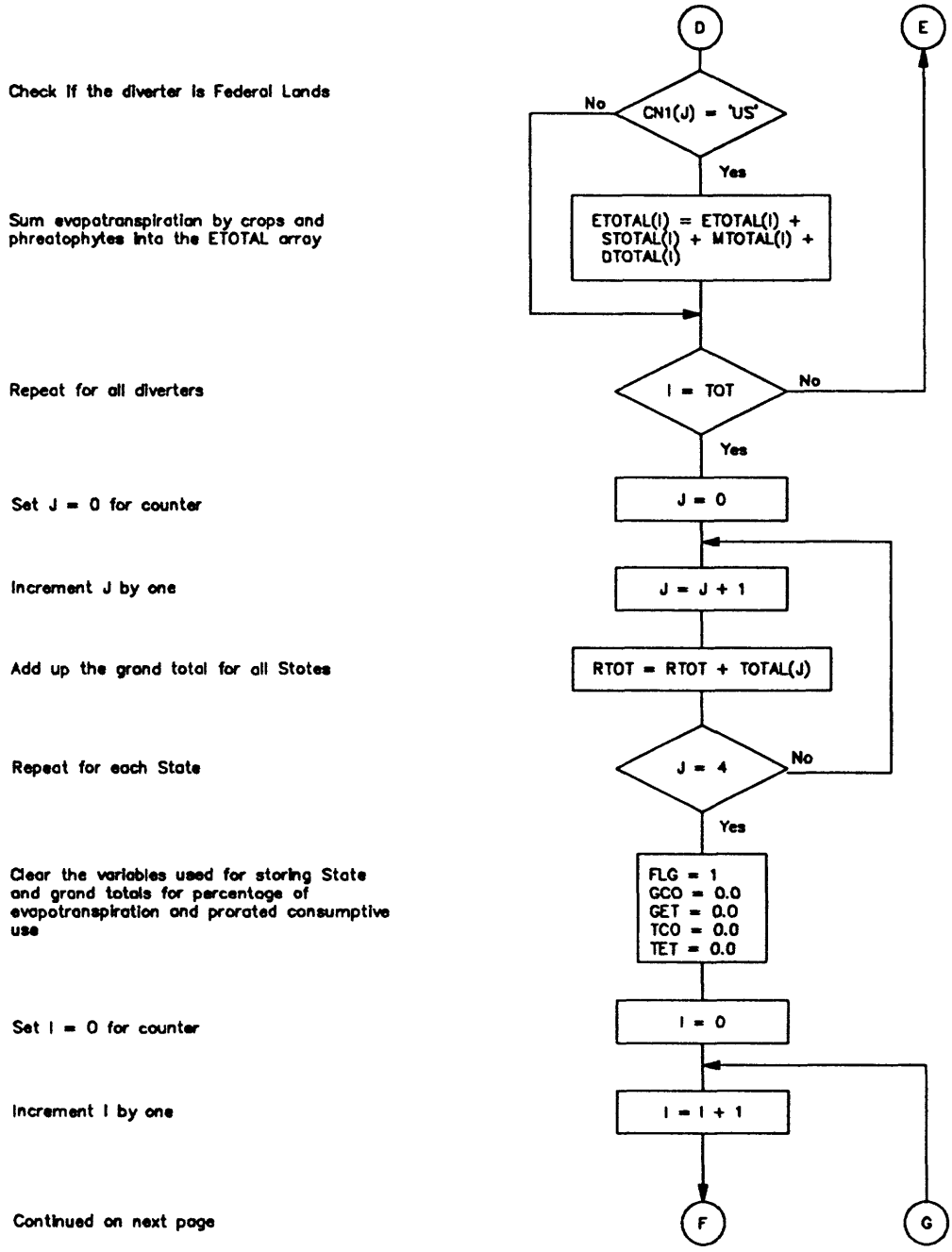
Add the total evapotranspiration for all vegetation types to the TOTAL array and only the totals for the phreatophytes to the PTOT array



