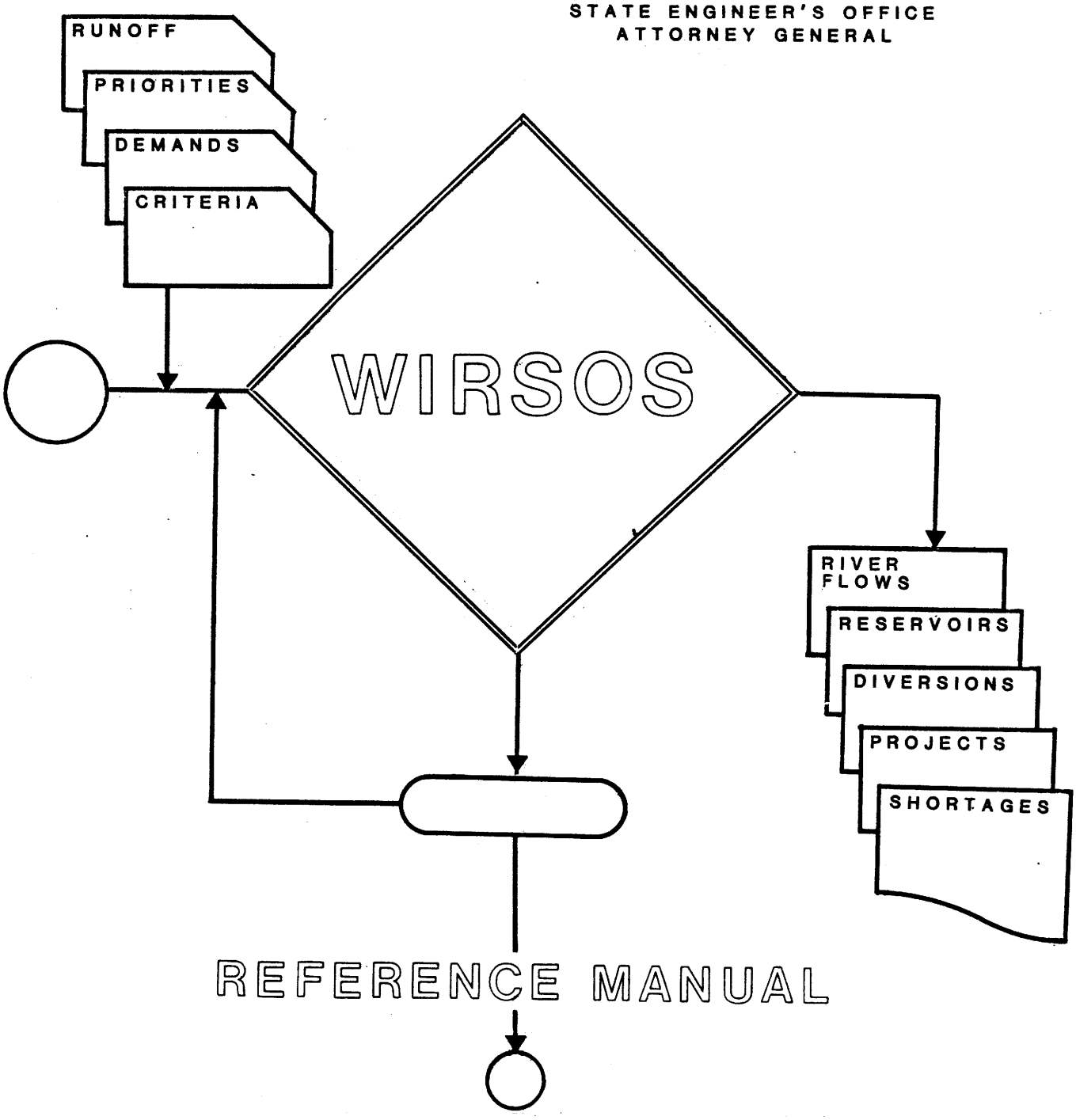
STATE OF WYOMING

WATER RESEARCH CENTER
WATER DEVELOPMENT COMMISSION
STATE ENGINEER'S OFFICE
ATTORNEY GENERAL



WYOMING INTEGRATED RIVER SYSTEM OPERATION STUDY

Leonard Rice Consulting Water Engineers, Inc.

APRIL 1985

390WYØ02

ACKNOWLEDGEMENTS

The technical material in this report was prepared by or under the supervision and direction of the undersigned whose seal as a professional engineer and certified consulting engineer are affixed below:

Leonard Rice
Wyoming No. 1046

This manual has been prepared to describe the content and operation of the WIRSOS Model developed by Leonard Rice Consulting Water Engineers, Inc., for the Wyoming Attorney General, in connection with the Bighorn River Adjudication. Changes made to the model logic or data base subsequent to the publication of these manuals is the responsibility of the user making the changes.

The following members of the Leonard Rice Consulting Water Engineers, Inc., staff contributed to the preparation of this Reference Manual.

Principal	:	Leonard Rice, President
Principal Author	:	Joanne J. Greenberg
Technical Review	:	G. Ross Bethel
Drafting	:	Hazel Nelson
Editorial Review	:	Kay Rice
Technical Typist	:	Kathryn Morstad

WIRSOS REFERENCE MANUAL

TABLE OF CONTENTS

Table of Contents (continued)

LIST OF TABLES

LIST OF FIGURES

STATE OF WYOMING

WIRSOS MODEL DOCUMENTATION

REFERENCE MANUAL

I. INTRODUCTION

A. SCOPE AND PURPOSE

The Wyoming Integrated River System Operation Study (WIRSOS) Model is a computer model developed for the State of Wyoming as a tool for defining and quantifying the impact of Federal claims for reserved rights, including Indian rights, on State-awarded water rights in connection with the general adjudication of water rights in the Bighorn River Basin of Wyoming. Because the model was originally developed and used in connection with a litigation proceeding, only minimum documentation of the model logic and application procedures was produced during the active litigation process.

The State of Wyoming now proposes to utilize the WIRSOS model as a tool for evaluating water resource projects and administering the State's water resources. This WIRSOS REFERENCE MANUAL and the accompanying WIRSOS USER'S MANUAL have been prepared to provide a means of transferring the technology involved in developing and utilizing the WIRSOS Model from Leonard Rice Consulting Water Engineers, Inc. (LRCWE), the developers of the model, to the State of Wyoming, under the auspices of the Wyoming Water Research Center at the University of Wyoming.

The purpose of this reference manual is to describe the data needed by and the logic, criteria, and assumptions incorporated in the model. A description of how to use hydrologic data,

i.e., virgin flows, consumptive use, ground water return flow patterns, etc., is presented in the WIRSOS User's Manual along with sample data input.

B. BACKGROUND

In January, 1977, the State of Wyoming filed suit in District Court for a comprehensive adjudication of all water rights in the Bighorn and Clarks Fork River Basins (Water Division No. 3), including Federal claims on behalf of the Wind River Indian Reservation, Yellowstone National Park, Shoshone and Bighorn National Forests, Bighorn Canyon National Recreation Area and other Federal lands, as well as Indian claims made in addition to those made by the Federal Government. The suit was answered by an effort on the part of the United States to remove the case to Federal court. After resolution of the jurisdiction issue in the State's favor, the case proceeded in 1979 before a Special Master who issued his partial report in December, 1982, concerning the claims for the Wind River Indian Reservation. In May, 1983, following a hearing on exceptions to the Special Master's Report, the District Court issued a decision and decree. Since then, the State has been engaged in negotiations with the Indian tribes and the Federal Government in an attempt to reach a settlement concerning the Indian reserved water rights rather than having the case appealed to the Supreme Court. At the time of preparation of this Reference Manual, the negotiations were still proceeding.

The Federal Government claimed a diversion requirement of some 600,000 acre-feet for uses on the Wind River Indian Reservation and several hundred thousand acre-feet more for protection of instream flows for on- and off-reservation fishing and hunting rights, as well as for aesthetic and recreational purposes.

The State of Wyoming considered the off-reservation instream flow claims to be unprecedented, in that the United States had not before claimed reserved water rights explicitly for off-reservation fishing and hunting under such circumstances.

The Arapahoe and Shoshone Tribes claimed a diversion requirement of approximately 800,000 acre-feet for consumptive uses, including irrigation of allotted and fee lands omitted by the Federal Government and additional amounts for instream flow protection. This could leave individual State water rights in severe jeopardy if all water requested were allocated under reserved rights.

Within the Bighorn Basin, some 25,000 to 30,000 State water rights holders presently irrigate more than 500,000 acres, but hold permits to irrigate twice that amount of land. Wyoming has estimated that the historic gaged outflow from the Bighorn River Basin is 2,000,000 acre-feet annually, some of which is subject to the terms of the Yellowstone River Compact with Montana and North Dakota. Under the compact, Wyoming is entitled to beneficially use, by storage or diversion, 80 percent of the unused and unappropriated streamflow from the Bighorn River mainstem and 60 percent of the unused or unappropriated streamflow from the Clark's Fork River as of 1950.

One of the contested issues of fact before the court was defined in the Special Master's Report as "the injury to any State-awarded water rights resulting from the exercise of Federal reserved rights, if the Master finds any such rights to exist." Federal reserved water rights generally hold a priority date equal to the date the reservation was established (1868 for the Wind River Indian Reservation). The exercise of reserved rights may cause injury to State-awarded water rights by diminishing the water availability. To develop a factual basis for addressing

this issue, it was necessary for the State to define the hydrologic and water rights operation of the Bighorn Basin, including the Wind River Indian Reservation and major tributaries of the Bighorn River. In July, 1978, LRCWE was retained by the Wyoming Attorney General's Office to provide technical assistance in evaluating Federal claims, performing hydrologic investigations and in developing a procedure for identifying the physical and legal availability of water to specific Federal claims under the Wyoming system of prior appropriation and quantifying in terms of amount and time the impact of those claims on individual State-awarded water rights.

C. DEVELOPMENT OF THE WIRSOS MODEL

Because of the size of the basin, the magnitude of the Federal and Indian claims, the extraordinary number of State-awarded water rights involved and the complexity of Wyoming water administration, it soon became apparent that a computer model would be required to accomplish a fair evaluation of the effects of reserved rights on State-appropriated rights. A review was made of available models, such as the U.S.B.R. HYDROSS, the Corps of Engineers HEC-3 and the Colorado River Simulation Model (CORSIM), to see if it would be feasible to adopt an existing model to the Bighorn system. None of the models evaluated were considered adequate for simulating both the physical and legal operation of the basin at the level of detail and accuracy required. Accordingly, the decision was made to develop the Wyoming Integrated River System Operation Study (WIRSOS) Model specifically for the Bighorn River Basin General Adjudication proceedings.

Development of the model proceeded under the direction of LRCWE with programming and processing assistance provided by Boeing Computer Services Company. Valuable assistance was provided

during the course of model development by continuing consultation with the Wyoming State Engineer, Water Division No. 3 Superintendent and representatives of the State Attorney General's Office. The primary objective of the WIRSOS model was to accurately reflect the operation of the basin modeled in terms of river flows and water rights administration. This objective was achieved through verification of model routines by comparison of computed results with hand calculations and through reviewing model logic and assumptions with State water administrative personnel, irrigation district operators, water right holders and water users at various levels. In addition, simulated river flows were compared, where appropriate, to U.S.G.S. records for verification of "real world" conditions.

Results produced by the WIRSOS model were presented to and accepted by the Special Master after withstanding extensive challenge by the Federal and Indian attorneys. Subsequent to the Special Master's Report and District Court decision, the model was used to provide the basis for settlement of certain issues and is currently being used to provide data relative to issues still in negotiation.

D. APPLICATION OF THE WIRSOS MODEL

In addition to its use for litigation support and water right impact evaluation for the Bighorn River Basin Adjudication (Bighorn Adjudication), the WIRSOS model has been applied to project feasibility studies for the Wyoming Water Development Commission. In Water Division No. 3, it has been used to evaluate the Gooseberry and Wind River/Blue Holes projects and, in Water Division No. 4, WIRSOS was used in the analysis of seven storage sites as part of the Upper Green River Study.

A by-product of the development and application of the WIRSOS model to a basin is the production of schematic diagrams that display the hydrologic and water rights operation of the basin studied. This information, combined with the model data base, provides a valuable tool for water administrators and operators. The level of detail desired for the analysis can be limited or expanded, as appropriate, by selection of the criteria for the data base. Thus, for a reconnaissance level study, data for an average year could be used, whereas for a detailed project development analysis, a 20- to 30-year monthly data record might be appropriate. Similarly, for a reconnaissance level study, only the most significant water rights would be included and maximum use of "grouping" rights in a reach to a single accounting point would be used. For a detailed study, such as the Bighorn Adjudication, it was necessary to include in the data base decreed water rights representing a significant portion of the water used. For the Division No. 3 Bighorn Adjudication, the certificated water rights representing 85-90 percent of the water and 65 percent of the permitted water rights were included in the data base. Figure I-1 illustrates the relationship between basic data, model data base and operation and results of the WIRSOS model.

The State of Wyoming administers water rights on a strict prior appropriation system with few exceptions. This essentially follows "first in time, first in right" theory or the most senior water right in the basin will be allowed to divert its full supply, providing the physical availability is not a limiting factor. If the physical availability is limited, the senior right may "call out" an upstream junior right. A "called out" water right is defined as a right which must curtail its diversions so that a senior water right, a right with an earlier priority date, may attempt to meet its full diversion demand.

Figure I-1 (continued)

DESCRIPTION OF WYOMING INTEGRATED RIVER SYSTEM OPERATION STUDY (WIRSOS) MODEL

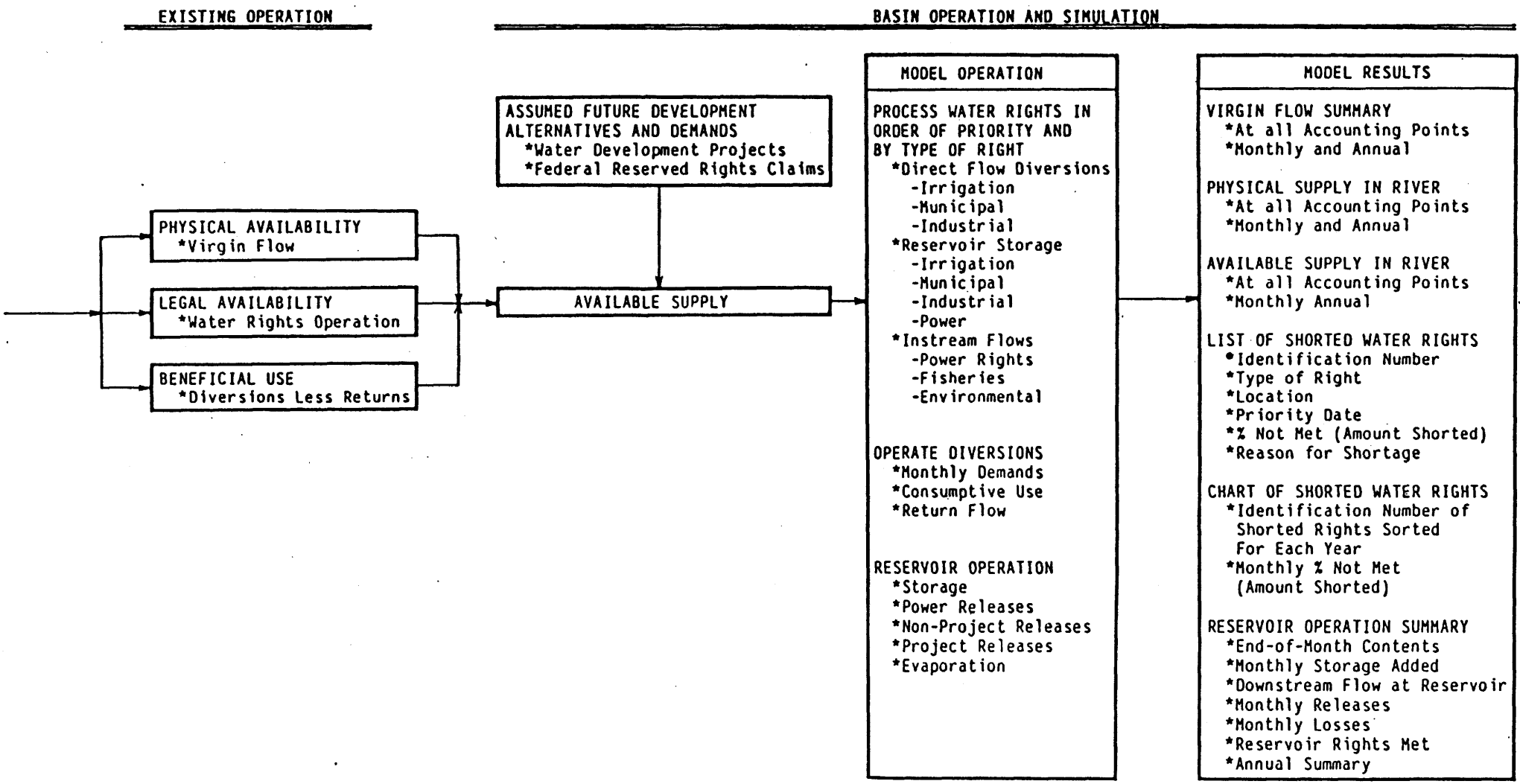
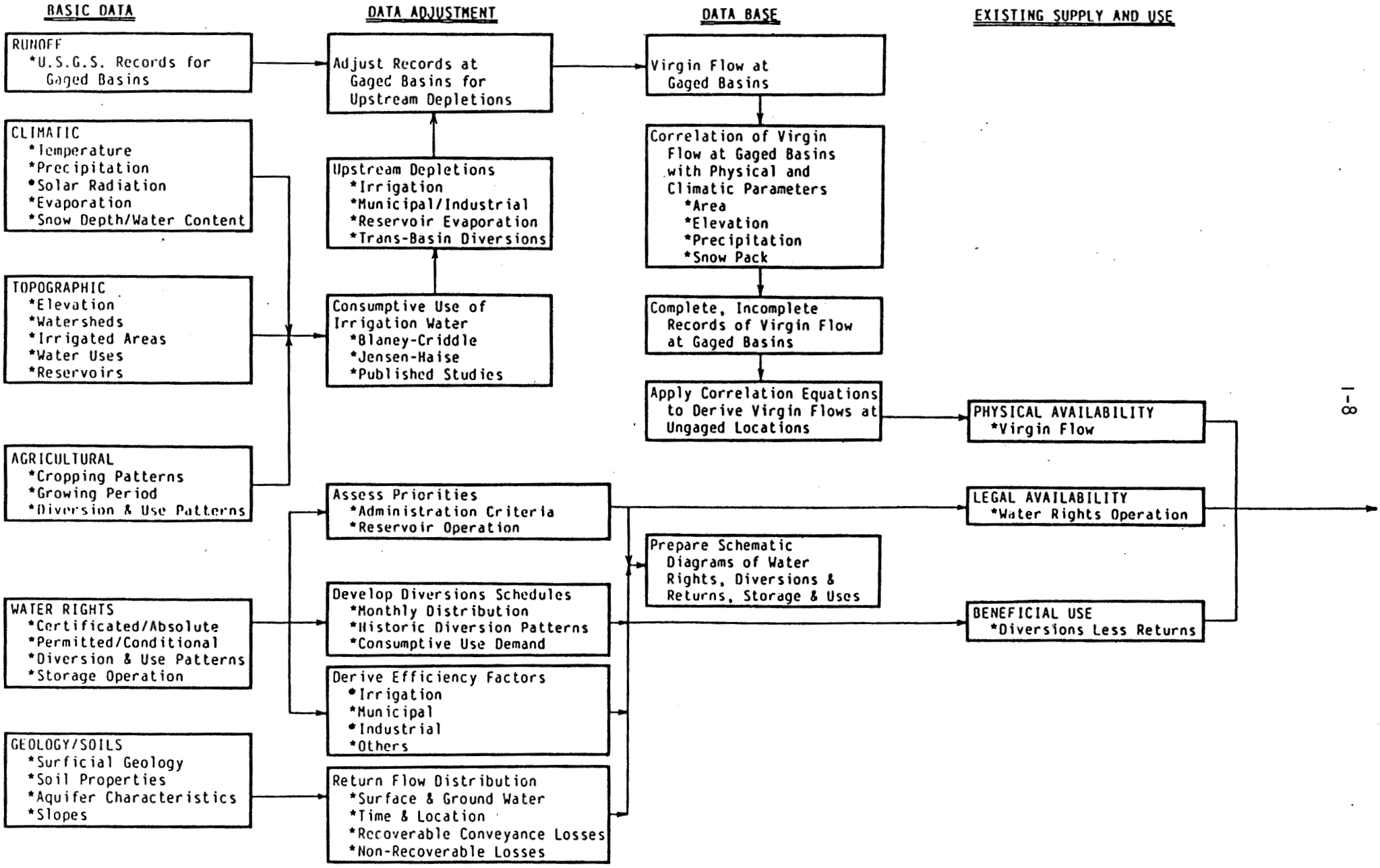