Continued on next page

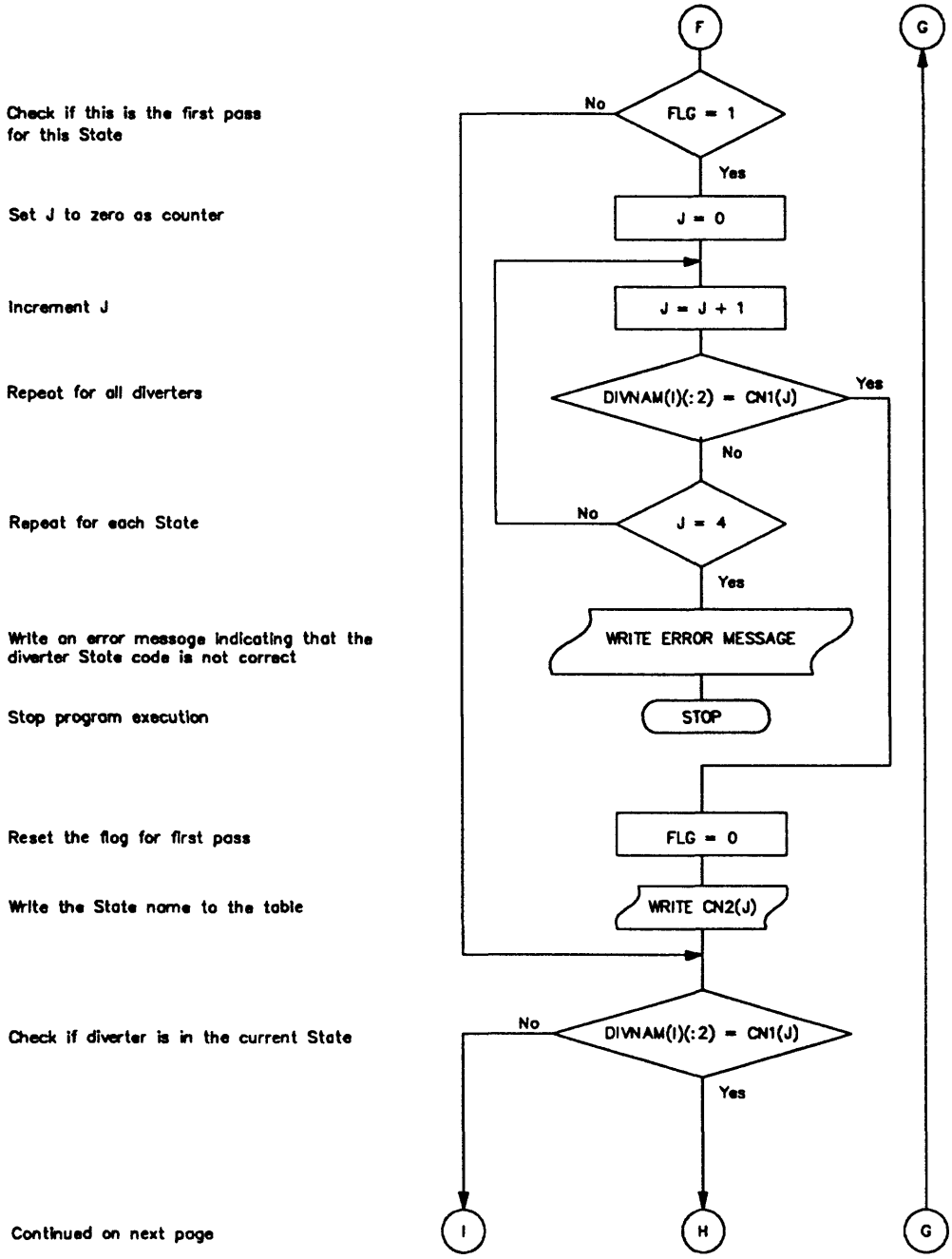
Lower Colorado River Accounting System

Subroutine TABLE4 — Continued



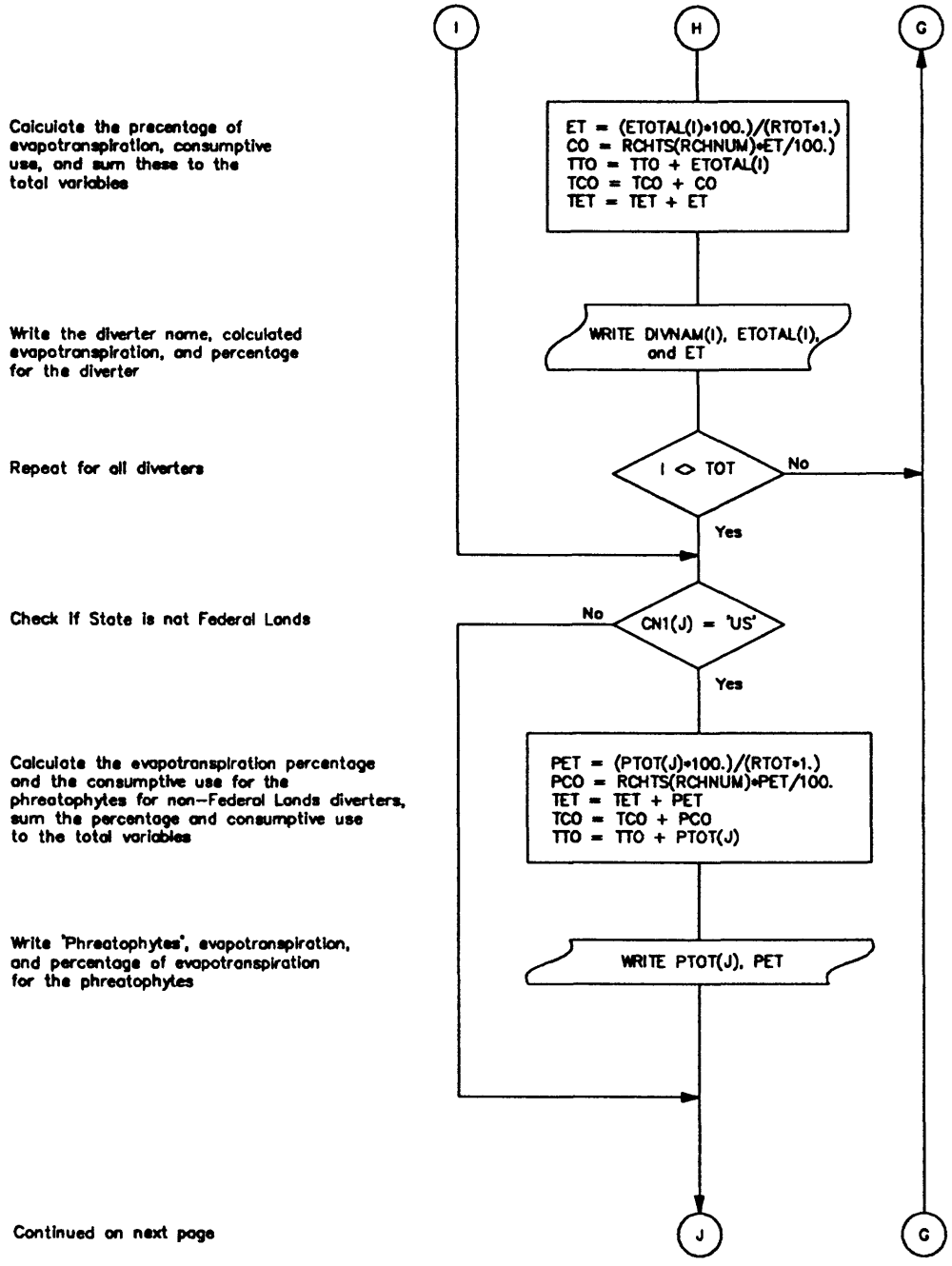
Lower Colorado River Accounting System

Subroutine TABLE4 — Continued



Lower Colorado River Accounting System

Subroutine TABLE4 — Continued



Lower Colorado River Accounting System

Subroutine TABLE4 — Continued

Write the totals heading, evapotranspiration, and percentage for the State

Sum the grand total variables and clear the State variable for the next State

Repeat if the flag is set to 2

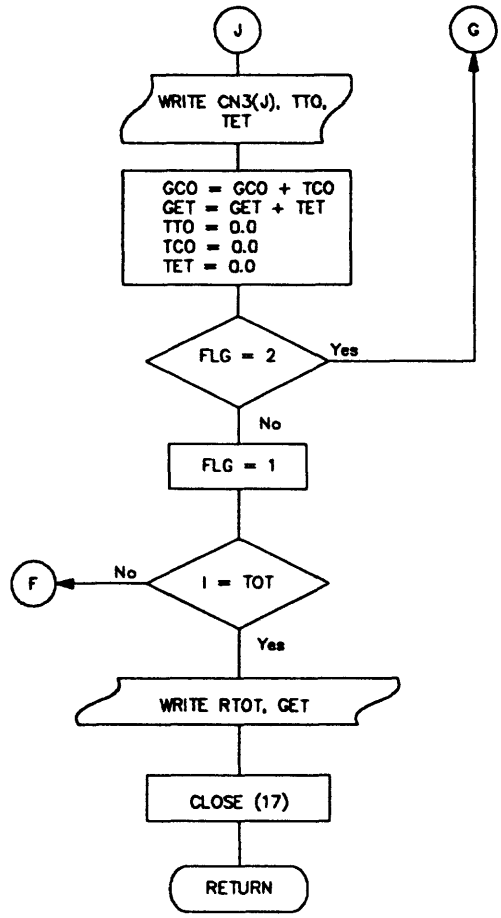
Set FLG = 1 for first pass test

Repeat for all diverters

Write the grand total label and grand totals for the evapotranspiration and percentage to the table

Close the table file

Return to the main program



Program Listing

```
      SUBROUTINE TABLE4
C
C       This subroutine reads the titles and the output file names
C       from the CONUSE.TIT file and creates an output table
C       consisting of the following:  a title, headings EVAPOTRANSPIRATION
C       and PERCENTAGE, the Arizona diverter's evapotranspiration and
C       percentage of evapotranspiration associated with the Bill Williams
C       River.  This is different than TABLE 2 in that it will not add
C       the diverters to the master diverter list.  This table included only
C       the output from the BWR subroutine.
C
      CHARACTER*100 TITLE(10)
      CHARACTER*40  DIVNAM(100),  FDNAME(250)
      CHARACTER*22  TANAME,       INFILE(10)
      CHARACTER*20  VEGNAM(50)
      CHARACTER*24  CN2(4),       CN3(4)
      CHARACTER*2   CN1(4)
      INTEGER*4     LOCLAT(10),   XLINES,       NUMVEG,      TOT,
     *              FLG,          YEAR,         NUMDIV(10),  RCHNUM,
     *              NUMSUB,       NUMMR,        SUBNUM,      FDNUM,
     *              ETOTAL(100),  CORVEG(10),   STOTAL(50),  TTO,
     *              MTOTAL(50),   DTOTAL(50),   GCO,         RTOT,
     *              PTO,          CO,           TOTAL(4),    PTOT(4),
     *              PCO,          TCO,          FDETOT(250)
      REAL*8        EVAPS(20),    FLOWS(30),    TRIBS(40),   DUS(20),
     *              AREAS(20),    GET,          ET,          PET,
     *              TET,          RCHTS(5)
C
      COMMON / VEGDAT / DIVNAM, VEGNAM, NUMVEG, NUMDIV, TOT
      COMMON / INDATA / FLOWS,  TRIBS,  AREAS,  EVAPS,  DUS,  RCHTS
      COMMON / BLCR1  / LOCLAT, ETOTAL, YEAR
      COMMON / PHRDAT / DTOTAL, MTOTAL, STOTAL
      COMMON / COUNTS / NUMSUB, NUMMR,  SUBNUM, RCHNUM, CORVEG
      COMMON / LUMP1  / INFILE
      COMMON / SUMMRY / FDNAME, FDETOT, FDNUM
C
C     Calculate and sum evapotranspiration and percentage of
C     evapotranspiration for Arizona diverters, including the
C     phreatophytes.
C
      CN1(1) = 'AZ'
      CN2(1) = 'Arizona                '
      CN3(1) = 'Totals for Arizona     '
      CN1(2) = 'CA'
      CN2(2) = 'California             '
      CN3(2) = 'Totals for California  '
      CN1(3) = 'NV'
      CN2(3) = 'Nevada                 '
      CN3(3) = 'Totals for Nevada      '
      CN1(4) = 'US'
      CN2(4) = 'Federal Lands          '
      CN3(4) = 'Totals for Federal Lands'
C
C     Read the titles from the input file and write to the output file.
C
      READ (62,'(I2,A22)',ERR= 80) XLINES, TANAME
      OPEN (17, FILE= TANAME, ERR=400)
      DO 45 I=1, XLINES
        READ (62,'(A100)',    ERR= 80) TITLE(I)
        WRITE (17,'(5X,A100)',ERR=400) TITLE(I)
   45 CONTINUE
      WRITE (17,600)
      WRITE (17,600)
  600 FORMAT (2X)
      WRITE (17,100,ERR=80)
  100 FORMAT ('Diverter',21X,'Evapotranspiration',7X,
     *        'Percentage',4X,'Consumptive use')
      WRITE (17,600)
C
C     Remove any diverter that is flagged with an '*' in the third
C     column.
C
      DO 666 I=1,TOT
        IF (DIVNAM(I)(3:3) .EQ. '*') THEN
```

```
          TOT = TOT-1
          DO 667 J=I,TOT
            DIVNAM(J) = DIVNAM(J+1)
            ETOTAL(J) = ETOTAL(J+1)
            STOTAL(J) = STOTAL(J+1)
            MTOTAL(J) = MTOTAL(J+1)
            DTOTAL(J) = DTOTAL(J+1)
  667     CONTINUE
        END IF
  666 CONTINUE
C
C     Clear the TOTAL and PTOT arrays for calculations.
C
      DO 5 J=1,4
        TOTAL(J) = 0.0
        PTOT(J)  = 0.0
    5 CONTINUE
      RTOT = 0
C
C     Sum evapotranspiration for each diverter for each State
C     and sum a grand total for the reach.
C
      DO 10 I=1,TOT
        DO 15 J=1,4
          IF (DIVNAM(I)(:2) .EQ. CN1(J)) GOTO 16
   15   CONTINUE
   16   TOTAL(J) = TOTAL(J)+ ETOTAL(I)+ STOTAL(I)+ MTOTAL(I)+DTOTAL(I)
        PTOT(J)  = PTOT(J) + STOTAL(I) + MTOTAL(I) + DTOTAL(I)
        IF (CN1(J) .EQ. 'US') THEN
          ETOTAL(I) = ETOTAL(I) + STOTAL(I) + MTOTAL(I) + DTOTAL(I)
        END IF
   10 CONTINUE
C
      DO 20 J=1,4
        RTOT = TOTAL(J) + RTOT
   20 CONTINUE
C
      FLG = 1
      GCO = 0.0
      GET = 0.0
      TCO = 0.0
      TET = 0.0
C
      DO 250 I = 1, TOT
   24   IF (FLG .EQ. 1) THEN
          DO 25 J=1,4
            IF (DIVNAM(I)(:2) .EQ. CN1(J)) GOTO 26
   25     CONTINUE
          WRITE (*,29)
   29     FORMAT (2X,'I CAN NOT MATCH THE DIVERTER STATE')
          STOP
   26     FLG = 0
          WRITE (17,106,ERR=80) CN2(J)
  106     FORMAT (2X,A24,/)
        END IF
C
C       Calculate the percentage of evapotranspiration for
C       each diverter and sums for each State.
C
        IF (DIVNAM(I)(:2) .EQ. CN1(J)) THEN
          ET  = (ETOTAL(I)*100.)/(RTOT*1.)
          CO  = RCHTS(RCHNUM) * ET / 100.
          TTO = TTO + ETOTAL(I)
          TCO = TCO + CO
          TET = TET + ET
          WRITE (17, 70, ERR=80) DIVNAM(I), ETOTAL(I), ET, CO
   70     FORMAT (4X,A20,9X,I12,9X,F8.2,7X,I12)
          IF (I .NE. TOT) GOTO 250
          IF (I .EQ. TOT) FLG = 2
        END IF
C
        IF (CN1(J) .NE. 'US') THEN
          PET = (PTOT(J)*100.)/(RTOT*1.)
          PCO = RCHTS(RCHNUM) * PET / 100.
          TET = TET + PET
          TCO = TCO + PCO
          TTO = TTO + PTOT(J)
          WRITE  (17,470, ERR=402) PTOT(J), PET, PCO
```

```
  470     FORMAT (4X,'PHREATOPHYTES',16X,I12,F17.2,I19)
        END IF
        WRITE  (17,471, ERR=402) CN3(J), TTO, TET, TCO
  471   FORMAT (1X,/,2X,A24,3X,I16,F17.2,I19,//)
C
        GCO = GCO + TCO
        GET = GET + TET
        TTO = 0.0
        TCO = 0.0
        TET = 0.0
        IF (FLG .EQ. 2) GOTO 250
        FLG = 1
        GOTO 24
  250 CONTINUE
      WRITE (17,75,ERR=80) RTOT, GET, GCO
   75 FORMAT ('Reach totals',21X,I12,11X,F6.2,7X,I12)
      WRITE (17,600)
      IRCHTS = INT(RCHTS(RCHNUM))
      WRITE (17,450) IRCHTS
  450 FORMAT ('Water-Budget Estimate  ',43X,I15)
      CLOSE (17)
      RETURN
C
C     Error messages.
C
  200 WRITE (*,201)
  201 FORMAT (//,20X,'ERROR - Reading input files')
      STOP
   80 WRITE(*,81)
   81 FORMAT (//,20X,'ERROR - Reading TANAME')
      STOP
  400 WRITE(*,401)
  401 FORMAT (//,20X,'ERROR - Writing TANAME')
      STOP
   90 WRITE (*,91)
   91 FORMAT (//,20X,'ERROR - Writing VEGNAM(K,J), ETUSED(K,I,J)')
      STOP
  402 WRITE  (*,403)
  403 FORMAT (//,20X,'ERROR - WRITING TO TABLE 2')
      STOP
      END
```


PAGE 23-1 FOLLOWS

SELECTED REFERENCES

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U.S. Bureau of Reclamation, 1987, Compilation of records in accordance with Article V of the Decree of the Supreme Court of the United States in Arizona vs. California dated March 9, 1964, calendar year 1985: U.S. Bureau of Reclamation duplicated report, 37 p.

U.S. Supreme Court, 1964, State of Arizona, plaintiff v. State of California, et al., defendants: Decree--March 9, 1964, no. 8, original, 14 p.

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FOLLOWS

ATTACHMENTS

```
        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345
 1 o FLOW84.DAT                (Flow data file)                                                  o
 2   TRIB.DAT                  (Tributary inflow data file)
 3 o DU84.DAT                  (Domestic-use data file)                                          o
 4   AREA84.DAT                (Open-water surface area & evaporation-rates data file)
 5 o KC.DAT                    (Empirical water-use coefficients data file)                      o
 6   LIGHT.DAT                 (Daylight data file name)
 7 o AREAS84.TIT               (Title data file for TABLE1 subroutine)                           o
 8   CONUSE84.TIT              (Title data file for TABLE2 and TABLE4 subroutines)
 9 o RATES84.TIT               (Title data file for TABLE3 subroutine)                           o
10   DU84.OUT                  (File name for domestic-use output file)
11 o BUD84.OUT                 (File name for water-budget output file)                          o
12   1984                      (Calendar year to run LCRAS)
13 o 4                         (Number of major reaches)                                         o
14   HV2DV                     (First reach subroutine name)
15 o 1                         (Number of subreaches in the reach)                               o
16   HOOV2DAV.DAT              (Image-classification data file)
17 o 36                        (Latitude for the subreach)                                       o
18   WILLOW-B.TMP              (Temperature file for the subreach)
19 o WILLOW-B.PPT              (Precipitation file for the subreach)                             o
20   DV2PK                     (Second reach subroutine name)
21 o 1                         (Number of subreaches in the reach)                               o
22   BILLWR.DAT                (Image-classification data file)
23 o 36                        (Latitude for subreach)                                           o
24   PARKER.TMP                (Temperature file for the subreach)
25 o PARKER.PPT                (Precipitation file for the subreach)                             o
26   3                         (Third reach subroutine name)
27 o DAV2PARK.PHR              (Image-classification data file for the 1st subreach)             o
28   36                        (Latitude of the 1st subreach)
29 o BULLCITY.TMP              (Temperature file for the 1st subreach)                           o
30   BULLCITY.PPT              (Precipitation file for the 1st subreach)
31 o DAV2PARK.DAT              (Image-classification data file for the 2nd subreach)             o
32   36                        (Latitude of the 2nd subreach)
33 o BULLCITY.TMP              (Temperature file for the 2nd subreach)                           o
34   BULLCITY.PPT              (Precipitation file for the 2nd subreach)
35 o HAV2PARK.DAT              (Image-classification data file for the 3rd subreach)             o
36   36                        (Latitude for the 3rd subreach)
37 o BULLCITY.TMP              (Temperature file for the 3rd subreach)                           o
38   BULLCITY.PPT              (Precipitation file for the 3rd subreach)
39 o PK2IP                     (.....                                                            o
40   5
41 o PARK2IMP.DAT                                                                               o
42   34
43 o PARKER.TMP                                                                                 o
44   PARKER.PPT
45 o PARK2IMP.PHR                                                                               o
46   34
47 o PARKER.TMP                                                                                 o
48   PARKER.PPT
49 o PV2IMP.DAT                                                                                 o
50   34
51 o BLYTHE.TMP                                                                                 o
52   BLYTHE.PPT
53 o PV2IMP.PHR                                                                                 o
54   34
55 o BLYTHE.TMP                                                                                 o
56   BLYTHE.PPT
57 o YUM2IMP.DAT                                                                                o
58   34
59 o BLYTHE.TMP                                                                                 o
60   BLYTHE.PPT
61 o IP2ML                                                                                      o
62   3
63 o IMP2MORL.DAT                                                                               o
64   32
65 o YUMA.TMP                                                                                   o
66   YUMA.PPT
67 o IMP2MORL.PHR                                                                               o
68   32
69 o YUMA.TMP                                                                                   o
70   YUMA.PPT
71 o SOUTHYUM.DAT                                                                               o
72   32
73 o YUMA.TMP                                                                                   o
74   YUMA.PPT                        .....)
75 o                                                                                            o
```