Figure I-1

DESCRIPTION OF WYOMING INTEGRATED RIVER SYSTEM OPERATION STUDY (WIRSOS) MODEL



The WIRSOS model has been developed to incorporate the priority system as the basis of operation. The theoretical basis the model uses for water allocation differs in part from the actual administration of the river system by Wyoming water administration officials. The model will process each right in priority, and so the system of "calling out" a junior water right does not exist in the true sense. Each right from the most senior to the most junior is processed against the physical supply available. Any time the availability is zero or when senior downstream rights have not previously been able to receive enough water to meet the full demand, the right in process is "called out."

In actual practice, the Wyoming water administration official would first allow upstream users to divert water regardless of their priority and if shortages are experienced by downstream rights of senior priority, then diversions by upstream rights would be curtailed to produce water for the downstream right. Diversions of the most junior upstream (on the same stream or tributary) water right would be curtailed to provide water to the senior priority right. If the senior water right is still shorted, then the next most junior upstream water right would be curtailed, and so on, until either the senior water right is satisfied or there remains no more water in the system upstream of the senior right.

In summary, the WIRSOS model is essentially an accounting model and is based on the prior appropriation doctrine and the "one-fill" rule for reservoir storage in Wyoming. The model is general in nature; the hydrology of the basin is reflected in the composition of the input data.

The WIRSOS model can be used for various types of water resource or water rights investigations. Typically, the "base" model data would represent existing conditions in a river basin. Federal reserved water rights or permits not currently in use may be imposed on the "base" to determine water availability impact on existing conditions. As in a Federal reserved water rights case, the model may be a tool in determining the impact of the reserved rights on State-awarded water rights. River flow available for storage may be determined from the "base" model output and reservoir siting from a hydrologic standpoint may be assisted by applying the model to a river basin.

E. ACKNOWLEDGEMENTS

The model described in these manuals was developed during the Bighorn River Adjudication process and reflects the efforts and contributions of many people representing the State of Wyoming. We are particularly grateful for the assistance provided by George L. Christopulos and Gordon W. (Jeff) Fassett of the State Engineer's Office; Steven F. Freudenthal, Lawrence J. Wolfe and Randall T. Cox of the Attorney General's Office; and Michael D. White and James L. Merrill, Special Assistant Attorney Generals. In addition, preparation of these manuals was aided by the contributions of Gordon W. (Jeff) Fassett, Deputy State Engineer, Victor Hasfurther, Associate Director of the Wyoming Water Research Center, University of Wyoming and Craig Goodwin of the Wyoming Water Development Commission.

II. WIRSOS MODEL LOGIC, CRITERIA AND ASSUMPTIONS

A. GENERAL DESCRIPTION

The WIRSOS model is a generalized river basin simulation model which accounts for the man-made use of the natural hydrologic environment. The model specifically embodies the practices of administering water rights according to the Wyoming State Engineer's Office to reflect accurately existing conditions in a river basin. To understand WIRSOS, it is important to describe the configuration of the model and how the input data, in general, pertains to the model.

The WIRSOS model program listing contains numerous comments and brief explanations. Each procedure through which the model progresses is highlighted by a "section" title. For example, the procedure of supplying Junior Project Rights' demands from the available river flow when the associated reservoir is not full is titled "JPR (NO SPILL) FROM RIVER." This "section" will be referred to in this documentation as "section" or by its title. A sample data base was developed for illustrative purposes for this manual and the User's Manual. Two computer runs using the sample data were completed and input and output data are used as necessary to more clearly define the logic.

1. Configuration of River Basin

For WIRSOS to simulate a river basin, a modeling system is necessary to define the network of streams which comprise the river basin to be studied. The stream network identified determines the direction of the flow of the river and facilitates the distribution of runoff and the superposition of diversions, instream flows, and reservoirs.

The network of streams is comprised of stream reaches identified by a station number and stream order number. The number of reaches and their location in the study basin are a function of the detail desired in the analysis. The model determines the relative location of a stream reach in the basin from its unique six-digit station number and a stream order number assigned to the reach.

Station numbers are assigned to the downstream point (node) of modeled reaches. The station numbers increase in a downstream direction. Thus, in WIRSOS, water flow is in the direction of increasing station numbers. Typically, when configuring a stream system, station numbers may be grouped by sub-basin. The first four digits of a station number identify a stream reach. The last two numbers identify the relative location of stations within each reach. Figure II-1 is a simple illustration of station numbering. Birds Nest Creek station numbers begin with 0722, the mainstem stations on Beaumont River between Birds Nest Creek and Flushing Creek, begin with 0724, and Flushing Creek Stations begin with 0726. Grouping of station numbers within a sub-basin generally allows for quicker interpretation of the model results and better understanding of the basin configuration.

In addition to station numbers increasing in a downstream direction, there must be a station located between tributaries to the main stream or to a lower order stream.

Stream order is generally defined as the amount of branching in a river basin. The smallest unbranched tributary is referred to as a first order stream and the stream which accepts the flow of a first order stream is called a second order stream. In this manner, stream order numbers would be assigned according to the order. For example, a first order stream would have

a one assigned as the stream order. The mainstem would have the highest stream order.

The WIRSOS model incorporates an approach similar to stream ordering to provide maximum flexibility within the data base. The mainstem river is assigned a stream order of one, the primary tributaries are assigned a stream order of two, secondary tributaries are assigned a stream order of three and so on. Figure II-2 demonstrates the manner in which stream order is assigned to a stream reach. This method proved useful in the Bighorn River Adjudication. The data base was expanded after the initial effort to include more levels of stream ordering when the United States' instream flow claims in the National Forests were analyzed. If the traditional method of stream ordering had been adopted, expansion upstream would have meant extensive changes in the existing data base.

Each water right (direct flow, instream flow, or storage) to be modeled is linked to a station and identified by a permit number. If available, permit numbers assigned by the State of Wyoming should be used. Though more than one water right can be linked to a stream station, it should be realized that stream configurations involving multiple water rights in one flow reach which have return flows within that reach may produce improper water accounting. If one water right returns water which is subsequently diverted by a downstream right, locating both of these rights at the same stream station would eliminate the use of the return flow by the downstream right. The downstream right, therefore, may not receive a correct allocation of water and should properly be placed at a separate downstream station.

2. Summary Description of Water Resource Data for Model

Basic data for the WIRSOS model can generally be obtained from one or all of the following Federal and State agencies: the State Engineer's Office, U.S.G.S., National Oceanic and Atmospheric Administration (NOAA), Soil Conservation Service, U.S. Bureau of Reclamation, cities, counties, irrigation districts, and colleges and universities. Runoff records for gaged basins must be adjusted for upstream depletions to derive virgin flows which establish the flow base upon which demands can be superimposed. Incomplete streamflow records for the selected study period can be extended by regression with long-term records. The basic procedures for developing a model data base are described briefly below.

a. Virgin Flow Analysis

Virgin flows can be developed for the selected study period, although any set of streamflow or runoff values can be used. (Virgin flows were used in the data base for the Bighorn Adjudication). The streamflows are developed for the entire basin to be studied. Selection of the study period requires the determination of the representative period reflecting both the hydrologic situation and administrative practices and the availability of records. Once the study period is selected, available U.S.G.S. surface runoff records are compiled and a comparison made of the length of record, drainage area, elevation and other data to provide a basis for selecting those gages most representative and suitable for use in developing virgin flows. After the selection of key gages, hydrologic correlation parameters, such as drainage area, mean elevation, mean annual precipitation and seasonal snowpack, water content, or other variables, as

available, are developed for each of the gages if the data for the given parameters is available for that gaged basin.

Virgin flow estimates at key gages are derived on a monthly basis by adjusting gage flow for upstream depletions. Calculation of upstream depletions is based on long-term average irrigated acreage and cropping patterns, consumptive use and historic diversion records.

Once virgin flows have been developed for the key gages, statistical linear regression techniques utilizing data transforms are used to extend incomplete records to provide a full period of record for the entire gage network over the selected study period. Using the full record of virgin flows for the gage network and study period, the hydrologic parameters are tested to determine which provide the best degree of statistical correlation between gaged flows and measurable hydrologic parameters for use on ungaged basins. Once the best parameters have been selected, the derived correlation parameters are used statistically to generate monthly (annual, daily, etc.) flows for the study period at key ungaged points within the river basin being modeled.

Streamflows for the flow network must be generated (in acre-feet) for each month of the study period to reflect the flow originating in each modeled reach. Flow input to a stream reach is added to all downstream reaches by the model. If a tributary is not modeled and if it is desirable to account for the streamflow from that sub-basin, the intermediate flow contribution can be input at an appropriate station on the mainstem river or on the next lower order stream. Figure II-3 contains examples of how the flow is distributed in the sample model data base.

b. Diversions

There are four types of direct flow diversions. All types are input into the model in the same format. The "normal" diversions satisfy their demand by requesting a supply, in priority, from the river. A supplemental reservoir supply would not be available to this class of diversion rights. The "junior project rights," "senior project rights," and the "junior project rights processed as if they were senior project rights" types of diversions are all linked to a reservoir and can enhance their water supply by requesting water be released from the associated reservoir.

Each diversion is identified by a permit number or similar notation and is located by its station number. Other information needed as input data for each diversion includes the priority date, type of use, whether or not the right receives water from a reservoir supply, number of return flow points, return flow locations and amounts at each location, the delay table to be used with the return flow and the monthly diversion amounts.

The point of diversion for each water right is located at the station number identified on the input record for that right. There can be more than one water right at each station.

Return flow locations are also identified by a station number. Water can be diverted at a station and the return flow can occur at one or several (up to ten) downstream locations or, in some cases, to another diversion ditch.

Prior to data input of diversions, key information for those water rights must be derived. A general discussion of the development of efficiencies, diversion schedules and return flow patterns included as part of each water right record follows:

1) Climatic Zones and Crop Consumptive Use

The computation of consumptive use involves establishing climatic zones based on weather and other relevant data, reviewing county and basin crop statistics for the study period to select a representative mix of crops and, for the selected crops, preparing an area weighted average cropping pattern for the study area or region. Once this has been established, consumptive use for the selected crops can be computed using Blaney-Criddle, Jensen-Haise or other techniques. A weighted average consumptive use value can be calculated for each climatic zone, the result of which will represent the consumptive use for the cropping pattern in that zone.

Crop consumptive use is one of the major factors required to determine irrigation efficiencies. The crop consumptive use by itself, however, is not used as input data in the WIRSOS model.

2) Efficiency and Diversion Schedules

Irrigation efficiency is defined for the WIRSOS model as the percentage of the water diverted which does not return to the stream system and is no longer available for subsequent use. This depleted amount includes crop consumptive use, non-returnable portion of conveyance and on-farm losses, including deep percolation to ground water. Efficiencies for other uses such as municipal, industrial and power generation must also be derived by analysis of available data for diversions and return flows. Table II-1 illustrates the various recoverable and non-recoverable losses from an example 100 acre-feet diversion.

Table II-1

DISTRIBUTION OF LOSSES AND RETURN FLOWS

FUNCTION	Loss Expressed as A Percentage Of		Distribution of Non-Recoverable Losses and Recoverable Return Flow For an Assumed Headgate Diversion of 100.00 Acre-Feet					
			Non-Recoverable		Recoverable		Total	
	Headgate Diversion	Indicated Function	Percent	Amount Acre Ft.	Percent	Amount Acre Ft.	Percent	Amount Acre Ft.
CONVEYANCE	25							
Surface		25	30	1.88	70	4.38	100	6.25
Seepage		75	5	0.94	95	17.81	100	18.75
Sub-Total Conveyance				2.81		22.19		25.00
CROP EVAPOTRANSPIRATION	38	100	100	38.00	0	0	100	38.00
ON FARM APPLICATION	37							
Surface		50	15	2.78	85	15.73	100	18.50
Percolation		50	5	0.93	95	17.58	100	18.50
Sub-Total On Farm				3.70		33.30		37.00
TOTAL LOSSES								
Surface				4.65		20.10		24.75
Seepage & Percolation				1.86		35.39		37.25
Crop Evapotranspiration				38.00		0.00		38.00
GRAND TOTAL OF LOSSES				44.51		55.49		100.00

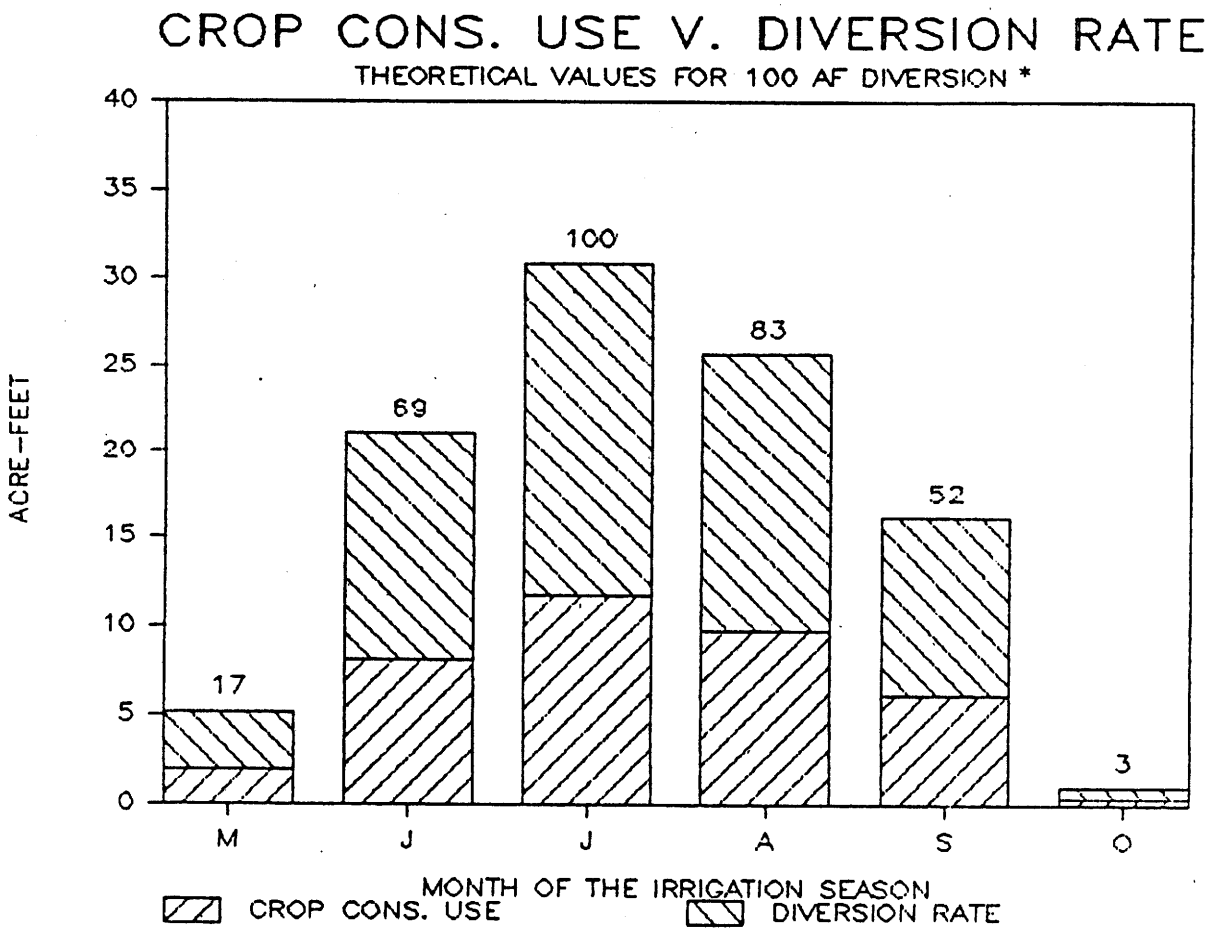
DITCH HEADGATE EFFICIENCY = CROP EVAPOTRANS./TOTAL DIVERSION = 38 %
FARM HEADGATE EFFICIENCY = CROP EVAPOTRANS./FARM HG DELIVERY = 51 %

The efficiency is input as a percentage and only one value is used for each water right.