A. Example of the primary data file.

```
        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345

      GAGED FLOWS FOR EACH REACH

CALENDAR YEAR:  1984

                                          Flow, in      Station      LCRAS
                                          acre-feet      Number      Variable

Hoover Dam to Davis Dam
Colorado River below Hoover Dam            21861000     09421500    FLOWS(1)
  Change in storage Lake Mohave             -150000     09422500    FLOWS(2)

Davis Dam to Parker Dam
Colorado River below Davis Dam             21658000     09423000    FLOWS(3)
  Colorado River Aqueduct                   1237230     09424150    FLOWS(4)
  Bill Williams River below Alamo Dam        111800     09426000    FLOWS(5)
  Central Arizona Project Canal                   0     09426650    FLOWS(6)
  Change in storage Lake Havasu              53100     09427500    FLOWS(7)

Parker Dam to Imperial Dam
Colorado River below Parker Dam            20464000     09427520    FLOWS(8)
  Change in storage Senator Wash               652     *           FLOWS(9)
Colorado River above Imperial Dam          19106000     09429490    FLOWS(10)

Imperial Dam to Morelos Dam
  Diversion to Mittry Lake                     9790     09522400    FLOWS(11)
  All American Canal                        8269000     09523000    FLOWS(12)
  All American Canal below Pilot Knob       3046000     09527500    FLOWS(13)
  Gila Gravity Main Canal                    754800     09522500    FLOWS(14)
  Wellton-Mohawk Canal                       391400     09522700    FLOWS(15)
Colorado River below Imperial Dam          10080000     09429500    FLOWS(16)
  Gila River near Dome                       266000     09520500    FLOWS(17)
Colorado River at NIB                      15431000     09522000    FLOWS(18)
  Eleven Mile wasteway                         1530     09525000    FLOWS(19)
  Copper wasteway                               721     09531850    FLOWS(20)
  Twenty-One Mile wasteway                        0     09533000    FLOWS(21)
  Main drain                                 99380     09534000    FLOWS(22)
  West Main Canal wasteway                        0     09534300    FLOWS(23)
  East Main Canal wasteway                     4090     09534500    FLOWS(24)

*  Added to Colorado River above Imperial Dam table in the annual report.
```

B. Example of the flow data file.

```
        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345
```

```
      UNMEASURED TRIBUTARY INFLOW ESTIMATES

CALENDAR YEAR:  1984                          Flow, in      LCRAS
                                              acre-feet     Variable
Hoover Dam to Davis Dam
  Springs                                        3080  E    TRIB(1)
  Unmeasured runoff                              2100  E    TRIB(2)
  Ground-water discharge                          200  E    TRIB(3)
    Eldorado Valley                              1100  E    TRIB(4)

Davis Dam to Parker Dam
  Unmeasured runoff
    Davis Dam to Topock                         12000  E    TRIB(5)
    Topock to Parker Dam                        15000  E    TRIB(6)
    Whipple Mountains                            1150  E    TRIB(7)
  Unmeasured runoff from tributary streams
    Piute Wash                                   1000  E    TRIB(8)
    Sacramento Wash                              2500  E    TRIB(9)
    Bill Williams River subarea                  4000  E    TRIB(10)
  Ground-water discharge
    Davis Dam to Topock                             0  E    TRIB(11)
    Topock to Parker Dam                          880  E    TRIB(12)
    Piute Valley                                 2300  E    TRIB(13)
    Sacramento Valley                           10000  E    TRIB(14)
    Chemehuevi Valley                             260  E    TRIB(15)
    Bill Williams River subarea                  4000  E    TRIB(16)

Parker Dam to Imperial Dam
  Unmeaaured runoff
    Whipple Mountains                            1150  E    TRIB(17)
    Big Marie-Riverside Mountains                2300  E    TRIB(18)
    Palo Verde-Mule Mountains                    1200  E    TRIB(19)
    Dome Rock-Trigo-Chocolate Mountains         16200  E    TRIB(20)
  Unmeasured runoff in tributary streams
    Vidal Wash                                   1300  E    TRIB(21)
    Bouse Wash                                   4800  E    TRIB(22)
    Tyson Wash                                   2600  E    TRIB(23)
    McCoy Wash                                    800  E    TRIB(24)
    Milpitas Wash                                1200  E    TRIB(25)
  Ground-water discharge
    Bouse Wash                                   1200  E    TRIB(26)
    Tyson Wash                                    350  E    TRIB(27)
    Vidal Wash                                    250  E    TRIB(28)
    Chuckwalla Valley                             400  E    TRIB(29)

Imperial Dam to Morelos Dam
  Ground-water discharge
    Gila River                                   1000  E    TRIB(30)
  Unmeasured runoff from Yuma area               2000  E    TRIB(31)
```

C. Example of the tributary-inflow data file.

```
                1         2         3         4         5         6         7         8
       12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345
 1   o DOMESTIC- AND MUNICIPAL-USE DATA FILE--Calendar Year:  1984                                      o
 2     Data Column 1:  Pumpage, in acre-feet, with no returns to the river
 3   o Data Column 2:  Resident population                                                              o
 4     Data Column 3:  Resident per capita water use, in acre-feet
 5   o HOOVER TO DAVIS                                                                                  o
 6       Willow Beach                 90          0    .00      AZ
 7   o   Cottonwood Cove             439          0    .00      NV                                     o
 8       Katherine                   370          0    .00      AZ
 9   o   Diversion - Davis Dam        142          0    .00      AZ                                     o
10       L.C.R.D. Project             60          0    .00      AZ
11   o DAVIS TO PARKER                                                                                  o
12       Bullhead City-Riviera         0      15895    .03      AZ
13   o   Bermuda City                  0        500    .03      AZ                                     o
14       Laughlin                      0         95    .30      NV
15   o   Mohave Steam Plant        14198          0    .00      NV                                     o
16       Golden Shores                 0        650    .03      AZ
17   o   Topock                        0         25    .03      AZ                                     o
18       Lake Havasu City              0      17645    .03      AZ
19   o   Needles                       0       5100    .39      CA                                     o
20       Havasu Lake                   0          0    .00      CA
21   o   Mojave Water Cons Dis       108          0    .00      AZ                                     o
22       Lake Havasu I&D Dis        9085          0    .00      AZ
23   o   Consol Water Util Ltd       291          0    .00      AZ                                     o
24       San Bernardino Co.           15          0    .00      CA
25   o   Clark Co Parks & Rec          6          0    .00      NV                                     o
26       Portenier, Warren E.         42          0    .00      NV
27   o PARKER TO IMPERIAL                                                                               o
28       Parker (Town)                 0       2530    .13      AZ
29   o   Poston                        0        260    .03      AZ                                     o
30       Ehrenberg                     0       1204    .03      AZ
31   o   Cibola                        0        293    .03      AZ                                     o
32       Martinez Lake                 0         10    .03      AZ
33   o   Earp                          0       1500    .75      CA                                     o
34       Parker Dam/Govt Camp          0        136    .88      CA
35   o   Vidal                         0         36    .07      CA                                     o
36       Blythe (City)                 0       7512    .29      CA
37   o   East Blythe                   0       1940    .25      CA                                     o
38       Ripley                        0        450    .16      CA
39   o   Palo Verde                    0        332    .07      CA                                     o
40       Big River                   890          0    .00      CA
41   o   BLM Permittees              206          0    .00      CA                                     o
42     IMPERIAL TO MORELOS
43   o   Yuma (City)                   0      45960    .09      AZ                                     o
44       Yuma (County)                 0      19406    .03      AZ
45   o   Yuma Proving Ground           0       1100    .03      AZ                                     o
46       Bard                          0       1532    .06      CA
47   o   Winterhaven                   0        896    .09      CA                                     o
48       Marine Corps Air Sta       1775          0    .00      AZ
49   o   S. Pacific Co.               48          0    .00      AZ                                     o
50       Yuma Co.                     12          0    .00      AZ
51   o   Yuma Mesa Fruit Grow         12          0    .00      AZ                                     o
52       Yuma Union HS               200          0    .00      AZ
53   o MORELOS TO SIB                                                                                   o
54       Somerton                      0       4320    .03      AZ
55   o   Gadsden                       0          0    .00      AZ                                     o
56       San Luis                      0       2575    .03      AZ
57   o                                                                                                  o
58
59   o                                                                                                  o
60
61   o                                                                                                  o
62
63   o                                                                                                  o
64
65   o                                                                                                  o
66
67   o                                                                                                  o
68
69   o                                                                                                  o
70
71   o                                                                                                  o
72
73   o                                                                                                  o
74
75   o                                                                                                  o
```

D. Example of the domestic-use data file.

```
      OPEN-WATER SURFACE AREAS AND EVAPORATION RATES FOR EACH REACH

CALENDAR YEAR:     1984

Surface Areas
  HV.DV                                25419.38  acres   AREAS(1)
  DV.PK                                21961.86  acres   AREAS(2)
  PK.IP                                10262.38  acres   AREAS(3)
  IP.ML                                 1385.66  acres   AREAS(4)
  BWR                                    576.00  acres   AREAS(5)
  Senator Wash                             0.00  acres   AREAS(6)

Evaporation Rates
  HV.DV                                    5.85  feet    EVAPS(1)
  DV.PK                                    5.91  feet    EVAPS(2)
  PK.IP                                    5.68  feet    EVAPS(3)
  IP.ML                                    5.20  feet    EVAPS(4)
  BWR                                      5.00  feet    EVAPS(5)

Area of Open Water
  HV.DV                                25419.38  feet    OPNWTR(1)
  DV.PK                                21961.86  feet    OPNWTR(2)
  PK.IP                                10262.38  feet    OPNWTR(3)
  IP.ML                                 1385.66  feet    OPNWTR(4)
```

E. Example of the open-water surface areas and evaporation-rates data file.

```
          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345
SUBREACH          : MOJAVE              (Subreach name)
NUMBER OF CLASSES : 24                  (Number of classes from the image)
VEGETATION TYPES  :  6                  (Number of different vegetation types)
ALFALFA             3                   (First vegetation name, number of classes)
7,16,18                                 (Class numbers for the 1st vegetation type)
COTTON              2                   (Second vegetation name, number of classes)
8,10                                    (Class numbers for the 2nd vegetation type)
WHEAT               1                   (.....
17
DENSE               0
0
MEDIUM              1
24
SPARSE              3
3,11,15                                 .....)
                                        (Required 2 blank lines before each
                                         diverter name)
AZ PORT MOJAVE IR                       (Diverter name)
                                        (Required blank line after name)
CLASS #           ACREAGE               (Title line)
 1                7357.42               (Class one, acreage for class one)
 2                1026.09               (Class two, acreage for class two)
 3                 201.99               (Class three, acreage for class three)
 4                 470.75               (.....
 5                 328.64
 6                1515.34
 7                2015.73
 8                 671.51
 9                  63.01
10                3157.94
11                 532.53
12                1100.21
13                1048.96
14                1699.42
15                2822.51
16                2804.58
17                 221.77
18                1052.67
19                 544.26
20                  18.54
21                  16.69
22                   8.65
23                   1.86
24                    .00               .....)
                                        (Required 2 blank lines before each
                                         diverter name)
CA PORT MOJAVE IR                       (Second diverter name)
                                        (Required blank line after name)
CLASS #           ACREAGE               (Title line)
 1                 216.21               (Class one, acreage for class one)
 2                  33.98               (Class two, acreage for class two)
 3                  27.18               (Class three, acreage for class three)
 4                  15.45               (.....
 5                  46.33
 6                   2.47
 7                 142.09
 8                  17.91
 9                    .00
10                   1.24
11                  82.78
12                  61.77
13                  69.81
14                  92.66
15                 158.14
16                1069.32
17                 345.94
18                 537.44
19                  35.83
20                    .62
21                    .00
22                    .00
23                    .00
24                    .00               .....)
                                        (Required 2 blank lines before each
                                         diverter name)
```

F. Example of an image-processing data file.

```
          1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345
 76 o NV FORT MOJAVE IR                          (Third diverter name)                          o
 77                                              (Required blank line after name)
 78 o CLASS #              ACREAGE               (Title line)                                   o
 79    1                    736.36               (Class one, acreage for class one)
 80 o  2                    502.84               (Class two, acreage for class two)             o
 81    3                     40.15               (Class three, acreage for class three)
 82 o  4                    110.58               (.....                                         o
 83    5                    406.48
 84 o  6                      8.65                                                              o
 85    7                    134.67
 86 o  8                     25.94                                                              o
 87    9                       .00
 88 o 10                       .00                                                            o
 89   11                     16.68
 90 o 12                    271.20                                                            o
 91   13                    494.82
 92 o 14                    695.58                                                            o
 93   15                    430.57
 94 o 16                     16.06                                                            o
 95   17                       .00
 96 o 18                       .00                                                            o
 97   19                    132.20
 98 o 20                       .00                                                            o
 99   21                       .00
100 o 22                       .00                                                            o
101   23                       .00
102 o 24                       .00               .....)                                       o
103                                              (Required 2 blank lines before each
104 o                                             diverter name)                                o
105   AZ STATE OF AZ                             (Fourth diverter name)
106 o                                            (Required blank line after name)             o
107   CLASS #              ACREAGE               (Title line)
108 o  1                   3520.56               (Class one, acreage for class one)           o
109    2                   1189.20               (Class two, acreage for class two)
110 o  3                    238.44               (Class three, acreage for class three)       o
111    4                    427.49               (.....
112 o  5                    730.79                                                            o
113    6                    347.19
114 o  7                   1734.65                                                           o
115    8                    369.44
116 o  9                     33.36                                                           o
117   10                    745.00
118 o 11                    619.62                                                          o
119   12                    954.45
120 o 13                   1406.62                                                          o
121   14                   2265.90
122 o 15                   2608.14                                                          o
123   16                   1910.68
124 o 17                    156.92                                                          o
125   18                    610.96
126 o 19                    583.17                                                          o
127   20                     12.99
128 o 21                     15.45                                                         o
129   22                      3.71
130 o 23                       .00                                                         o
131   24                       .00               .....)
132 o                                            (Required 2 blank lines before each          o
133                                               diverter name)
134 o CA STATE OF CA                             (Fifth diverter name)                        o
135                                              (Required blank line after name)
136 o CLASS #              ACREAGE               (Title line)                                 o
137    1                   1087.23               (Class one, acreage for class one)
138 o  2                    160.01               (Class two, acreage for class two)           o
139    3                     27.18               (Class three, acreage for class three)
140 o  4                    163.09               (.....                                       o
141    5                    160.63
142 o  6                     88.35                                                           o
143    7                    677.06
144 o  8                    130.34                                                          o
145    9                     11.74
146 o 10                    140.23                                                          o
147   11                    176.06
148 o 12                    319.38                                                          o
149   13                    221.77
150 o 14                    540.54                                                          o
```

F. Example of an image-processing data file—Continued.

```
                1         2         3         4         5         6         7         8
       12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345
151    15                    867.32
152    16                    932.18
153    17                    557.21
154    18                    383.63
155    19                    162.47
156    20                      2.47
157    21                      6.18
158    22                      3.71
159    23                      1.24
160    24                       .00              .....)
161                                              (Required 2 blank lines before each
162                                               diverter name)
163    NV STATE OF NV                            (Sixth diverter name)
164                                              (Required blank line after name)
165    CLASS #              ACREAGE              (Title line)
166     1                  1918.11              (Class one, acreage for class one)
167     2                   701.76              (Class two, acreage for class two)
168     3                   295.29              (Class three, acreage for class three)
169     4                   261.92              (.....
170     5                   234.13
171     6                    88.33
172     7                     0.00
173     8                     0.00
174     9                     9.88
175    10                     0.00
176    11                    27.18
177    12                   358.30
178    13                   781.46
179    14                   859.29
180    15                   560.30
181    16                   418.23
182    17                     0.00
183    18                     0.00
184    19                   135.29
185    20                     3.71
186    21                     5.57
187    22                     1.86
188    23                      .00
189    24                   468.19              .....)
190
191
192
193
194
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```

F. Example of an image-processing data file—Continued.

```
      1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345
 1 o 02019376    WILLOW BEACH, AZ, Mean monthly temperatures, in 1/10ths degrees Fahrenheit      o
 2   1967                                                  772  645  485
 3 o 1968  514  618  648  691  802  910  957  909  872  747  621  486                           o
 4   1969  547  534  608  724  830  887  964  995  898  711  622  548
 5 o 1970  519  596  626  667  820  901  968  959  845  719  623  511                           o
 6   1971  508  569  632  705  754  890  978  950  844  693  570  474
 7 o 1972  478  570  690  697  800  905  983  929  839  694  559  470                           o
 8   1973  471  540  567  684  828  913  974  942  845  730  591  519
 9 o 1974  475  539  650  693  831  937  954  920  882  754  600  486                           o
10   1975  494  541  593  649  789  899  968  923  868  714  577  513
11 o 1976  515  583  606  680  822  886  963  908  832  696  000  000                           o
12   1977  488  569  576  727  735  915  965  946  852  746  601  552
13 o 1978  514  552  629  684  779  911  956  920  820  755  561  448                           o
14   1979  440  505  593  691  796  878  921  886  891  761  573  518
15 o 1980  526  577  595  696  751  864  947  916  844  729  607  566                           o
16   1981  552  574  611  751  793  922  975  948  870  714  635  543
17 o 1982  507  563  606  695  795  873  923  929  844  697  577  504  709                     o
18   1983  519  570  620  651  783  869  919  882  865  723  606  531  712
19 o 1984  516  546  629  675  837  876  925  898  871  690  586  490  712                     o
20   1985  496  516  599  733  811  898  935  904  811  719  570  520  709
21 o 1986  551  587       717  811  916  917  961  804  717  629  533                          o
22   1987  500  578  608  744  802  897  908  931  865  772  600  480  724
23 o                                                                                          o
24
25 o                                                                                          o
26
27 o                                                                                          o
28
29 o                                                                                          o
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31 o                                                                                          o
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33 o                                                                                          o
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35 o                                                                                          o
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37 o                                                                                          o
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39 o                                                                                          o
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41 o                                                                                          o
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43 o                                                                                          o
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51 o                                                                                          o
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53 o                                                                                          o
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55 o                                                                                          o
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57 o                                                                                          o
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71 o                                                                                          o
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73 o                                                                                          o
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75 o                                                                                          o
```

G. Example of a temperature data file.