The WIRSOS model requires, as input, a monthly diversion rate for each water right. The rate at which a water right diverts can be derived from historic diversion patterns and consumptive use patterns. For the Bighorn River Adjudication, a percentage monthly distribution was developed and then applied to the water righted amount through the use of a program external to the model.

Theoretically, the consumptive use graph and the historic diversion pattern graph should be similar as depicted in Figure II-4. The difference in the two graphs is caused by losses in the system, both recoverable and non-recoverable. Under practical circumstances the rate of diversion may not follow the same pattern as the consumptive use curve. Water availability may be a limiting factor or, the other extreme, an abundant water supply may cause the irrigator to divert quantities greater than the amount required to satisfy crop consumptive use. In such situations, an average curve should be developed which would best represent actual conditions. The maximum month is then assigned a diversion of 100 percent to be applied to the water right decreed amount. Each additional month will then be assigned a diversion percentage based on the maximum month. For example, Figure II-4 shows a diversion graph and the percent of the maximum month for each month, based on July as the maximum month (100%). If a water right is entitled to divert 5 cfs under its decree, the following table reports the monthly diversion schedule based on the data in Figure II-4.

Figure II-4



*The numbers above the bar graphs represent a percentage distribution, based on July as the maximum month (100%). These percentages may be applied to a water right amount for a resulting diversion schedule.

Table II-2
DIVERSION SCHEDULE FOR A 5 CFS WATER RIGHT

	April	May	June	July	August	Sept.	Oct.
Diversion Distribution (Percentage)	0	17	69	100	83	52	3
5 cfs Water Right	0	0.85	3.45	5.00	4.15	2.60	0.15

This approach was used in developing diversion schedules for the Bighorn Adjudication although other methods may be used.

3) Return Flow Patterns

A significant feature of the WIRSOS model is the use of delayed return flow patterns to reflect the effect of ground water return flows. This is accomplished by analyzing soil types, defining aquifer characteristics and calculating the ground water return pattern using available ground water equations, such as those developed by R.E. Glover, in Colorado, entitled Transient Ground Water Hydraulics (January, 1974). Surface and ground water returns are then combined to develop a composite delayed return flow pattern to be assigned to each return flow.

The simulated delayed effect allows return flows to occur in more than just the current month of operation. The delayed return flow pattern spans twelve months allowing returns from one water right to be accounted for in the available river flow in the current and subsequent eleven months. In this manner, water rights actually relying on return flows from upstream diversions can be more accurately simulated in the model.

The composite delayed return flow pattern is read by the model as 12 monthly values which are input as percentages. Each return

flow pattern is also assigned a number for identification purposes, which is used as part of the input data.

c. Instream Flows

Instream flows are identified by a permit number and the locations of the instream flows are identified for each stream reach or segment by station numbers. A priority date is also a portion of the input data along with 12 monthly instream flow values. The flow values are input in cubic feet per second (cfs).

Most often, instream flows are identified for a stream reach rather than for one point as in a diversion. In this situation, the instream flow must be input for analysis at each station number within the required stream reach.

To avoid improper water accounting, no more than one instream flow requirement should be modeled at each station number.

d. Reservoir Operations

To accurately reflect reservoir operation in the WIRSOS model, it is necessary to obtain and analyze data describing the physical and operational characteristics of each reservoir. This includes the capacity-surface area relationship, outlet works discharge capacity, minimum and maximum storage amounts, filling and release restrictions and water delivery schedules. Depending on the size and complexity of the basin modeled, reservoirs may be divided into categories according to size. For instance, all reservoirs, except very large project reservoirs, may be properly simulated in the model as direct flow diversions. The very large reservoirs will, of course, be best simulated by inclusion

in the reservoir operations section of the program, discussed in detail in subsequent sections.

Reservoir information is required by the model from two data files; 1) a reservoir rights file, and 2) a reservoir data file. A detailed description of both files can be found in the User's Manual.

3. Schematic Diagrams

As part of the development of the WIRSOS model, schematic diagrams evolved as useful tools to illustrate the stream network, station numbers, diversions, instream flows and reservoirs. The diagrams represent a good description of the operations of a river basin and can be made as detailed or as general as desired.

Schematic diagrams are used to show the stream, ditch and reservoir system, location of diversions, storage and return flows, streamflow gages and other useful information. In addition to defining the watershed and water rights system under analysis, these diagrams serve as valuable tools for administration of the system on a day-to-day basis.

Schematic diagrams are normally compiled on U.S.G.S. quadrangle map bases reduced to 1" = 1 mile scale and spliced together, however, different scale maps can also be used as appropriate. River and reservoir system, gages, towns and other cultural features can also be located on the map. Water rights data, including structure name, amount, appropriation and adjudication date and other descriptive information are also shown. Figure II-5 is a sample schematic diagram.

B. MODEL OPERATION

WIRSOS operates on a strict prior appropriation basis. The most senior priority water right demand in the basin will be satisfied first subject to physical water availability, then the next most senior water right will be evaluated, and so on until the most junior right has been processed.

The operation of satisfying water right demands is repeated for each month in each year of the study period.

If two water rights hold the same priority date and are of the same type (diversion, storage, instream flow), the model will analyze the upstream right first and the downstream right second. If the two rights are located at the same point and are of the same type, the model will satisfy the right listed first in the data file.

If two water rights hold the same priority date, the type of each right determines which one will be allowed to divert first. Direct flow diversions take precedence over reservoirs which in turn precede instream flow rights.

1. Diversions

The WIRSOS model is designed to process four different types of direct flow diversions: (1) normal diversions, (2) junior project right diversions, (3) senior project right diversions and (4) junior project rights processed as if they were senior project rights. The project rights are different from a normal diversion in that they can receive water from reservoir storage. These project rights can be linked to one reservoir only. The way in which these rights are satisfied under the priority system

in relation to the priority of the reservoir determines whether they are considered junior or senior project rights. A definition of each type of right and the processing procedure which the model logic follows for each type of right is described below.

a. Normal Diversions

To satisfy the monthly demands of a normal direct flow water right, the available river flow is compared to the demand. If the river flow cannot meet the demand of the diversion, the right will not be fully satisfied and will, subsequently, be placed on the "call out" list. These direct flow diversions are not associated with a reservoir and cannot, therefore, receive supplemental water from a reservoir.

Under the "NORMAL DIVERSION" section of the model logic, the program will first check for any previously called out diversions, reservoirs or instream flows, if the available flow at the point of diversion is greater than zero. If any downstream senior rights have not received a full water supply, then the present right in question will not receive any water and will be placed on the "call out" list as 100 percent called out. If no water rights have yet been called out, then the program determines the amount of flow available at the diversion point of the present water right.

The flow available for use at the point of diversion will be equal to the minimum flow available at and downstream of the diversion station. Three situations can exist:

1) The demand is less than or equal to the available flow.

Under this situation, the water right will be fully satisfied. The amount diverted will be subtracted from the river at and downstream of the diversion station. The return flows will be calculated and added back into the river for the current diversion month and subsequent months, as appropriate for irrigation rights, at the return flow location(s) and all downstream stations.

2) The demand is greater than the available flow.

The demand will only be partially satisfied and the portion of the right not met will be calculated as a percentage called out. Prior to the calculation of the called out amount, the return flow amount is calculated and added in with the available flow. This new available amount is again compared to the demand to determine if enough water is now available to fully satisfy the right. If the amount available does not satisfy the demand (within 1 cfs) the return flow calculation process is repeated up to 1000 times. If the right is still not satisfied, the demand is reduced in increments of 3 cfs and the process is repeated. If the initial demand is not met, the called out portion is calculated and written to the "call out" list. The return flow accounting will be based on the amount diverted by the water right. This diverted flow is subtracted from the river at and downstream of the diversion station. The return flow for the diverted amount will be calculated and added back into the river at the return flow location(s) and all downstream stations.

For example, in sample run #1, the water right #N1961 requires a diversion of 2.0 cfs in April of the first year. The efficiency is 10 percent with all of the return flow occurring in the diversion month. The minimum available flow at or downstream of the #N1961 diversion point (072204) is 0.0487 cfs at 072208. The river flow at Station 072204 is 20.0487 cfs. (See Tables E-3 and E-5

in the User's Manual). The water right #N1961 may possibly be able to divert an amount greater than 0.0487 cfs, so long as the stream depletion due to the diversion does not exceed 0.0487 cfs. Table II-3 illustrates the iterative process through which the program will progress until the diversion amount is less than the available flow (including return flow).

If the water right has no return flows, the iterative process cannot be used and the right will simply receive the amount of water available for diversion. The remaining portion of the right will be placed on the "call out" list.

3) The available flow is equal to zero.

If the available flow, at the diversion point and downstream points, is equal to zero, the water right will not receive any water and it will be written to the "call out" list as 100 percent called out.

b. Junior Project Rights

Junior Project Rights (JPR) are water rights "linked" (able to receive supplemental storage water) to a reservoir where the priority date of the JPR is junior to the reservoir's water right priority date. If the reservoir is not full after the operation of storing water under its reservoir right (JUNIOR PROJECT RIGHTS (NO SPILL) FROM RESERVOIR), the JPRs linked to the reservoir are processed at the time the reservoir right is under analysis. If the reservoir is full and spilling water into the river (JUNIOR PROJECT RIGHTS (SPILL)), then the JPRs are processed at their own priority date and will search for a supply from the river and then from the reservoir. In addition, water rights not totally satisfied from the reservoir in a no

Table II-3

EXAMPLE OF COMPUTING "NORMAL DIVERSION" AMOUNT WHEN RIVER FLOW IS GREATER THAN AVAILABLE FLOW

DIFFER	#N1961 DIVER		AVWRET
			.0487 (AVAIL)
.1513	2.0		1.8487
.1312	1.7987		1.6675
.1131	1.6175		1.5045
.0968	1.4545		1.3578
.0821	1.3078		1.2257
.0689	1.1757		1.1068
.0570	1.0568		.9998
.0463	.9498		.9035
.0366	.8535		.8169
.0280	.7669		.7389
.0202	.6889		.6687
.013	.6187		.6055
.0068	.5555		.5487
.0012	.4987		.4975
-.0040	.4475	<	.4515

Permit #N1961 can divert .4475 cfs.

DIFFER = DIVER - AVWRET
AVWRET = (AVAIL + RET)
DIVER = Diverson amount, initially set to 2.0 cfs for N1961 right.
AVAIL = Minimum downstream flow available for diversion.
EFFICIENCY = 10%
RET = DIVER * Amount returned in current month (100%) * (1-Efficiency)
RET (initial) = (2.0)(.9) = 1.8

spill situation will also be processed against available water from the river to satisfy the remaining demand at the priority date of the direct flow water right (JPR (NO SPILL) FROM RIVER).

Under the scenario of the reservoir not attaining full capacity (no spill), the water available for release to the river and subsequently available for the JPR downstream diversion is calculated. The amount of reservoir water available is equal to the current storage less the minimum pool level. The flow capacity through the outlet works is calculated as the maximum capacity of the outlet works less the river flow. The limiting factor for the amount which is available for release is the lesser of the remaining flow capacity of the outlet works and the amount of reservoir water available.

If the monthly demand value of the JPR is less than or equal to the amount which the reservoir is able to release, the JPR will be fully satisfied. The return flow is calculated and the river array is updated to include these values. The current storage in the reservoir is reduced by the amount diverted by the JPR and the total reservoir project releases variable is increased by the same amount. The amount of water released from the reservoir is also added to the river at all sectors between the reservoir and the point of diversion of the JPR. The JPR will then divert the water from the river and the return flows will be calculated for current and subsequent months and added into the available river flow array.

If the monthly demand value of the JPR is greater than the amount which the reservoir can release, the JPR will be satisfied to the extent possible by the reservoir water and the portion remaining to be satisfied will be processed in order of priority under the "JPR (NO SPILL) FROM RIVER" section. The amount which the

reservoir can serve to the JPR will be released, subtracted from storage, added in to the river flow between the reservoir station and the JPR station, and added in to the total project release amount. The difference, then, between the amount released from storage and the demand is equal to the amount of the right yet to be satisfied.

A JPR not satisfied fully by the reservoir is processed under the "JPR (NO SPILL) FROM RIVER" section. The procedure is similar to that under the "NORMAL DIVERSION" section. The first check is for water availability at the JPR station. If there is no water available, the remaining portion of the JPR not satisfied will be considered called out and will be written to the "call out" list. If water is available at the JPR station then the program will search for any previously called out diversions, reservoirs or instream flows. If any have been called out, the remaining JPR demand will also be called out and will be written to the "call out" list.

If water is available for diversion, the JPR will divert the remaining portion of its demand provided the available flow is greater than the demand. Under this condition, then, the JPR will now be fully satisfied. If the available flow is less than the remaining demand, the JPR will divert the entire available flow. In either situation, the amount diverted will be subtracted from the diversion station and all downstream stations in the available river flow array. Return flows will subsequently be calculated and added back at the return flow station(s) and all downstream stations. The iterative process of accounting for return flows to increase the divertable amount under the normal diversion section is not used in the "JPR (NO SPILL) FROM RIVER" section. This is the primary difference between the two sections of the model.

Junior project rights are processed the same as senior project rights provided the associated reservoir is full and spilling water into the river. This scenario is, therefore, discussed under senior project rights.

Caution should be used when establishing a data base for the model and incorporating junior project rights. If a reservoir has two water rights senior to a junior project right, the model will try to satisfy the junior project right's demand subsequent to processing each reservoir right. This means the demand will try to be satisfied twice.

c. Senior Project Rights

Senior Project Rights (SPR) are defined as direct flow diversion rights which are linked to a reservoir for supplemental water where the priority date of the SPR is senior to the water right date of the reservoir. The general procedure used for operating SPR (and JPR under a reservoir spill condition) is that the water rights will try to satisfy their demands from the river first. If the demand is not completely satisfied by the available river flow, then the right will call for available water to be released from the reservoir to which it is associated. In this way reservoir storage is used as a supplemental supply to the water rights linked to that reservoir.

The same initial procedures are followed here as in the normal diversion section and the junior project right section. First the available flow at the senior project right station is determined and secondly, the program searches for previously called out water rights. If the water availability at the station of interest is zero or if any downstream senior water rights

have been called out, then the program calculates the volume of water available for release from the reservoir. As in the JPR section, the limiting factor to meeting the demand is either the remaining flow capacity of the outlet works after accounting for the river flow or the amount of reservoir water available (current storage minus the minimum pool) whichever is less. If the reservoir release does not satisfy the demand of the SPR, the percent called out is calculated and tabulated on the "call out" list.

If a SPR is partially satisfied by the river flow and partially satisfied by the reservoir flow, the amount of water diverted under each condition is totaled and that amount is then processed in the "DIVERSION AND PROJECT RETURN FLOW SECTION". The program also moves directly to this section after the right diverts its entire demand from the river or after it diverts as much as possible from the reservoir under the condition when the river supplies none of the demand.

The WIRSOS model is also capable of handling JPRs as SPRs. The JPR section was originally designed to satisfy very junior water rights a substantial distance downstream of a reservoir without going through an iterative procedure. If a reservoir was not spilling chances were the downstream junior rights would be called out. The JPR section allows these rights to try and satisfy their demands without going through the normal diversion section. In a more generic situation, the modeler may want a JPR to try and satisfy its demand from the available direct river flow first regardless of the spill or no spill condition of the reservoir. One small data change on the diversion card can accommodate this procedure.

2. Return Flows

The return flows for all types of diversions occurs in the "DIVERSION AND PROJECT RETURN FLOW" section. It is possible for a diversion to be entirely consumed and, therefore, the number of return flow locations would be equal to zero. For example, this might occur if there is a trans-basin diversion, small reservoir modeled as a diversion, or an industrial water right with 100 percent consumptive use. This section would not operate under the above conditions. A maximum of ten return flow locations per water right is currently allowed under the program's logic.

The total return flow volume or flow rate associated with a diversion is calculated as:

TOTRET = DIV * ((100 - EFF)/100)

where EFF is defined as the diversions depletion (%) and;
DIV is the actual diversion

Delay tables, which incorporate ground water and surface returns to the river system, are developed as part of the data base preparation. The delay tables represent the lagged effects of return flow from the portion of the diversion right which is not entirely consumed by crops or by non-recoverable losses. Surface returns are assumed to return in the same month in which the water was diverted. The lagged effect, therefore, represents the movement of subsurface water which, according to model logic, may take up to twelve months to return to the river system. Delay table numbers are assigned to each series of twelve return flow percentages. Table II-4 represents each of the two types of return flows which the model processes.

Table II-4

DELAY TABLES
Sample of Each Type of Delay Pattern

Number	Mo.1	Mo.2	Mo.3	Mo.4	Mo.5	Mo.6	Mo.7	Mo.8	Mo.9	Mo.10	Mo.11	Mo.12
11	59	27	4	2	1	1	1	1	1	1	1	1

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
51	1	1	1	1	1	1	13	35	32	11	2	1

Under the current formats, if the delay table number is less than or equal to 50, the first value in the delay pattern will be applied to the current month and the second value to the next month and so on for twelve months. For example, using Table II-4, a water right has a delay table number 11 and first diverts in April. The return flow which occurs in April is 59 percent of the total return flow amount. In May, 27 percent of the total will return to the river and, in June, 4 percent of the total will return. If the delay table number is greater than 50, the value in the delay pattern corresponding to the current month is applied to the current month and so on for the next twelve months. For example, a water right has a delay table number 51 and begins to divert in May. According to Table II-4, one percent of the water will return in May, one percent will return in June, 13 percent will return in July and so on.

The WIRSOS model calculates and distributes return flow by first retrieving the delay pattern for the diversion and determining whether the number of the pattern is less than or equal to 50 or greater than 50. Next, the return flow station is located. Then, the total amount returned to that station in the current month is calculated by the following algorithm:

```
RET = TOTRET * PCTTOT/100 *(DLY/100)
```

where PCTTOT is the percentage of the total return flow returning to the station of interest and;

DLY is the percent of the total return flow returning in the current month

This amount of return flow (RET) is then added in to the river at the return flow station identified and at all downstream stations. Then the next return flow station is selected and the above procedure is repeated. This process is iterated until the model has accounted for the return flows at all stations associated with the water right of interest. The model will also, at this time, calculate the return flow amounts at each station for each of the subsequent eleven months and store that amount in the monthly river array.