```
        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345

 1  02019376    WILLOW BEACH, AZ, Monthly precipitation, in 1/100ths inches
 2  1967                                                 0000000173000 77
 3  1968000010003500030000040000100012000330002000007000200001400000
 4  1969001350009700033000010003800014000330000100006000120001000000
 5  1970000050002700085000000000000001000290016600000000000005000020
 6  1971000030002900020000200055000000000200095000000001500006000 42
 7  1972000000000000000000160000700004000270006100022000500015100026
 8  1973  058  045  229  011  030  067  000  005  000  000  045    0
 9  1974  098  001  050  000    0  000  006  028    0  138  041  049
10  1975  002  010  114  071  031  000  033  101  074  021  012  002
11  1976  000  133  011  025  039  000  104  000  342  148  013  005
12  1977  026  000  106    0  088  005  032  100  196  025  006  073
13  1978  147  098  173  108  045  000    0  154  088  066  144  096
14  1979  180  065  205  000  016  008  061  008    0  016  025  079
15  1980  149  314  109    1   22    0   97   11   83   13    0    0
16  1981   52   32  126    0   56    0    0  141  232   31   30    0
17  1982   75   97  106   11   23    0    5  193    6   19   49   87  671
18  1983   42   26   71   47    0    0    1  199   42   85   10   51  573
19  1984    0    0    5    0    0    2  183  185   75   27   76  293  846
20  1985   80   18    4   17    0    2  110    0    6   10   75    5  327
21  1986   35   19         0    4    3   24    0    7   15   27  101
22  1987   83   32   21   30   37   15    9    0    0  147   82   75  531
23  1988   55   56    0  102    3
24
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```

H. Example of a precipitation data file.

EMPIRICAL WATER-USE COEFFICIENTS

CROP	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
COTTON	0.00	0.00	0.00	0.09	0.27	0.60	1.20	1.40	1.11	0.60	0.27	0.00
ALFALFA	0.00	0.92	1.21	1.25	1.36	1.36	1.22	1.10	1.33	0.95	0.80	0.00
BERMUDA	0.00	0.00	0.00	0.66	0.79	1.06	1.17	1.10	0.89	0.71	0.00	0.00
SORGHUM	0.00	0.00	0.00	0.00	0.00	0.00	0.44	1.48	1.05	0.35	0.00	0.00
COTTON	0.00	0.00	0.00	0.09	0.27	0.60	1.20	1.40	1.11	0.60	0.27	0.00
WHEAT	0.43	0.80	1.63	1.63	0.42	0.00	0.00	0.00	0.00	0.00	0.04	0.30
CITRUS	0.39	0.48	0.41	0.46	0.47	0.55	0.58	0.63	0.64	0.63	0.59	0.40
BROCCOLI	1.02	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.74	1.19	0.99
MELONS	0.00	0.00	0.00	0.12	0.51	1.42	0.63	0.00	0.00	0.00	0.00	0.00
CAULIFLOWER	0.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.66	1.33	0.78
FALL LETTUCE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.35	0.67	0.94
SAFFLOWER	0.14	0.33	0.80	1.92	1.49	1.56	0.34	0.00	0.00	0.00	0.00	0.00
SPRING LETTUCE	0.04	0.35	0.67	0.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DRY ONIONS	0.34	0.56	1.23	1.72	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MILO	0.00	0.00	0.00	0.00	0.00	0.00	0.44	1.48	1.10	0.34	0.00	0.00
CORN	0.07	0.44	1.50	1.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DATES	5.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOMATOES	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MEDIUM	0.00	0.71	0.93	0.96	1.05	1.05	1.05	1.04	1.02	0.73	0.62	0.00
SPARSE	0.00	0.57	0.74	0.77	0.84	0.84	0.84	0.83	0.82	0.58	0.49	0.00
DENSE	0.00	0.85	1.12	1.15	1.26	1.26	1.26	1.25	1.23	0.88	0.74	0.00

I. Example of the empirical water-use coefficients data file.

DAYTIME HOUR PERCENTAGES FOR EACH MONTH FOR INDICATED DEGREES OF LATITUDE

LAT	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
24	7.58	7.17	8.40	8.60	9.30	9.20	9.41	9.05	8.31	8.09	7.43	7.46
26	7.49	7.12	8.40	8.64	9.38	9.30	9.49	9.10	8.31	8.06	7.36	7.35
28	7.40	7.07	8.39	8.68	9.46	9.38	9.58	9.16	8.32	8.02	7.27	7.27
30	7.30	7.03	8.38	8.72	9.53	9.49	9.67	9.22	8.34	7.99	7.19	7.14
32	7.20	6.97	8.37	8.75	9.63	9.60	9.77	9.28	8.34	7.93	7.11	7.05
34	7.10	6.91	8.36	8.80	9.72	9.70	9.88	9.33	8.36	7.90	7.02	6.92
36	6.99	6.86	8.35	8.85	9.81	9.83	9.99	9.40	8.36	7.85	6.92	6.79
38	6.87	6.79	8.34	8.90	9.92	9.95	10.10	9.47	8.38	7.80	6.82	6.66
40	6.76	6.73	8.33	8.95	10.02	10.08	10.22	9.54	8.38	7.75	6.72	6.52
42	6.62	6.65	8.31	9.00	10.14	10.21	10.35	9.62	8.40	7.70	6.62	6.38
44	6.49	6.58	8.30	9.05	10.26	10.38	10.49	9.70	8.41	7.63	6.49	6.22
46	6.33	6.50	8.29	9.12	10.39	10.54	10.64	9.79	8.42	7.58	6.36	6.04
48	6.17	6.42	8.27	9.18	10.53	10.71	10.80	9.89	8.44	7.51	6.22	5.86
50	5.98	6.32	8.25	9.25	10.69	10.93	10.99	10.00	8.44	7.43	6.07	5.65

J. Example of the daylight data file.

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AREAS84.TIT

1 HV2DV84.A
   Table 32.--Areas of phreatophytes, in acres, Hoover Dam to Davis Dam, 1984
1 BWR84.A
   Table 6A.--Areas of each vegetation type, in acres, along the Bill Williams River, 1984
1 DV2PK84.A
   Table 34.--Areas of each vegetation type by diverter, in acres, Davis Dam to Parker Dam, 1984
1 PK2IM84.A
   Table 36.--Areas of each vegetation type by diverter, in acres, Parker Dam to Imperial Dam, 1984
1 IM2ML84.A
   Table 38.--Areas of each vegetation type by diverter, in acres, Imperial Dam to Morelos Dam, 1984
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CONUSE84.TIT

1 HV2DV84.CU
   Table 33.--Evapotranspiration and consumptive use, in acre-ft, Hoover Dam to Davis Dam, 1984
1 BWR84.CU
   Table 6B.--Evapotranspiration, in acre-ft, for the Bill Williams River, 1984
1 DV2PK84.CU
   Table 35.--Evapotranspiration and consumptive use, in acre-ft, Davis Dam to Parker Dam, 1984
1 PK2IM84.CU
   Table 37.--Evapotranspiration and consumptive use, in acre-ft, Parker Dam to Imperial Dam, 1984
1 IM2ML84.CU
   Table 39.--Evapotranspiration and consumptive use, in acre-ft, Imperial Dam to Morelos Dam, 1984
1 HV2ML84.CU
   Table 40.--Evapotranspiration and consumptive use, in acre-ft, Hoover Dam to Morelos Dam, 1984
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RATES84.TIT

1 RATES84.OUT
   Table 18.--Water-use rates, in feet, along the lower Colorado River, 1984
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K. Example of the title input data files for the output tables.

Table 18.--Water-use rates, in feet, along the lower Colorado River, 1984

Vegetation type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
HOOV2DAV.DAT		- WILLOW-B.PPT											
MEDIUM	.00	.22	.41	.48	.72	.75	.81	.73	.62	.33	.21	.00	5.28
SPARSE	.00	.18	.32	.38	.57	.60	.65	.58	.50	.26	.17	.00	4.21
BILLWR.DAT		- PARKER.PPT											
ALFALFA	.00	.31	.56	.66	.95	.98	.87	.77	.73	.43	.24	.00	6.50
COTTON	.00	.00	.00	.05	.19	.43	.85	.99	.59	.27	.06	.00	3.43
DENSE	.00	.28	.52	.60	.88	.91	.98	.91	.75	.40	.25	.00	6.48
MEDIUM	.00	.24	.43	.50	.73	.75	.81	.75	.63	.33	.21	.00	5.38
SPARSE	.00	.19	.34	.40	.59	.60	.65	.60	.50	.26	.17	.00	4.30
DAV2PARK.PHR		- BULLCITY.PPT											
ALFALFA	.00	.31	.56	.66	.97	1.00	.72	.70	.82	.44	.14	.00	6.32
COTTON	.00	.00	.00	.05	.19	.44	.70	.92	.68	.28	.00	.00	3.26
WHEAT	.14	.27	.75	.86	.30	.00	.00	.00	.00	.00	.00	.00	2.32
DENSE	.00	.28	.52	.61	.90	.92	1.01	.92	.77	.41	.25	.00	6.59
MEDIUM	.00	.24	.43	.51	.75	.77	.84	.76	.63	.34	.21	.00	5.48
SPARSE	.00	.19	.34	.41	.60	.62	.67	.61	.51	.27	.17	.00	4.39
PARK2IMP.DAT		- PARKER.PPT											
ALFALFA	.00	.31	.56	.65	.94	.96	.86	.76	.73	.44	.24	.00	6.45
CITRUS	.13	.16	.19	.24	.32	.39	.37	.42	.30	.29	.17	.00	2.98
COTTON	.00	.00	.00	.05	.19	.43	.84	.98	.59	.28	.06	.00	3.42
FALL LETTU	.00	.00	.00	.00	.00	.00	.00	.00	.00	.16	.20	.00	.36
MELONS	.00	.00	.00	.06	.35	1.01	.41	.00	.00	.00	.00	.00	1.83
SPRING LET	.01	.12	.31	.49	.00	.00	.00	.00	.00	.00	.00	.00	.93
WHEAT	.14	.27	.75	.85	.29	.00	.00	.00	.00	.00	.00	.00	2.30
DENSE	.00	.28	.52	.60	.87	.89	.96	.90	.75	.40	.26	.00	6.43
MEDIUM	.00	.24	.43	.50	.72	.74	.80	.75	.63	.34	.21	.00	5.36
SPARSE	.00	.19	.34	.40	.58	.60	.64	.60	.50	.27	.17	.00	4.29
PV2IMP.DAT		- BLYTHE.PPT											
ALFALFA	.00	.30	.55	.63	.93	.94	.83	.59	.80	.43	.23	.00	6.23
CITRUS	.12	.16	.19	.23	.32	.38	.35	.26	.39	.29	.16	.00	2.85
COTTON	.00	.00	.00	.05	.18	.41	.82	.80	.67	.27	.05	.00	3.25
FALL LETTU	.00	.00	.00	.00	.00	.00	.00	.00	.02	.16	.18	.00	.36
MELONS	.00	.00	.00	.06	.35	.98	.39	.00	.00	.00	.00	.00	1.78
SPRING LET	.01	.11	.30	.48	.00	.00	.00	.00	.00	.00	.00	.00	.90
WHEAT	.13	.26	.74	.83	.28	.00	.00	.00	.00	.00	.00	.00	2.24
DENSE	.00	.28	.51	.58	.86	.87	.95	.88	.74	.40	.25	.00	6.32
MEDIUM	.00	.23	.42	.49	.72	.73	.79	.74	.62	.33	.21	.00	5.28
SPARSE	.00	.19	.34	.39	.57	.58	.64	.59	.50	.26	.17	.00	4.23

L. Example of the output file of the calculated water-use rates for the vegetation types along the lower Colorado River by reach

IMP2MORL.DAT		- YUMA.PPT										
BERMUDA	.00	.00	.00	.29	.51	.70	.64	.66	.53	.33	.00	.00	3.66
CITRUS	.13	.16	.19	.19	.30	.36	.21	.33	.38	.29	.18	.00	2.72
COTTON	.00	.00	.00	.01	.17	.40	.66	.86	.67	.28	.07	.00	3.12
FALL LETTU	.00	.00	.00	.00	.00	.00	.00	.00	.02	.16	.21	.16	.55
SAFFLOWER	.05	.11	.36	.90	.96	1.04	.04	.00	.00	.00	.00	.00	3.46
SPRING LET	.01	.12	.30	.42	.00	.00	.00	.00	.00	.00	.00	.00	.85
WHEAT	.15	.27	.74	.76	.27	.00	.00	.00	.00	.00	.00	.00	2.19
DENSE	.00	.29	.51	.56	.81	.84	.91	.85	.74	.41	.26	.00	6.18
MEDIUM	.00	.24	.42	.47	.68	.70	.76	.71	.62	.34	.22	.00	5.16
SPARSE	.00	.19	.33	.38	.54	.56	.61	.57	.49	.27	.17	.00	4.11

L. Example of the output file of the calculated water-use rates for the vegetation types along the lower Colorado River by reach—Continued.

Table 36.--Areas of each vegetation type by diverter, in acres, Parker Dam to Imperial Dam, 1984

DIVERTER	ALFALFA	CITRUS	COTTON	FALL LETT	MELONS	SPRING LE	WHEAT	DENSE	MEDIUM	SPARSE	TOTAL
AZ ARKELIAN FARMS	265	15	0	26	49	0	57	7	9	5	433
AZ CIBOLA ID	430	99	2077	11	65	13	60	301	302	296	3654
AZ CIBOLA ISLAND	18	12	26	3	1	6	16	4	0	0	86
AZ CRIR	27434	1601	25594	4634	4128	1727	11698	4339	5265	5805	92225
AZ CRIR MESA	62	0	3	0	6	0	0	12	10	44	137
AZ CRIR SOUTH FARM	553	94	1	88	8	0	286	233	323	155	1741
AZ EHRENBERG FARM	2	12	468	3	31	20	47	36	88	73	780
AZ LOWER QUAIL MESA	447	104	192	0	11	7	44	161	64	40	1070
AZ STATE OF AZ	28	14	487	14	142	20	58	479	1114	1045	3401
CA BERNAL FARMS	5	0	336	7	45	0	7	68	75	72	615
CA CLARK FARM	553	106	469	82	9	20	184	269	403	204	2299
CA CRIR	864	4	202	6	100	0	11	1168	1256	2030	5641
CA NORTH LYN-DE FARM	40	1	120	2	95	0	2	432	166	48	906
CA PICACHO SRA	0	0	0	0	0	0	0	30	472	180	682
CA PV MESA	175	225	574	19	500	27	156	103	36	32	1847
CA PVID	22486	5169	23505	9493	11972	3672	20963	2969	2541	1391	104161
CA SOUTH LYN-DE FARM	0	0	105	9	83	0	9	25	41	34	306
CA STATE OF CA	92	12	518	159	596	1	285	814	809	741	4027
US CIBOLA NWR	0	0	0	0	0	0	0	2322	794	3937	7053
US HAVASU NWR	0	0	0	0	0	0	0	10	75	43	128
US IMPERIAL NWR	0	0	0	0	0	0	0	527	4692	2381	7600
TOTAL	53454	7468	54677	14556	17841	5513	33883	14309	18535	18556	238792

Total vegetated area 238792

Net vegetated area 214956

M. Example of the output file for the Parker Dam to Imperial Dam reach showing the area of each vegetation type by diverter.

Table 6B.--Evapotranspiration, in acre-ft, along the Bill Williams River, 1984

Diverter	Evapotranspiration	Percentage
Arizona		
AZ BWR	9872	21.15
PHREATOPHYTES	36797	78.85
Totals for Arizona	46669	100.00
Reach totals	46669	100.00