3. Instream Flow Requirements

The processing of Instream Flow Requirements (IFR) is a relatively simple procedure. Once an instream flow right is selected for processing based on priority date and rank among other types of water rights with the same date, the amount of the flow requirement is compared to the available river flow. If the IFR is greater than zero and less than the available river flow at the instream flow point, then the IFR is fully satisfied and the available flow at the IFR station is subsequently reduced by the IFR amount. The final river array, however, is not reduced by the IFR amount since the water remains in the river. If the IFR is greater than the available river flow, the available river flow is reduced to zero and the portion of the IFR not met is calculated as follows:

PCTCAL = 100 - (100 * AVAIL/FLOWRQ)

where AVAIL is the available river flow;
FLOWRQ is the IFR requirement;
PCTCAL is the percent of the IFR not satisfied

The remaining portion of an IFR which has not been fully satisfied is subsequently written to the "call out" list.

This procedure will be repeated for each instream flow station. The input data must contain one record for each IFR station and all points for the same IFR would have the same priority date. The model, therefore, would process each IFR in a downstream direction.

IFRs cannot be linked to a reservoir and, therefore, must rely totally on the available flow of the river.

4. Reservoirs

a. Filling Criteria

Reservoirs operate according to the "one-fill" rule as dictated by administrative practice of the Wyoming State Engineer's Office. A reservoir can store in any one year the difference between the maximum amount for which the reservoir is decreed and the amount of storage in the reservoir at the beginning of the water year (carry-over storage).

The model keeps track of the amount stored in the reservoir in each month and compares this running total to the amount which the reservoir is allowed to store. Once the water storage requirement is determined, the model checks for water availability. If any downstream senior rights have been called out, the reservoir will not be able to store any water in the current month. The

total storage requirement for the month would then be written to the "call out" list.

If water rights downstream had not been shorted a supply, the program will then find the maximum amount of water available for storage by determining the minimum available flow at and downstream of the reservoir station. If the available flow is zero, the reservoir right is 100 percent called out. If the storage requirement is less than the available flow, the entire requirement will be fulfilled. Under this circumstance, the reservoir storage contents variable will be increased and the available river flow decreased accordingly. The reservoir would not be allowed to store any more water during the remainder of the current water year even though water may be released from storage for downstream uses.

In the event the storage demand is greater than the river flow available to be stored, the reservoir will store the available flow and the storage demand will be recalculated. The reservoir will then try to satisfy the remaining storage demand in subsequent months. In addition, the portion of the demand not satisfied will be computed and tabulated on the "call out" list.

The program will check to see if the reservoir is full and spilling water into the river after processing the reservoir water right. If the reservoir is not spilling, the JPRs tied to the reservoir will be processed, if any exist. If the reservoir is spilling, the program will continue to process water rights in order of priority.

The downstream river flows will be reduced by the amount stored in the reservoir. The program also tabulates monthly and year-to-date storage in the reservoir.

b. Evaporation

After all water rights have been processed during a month, evaporation is calculated and subtracted from the current storage. The evaporation is calculated by the following algorithm:

$$EVAP = ((AREA1 + AREA2)/2) * EVAPRT$$

where AREA1 is the surface area of the reservoir with the initial monthly storage volume;
AREA2 is the surface area of the reservoir with the end-of-month storage volume;
EVAPRT is the monthly evaporation rate read as part of the input data (feet).

The surface area is determined from the area-capacity curves which are input in a separate data file.

For the Bighorn River Adjudication, seasonal gross evaporation rates derived from U.S. Weather Bureau data were used in the model data base. The WIRSOS model will also accept year-round and/or net evaporation rates.

c. Power Releases and Non-Project Releases

Power releases are processed at the beginning of each month. The goal date is the date by which the total amount of power releases need to be met. If the goal date is greater than zero, a target volume is subtracted from current storage and tabulated as the goal volume to be released. The actual power release is calculated by dividing the goal volume to be released by the number of months remaining before meeting the goal date. For example, if the goal month is March and the current month

is November, the number of months remaining to release the desired volume of water is four. Therefore, the total amount to be released will be divided by four and the result is the amount to be released from the reservoir. The monthly amount to be released is calculated at the end of each month after all water rights have been processed and adjusted accordingly to reflect changes in contents during the month.

The power releases and the non-project releases are made at the beginning of each month. If the available reservoir volume (current storage - minimum volume)is less than the flow capacity of the outlet (maximum capacity - river flow), the power release requested will be compared to this volume. In the event the power request is greater than the available reservoir volume, the power released will be reduced to that volume. If the request is less than the amount available for release from the reservoir, then the full request will be satisfied.

If the flow capacity is less than the available reservoir volume, the power request is compared to the flow capacity and treated in the same manner as described above.

Following the power release, the reservoir volume available for release is reduced by the amount of the power release. The non-project releases are then calculated.

Non-project releases were designed as a means to release water from a reservoir when data for specific uses is unavailable. This release mechanism is necessary to evacuate the water from the reservoir as might happen under actual conditions.

The non-project release requests are calculated as a percent of the available reservoir volume. The computation is demonstrated as follows:

REQNP = RNPJRL * .01 * RESAVL

where RNPJRL is the monthly percent requested for release;
RESAVL is the volume of reservoir water available for release.

The non-project release request is then compared to the reservoir volume available and the flow capacity similar to the manner in which the power releases were compared. The non-project release is reduced to the lower of the two, if necessary.

III. PROGRAM DESCRIPTION

The WIRSOS program source listing, flowcharts, and variable definition list are located in Appendices A, B and C, respectively. The program source listing is output from program compilation and the line number of each executable statement is printed to the left of each line of source code. These line numbers can be used for easy reference when locating a variable within the program. Beginning on page A-101, in Appendix A, is an alphabetical listing of all the variables used in the WIRSOS program. To the right of each variable is a list of line numbers which identify the location where each variable is used. This list should be referred to in the event any program changes become necessary.

The WIRSOS program is divided into subsections outlined by dashes on the line above and the line below the title of the sub-section. These titles are also used on the flowcharts for ease in tracking the program. For example, the first sub-section is entitled "START BEGINNING-OF-RUN SECTION" (page A-5) and the first flowchart (page B-2) after the overview is entitled "BEG OF RUN SECTION". This flowchart page summarizes the WIRSOS program steps in the "START BEGINNING-OF-RUN SECTION".

The next sub-section is labeled "START 1ST YEAR RUNOFF SECTION" in the program source code. The flowchart which corresponds to this section is entitled "FIRST YEAR RUNOFF SECTION" (page B-3). The end of this flowchart signifies the end of both the "1ST YEAR RUNOFF SECTION" and the "BEGINNING-OF-RUN SECTION". These two sections are then followed by the "START BEGINNING OF YEAR SECTION", page A-14 of the program listing and page B-4 of the flowcharts. The remaining sections of the WIRSOS model are similarly summarized on the flowcharts. The title of each flowchart is located in the upper right hand corner of the page.

The variable list in Appendix C is a comprehensive list of the variables used by the WIRSOS program followed by the definition of each of these variables. This list used in conjunction with the flowcharts and the program source code will enable the user to obtain a better understanding of how the WIRSOS model operates.

APPENDIX A

WIRSOS SOURCE LISTING

```
      1.       PROGRAM WAT12S(INPUT,OUTPUT,TAPE1,TAPE2,TAPE3,TAPE4,
     +TAPE5=INPUT,TAPE6=OUTPUT,TAPE7,TAPE8,TAPE9,TAPE10,TAPE11,TAPE12
     +,TAPE13,TAPE14,TAPE15,TAPE16,TAPE17,TAPE18)
C
C-------------------------------------------------------------------
C
C-------         DATE: JUNE 16, 1983
C
C-------         AUTHOR: PAUL T. MUSSER
C                       DENVER, COLORADO
C
C-------         CONTRACTED BY: LEONARD RICE CONSULTING WATER ENGINEERS, INC
C                              DENVER, COLORADO
C
C-------         PROJECT: 390 WYO 01     BIGHORN
C
C------          VERSION  12.3
C
C-------------------------------------------------------------------------
C
C
C          11.0   FINAL WYOMING MODEL
C          11.1   RESERVOIR RELEASE TO SECOND STATION DOWNSTREAM.
C          12.0   RESERVOIR AREA/CAPACITY CALC CHG
C          12.1   FIX OF JPR RETURN FLOW PROBLEM
C
C          12.2   6-83   ADDED SENIOR PROJECT RIGHTS WITH JUNIOR DATE
C
C         12.3   4-84    FIX OF DECREE MAX RESET - VECTORIZED WRONG
C-----------------------------------------------------------------
C
C      FILES AND REQUIRED SORT PRIORITIES:
C
C      TAPE 1 - INPUT STATION FILE  -  SORT BY STATION
C      TAPE 2 - INPUT RUNOFF FILE  - SORT BY YEAR
C      TAPE 3 - INPUT IFR FILE  -  SORT BY DATE THEN STATION
C      TAPE 4 - INPUT DIVERSION AND RET FLOW FILE  -  SORT BY DATE
```

```
38          C                       THEN STATION.
39          C      TAPE 5 - INPUT FROM TERMINAL / JOB STREAM
40          C      TAPE 6 - OUTPUT TO TERMINAL / PRINTER
41          C      TAPE 7 - INPUT RETURN FLOW DELAY TABLES
42          C      TAPE 8 - OUTPUT INITIAL RUNOFF REPORT.  WRITTEN FOR ALL STATIONS,
43          C                       12 MONTHS, EACH YEAR.
44          C      TAPE 9 - OUTPUT FINAL RIVER STATUS REPORT.  CFS WHICH IS ACTUALLY
45          C                        IN THE STREAM
46          C                       (INCLUDING IFR AMOUNTS) WRITTEN FOR ALL STATIONS,
47          C                       12 MONTHS, EACH YEAR.
48          C      TAPE 10- OUTPUT FINAL WATER AVAILABLE REPORT.  CFS WHICH IS
49          C                      AVAILABLE IN THE STREAM FOR OTHER RIGHTS.
50          C                        WRITTEN FOR ALL STATIONS, 12 MONTHS,
51          C                       EACH YEAR.
52          C      TAPE 11- OUTPUT LIST OF STATIONS CALLED OUT.  WRITTEN FOR ALL
53          C                       RIGHTS CALLED OUT EACH MONTH.
54          C      TAPE 12- OUTPUT LIST OF PERMIT NUMBERS AND PERCENTAGES CALLED OUT
55          C                          FOR DIVERSIONS.
56          C      TAPE 13- OUTPUT LIST OF STATIONS AND PERCENTAGES CALLED OUT FOR
57          C                        INSTREAM FLOW REQUIREMENTS.
58          C      TAPE 14- INPUT  RESERVOIR AREA-CAPACITY CURVE DATA.
A-2 1     PAGE 2                    ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 2

59          C      TAPE 15- INPUT RESERVOIR DATA FILE -  SORT BY RESERVOIR CODE
60          C      TAPE 16- INPUT RESERVOIR RIGHTS FILE - SORT BY PRIORITY DATE THEN
61          C                       STATION.
62          C      TAPE 17- INPUT JUNIOR PROJECT RIGHTS FILE - SORT BY RESERVOIR
63          C                       CODE, THEN PRIORITY DATE.
64          C      TAPE 18- OUTPUT MONTHLY RESERVOIR STATUS REPORT. SORTED BY
65          C                      RESERVOIR CODE, THEN YEAR.
66          C      TAPE 19- OUTPUT/INPUT - TEMP RESERVOIR STATUS REPORT
67          C
68          C-----------------------------------------------------------------*
69          C
70          C      PROGRAM LIMITS:
71          C
72          C      STATIONS                1550
73          C      DIVERSIONS              4500
74          C      IFRS                     500
75          C      RETURNS/DIV               10
76          C      RET DELAY TYPES           99
```

```
      C      YEARS                    DEPENDANT ON AMOUNT OF DATA IN RUNOFF FIL
      C      RESERVOIRS               50
      C      RIGHTS PER RESERVOIR      4
      C      JUNIOR PROJECT RIGHTS   100
      C
      C-----------------------------------------------------------------8
      C
      C
      C------  RIVER BASIN
      C
     2.       DIMENSION ISTATA(1550,12),RIVER(1550,24)
     3.       DIMENSION AVAIL(1550),AVWRET(1550),AVOUT(1550,12)
      C
      C------  RUNOFF
      C
     4.       DIMENSION RUNOFF(12)
      C
      C------  DIVERSIONS
      C
     5.       DIMENSION DIVER(12),DIVPMT(2),IDDATE(2)
     6.       DIMENSION RETSTA(10),RETDLY(10),PCTTOT(10)
      C
      C------  INSTREAM FLOW REQUIREMENTS
      C
     7.       DIMENSION FLOWRQ(12),IFRPMT(2),IFDATE(2)
      C
      C------  RESERVOIRS
      C
     8.       DIMENSION RESNAM(50,4),RESPMT(2),IRDATE(2),RSTNUM(50)
     9.       DIMENSION RSRMET(50),IRSTAN(50),IRSORD(50),INDXRR(50)
    10.       DIMENSION IRESSWI(50)
      C
      C------  RESERVOIR LIMITS
      C
    11.       DIMENSION VOLMIN(50),VOLMAX(50),FLOMAX(50),DCRMAX(50),DECREE(50)
      C
      C------  RESERVOIR - POWER AND NON-PROJECT RELEASES, EVAPORATION
      C
    12.       DIMENSION POWREQ(50),POWREL(50),GOALDT(50),GOALVL(50)
    13.       DIMENSION EVAPRT(50,12),EVAP(50)
1WAT12S    PAGE 3                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 3
WAT12S
```

```
      DIMENSION RNPJRL(50,12),REQNP(50),RELNP(50)
      DIMENSION NRANGE(50),RLIMIT(50,3),NEQTYPE(50,3),ACOEF(50,3,3)
C
C------  RESERVOIR SUBTOTALS
C
      DIMENSION VOLINT(50),STOMON(50),CURSTO(50),YTDSTO(50),BEGVOL(50)
      DIMENSION RRYTD(50,4),PROJTF(50),RSDATA(10),RTOTAL(8)
C
C------  JUNIOR PROJECT RIGHTS
C
      DIMENSION RITJPR(12),JPRPMT(2),IJDATE(2)
      DIMENSION JPRETS(10),JPRDLY(10),PCTJPR(10)
      DIMENSION REMJPR(100),JPREMP(100,2)
C
C------  CALLED OUT RIGHTS
C
      DIMENSION NODIV(4500),NOFLOW(500),NORES(200)
C
C------  MISC
C
      DIMENSION RTEMP(30),IRTEMP(8)
      DIMENSION DLYRAT(100,12),DLYNUM(100)
      DIMENSION MONTHN(12),MTHDAY(12)
      DIMENSION IHEAD(10),HEAD2(2)
C
C
      LOGICAL IFFLAG,IDFLAG,RNFLAG,IRFLAG,RESFLG(50)
      LOGICAL IRFILL(50),MSPILL(50)
C
      COMMON ILINE
C
      INTEGER DIVPMT,RETSTA,RETDLY,RESNAM,RESPMT,RSTNUM,RSRMET,DLY
      INTEGER DIVDAT,RESDAT
      INTEGER GOALDT,DLYNUM,RESNUM,ORDER,ORDERR,ORD,ORDR,DIVTYP
      INTEGER RESTAT,CONSTA,DIVSTA,GLDATE
C
C     ARRAY *NORD* ADDED FOR VECTORIZING
C
      DIMENSION NORD(4500)
      LOGICAL BITV
C
```

```
      158         C-------------------------------------------------------------------
      159         C
      160      35.       DATA MTHDAY/31,28,31,30,31,30,31,31,30,31,30,31/
      161         C
      162      36.       DATA MONTHN/3HJAN,3HFEB,3HMAR,3HAPR,3HMAY,4HJUNE,4HJULY,
      163                +3HAUG,4HSEPT,3HOCT,3HNOV,3HDEC/
      164         C
      165      37.       DATA FACTOR/1.9835/
      166         C
      167         C-------------------------------------------------------------------
      168         C
      169         C
      170         C-------------------------------------------------------------*
      171         C
      172         C----       START  BEGINNING-OF-RUN SECTION
      173         C
      174         C-------------------------------------------------------------
1WAT12S    PAGE 4                  ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 4
WAT12S

      175         C
      176         C
      177         C------READ REPORT HEADING FOR FILES TAPE8, TAPE9, TAPE10, TAPE11,
      178         C------  AND TAPE18.
      179         C
      180      38.       READ(5,5000) IHEAD
      181      39. 5000  FORMAT(10A4)
      182         C
      183         C------READ NUMBER OF ENTRY STATIONS PER YEAR TO RECIEVE RUNOFF DATA,
      184         C
      185      40.       READ(5,5010) NUMRUNS
      186      41. 5010  FORMAT(I3)
      187         C
      188         C------  READ RESERVOIR/NO RESERVOIR OPTION  -  RES/NOR
      189         C
      190      42.       READ(5,5020) IRESOPT
      191      43. 5020  FORMAT(A3)
      192         C
      193         C------  CALL SYSTEM TIME AND DATE FOR REPORT HEADINGS.
      194         C
      195      44.       CALL CLOCK(HEAD2(1))
      196      45.       CALL DATE(HEAD2(2))
```

```
197          C
198          C------INITIALIZE CONTROL AND INDEXING VARIABLES.
199          C------  LINPPAG - NUMBER OF LINES PER PAGE ON OUTPUT FORMS.
200          C------  IYR - CURRENT YEAR BEING PROCESSED.
201          C------  IMO - CURRENT MONTH BEING PROCESSED.  (1 THROUGH TOTAL NUMBER .
202          C------              OF MONTHS TO BE PROCESSED)
203          C------  RNFLAG - SET TO TRUE WHEN AN END-OF-FILE IS READ ON THE
204          C------           RUNOFF FILE (TAPE2). THIS TELLS THE PROGRAM TO
205          C------           PROCESS ONE MORE YEAR AND STOP.
206          C
207       46.        MAXRES=50
208       47.        LINPPAG=60
209       48.        IYR=0
210       49.        IMO=1
211       50.        RNFLAG=.FALSE.
212          C
213          C------READ IN RETURN FLOW DELAY TABLES FROM TAPE7
214          C
215       51.        DO 10 IDL=1,99
216       52.        READ(7,5030) DLYNUM(IDL),(DLYRAT(IDL,IM),IM=1,12)
217       53. 5030   FORMAT(4X,I2,12(2X,F3.0))
218       54.        IF(EOF(7)) 15,10
219       55. 10     CONTINUE
220          C
221          C------FILL ISTATA ARRAY WITH STATION NUMBERS , STREAM ORDERS AND
222          C------STATION DESCRIPTIONS FROM TAPE1
223          C
224       56. 15     DO 25 IS=1,1550
225       57.        READ(1,5040) (ISTATA(IS,IM),IM=1,12)
226       58. 5040   FORMAT(4X,I6,I2,8X,10A4)
227       59.        IF(EOF(1)) 20,25
228          C
229          C------   SET NUMSTA TO NUMBER OF STATIONS READ.
230          C
231       60. 20     NUMSTA=IS-1
232       61.        GO TO 30
1WAT12S    PAGE 5                    ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 5
WAT12S

233       62. 25     CONTINUE
234          C
235          C------  IF NO RESERVOIRS, SKIP RESERVOIR INITIALIZATION SECTION, GO
```

```
236         C------   TO FIRST YEAR RUNOFF SECTION.
237         C
238      63. 30     IF(IRESOPT.EQ.3HNOR) GO TO 60
239         C
240         C
241         C------READ RESERVOIR DATA FROM TAPE 15.
242         C
243      64.        NUMRES=0
244      65.        MAXRESD=MAXRES+1
245      66.        DO 55 NUMR=1,MAXRESD
246      67.        READ(15,5050) (IRTEMP(I),I=5,8),(IRTEMP(J),J=1,3),(RTEMP(K),
247                +  K=1,17)
248      68.   5050 FORMAT(4A4,I6,1X,I2,1X,I1,2(1X,F8.0),1X,F5.0,1X,F8.0,1X,
249                +  12F4.2,1X,F8.0)
250         C
251      69.        IF(EOF(15) )  35,40
252         C
253         C------  SET NUMREST TO THE CODE OF THE RESERVOIR WITH THE
254         C------    HIGHEST CODE WHICH IS ACTIVE.
255         C
256      70. 35     MR=MAXRES+1
257      71.    36  MR=MR-1
258      72.        IF(MR.GT.0) GO TO 37
259         C
260      73.        WRITE(6,5055)
261      74.   5055 FORMAT("RESERVOIR OPTION IS SET TO -RES- , BUT THERE",
262                +   "ARE NO ACTIVE RESERVOIRS.")
263      75.        STOP 18
264         C
265      76.    37  IF(IRESSWI(MR).EQ.0) GO TO 36
266      77.        NUMREST=MR
267      78.        GO TO 60
268         C
269      79. 40     READ(15,5060) (RTEMP(I),I=18,29),IRTEMP(4),RTEMP(30)
270      80.   5060 FORMAT(12F4.0,4X,I2,F8.0)
271         C
272         C------  IF RES IS NOT ACTIVE, SET SWITCH TO 0 AND GO
273         C------     TO READ OF NEXT RESERVOIR.
274         C
275      81.        IF(IRTEMP(3).EQ.1) GO TO 42
276      82.        IRSNUM=IRTEMP(2)
277      83.        IRESSWI(IRSNUM)=0
```

```
    278     84.       GO TO 55
    279         C
    280         C------  IF RES IS ACTIVE, SET RES VARIABLES TO TEMP VARIABLE
    281         C
    282     85.    42 NUMRES=NUMRES+1
    283     86.       IRSNUM=IRTEMP(2)
    284     87.       RESNAM(IRSNUM,1)=IRTEMP(5)
    285     88.       RESNAM(IRSNUM,2)=IRTEMP(6)
    286     89.       RESNAM(IRSNUM,3)=IRTEMP(7)
    287     90.       RESNAM(IRSNUM,4)=IRTEMP(8)
    288     91.       RSTNUM(IRSNUM)=IRTEMP(1)
    289     92.       IRESSWI(IRSNUM)=IRTEMP(3)
    290     93.       VOLMIN(IRSNUM)=RTEMP(1)
1WAT12S    PAGE 6                  ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 6
WAT12S

    291     94.       VOLMAX(IRSNUM)=RTEMP(2)
    292     95.       FLOMAX(IRSNUM)=RTEMP(3)
    293     96.       BEGVOL(IRSNUM)=RTEMP(4)
    294         C
    295     97.       DO 43 IMTH=1,12
    296     98.       EVAPRT(IRSNUM,IMTH)=RTEMP(IMTH+4)
    297     99.       RNPJRL(IRSNUM,IMTH)=RTEMP(IMTH+17)
    298    100.    43 CONTINUE
    299         C
    300    101.       DECREE(IRSNUM)=RTEMP(17)
    301    102.       GOALDT(IRSNUM)=IRTEMP(4)
    302    103.       GOALVL(IRSNUM)=RTEMP(30)
    303         C
    304         C
    305         C------  SET JUNIOR PROJECTS PROCESSED WITH RESERVOIR FLAG TO FALSE
    306         C
    307    104. 45    RESFLG(IRSNUM)=.FALSE.
    308         C
    309         C------  SET POWER REQUEST AND RELEASE TO ZERO FOR THE FIRST MONTH
    310         C
    311    105.       POWREL(IRSNUM)=0.
    312    106.       POWREQ(IRSNUM)=0.
    313         C
    314         C------  SET RESERVOIR RIGHT INDEX AND YTD SUBTOTALS TO ZERO.
    315         C
    316    107.       INDXRR(IRSNUM)=0
```

```
    317    108.       RRYTD(IRSNUM,1)=0.
    318    109.       RRYTD(IRSNUM,2)=0.
    319    110.       RRYTD(IRSNUM,3)=0.
    320    111.       RRYTD(IRSNUM,4)=0.
    321         C
    322         C------  SET MONTHLY AND YEARLY SUBTOTALS TO ZERO FOR FIRST MONTH OF RUN
    323         C
    324    112.       STOMON(IRSNUM)=0.
    325    113.       YTDSTO(IRSNUM)=0.
    326         C
    327         C------  SET RESERVOIR RIGHTS MET FLAG TO  NO.
    328         C
    329    114.       RSRMET(IRSNUM)=2HNO
    330         C
    331         C------  SET CURRENT STORAGE TO BEGINNING VOLUME FROM RES DATA FILE
    332         C
    333    115.       CURSTO(IRSNUM)=BEGVOL(IRSNUM)
    334         C
    335         C------  STORE DECREE MAX FOR LATER USE.
    336         C
    337    116.       DCRMAX(IRSNUM)=DECREE(IRSNUM)
    338         C
    339         C------  SET RESERVOIR FILL AND SPILL FLAGS TO FALSE.
    340         C
    341    117.       IRFILL(IRSNUM)=.FALSE.
    342    118.       MSPILL(IRSNUM)=.FALSE.
    343         C
    344         C------ FIND RESERVOIR STATION INDEX AND ORDER IN ISTATA ARRAY.
    345         C
    346    119.       DO 50 IS=1,NUMSTA
    347    120.       IF(ISTATA(IS,1).NE.RSTNUM(IRSNUM)) GO TO 50
    348    121.       IRSTAN(IRSNUM)=IS
1WAT12S    PAGE 7                  ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 7
WAT12S

    349    122.       IRSORD(IRSNUM)=ISTATA(IS,2)
    350    123.       GO TO 55
    351    124. 50    CONTINUE
    352         C
    353         C------   IF STATION IS NOT FOUND, WRITE ERROR MESSAGE AND STOP PROGRAM
    354         C
    355    125.       WRITE(6,5100) RSTNUM(IRSNUM)
```

```
356    126.       STOP 2
357         C
358         C------  GO TO NEXT RESERVOIR
359         C
360    127. 55    CONTINUE
361         C
362    128.       WRITE(6,5070) MAXRES
363    129.  5070 FORMAT("TOO MANY RESERVOIRS     MAXIMUM = ",I5)
364         C
365    130.       STOP 12
366         C
367         C--------    READ RES AREA/CAPACITY CURVE DATA
368         C
369    131.    60 DO 64 IR=2,MAXRESD
370         C
371         C
372    132.       READ(14,5073) IRC
373    133.  5073 FORMAT(I2)
374         C
375    134.       IF(EOF(14)) 63,61
376         C
377    135.    61 READ(14,5075) NRANGE(IRC)
378    136.  5075 FORMAT(I1)
379         C
380    137.       NR=NRANGE(IRC)
381         C
382    138.       DO 62 IRG=1,NR
383         C
384    139.       READ(14,5077) RLIMIT(IRC,IRG),NEQTYPE(IRC,IRG)
385    140.  5077 FORMAT(F10.0,2X,I1)
386         C
387    141.       READ(14,5078) (ACOEF(IRC,IRG,IC),IC=1,3)
388    142.  5078 FORMAT(3F12.4)
389         C
390    143.    62 CONTINUE
391         C
392    144.    64 CONTINUE
393         C
394         C
395         C-----------------------------------------------------------------
396         C     START 1ST YEAR RUNOFF SECTION
397         C-----------------------------------------------------------------*
```

```
      C
      C------READ RUNOFF DATA FOR THE 1ST YEAR FROM TAPE2  ----------
      C------  RUNOFF AT EACH ENTRY STATION IS READ AND PROCESSED SEPARATELY.
      C
  145.    63 DO 110 IRN=1,NUMRUNS
      C
      C------READ IN RUNOFF STATION AND AMOUNTS.
      C
  146.       READ(2,5080) ISTAT,RUNOFF
1WAT12S    PAGE 8                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 8
WAT12S

  147.       IF(EOF(2)) 65,70
  148. 5080  FORMAT(4X,I6,12F8.0)
      C
      C------ IF THERE IS LESS THAN 1 YEAR OF DATA IN THE RUNOFF FILE,
      C------ WRITE AN ERROR MESSAGE TO OUTPUT AND STOP PROGRAM.
      C