N. Example of the output file for the Bill Williams River below Alamo Dam showing evapotranspiration

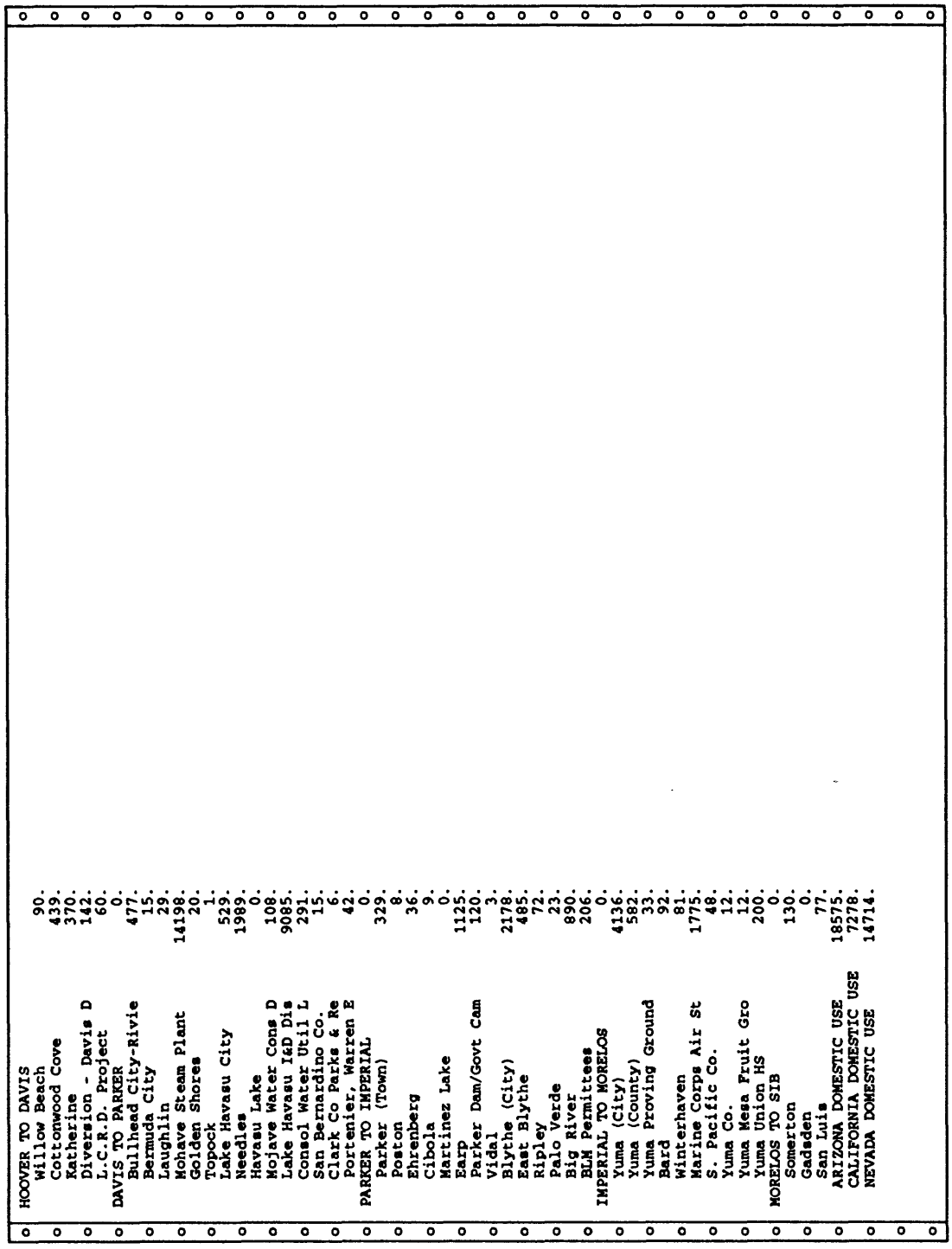
Table 40.--Evapotranspiration and consumptive use, in acre-ft, Hoover Dam to Morelos Dam, 1984

Diverter	Evapotranspiration	Percentage	Consumptive use
ARIZONA			
AZ ARKELIAN FARMS	1918	.11	2349
AZ BULLHEAD CITY	0	.00	0
AZ CIBOLA ID	9977	.59	12221
AZ CIBOLA ISLAND	275	.02	336
AZ CITY OF YUMA	0	.00	0
AZ COCOPAH IR	903	.05	1106
AZ CRIR	300291	17.77	367847
AZ CRIR MESA	421	.02	515
AZ CRIR SOUTH FARM	4403	.26	5393
AZ EHRENBERG FARM	1747	.10	2140
AZ FIVE MILE ZONE	0	.00	0
AZ FORT MOJAVE IR	50115	2.97	61389
AZ FYIR RES DIV	1019	.06	1248
AZ LAKE HAVASU AIRPO	0	.00	0
AZ LOWER QUAIL MESA	3830	.23	4691
AZ NORTH GILA VALLEY	21768	1.29	26665
AZ SOUTH GILA VALLEY	13212	.78	16184
AZ STATE OF AZ	49688	2.94	60866
AZ UNIT B ID	3228	.19	3954
AZ YUMA DESERT	3844	.23	4708
AZ YUMA MESA ID	92834	5.49	113718
AZ YUMA VALLEY	148254	8.77	181606
AZ PHREATOPHYTES	313995	18.58	384634
Totals for Arizona	1021722	60.46	1251570
CALIFORNIA			
CA BARD ID	18995	1.12	23268
CA BERNAL FARMS	1221	.07	1495
CA CHEMEHUEVI IR	0	.00	0
CA CITY OF NEEDLES	0	.00	0
CA CLARK FARM	5747	.34	7039
CA CRIR	6458	.38	7910
CA FORT MOJAVE IR	11918	.71	14599
CA FYIR BARD ID	18519	1.10	22685
CA MOABI PARK	0	.00	0
CA NORTH LYN-DE FARM	816	.05	999
CA PICACHO REC. LAND	0	.00	0
CA PICACHO SRA	0	.00	0
CA PV MESA	4868	.29	5963
CA PVID	306200	18.12	375085
CA SOUTH LYN-DE FARM	512	.03	627
CA STATE OF CA	25725	1.52	31512
CA PHREATOPHYTES	144847	8.57	177433
Totals for California	545826	32.30	668615

O. Example of the output file for the Hoover Dam to Morelos Dam reach showing evapotranspiration and consumptive use.

NEVADA			
NV FORT MOJAVE IR	1039	.06	1272
NV STATE OF NV	2642	.16	3236
NV PHREATOPHYTES	8579	.51	10509
Totals for Nevada	12260	.73	15017
FEDERAL LANDS			
US CIBOLA NWR	35521	2.10	43512
US HAVASU NWR	33005	1.95	40430
US IMPERIAL NWR	38177	2.26	46765
US LAKE MEAD NRA	3178	.19	3892
US LUKE AFR	94	.01	115
Totals for Federal Lands	109975	6.51	134714
Reach Totals	1689783	100.00	2069934
Water-Budget Estimate			2069932

O. Example of the output file for the Hoover Dam to Morelos Dam reach showing evapotranspiration and consumptive use—Continued.



HOOVER TO DAVIS	90.
Willow Beach	439.
Cottonwood Cove	370.
Katherine	142.
Diversion - Davis D	60.
L.C.R.D. Project	0.
DAVIS TO PARKER	477.
Bullhead City-Rivie	15.
Bermuda City	29.
Laughlin	14198.
Mohave Steam Plant	20.
Golden Shores	1.
Topock	529.
Lake Havasu City	1989.
Needles	0.
Havasu Lake	108.
Mojave Water Cons D	9085.
Lake Havasu I&D Dis	291.
Consol Water Util L	15.
San Bernardino Co.	6.
Clark Co Parks & Re	42.
Portenier, Warren E	0.
PARKER TO IMPERIAL	329.
Parker (Town)	8.
Poston	36.
Ehrenberg	9.
Cibola	0.
Martinez Lake	1125.
Earp	120.
Parker Dam/Govt Cam	3.
Vidal	2178.
Blythe (City)	485.
East Blythe	72.
Ripley	23.
Palo Verde	890.
Big River	206.
BLM Permittees	0.
IMPERIAL TO MORELOS	4136.
Yuma (City)	582.
Yuma (County)	33.
Yuma Proving Ground	92.
Bard	81.
Winterhaven	1775.
Marine Corps Air St	48.
S. Pacific Co.	12.
Yuma Co.	12.
Yuma Mesa Fruit Gro	200.
Yuma Union HS	0.
MORELOS TO SIB	130.
Somerton	0.
Gadsden	77.
San Luis	18575.
ARIZONA DOMESTIC USE	7278.
CALIFORNIA DOMESTIC USE	14714.
NEVADA DOMESTIC USE	

P. Example of the output file showing domestic use for each diverter within each reach and totals by State.

```
HOOVER TO DAVIS REACH
  AREAS(1)                     25419.38
  EVAPS(1)                         5.85
  AREAS(1)*EVAPS(1)           148703.37
  DUS(1)                        1101.00
  (AREAS(1)+NETACR)*PPTS       18549.73
  PRECIPITATION                     .71
  CONSUMPTIVE USE             228225.36
BILL WILLIAMS REACH
  AREAS(5)                       576.00
  EVAPS(5)                         5.00
  AREAS(5)*EVAPS(5)             2880.00
  (AREAS(5)+NETACR)*PPTS        5344.35
  PRECIPITATION                     .55
  FLOW TO COLORADO RIVER       75595.35
DAVIS TO PARKER REACH
  AREAS(2)                     21961.86
  EVAPS(2)                         5.91
  AREAS(2)*EVAPS(2)           129794.59
  DUS(2)                       26803.95
  (AREAS(2)+NETACR)*PPTS       51909.48
  PRECIPITATION                     .86
  CONSUMPTIVE USE             -80333.71
PARKER TO IMPERIAL REACH
  AREAS(3)                     10262.38
  EVAPS(3)                         5.68
  AREAS(3)*EVAPS(3)            58290.32
  DUS(3)                        5483.83
  (AREAS(3)+NETACR)*PPTS      137383.21
  PRECIPITATION                     .61
  CONSUMPTIVE USE            1464707.06
IMPERIAL TO MORELOS REACH
  AREAS(4)                      1385.66
  EVAPS(4)                         5.20
  AREAS(4)*EVAPS(4)             7205.43
  DUS(4)                        6971.14
  (AREAS(4)+NETACR)*PPTS       70631.77
  PRECIPITATION                     .51
  CONSUMPTIVE USE             457334.19

HV2ML
  SUM(AREAS*EVAPS)            343993.72
  DUS(SUM)                     40359.92
  SUM(AREAS+NETACR)*PPTS      278474.19
  SUM PRECIPITATION                2.69
  CONSUMPTIVE USE               2069934
```

Q. Example of the output file showing the water-budget calculation results for each reach.