  149. 65    WRITE(6,5090)
  150. 5090  FORMAT(" NOT ENOUGH DATA IN RUNOFF FILE")
  151.       STOP 3
      C
      C------CONVERT RUNOFF DATA FROM ACRE-FEET TO CFS.
      C
  152. 70    DO 75 IM=1,12
  153.       RUNOFF(IM)=RUNOFF(IM)/FACTOR/MTHDAY(IM)
  154. 75    CONTINUE
      C
      C------  FIND ENTRY STATION INDEX AND STREAM ORDER IN ISTATA ARRAY.
      C
  155.       DO 80 IS=1,NUMSTA
  156.       IF(ISTATA(IS,1).NE.ISTAT) GO TO 80
  157.       ORDER=ISTATA(IS,2)
      C       NSTAT - STATION INDEX WHERE CURRENT RUNOFF ENTERS THE BASIN.
  158.       NSTAT=IS
  159.       GO TO 85
  160. 80    CONTINUE
      C
      C------ IF THE STATION IS NOT FOUND, WRITE AN ERROR MESSAGE TO OUTPUT
      C------ AND STOP THE PROGRAM.
      C
  161.       WRITE(6,5100) ISTAT
```

```
437    162. 5100  FORMAT("1 STATION NOT FOUND - ",I6)
438    163.       STOP 4
439         C
440         C------ADD RUNOFF AMOUNTS TO ALL STATIONS AT AND DOWNSTREAM OF THE STATI
441         C------WHERE IT ENTERS THE BASIN IN MONTHS 1-12 IN RIVER ARRAY.
442         C
443    164. 85    DO 105 ISS=NSTAT,NUMSTA
444    165.       IF(ISTATA(ISS,2).EQ.ORDER) GO TO 95
445    166.       IF(ISTATA(ISS,2).EQ.ORDER-1) GO TO 90
446    167.       GO TO 105
447    168. 90    ORDER=ORDER-1
448    169. 95    DO 100 IM=1,12
449    170.       RIVER(ISS,IM)=RIVER(ISS,IM)+RUNOFF(IM)
450    171. 100   CONTINUE
451         C
452    172. 105   CONTINUE
453         C
454         C------GO TO READ OF NEXT RUNOFF STATION
455         C
456    173. 110   CONTINUE
457         C
458         C------ WHEN ALL THE RUNOFF HAS BEEN ENTERED FOR THE FIRST YEAR,
459         C------ WRITE THE FIRST 12 MONTHS OF RIVER ARRAY ON
460         C------  INITIAL RUNOFF REPORT(TAPE8)
461         C------ THE MONTHLY DATA IS IN CFS, YEARLY TOTALS ARE IN ACRE-FEET.
462         C
463    174.       IRUNYR=1
464    175.       WRITE(8,5110) IRUNYR,IHEAD,HEAD2
1WAT12S  PAGE 9                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 9
WAT12S

465    176. 5110  FORMAT("1",*YEAR *,I2,45X," INITIAL RUNOFF IN MONTHLY CFS",/,35X
466              +,10A4,2X,A8," PST ",A8,/)
467    177.       WRITE(8,5120)
468    178. 5120  FORMAT(" STATION ORD",4X,"JAN",6X,"FEB",6X,"MAR",5X,"APRIL",5X,
469              +"MAY",6X,"JUNE",5X,"JULY",5X,"AUG",6X,"SEPT",5X,"OCT",6X,"NOV",
470              +6X,"DEC",3X,"TOTAL (AF)",/)
471         C
472    179.       DO 120 IS=1,NUMSTA
473    180.       DO 115 IM=1,12
474         C
475         C------CONVERT TOTALS FROM CFS TO ACRE-FEET
```

```
476         C
477     181.        YTOT=YTOT+RIVER(IS,IM)*MTHDAY(IM)*FACTOR
478     182. 115    CONTINUE
479         C
480     183.        WRITE(8,5130) ISTATA(IS,1),ISTATA(IS,2),(RIVER(IS,I),I=1,12)
481                +,YTOT
482     184. 5130   FORMAT(" ",I6,I3,2X,12(F8.1,1X),F9.0)
483     185.        YTOT=0.
484         C
485     186. 120    CONTINUE
486         C
487         C-------------------------------------------------------------------*
488         C------   END 1ST YEAR RUNOFF SECTION
489         C-------------------------------------------------------------------*
490         C
491         C-------------------------------------------------------------------*
492         C
493         C----            END  BEGINNING-OF-RUN SECTION.
494         C
495         C-----------------------------------------------------------------------
496         C
497         C-----------------------------------------------------------------
498         C-----------------------------------------------------------------
499         C------   START  OF  MAJOR  PROGRAM  LOOP
500         C------
501         C------   1 THE NEXT YEAR OF DATA IN THE RUNOFF FILE IS READ INTO THE
502         C------      SECOND YEAR OF ARRAY 'RIVER', AND WRITTEN ON TAPE8.
503         C------
504         C------   2 DIVERSIONS, INSTREAM FLOW REQUIREMENTS, RESERVOIRS,
505         C------     AND JUNIOR AND SENIOR PROJECT RIGHTS ARE PROCESSED
506         C------     AGAINST EACH MONTH IN THE FIRST YEAR OF RIVER ARRAY.
507         C------     CALL OUT MESSAGES ARE WRITTEN TO TAPE11, TAPE12 AND TAPE13.
508         C------     RESERVOIR ACTIVITY IS WRITTEN TO TAPE19.
509         C------
510         C------   3 FINAL STATUS OF WATER IN THE BASIN, IN YEAR 1 OF RIVER ARRAY
511         C------     IS WRITTEN ON TAPE9 AND TAPE10.
512         C------
513         C------   4 YEAR 2 DATA IS MOVED TO YEAR 1 IN ARRAY 'RIVER'.
514         C------
515         C------   5 YEAR 2 OF ARRAY 'RIVER' IS RESET TO ZERO.
516         C------
517         C------   6 START AGAIN AT STEP 1.
```

```
    518         C------
    519         C------     WHEN THERE IS NO MORE DATA IN THE RUNOFF FILE, STEPS
    520         C------      2 THROUGH 5 ARE EXECUTED ONCE MORE AND THE .
    521         C------        END OF RUN SECTION IS PROCESSED.
    522         C------
1WAT12S    PAGE 10                 ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 10
WAT12S

    523         C-----------------------------------------------------------------"--
    524         C-----------------------------------------------------------------
    525         C
    526         C-----------------------------------------------------------------*
    527         C------
    528         C----------*      START  BEGINNING OF YEAR SECTION
    529         C------
    530         C-------------------------------------------------------------------
    531         C
    532         C------ INCREMENT YEAR COUNTER AND
    533         C------READ NEXT YEAR OF RUNOFF DATA, PROCESSING EACH ENTRY STATION SEPE
    534         C
    535    187. 125    IYR=IYR+1
    536    188.        DO 175 IRN=1,NUMRUNS
    537         C
    538         C------READ RUNOFF STATION AND AMOUNT
    539         C
    540    189.        READ(2,5080) ISTAT,RUNOFF
    541         C
    542         C------ IF THERE IS NO MORE DATA IN THE RUNOFF FILE,
    543         C------    SET RNFLAG TO TRUE,
    544         C------    SKIP BEGINNING OF YEAR SECTION,
    545         C------     GO TO BEGINNING OF MONTH SECTION.
    546         C
    547    190.        IF(EOF(2)) 130,135
    548    191. 130    RNFLAG=.TRUE.
    549    192.        GO TO 190
    550         C
    551         C------CONVERT RUNOFF FROM ACRE-FEET TO CFS
    552         C
    553    193. 135    DO 140 IM=1,12
    554    194.        RUNOFF(IM)=RUNOFF(IM)/FACTOR/MTHDAY(IM)
    555    195. 140    CONTINUE
    556         C
```

```
      C------FIND STATION INDEX AND STREAM ORDER TO RECIEVE RUNOFF
      C
196.        DO 145 IS=1,NUMSTA
197.        IF(ISTATA(IS,1).NE.ISTAT) GO TO 145
198.        ORDER=ISTATA(IS,2)
199.        NSTAT=IS
200.        GO TO 150
201. 145    CONTINUE
      C
      C------  IF ENTRY STATION NUMBER IS NOT FOUND, WRITE ERROR
      C------  MESSAGE AND STOP THE PROGRAM.
      C
202.        WRITE(6,5100) ISTAT
203.        STOP 5
      C
      C------ADD RUNOFF TO STATIONS AT AND DOWNSTREAM OF STATION WHERE IT ENTE
      C------  THE BASIN IN SECOND YEAR (MONTHS 13-24) OF RIVER ARRAY.
      C
204. 150    DO 170 ISS=NSTAT,NUMSTA
205.        IF(ISTATA(ISS,2).EQ.ORDER) GO TO 160
206.        IF(ISTATA(ISS,2).EQ.ORDER-1) GO TO 155
207.        GO TO 170
208. 155    ORDER=ORDER-1
      C
1WAT12S  PAGE 11                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 11
WAT12S

209. 160    DO 165 IM=1,12
210.        RIVER(ISS,IM+12)=RIVER(ISS,IM+12)+RUNOFF(IM)
      C
211. 165    CONTINUE
      C
212. 170    CONTINUE
      C
      C------GO TO READ OF NEXT RUNOFF STATION
      C
213. 175    CONTINUE
      C
      C------ WHEN MONTHS 13-24 OF ARRAY 'RIVER' ARE FILLED WITH THE
      C------ NEXT YEAR OF RUNOFF DATA ,
      C------ WRITE 2ND YEAR OF RIVER TO INITIAL RUNOFF REPORT(TAPE8)
      C------  WITH YEARLY TOTALS IN ACRE-FEET.
```

```
596         C
597     214.        IRUNYR=IYR+1
598     215.        WRITE(8,5110) IRUNYR,IHEAD,HEAD2
599     216.        WRITE(8,5120)
600         C
601     217.        DO 185 IS=1,NUMSTA
602         C
603     218.        DO 180 IM=1,12
604     219.        YTOT=YTOT+(RIVER(IS,IM+12)*FACTOR*MTHDAY(IM))
605         C
606     220. 180    CONTINUE
607         C
608     221.        WRITE(8,5130) ISTATA(IS,1),ISTATA(IS,2),(RIVER(IS,K),K=13,24),YTOT
609     222.        YTOT=0.
610         C
611     223. 185    CONTINUE
612         C
613         C-------------------------------------------------------------*
614         C
615         C-----
616         C-------    END  BEGINNING OF YEAR SECTION
617         C-----
618         C-------------------------------------------------------------*
619         C
620         C
621     224. 190    DO 1580 MON=1,12
622         C
623         C
624         C---------------------------------------------------------------
625         C
626         C----          START BEGINNING-OF-MONTH  SECTION
627         C
628         C---------------------------------------------------------------
629         C
630         C-------WRITE HEADINGS ON CALL OUT REPORT(TAPE11), AND SET LINE COUNTER
631         C
632     225.        WRITE(11,5140) IYR,MONTHN(MON),IHEAD,HEAD2
633     226. 5140   FORMAT("1  YEAR  ",I3," MONTH ",A4,10X,10A4,
634                +A8," PST ",A8,/)
635     227.        CALL PAGE11
636     228.        ILINE=7
637         C
```

```
    638         C------FILL AVAIL ARRAY WITH CURRENT MONTHS DATA FROM RIVER ARRAY
1WAT12S    PAGE 12                  ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 12
WAT12S

    639         C------ THIS ARRAY CONTAINS THE CFS IN THE STREAM WHICH IS ACTUALLY
    640         C------ AVAILABLE FOR OTHER RIGHTS TO USE.  IN ADDITION TO DIVERSIONS,
    641         C------   RESERVOIRS AND JUNIOR AND SENIOR PROJECT RIGHTS,
    642         C------ INSTREAM FLOW REQUIREMENTS WHICH ARE MET ARE SUBTRACTED FROM
    643         C------ THIS ARRAY EVEN THOUGH THE WATER IS NOT ACTUALLY REMOVED FROM
    644         C------ THE STREAM.
    645         C
    646    229.       DO 195 IS=1,NUMSTA
    647    230.       AVAIL(IS)=RIVER(IS,MON)
    648    231. 195   CONTINUE
    649         C
    650         C-------  INITIALIZE II, ID, IR, AND IJ
    651         C-------     II REPRESENTS HOW MANY SENIOR INSTREAM FLOW REQUIREMENTS WE
    652         C-------          SO FAR IN THE CURRENT MONTH.
    653         C-------     ID REPRESENTS HOW MANY SENIOR DIVERSIONS WERE CALLED OUT
    654         C-------          SO FAR IN THE CURRENT MONTH.
    655         C-------     IR REPRESENTS THE NUMBER OF RESERVOIRS WHICH WERE CALLED
    656         C------           SO FAR IN THE CURRENT MONTH.
    657         C------     IJ REPRESENTS THE NUMBER OF JPRS (NOSPILL) WHICH WERE NOT FU
    658         C------           BY THEIR RESERVOIR.  THESE JPRS ARE PROCESSED AGAIN
    659         C------           THE REMAINDER OF THEIR RIGHT FROM THE STREAM.
    660         C
    661    232.       II=0
    662    233.       ID=0
    663    234.       IR=0
    664    235.       IJ=0
    665         C
    666         C-------  INITIALIZE IFFLAG, IDFLAG AND IRFLAG.
    667         C-------     THESE FLAGS ARE SET TO .TRUE. WHEN AN END-OF-FILE IS
    668         C-------     READ ON THE RESPECTIVE FILE.  THIS BYPASSES READS OF THE FI
    669         C-------   WHEN ALL THREE FILES HAVE BEEN READ, THEY ARE REWOUND FOR THE
    670         C-------   NEXT MONTH.
    671         C
    672    236.       IFFLAG=.FALSE.
    673    237.       IDFLAG=.FALSE.
    674    238.       IRFLAG=.FALSE.
    675         C
    676         C------  IF NO RESERVOIRS, SKIP RESERVOIR MONTHLY INITIALIZATION SECTION
```

```
      C------  GO TO WATER RIGHT READING AND PROCESSING SECTION.
      C
239.        IF(IRESOPT.EQ.3HNOR) GO TO 275
      C
      C------ IF CURRENT MONTH IS BEGINNING OF NEW WATER YEAR(OCTOBER),
      C------  RESET FILL AND SPILL FLAGS, SUBTOTALS
      C------  YEAR TO DATE TOTALS, AND RESERVOIR RIGHTS MET FLAG,
      C------   FOR EACH RESERVOIR
      C
240.        IF(MON.NE.10) GO TO 205
      C
241.        DO 200 NUMR=2,NUMREST
      C
242.        IF(IRESSWI(NUMR).EQ.0) GO TO 200
      C
243.        IRFILL(NUMR)=.FALSE.
244.        MSPILL(NUMR)=.FALSE.
      C
245.        RRYTD(NUMR,1)=0.
246.        RRYTD(NUMR,2)=0.
1WAT12S  PAGE 13                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 13
 WAT12S
247.        RRYTD(NUMR,3)=0.
248.        RRYTD(NUMR,4)=0.
249.        YTDSTO(NUMR)=0.
250.        RSRMET(NUMR)=2HNO
      C
      C------  IF DECREE MAX IS GREATER THAN THE REMAINING CAPACITY OF THE
      C------  RESERVOIR, REDUCE DECREE MAX TO REMAINING CAPACITY
      C
251.        REMCP=VOLMAX(NUMR)-CURSTO(NUMR)
252.        DCRMAX(NUMR) = CVMGM(REMCP,DECREE(NUMR),REMCP-DECREE(NUMR))
      C
      C------  GO TO NEXT RESERVOIR
      C
253. 200    CONTINUE
      C
      C------  END NEW WATER YEAR RESETS AND CHECKS.
      C
      C
254. 205    DO 270 NUMR=2,NUMREST
```

```
      C
255.        IF(IRESSWI(NUMR).EQ.0) GO TO 270
      C
      C------  RESET RESERVOIR RIGHTS INDEX TO ZERO.
      C
256.        INDXRR(NUMR)=0
      C
      C-----  SET INITIAL VOLUME FOR THE MONTH FOR USE IN EVAPORATION CALCULAT
      C
257.        VOLINT(NUMR)=CURSTO(NUMR)
      C
      C------   CHECK BEGINNING OF MONTH POWER  RELEASE.
      C------  AGAINST FLOW AND VOLUME AVAILABLE FROM EACH RESERVOIR.
      C------   REDUCE RELEASE IF NECESSARY.
      C
258.       NSTR=IRSTAN(NUMR)
259.        ORDER=IRSORD(NUMR)
      C
      C------ CHECK AMOUNT AVAIL FROM RES
      C
260.        RESAVL=CURSTO(NUMR)-VOLMIN(NUMR)
261.        IF(RESAVL.GT.0.) GO TO 210
262.        RESAVL=0.
263.        POWREL(NUMR)=0.
264.        GO TO 230
      C
      C------  CHECK FLOW AVAIL FROM RES
      C
      C------  IF SPILL CONDITION EXISTS IN CURRENT MONTH, DO NOT CHECK FLOW.
      C
265. 210   IF(MSPILL(NUMR)) GO TO 220
266.        FLOAVL=FLOMAX(NUMR)-RIVER(NSTR+1,MON)
267.        IF(FLOAVL.GT.0.) GO TO 215
268.        FLOAVL=0.
269.        POWREL(NUMR)=0.
270.        GO TO 230
      C
271. 215   FAVLAF=FLOAVL*MTHDAY(MON)*FACTOR
272.        IF(FAVLAF.LT.RESAVL) GO TO 225
1WAT12S    PAGE 14                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 14
WAT12S
```

```
755    273. 220   IF(POWREL(NUMR).LE.RESAVL) GO TO 230
756    274.       POWREL(NUMR)=RESAVL
757    275.       GO TO 230
758         C
759    276. 225   IF(POWREL(NUMR).LE.FAVLAF) GO TO 230
760    277.       POWREL(NUMR)=FAVLAF
761         C
762         C------  SET RELINT TO POWER RELEASE TO BE MADE.
763         C
764    278. 230   RELINT=POWREL(NUMR)
765    279.       RESAVL=RESAVL-RELINT
766         C
767         C------ CALCULATE NON-PROJECT RELEASE AMOUNT AS PERCENT OF AVAILABLE VOL
768         C
769    280.       RELNP(NUMR)=0.
770    281.       REQNP(NUMR)=RNPJRL(NUMR,MON)*.01*RESAVL
771    282.       IF(REQNP(NUMR).LT.0.) REQNP(NUMR)=0.
772    283.       IF(REQNP(NUMR).LE.0.)  GO TO 250
773         C
774         C------  CHECK FLOW AVAIL FROM RESERVOIR, IF SPILL CONDITION EXISTS IN
775         C------     CURRENT MONTH, DO NOT CHECK FLOW.
776         C
777    284.       IF(MSPILL(NUMR)) GO TO 240
778         C
779    285.       FAVLAF=FAVLAF-RELINT
780    286.       IF(FAVLAF.LE.0.) GO TO 250
781         C
782    287. 235   IF(FAVLAF.GE.REQNP(NUMR)) GO TO 240
783    288.       RELNP(NUMR)=FAVLAF
784    289.       GO TO 245
785         C
786    290. 240   RELNP(NUMR)=REQNP(NUMR)
787         C
788         C------  ADD NON-PROJECT RELEASE TO INITIAL RELEASE .
789         C
790    291. 245   RELINT=RELINT+RELNP(NUMR)
791    292. 250   CURSTO(NUMR)=CURSTO(NUMR)-RELINT
792         C
793         C------  CONVERT INITIAL RELEASE FROM AF  TO CFS
794         C
795    293.       RELCFS=RELINT/MTHDAY(MON)/FACTOR
796         C
```

```
      C    ADD FLOW FROM INITIAL RELEASE TO ALL STATIONS DOWNSTREAM OF RESERVO
      C
      C
294.        ISTART=NSTR+1
295.        IST1 = ISTART + 1
296.        NORD(ISTART) = ORDER
      C
297.        DO 260 ISS=IST1,NUMSTA
298.            IF(ISTATA(ISS-1,2) .EQ. (ORDER-1)) ORDER=ORDER-1
299.            NORD(ISS) = ORDER
300.  260 CONTINUE
      C
301.        IF(ISTATA(NUMSTA,2) .EQ. (ORDER-1)) ORDER=ORDER-1
      C
302.        DO 265 ISS=ISTART,NUMSTA
303.            BITV = ISTATA(ISS,2) .EQ. NORD(ISS)  .OR.
1WAT12S PAGE 15                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 15
WAT12S

     1           ISTATA(ISS,2) .EQ. (NORD(ISS)-1)
304.            AVAIL(ISS) = CVMGT(AVAIL(ISS)+RELCFS,AVAIL(ISS),BITV)
305.            RIVER(ISS,MON) = CVMGT(RIVER(ISS,MON)+RELCFS,RIVER(ISS,MON),
     1                          BITV)
306. 265   CONTINUE
      C
      C------   GO TO NEXT RESERVOIR
      C
307. 270   CONTINUE
      C
      C-------------------------------------------------------------------
      C
      C-----       END  BEGINNING-OF-MONTH SECTION
      C
      C-------------------------------------------------------------------
      C
      C
      C
      C-------------------------------------------------------------------
      C
      C            START WATER RIGHT READING AND PROCESSING  SECTION
      C
      C-------------------------------------------------------------------
```

```
    836         C
    837         C
    838         C------READ FIRST INSTREAM FLOW REQUIREMENT DATA FROM TAPE3
    839         C
    840    308. 275   READ(3,5150) IFRSTA,IFRPMT,IFDATE,(FLOWRQ(I),I=1,12)
    841    309.       IF(EOF(3)) 350,280
    842    310. 5150  FORMAT(4X,I6,A4,A3,2I4,12F7.1)
    843         C
    844         C------CONVERT I F R PRIORITY DATE FROM MMDDYYYY TO YYYYMMDD
    845         C
    846    311. 280   IFRDAT=IFDATE(1)+(IFDATE(2)*10000)
    847         C
    848         C------ IF NO RESERVOIRS, SKIP READ OF RES RIGHT, SET FLAG AND DATE,
    849         C------  AND GO TO READ OF DIVERSION RIGHT.
    850         C
    851    312.       IF(IRESOPT.EQ.3HRES) GO TO 285
    852         C
    853    313.       IRFLAG=.TRUE.
    854    314.       RESDAT=99999999
    855    315.       GO TO 295
    856         C
    857         C------READ FIRST RESERVOIR RIGHT FROM TAPE 16
    858         C
    859    316. 285   READ(16,5160) RESTAT,IRDATE,RESPMT,IRESCD,RESRIT,LR
    860    317. 5160  FORMAT(I6,1X,2I4,1X,A4,A3,1X,I2,1X,F8.0,1X,I1)
    861         C
    862    318.       IF(EOF(16) ) 640,290
    863         C
    864         C------ CONVERT RES PRIORITY DATE FROM MMDDYYYY TO YYYYMMDD
    865         C
    866    319.   290 IF(IRESSWI(IRESCD).EQ.0) GO TO 285
    867         C
    868    320.       RESDAT=IRDATE(1)+(IRDATE(2)*10000)
    869         C
    870         C------READ DIVERSION DATA FROM TAPE4
1WAT12S    PAGE 16                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 16
WAT12S

    871         C
    872    321. 295   READ(4,5170) DVTYP2,DIVSTA,DIVTYP,DIVEFF,DIVPMT,IDDATE,NRET
    873              +,(DIVER(I),I=1,12),((RETSTA(J),PCTTOT(J),RETDLY(J)),J=1,10)
    874    322. 5170  FORMAT(A2,1X,I6,I2,F3.0,A4,A3,2I4,I2,12F7.0,/,10(I6,F3.0,I2))
```

```
875         C
876         C------  IF THERE IS NO MORE DATA IN THE DIVERSION FILE, CHECK IF
877         C------    IRFLAG AND IFFLAG ARE BOTH TRUE,  IF SO GO TO END OF MONTH SE
878         C
879     323.       IF(EOF(4)) 300,305
880         C
881     324. 300   IF(IRFLAG.AND.IFFLAG) GO TO 1255
882         C
883         C------  IF NOT  SET IDFLAG TO TRUE,
884         C------          SET DIVDAT TO 99999999
885         C------          GO TO DATE COMPARISON SECTION.
886         C
887     325.       IDFLAG=.TRUE.
888     326.       DIVDAT=99999999
889     327.       GO TO 310
890         C
891         C------CONVERT DIVERSION PRIORITY DATE FROM MMDDYYYY TO YYYYMMDD
892         C
893     328. 305   DIVDAT=IDDATE(1)+(IDDATE(2)*10000)
894         C
895         C---------------------------------------------------------------------
896         C
897         C----    DATE COMPARISON SECTION
898         C
899         C---------------------------------------------------------------------
900         C
901         C------ COMPARE CURRENT DIVERSION, RESERVOIR AND IFR PRIORITY DATES
902         C------  AND GO TO SECTION OF MOST SENIOR RIGHT.
903         C------   IF THE DATES ARE ALL THE SAME
904         C------ THE DIVERSION GETS PRIORITY, THEN THE RESERVOIR RIGHT,
905         C------  THEN THE FLOW REQUIREMENT.
906         C
907     329. 310   IF(DIVDAT.LE.RESDAT.AND.DIVDAT.LE.IFRDAT) GO TO 765
908     330.       IF(IFRDAT.LT.RESDAT.AND.IFRDAT.LT.DIVDAT) GO TO 315
909     331.       IF(RESDAT.LE.IFRDAT.AND.RESDAT.LT.DIVDAT) GO TO 360
910     332.       STOP 6
911         C
912         C-----------------------------------------------------------
913         C---------------------------------------------------------------------
914         C
915         C-----  START INSTREAM FLOW REQUIREMENT SECTION
916         C
```

```
      C-----------------------------------------------------------------*
      C
      C
      C------ IF THE CURRENT MONTH REQUIREMENT IS ZERO, READ NEXT I F R.
      C
  333. 315   IF(FLOWRQ(MON).EQ.0.) GO TO 345
      C
      C-----  FIND FLOW STATION INDEX IN ISTATA ARRAY
      C
  334. 320   DO 325 IS=1,NUMSTA
  335.       IF(IFRSTA.NE.ISTATA(IS,1)) GO TO 325
  336.       NSTAT=IS
1WAT12S PAGE 17                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 17
WAT12S

  337.       GO TO 330
  338. 325   CONTINUE
      C
      C------ IF THE STATION IS NOT FOUND, WRITE AN ERROR MESSAGE
      C------  TO OUTPUT AND STOP THE PROGRAM.
      C
  339.       WRITE(6,5100) IFRSTA
  340.       STOP 7
      C
      C------  CHECK IF INSTREAM FLOW REQUIREMENT IS MET AT CURRENT STATION.
      C
      C
  341. 330   IF(FLOWRQ(MON).LE.AVAIL(NSTAT)) GO TO 340
      C
      C------ IF I F R IS NOT FUTLLY MET, CALCULATE PERCENT CALLED
      C------ OUT AND WRITE MESSAGE TO TAPE11 AND TAPE13.
      C
  342. 335   PCTCAL=100.-(100.*AVAIL(NSTAT)/FLOWRQ(MON))
  343.       IF(ILINE.GE.LINPPAG) CALL PAGE11
  344.       ILINE=ILINE+1
  345.       WRITE(11,5180) IFRSTA,IFRPMT,IFDATE,PCTCAL,(ISTATA(NSTAT,J),
      +  J=3,12),FLOWRQ(MON),AVAIL(NSTAT)
  346. 5180  FORMAT(" IFR NOT MET   ",I6,2X,A4,A3,3X,I4,1X,I4,3X,F5.1,
      +       6X,10A4,1X,F7.1," REQ  ",F7.1," AVAILABLE")
  347.       WRITE(13,5360) IMO,IFRPMT,PCTCAL,IFRSTA
      C
      C------INCREMENT COUNTER OF I F R CALLED OUT AND STORE STATION NUMBER
```

```
    956         C
    957    348.       II=II+1
    958    349.       NOFLOW(II)=IFRSTA
    959         C
    960         C------ALL AVAILABLE CFS IS TAKEN, SO AVAIL IS SET TO ZERO AT
    961         C------ ITS STATION.
    962         C
    963    350.       AVAIL(NSTAT)=0.
    964         C
    965         C------ GO TO READ OF NEXT I F R.
    966         C
    967    351.       GO TO 345
    968         C
    969         C------ IF I F R IS FULLY MET, ADJUST THE AMOUNT AVAILABLE AT
    970         C------ THAT STATION.
    971         C
    972    352. 340   AVAIL(NSTAT)=AVAIL(NSTAT)-FLOWRQ(MON)
    973         C
    974         C------READ DATA FOR NEXT INSTREAM FLOW REQUIREMENT FROM FILE 3
    975         C
    976    353. 345   READ(3,5150) IFRSTA,IFRPMT,IFDATE,(FLOWRQ(I),I=1,12)
    977    354.       IF(EOF(3) ) 350,355
    978         C
    979         C------  IF THERE IS NO MORE DATA IN THE IFR FILE,
    980         C------         CHECK IF IDFLAG AND IRFLAG ARE BOTH TRUE,
    981         C------          IF SO, GO TO END OF MONTH SECTION.
    982         C
    983    355. 350   IF(IRFLAG.AND.IDFLAG) GO TO 1255
    984         C
    985         C------          IF NOT,    SET IFFLAG TO TRUE,
    986         C------                     SET IFRDAT TO 99999999,
1WAT12S    PAGE 18                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 18
WAT12S

    987         C------                     GO TO DATE COMPARISON SECTION.
    988         C
    989    356.       IFFLAG=.TRUE.
    990    357.       IFRDAT=99999999
    991    358.       GO TO 310
    992         C
    993         C------      CONVERT FLOW REQ DATE FROM MMDDYYYY TO YYYYMMDD.
    994    359. 355   IFRDAT=IFDATE(1)+(IFDATE(2)*10000)
```

```
      C
      C------  GO TO DATE COMPARISON SECTION
      C
360.        GO TO 310
      C
      C-----------------------------------------------------------------
      C
      C------  END OF INSTREAM FLOW REQUIREMENT SECTION
      C
      C-----------------------------------------------------------------
      C
      C
      C-----------------------------------------------------------------------
      C-----------------------------------------------------------------------
      C
      C       START  RESERVOIR RIGHTS  SECTION
      C
      C-----------------------------------------------------------------------
      C-----------------------------------------------------------------------
      C
      C------  FIND RESERVOIR STATION INDEX AND STREAM ORDER IN ISTATA ARRAY
      C
361. 360    NSTAT=IRSTAN(IRESCD)
362.        ORDER=IRSORD(IRESCD)
363.        ORD=ORDER
      C
      C------ INCREMENT RESERVOIR RIGHT INDEX FOR THIS RESERVOIR
      C
364.        INDXRR(IRESCD)=INDXRR(IRESCD)+1
365.        NRIGHT=INDXRR(IRESCD)
      C
      C-------   IF RES HAS BEEN FILLED THIS WATER YEAR, GO TO JUNIOR PROJECT
      C------    WITH RESERVOIR CHECK.
      C
366.       IF(IRFILL(IRESCD)) GO TO 465
      C
      C------   CALCULATE REMAINING WATER NOT TAKEN THIS YEAR FOR THE
      C------      CURRENT RIGHT.
      C
367.        REMRIT=RESRIT-RRYTD(IRESCD,NRIGHT)
      C
      C-------  CALCULATE REMAINING DECREE MAX LEFT THIS WATER YEAR
```

```
   1037          C
   1038     368.       REMDCR=DCRMAX(IRESCD)-YTDSTO(IRESCD)
   1039          C
   1040          C-------  IF REMAINING RIGHT IS GREATER THAN REMAINING DECREE, REDUCE
   1041          C-------     REMAINING RIGHT TO REMAINING DECREE.
   1042          C
   1043     369.       IF(REMRIT.GT.REMDCR) REMRIT=REMDCR
   1044          C
1WAT12S    PAGE 19                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 19
WAT12S

   1045          C------   IF REMAINING RIGHT IS ZERO, GO TO JUNIOR PROJECT
   1046          C------     WITH RESERVOIR CHECK.
   1047          C
   1048     370.       IF(REMRIT.LE.0.) GO TO 465
   1049          C
   1050          C------  CALCULATE REMAINING STORAGE CAPACITY OF RESERVOIR
   1051          C
   1052     371.       REMCAP=VOLMAX(IRESCD)-CURSTO(IRESCD)
   1053          C
   1054          C------  IF REMAINING RIGHT IS GREATER THAN REMAINING CAPACITY, REDUCE
   1055          C------     REMAINING RIGHT TO REMAINING CAPACITY.
   1056     372.       IF(REMRIT.GT.REMCAP) REMRIT=REMCAP
   1057          C
   1058          C------  IF REMAINING RIGHT IS ZERO, GO TO JUNIOR PROJECT
   1059          C------   WITH RESERVOIR CHECK.
   1060          C
   1061     373.       IF(REMRIT.LE.0.) GO TO 465
   1062          C
   1063          C------CHECK IF ALL SENIOR, DOWNSTREAM IFR, RES AND DIV HAVE BEEN FULLY
   1064          C------   IF ANY HAVE PUT A CALL ON THE RIVER,
   1065          C------            WRITE A MESSAGE TO TAPE11,
   1066          C------            INCREMENT COUNTER OF RESERVOIR RIGHTS CALLED OUT(IR)
   1067          C------            STORE STATION NUMBER
   1068          C------            AND GO TO JUNIOR PROJECT WITH RESERVOIR CHECK.
   1069          C
   1070          C
   1071     374.       IF(II.EQ.0.AND.ID.EQ.0.AND.IR.EQ.0) GO TO 405
   1072          C
   1073     375.       DO 400 ISS=NSTAT,NUMSTA
   1074     376.       IF(ISTATA(ISS,2).EQ.ORDER) GO TO 370
   1075     377.       IF(ISTATA(ISS,2).EQ.ORDER-1) GO TO 365
```

```
1076    378.        GO TO 400
1077         C
1078    379. 365    ORDER=ORDER-1
1079         C
1080         C------CHECK DIVERSIONS
1081         C
1082    380. 370    IF(ID.EQ.0) GO TO 380
1083         C
1084    381.        DO 375 IDV=1,ID
1085    382.        IF(NODIV(IDV).NE.ISTATA(ISS,1) ) GO TO 375
1086    383.        IF(ILINE.GE.LINPPAG) CALL PAGE11
1087    384.        ILINE=ILINE+1
1088    385.        WRITE(11,5190) RESTAT,RESPMT,IRDATE,(RESNAM(IRESCD,J),J=1,4),
1089                + NODIV(IDV)
1090    386. 5190   FORMAT(" NO RES   STOR ",I6,2X,A4,A3,3X,I4,1X,I4,3X,
1091                + "100.0",6X,4A4,24X,"   SEN DS DIV NOT FULLY MET AT ",I6)
1092    387.        IR=IR+1
1093    388.        NORES(IR)=RESTAT
1094         C
1095    389.        GO TO 465
1096         C
1097    390. 375    CONTINUE
1098         C
1099         C------  CHECK IFR S
1100         C
1101    391. 380    IF(II.EQ.0) GO TO 390
1102         C
1WAT12S  PAGE 20                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 20
WAT12S

1103    392.        DO 385 IFR=1,II
1104    393.        IF(NOFLOW(IFR).NE.ISTATA(ISS,1) ) GO TO 385
1105    394.        IF(ILINE.GE.LINPPAG) CALL PAGE11
1106    395.         ILINE=ILINE+1
1107    396.        WRITE(11,5200) RESTAT,RESPMT,IRDATE,(RESNAM(IRESCD,J),J=1,4),
1108                + NOFLOW(IFR)
1109    397. 5200   FORMAT(" NO RES   STOR ",I6,2X,A4,A3,3X,I4,1X,I4,3X,
1110                + "100.0 ",5X,4A4,24X,"   SEN DS IFR NOT FULLY MET AT ",I6)
1111    398.        IR=IR+1
1112    399.        NORES(IR)=RESTAT
1113    400.        GO TO 465
1114         C
```

```
1115    401. 385   CONTINUE
1116         C
1117         C------  CHECK RESERVOIRS
1118         C
1119    402. 390   IF(IR.EQ.0) GO TO 400
1120         C
1121    403.       IEND=IR
1122    404.       DO 395 IRS=1,IEND
1123    405.       IF(NORES(IRS).NE.ISTATA(ISS,1) ) GO TO 395
1124    406.       IF(ILINE.GE.LINPPAG) CALL PAGE11
1125    407.       ILINE=ILINE+1
1126    408.       WRITE(11,5210) RESTAT,RESPMT,IRDATE,(RESNAM(IRESCD,J),J=1,4),
1127              + NORES(IRS)
1128    409. 5210  FORMAT(" NO RES   STOR ",I6,2X,A4,A3,3X,I4,1X,I4,3X,
1129              + "100.0",6X,4A4,24X,"   SEN DS RES NOT FULLY MET AT ",I6)
1130    410.       IR=IR+1
1131    411.       NORES(IR)=RESTAT
1132    412.       GO TO 465
1133    413. 395   CONTINUE
1134         C
1135    414. 400   CONTINUE
1136         C
1137         C------  IF ALL SENIOR DOWNSTREAM RIGHTS WERE MET,
1138         C------   CHECK WATER AVAIL AT RESERVOIR STATION.
1139         C
1140    415. 405   ORDER=ORD
1141    416.       AVAILR=AVAIL(NSTAT)
1142         C------ NST - CONTROLLING STATION
1143    417.       NST=NSTAT
1144    418.       IF(AVAIL(NSTAT).LE.0.) GO TO 425
1145         C
1146         C------  FIND MAX WATER AVAIL DOWNSTREAM OF THE RESERVOIR.
1147         C
1148    419.       DO 420 ISS=NSTAT,NUMSTA
1149    420.       IF(ISTATA(ISS,2).EQ.ORDER) GO TO 415
1150    421.       IF(ISTATA(ISS,2).EQ.ORDER-1) GO TO 410
1151    422.       GO TO 420
1152    423. 410   ORDER=ORDER-1
1153    424. 415   IF(AVAIL(ISS).GE.AVAILR) GO TO 420
1154    425.       AVAILR=AVAIL(ISS)
1155    426.       NST=ISS
1156    427.       IF(AVAILR.LE.0.) GO TO 425
```

```
   1157         C
   1158    428. 420   CONTINUE
   1159         C
   1160    429.       GO TO 430
1WAT12S    PAGE 21                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 21
WAT12S

   1161         C
   1162         C------  IF NO WATER IS AVAIL FROM THE RIVER,
   1163         C------            WRITE MESSAGE TO TAPE11,
   1164         C------            INCREMENT COUNTER OF RESERVOIR RIGHTS CALLED OUT,
   1165         C------            AND GO TO JUNIOR PROJECT WITH RESERVOIR CHECK.
   1166         C
   1167    430. 425   IF(ILINE.GE.LINPPAG) CALL PAGE11
   1168    431.       ILINE=ILINE+1
   1169    432.       RITCFS=REMRIT/MTHDAY(MON)/FACTOR
   1170    433.       WRITE(11,5220) RESTAT,RESPMT,IRDATE,(RESNAM(IRESCD,J),J=1,4),
   1171              +  RITCFS,ISTATA(NST,1)
   1172    434. 5220  FORMAT(" NO RES   STOR ",I6,2X,A4,A3,3X,I4,1X,I4,3X,
   1173              + "100.0",6X,4A4,25X,F7.1," REQ      0.0 AVAIL AT ",I6)
   1174         C
   1175    435.       IR=IR+1
   1176    436.       NORES(IR)=RESTAT
   1177    437.       GO TO 465
   1178         C
   1179         C------  CONVERT CFS AVAILABLE IN RIVER FROM CFS TO AF
   1180         C
   1181    438. 430   AVRAF=AVAILR*MTHDAY(MON)*FACTOR
   1182         C
   1183         C------  IF THERE IS SUFFICIENT WATER IN STREAM, TO MEET RESERVOIR RIGHT
   1184         C------   GO TO FILL/SPILL CHECK.
   1185         C
   1186    439. 435   IF(REMRIT.LE.AVRAF) GO TO 440
   1187         C
   1188         C------ IF REMAINING RIGHT IS GREATER THAN AVAILABLE WATER,
   1189         C------       WRITE MESSAGE TO TAPE11
   1190         C
   1191    440.       RITCFS=REMRIT/MTHDAY(MON)/FACTOR
   1192    441.       PCTCAL=100.-(100.*AVAILR/RITCFS)
   1193    442.       IF(ILINE.GE.LINPPAG) CALL PAGE11
   1194    443.       ILINE=ILINE+1
   1195         C
```

```
1196    444.       WRITE(11,5230) RESTAT,RESPMT,IRDATE,PCTCAL,(RESNAM(IRESCD,J),
1197              +  J=1,4),RITCFS,AVAILR,ISTATA(NST,1)
1198    445. 5230  FORMAT(" PART RES STOR ",I6,2X,A4,A3,3X,I4,1X,I4,3X,F5.1,
1199              +  6X,4A4,25X,F7.1," REQ  ",F7.1," AVAIL AT ",I6)
1200         C
1201         C------  INCREMENT COUNTER OF RESERVOIR RIGHTS CALLED OUT, AND STORE STA
1202         C
1203    446.       IR=IR+1
1204    447.       NORES(IR)=RESTAT
1205         C
1206    448.       REMRIT=AVRAF
1207         C
1208         C------  IF REMAINING RIGHT IS GREATER THAN OR EQUAL TO THE REMAINING
1209         C------   CAPACITY, SET FILL AND SPILL FLAGS TO TRUE
1210         C
1211    449. 440   IF(REMRIT.LT.REMCAP) GO TO 445
1212    450.       MSPILL(IRESCD)=.TRUE.
1213    451.       IRFILL(IRESCD)=.TRUE.
1214         C
1215         C------  ADD WATER TO CURRENT STORAGE AND MONTHLY AND YEARLY TOTALS
1216         C
1217    452. 445   CURSTO(IRESCD)=CURSTO(IRESCD)+REMRIT
1218    453.       YTDSTO(IRESCD)=YTDSTO(IRESCD)+REMRIT
1WAT12S  PAGE 22                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 22
WAT12S

1219         C
1220         C------  IF YEAR TO DATE STORAGE IS GREATER THAN OR EQUAL TO
1221         C------  THE DECREE MAX, SET RESERVOIR RIGHTS MET FLAG TO  YES.
1222         C
1223    454.       IF(YTDSTO(IRESCD).GE.DCRMAX(IRESCD)) RSRMET(IRESCD)=3HYES
1224         C
1225    455.       STOMON(IRESCD)=STOMON(IRESCD)+REMRIT
1226    456.       RRYTD(IRESCD,NRIGHT)=RRYTD(IRESCD,NRIGHT)+REMRIT
1227         C
1228         C------  CONVERT AF STORED TO CFS.
1229         C
1230    457.       STOCFS=REMRIT/MTHDAY(MON)/FACTOR
1231         C
1232         C------ REMOVE WATER ADDED TO RESERVOIR STORAGE FROM STATIONS DOWNSTREAM
1233         C
1234    458.       ORDER=ORD
```

```
1235    459.        IST1 = NSTAT + 1
1236    460.        NORD(NSTAT) = ORDER
1237          C
1238    461.        DO 455 ISS=IST1,NUMSTA
1239    462.            IF(ISTATA(ISS-1,2) .EQ. (ORDER-1)) ORDER=ORDER-1
1240    463.            NORD(ISS) = ORDER
1241    464.     455 CONTINUE
1242          C
1243    465.        IF(ISTATA(NUMSTA,2) .EQ. (ORDER-1)) ORDER=ORDER-1
1244          C
1245    466.        DO 460 ISS=NSTAT,NUMSTA
1246    467.            BITV = ISTATA(ISS,2) .EQ. NORD(ISS)  .OR.
1247               1           ISTATA(ISS,2) .EQ. (NORD(ISS)-1)
1248    468.            AVAIL(ISS) = CVMGT(AVAIL(ISS)-STOCFS,AVAIL(ISS),BITV)
1249    469.            RIVER(ISS,MON)=CVMGT(RIVER(ISS,MON)-STOCFS,RIVER(ISS,MON),
1250               1                         BITV)
1251    470.     460 CONTINUE
1252          C
1253          C-------------------------------------------------------------------
1254          C
1255          C------  JUNIOR PROJECTS WITH RESERVOIR CHECK
1256          C
1257          C
1258          C------  CHECK IF SPILL SITUATION IN CURRENT MONTH.
1259          C------  IF SO, SKIP JPRS AND GO TO READ OF NEXT RES RIGHT
1260          C
1261    471. 465    IF(MSPILL(IRESCD) ) GO TO 635
1262          C
1263          C------ CHECK IF LAST WATER RIGHT FOR THIS RESERVOIR
1264          C------  IF NOT SKIP JPRS AND GO TO READ OF NEXT RES RIGHT
1265          C
1266    472.        IF(LR.EQ.0) GO TO 635
1267          C
1268          C-------------------------------------------------------------------
1269          C
1270          C------START JUNIOR PROJECT RIGHTS (NO SPILL) FROM RESERVOIR SECTION
1271          C
1272          C-------------------------------------------------------------------
1273          C
1274          C
1275          C------ SET JPRS PROCESSED WITH RESERVOIR FLAG TO TRUE
1276          C
```

```
1277    473.        RESFLG(IRESCD)=.TRUE.
1278         C
1279         C------FIND JPRS FOR CURRENT RESERVOIR IN JPR DATA FILE  TAPE17
1280         C
1281    474. 470    REWIND 17
1282    475. 475    READ(17,5240) RESNUM
1283    476.        IF(EOF(17)) 635,480
1284    477. 5240   FORMAT(9X,I2/5X)
1285    478. 480    IF(RESNUM.NE.IRESCD) GO TO 475
1286    479.        BACKSPACE 17
1287    480.        BACKSPACE 17
1288         C
1289         C------  READ JUNIOR PROJECT RIGHT DATA FROM TAPE 17
1290         C
1291    481. 485    READ(17,5170) DUMJPR,JPRSTA,RESNUM,EFFJPR,JPRPMT,IJDATE,NJPRET,
1292                +(RITJPR(I),I=1,12),((JPRETS(J),PCTJPR(J),JPRDLY(J)),J=1,10)
1293    482.        IF(EOF(17)) 635,490
1294         C
1295         C------ IF JPR RESERVOIR CODE IS NOT EQUAL TO CODE OF CURRENT RESERVOIR,
1296         C------ ALL THE JPRS FOR THIS RESERVOIR HAVE BEEN PROCESSED, GO TO
1297         C------  READ OF NEXT RESERVOIR RIGHT.
1298         C
1299    483. 490    IF(RESNUM.NE.IRESCD) GO TO 635
1300         C
1301         C----- IF JPR FOR CURRENT MONTH IS 0. GO TO READ OF NEXT JPR.
1302         C
1303    484. 495    IF(RITJPR(MON).EQ.0.) GO TO 485
1304         C
1305         C------ FIND JPR STATION INDEX IN ISTATA ARRAY
1306         C
1307    485.        DO 500 IS=1,NUMSTA
1308         C
1309    486.        IF(JPRSTA.NE.ISTATA(IS,1) ) GO TO 500
1310    487.        NSTATJ=IS
1311    488.        GO TO 505
1312         C
1313    489. 500    CONTINUE
1314         C
1315         C------  IF JPR STATION IS NOT FOUND, WRITE ERROR MESSAGE AND
```

```
1316          C------   STOP THE PROGRAM.
1317          C
1318     490.       WRITE(6,5100) JPRSTA
1319     491.       STOP 8
1320          C
1321          C------ CALCULATE WATER AVAIL FROM RES AND CONVERT TO CFS
1322          C
1323     492. 505   RESAVL=(CURSTO(RESNUM)-VOLMIN(RESNUM))/MTHDAY(MON)/FACTOR
1324     493.       IF(RESAVL.LT.0.) RESAVL=0.
1325          C
1326          C
1327          C-------  CALC REMAINING FLOW AVAIL FROM RES
1328          C
1329     494.       FLOAVL=FLOMAX(RESNUM)-RIVER(NSTAT+1,MON)
1330     495.       IF(FLOAVL.LT.0.)  FLOAVL=0.
1331     496.       IF(FLOAVL.LT.RESAVL) GO TO 520
1332          C
1333          C------  IF REMAINING VOLUME AVAILABLE IS LESS THAN REMAINING FLOW CAPAC
1334          C-------  RES MIN VOL IS LIMITING FACTOR
1WAT12S  PAGE 24                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 24
WAT12S
1335          C
1336     497. 510   IF(RITJPR(MON).LE.RESAVL) GO TO 530
1337     498.       IF(RESAVL.GT.0.) GO TO 515
1338          C
1339          C------  IF REMAINING VOLUME AVAILABLE IS ZERO,
1340          C------            WRITE MESSAGE TO TAPE11,
1341          C------            INCREMENT COUNTER OF JPRS NOT MET BY THE RESERVOIR
1342          C------             STORE THE JPR PERMIT NUMBER AND REMAINING AMOUNT IN
1343          C------            AND GO TO READ OF NEXT JPR.
1344          C
1345     499.       IF(ILINE.GE.LINPPAG) CALL PAGE11
1346     500.       ILINE=ILINE+1
1347     501.       WRITE(11,5250) JPRSTA,JPRPMT,IJDATE,(ISTATA(NSTATJ,J),J=3,12),
1348               + RITJPR(MON),RESNUM
1349     502. 5250  FORMAT(" NO JPR   NOSP ",I6,2X,A4,A3,3X,I4,1X,I4,3X,
1350               + "100.0",6X,10A4,1X,F7.1," REQ",6X,"0.0 AVAIL AT RES ",I2)
1351     503.       IJ=IJ+1
1352     504.       REMJPR(IJ)=RITJPR(MON)
1353     505.       JPREMP(IJ,1)=JPRPMT(1)
1354     506.       JPREMP(IJ,2)=JPRPMT(2)
```

```
1355          C
1356     507.       GO TO 485
1357          C
1358          C------ IF JPR IS PARTIALLY MET BY THE RESERVOIR,
1359          C------          WRITE MESSAGE TO TAPE11,
1360          C------          INCREMENT COUNTER OF JPRS MET BY THE RESERVOIR,
1361          C------          STORE THE JPR PERMIT NUMBER AND REMAINING AMOUNT OF RIG
1362          C------          AND GO TO CONVERSION OF RELEASE FROM AF TO CFS.
1363          C
1364     508. 515   PCTCAL=100.-(100.*RESAVL/RITJPR(MON))
1365     509.       IF(ILINE.GE.LINPPAG) CALL PAGE11
1366     510.       ILINE=ILINE+1
1367     511.       WRITE(11,5260) JPRSTA,JPRPMT,IJDATE,PCTCAL,(ISTATA(NSTATJ,J),
1368               + J=3,12),RITJPR(MON),RESAVL,RESNUM
1369     512. 5260  FORMAT(" PART JPR NOSP ",I6,2X,A4,A3,3X,I4,1X,I4,3X,F5.1,
1370               + 6X,10A4,1X,F7.1," REQ  ",F7.1," AVAIL AT RES ",I2)
1371          C
1372     513.       IJ=IJ+1
1373     514.       REMJPR(IJ)=RITJPR(MON)-RESAVL
1374     515.       JPREMP(IJ,1)=JPRPMT(1)
1375     516.       JPREMP(IJ,2)=JPRPMT(2)
1376          C
1377     517.       RITJPR(MON)=RESAVL
1378     518.       GO TO 530
1379          C
1380          C------  IF REMAINING FLOW CAPACITY IS LESS THAN THE REMAINING
1381          C------   VOLUME AVAILABLE,
1382          C------   FLOW CAPACITY IS LIMITING FACTOR
1383          C
1384     519. 520   IF(RITJPR(MON).LE.FLOAVL) GO TO 530
1385     520.       IF(FLOAVL.GT.0.) GO TO 525
1386          C
1387          C------  IF REMAINING FLOW CAPACITY IS ZERO,
1388          C------           WRITE MESSAGE TO TAPE11
1389          C------           INCREMENT COUNTER OF JPRS NOT MET BY THE RESERVOIR,
1390          C------           STORE THE JPR PERMIT NUMBER AND REMAINING AMOUNT OF R
1391          C------           AND GO TO READ OF NEXT JPR.
1392          C
1WAT12S  PAGE 25              ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 25
WAT12S

1393     521.       IF(ILINE.GE.LINPPAG) CALL PAGE11
```

```
1394    522.        ILINE=ILINE+1
1395    523.        WRITE(11,5270) JPRSTA,JPRPMT,IJDATE,(ISTATA(NSTAT,J),J=3,12),
1396               + RITJPR(MON),RESNUM
1397    524. 5270   FORMAT(" NO JPR   NOSP ",I6,2X,A4,A3,3X,I4,1X,I4,3X,
1398               +  "100.0",6X,10A4,1X,F7.1," REQ OUTFLOW AT MAX - RES ",I2)
1399    525.        IJ=IJ+1
1400    526.        REMJPR(IJ)=RITJPR(MON)
1401    527.        JPREMP(IJ,1)=JPRPMT(1)
1402    528.        JPREMP(IJ,2)=JPRPMT(2)
1403    529.        GO TO 485
1404         C
1405         C------  IF JPR IS PARTIALLY MET BY THE RESERVOIR,
1406         C------            WRITE MESSAGE TO TAPE11,
1407         C------            INCREMENT COUNTER OF JPRS NOT MET BY THE RESERVOIT,
1408         C------            STORE THE JPR PERMIT NUMBER AND REMAINING AMOUNT OF R
1409         C------            AND GO TO CONVERSION OF RELEASE FROM AF TO CFS.
1410         C
1411    530. 525    PCTCAL=100.-(100.*FLOAVL/RITJPR(MON))
1412    531.        IF(ILINE.GE.LINPPAG) CALL PAGE11
1413    532.        ILINE=ILINE+1
1414    533.        WRITE(11,5280) JPRSTA,JPRPMT,IJDATE,PCTCAL,(ISTATA(NSTAT,J)
1415               +  ,J=3,12),RITJPR(MON),FLOAVL,RESNUM
1416    534. 5280   FORMAT(" PART JPR NOSP ",I6,2X,A4,A3,3X,I4,1X,I4,3X,F5.1,
1417               +  6X,10A4,1X,F7.1," REQ  ",F7.1," OUTFLOW  RES ",I2)
1418         C
1419    535.        IJ=IJ+1
1420    536.        REMJPR(IJ)=RITJPR(MON)-FLOAVL
1421    537.        JPREMP(IJ,1)=JPRPMT(1)
1422    538.        JPREMP(IJ,2)=JPRPMT(2)
1423    539.        RITJPR(MON)=FLOAVL
1424         C
1425         C
1426         C------  CONVERT FROM CFS TO ACRE FEET
1427         C
1428    540. 530    JPRAF=RITJPR(MON)*MTHDAY(MON)*FACTOR
1429         C
1430         C------ REMOVE WATER FROM RESERVOIR CURRENT STORAGE
1431         C
1432    541.        CURSTO(RESNUM)=CURSTO(RESNUM)-JPRAF
1433         C
1434         C------ ADD TO TOTAL PROJECT FLOW FOR THIS MONTH
1435         C
```

```
 1436    542.       PROJTF(RESNUM)=PROJTF(RESNUM)+RITJPR(MON)
 1437         C
 1438         C------ADD RELEASED WATER TO STREAM BETWEEN RESERVOIR AND JPR STATION
 1439         C------  IN RIVER AND AVAIL ARRAYS.
 1440         C
 1441    543.       IF(NSTAT.EQ.NSTATJ) GO TO 550
 1442    544.       ORDER=ORD
 1443    545.       ISTART=NSTAT+1
 1444    546.       IEND=NSTATJ-1
 1445    547.       IF(ISTART.GT.IEND) GO TO 550
 1446    548.       IST1 = ISTART + 1
 1447    549.       NORD(ISTART) = ORDER
 1448         C
 1449    550.       DO 540 ISS=IST1,IEND
 1450    551.           IF(ISTATA(ISS-1,2) .EQ. (ORDER-1)) ORDER=ORDER-1
1WAT12S  PAGE 26                ON=ABCDELMPQRSTVX           11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 26
WAT12S

 1451    552.           NORD(ISS) = ORDER
 1452    553.   540 CONTINUE
 1453         C
 1454    554.       IF(ISTATA(IEND,2) .EQ. (ORDER-1)) ORDER=ORDER-1
 1455         C
 1456    555.       DO 545 ISS=ISTART,IEND
 1457    556.           BITV = ISTATA(ISS,2) .EQ. NORD(ISS)  .OR.
 1458              1           ISTATA(ISS,2) .EQ. (NORD(ISS)-1)
 1459    557.           AVAIL(ISS) = CVMGT(AVAIL(ISS)+RITJPR(MON),AVAIL(ISS),BITV)
 1460    558.           RIVER(ISS,MON) = CVMGT(RIVER(ISS,MON)+RITJPR(MON)
 1461              1                          ,RIVER(ISS,MON),BITV)
 1462    559.   545 CONTINUE
 1463         C
 1464         C------  JPR(NO SPILL) FROM RESERVOIR RETURN FLOW SECTION
 1465         C
 1466         C------  IF NO RETURN FLOW STATIONS, GO TO READ OF NEXT JPR.
 1467         C
 1468    560. 550   IF(NJPRET.EQ.0) GO TO 485
 1469    561. 555   TOTRET=RITJPR(MON)*((100.-EFFJPR)/100.)
 1470         C
 1471    562.       DO 630 IJP=1,NJPRET
 1472         C
 1473         C------FIND RETURN STATION INDEX IN ISTATA ARRAY
 1474         C
```

```
1475    563.        DO 560 IS=1,NUMSTA
1476    564.        IF(JPRETS(IJP).NE.ISTATA(IS,1) ) GO TO 560
1477    565.        ORDERR=ISTATA(IS,2)
1478    566.        ORDR=ORDERR
1479          C------  NSTJR - JPR RETURN STATION INDEX.
1480    567.        NSTJR=IS
1481    568.        GO TO 565
1482          C
1483    569. 560    CONTINUE
1484          C
1485          C------  IF RETURN STATION NUMBER IS NOT FOUND, WRITE ERROR MESSAGE
1486          C------  AND STOP PROGRAM.
1487          C
1488    570.        WRITE(6,5100) JPRETS(IJP)
1489    571.        STOP 9
1490          C
1491          C------FIND DELAY TABLE FOR CURRENT RETURN
1492          C
1493    572. 565    DO 570 IDL=1,99
1494    573.        IF(JPRDLY(IJP).NE.DLYNUM(IDL) ) GO TO 570
1495    574.        DLY=IDL
1496    575.        GO TO 575
1497          C
1498    576. 570    CONTINUE
1499          C
1500          C------ IF DELAY TYPE IS NOT FOUND, WRITE ERROR MESSAGE
1501          C------  AND STOP PROGRAM.
1502          C
1503    577.        WRITE(6,5410) JPRDLY(IJP)
1504    578.        STOP 10
1505          C
1506    579. 575    IF(JPRDLY(IJP).GT.50) GO TO 600
1507          C
1508          C------  IF THE DELAY TYPE IS LESS THAN OR EQUAL TO 50,
1WAT12S   PAGE 27          ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 27
WAT12S

1509          C-----  ADD RET FLOW TO ALL STATIONS DS FOR THE NEXT 12 MONTHS
1510          C-----  STARTING WITH THE FIRST VALUE IN THE DELAY TABLE
1511          C------  IN THE CURRENT MONTH.
1512          C
1513    580.        IEND=MON+12
```

```
1514    581.        I=0
1515         C
1516    582.        DO 595 ISS=NSTJR,NUMSTA
1517    583.        IF(ISTATA(ISS,2).EQ.ORDERR) GO TO 585
1518    584.        IF(ISTATA(ISS,2).EQ.ORDERR-1) GO TO 580
1519    585.        GO TO 595
1520         C
1521    586. 580    ORDERR=ORDERR-1
1522    587. 585    I=0
1523    588.        AVAIL(ISS) = AVAIL(ISS) + TOTRET*(PCTJPR(IJP)/100.)*
1524               1           (DLYRAT(DLY,1)/100.)
1525    589.        DO 590 IM=MON,IEND
1526    590.        I=I+1
1527    591.        RET=TOTRET*(PCTJPR(IJP)/100.)*(DLYRAT(DLY,I)/100.)
1528    592.        RIVER(ISS,IM)=RIVER(ISS,IM)+RET
1529         C
1530    593. 590    CONTINUE
1531         C
1532    594. 595    CONTINUE
1533         C
1534    595.        GO TO 630
1535         C
1536         C------  IF DELAY TYPE IS GREATER THAN 50,
1537         C------  ADD RETURN FLOW TO ALL STATIONS DOWNSTREAM FOR THE REST
1538         C------  OF THE CURRENT YEAR STARTING WITH THE CURRENT MONTH VALUE IN TH
1539         C------ DELAY TABLE.  THEN THE FIRST VALUES IN THE TABLE ARE USED FOR
1540         C------  THE FIRST MONTHS OF THE NEXT YEAR.
1541         C
1542    596. 600    DO 625 ISS=NSTJR,NUMSTA
1543    597.        K=MON
1544    598.        IF(ISTATA(ISS,2).EQ.ORDERR) GO TO 610
1545    599.        IF(ISTATA(ISS,2).EQ.ORDERR-1) GO TO 605
1546    600.        GO TO 625
1547         C
1548    601. 605    ORDERR=ORDERR-1
1549    602.   610  IF(K .EQ. MON) AVAIL(ISS) = AVAIL(ISS) + TOTRET*PCTJPR(IJP)/100.*
1550               1             (DLYRAT(DLY,MON)/100.)
1551    603.        DO 615 IM=MON,12
1552    604.        RET=TOTRET*PCTJPR(IJP)/100.*(DLYRAT(DLY,IM)/100.)
1553    605.        RIVER(ISS,K)=RIVER(ISS,K)+RET
1554    606.        IF(K.EQ.MON) AVAIL(ISS)=AVAIL(ISS)+RET
1555    607.        K=K+1
```

```
 1556    608. 615   CONTINUE
 1557         C
 1558    609.       IEND=MON-1
 1559         C
 1560    610.       DO 620 IM=1,IEND
 1561    611.       RET=TOTRET*PCTJPR(IJP)/100.*(DLYRAT(DLY,IM)/100.)
 1562    612.       RIVER(ISS,K)=RIVER(ISS,K)+RET
 1563    613.       K=K+1
 1564    614. 620   CONTINUE
 1565         C
 1566    615. 625   CONTINUE
1WAT12S  PAGE 28                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 28
WAT12S

 1567         C
 1568    616. 630   CONTINUE
 1569         C
 1570         C------ GO TO READ OF NEXT JPR
 1571         C
 1572    617.       GO TO 485
 1573         C
 1574         C-----------------------------------------------------------------8
 1575         C
 1576         C------     END  JPR-NO SPILL- FROM-RESERVOIR SECTION
 1577         C
 1578         C-------------------------------------------------------------------
 1579         C
 1580         C
 1581         C------ READ NEXT RESERVOIR WATER RIGHT.
 1582         C
 1583    618. 635   READ(16,5160) RESTAT,IRDATE,RESPMT,IRESCD,RESRIT,LR
 1584         C
 1585         C------  IF THERE ARE NO MORE RESERVOIR RIGHTS IN TAPE16,
 1586         C------          CHECK IF IDFLAG AND IFFLAG ARE BOTH TRUE,
 1587         C------               IF SO, GO TO END OF MONTH SECTION,
 1588         C------               IF NOT,  SET IRFLAG TO TRUE
 1589         C------                        SET RESDAT TO 99999999
 1590         C------                        GO TO DATE COMPARISON.
 1591         C
 1592    619.       IF(EOF(16) ) 640,645
 1593    620. 640   IF(IDFLAG.AND.IFFLAG) GO TO 1255
 1594    621.       IRFLAG=.TRUE.
```

```
1595    622.       RESDAT=99999999
1596    623.       GO TO 310
1597         C
1598         C------  IF ANOTHER RESERVOIR RIGHT IS READ,
1599         C------  CONVERT RESERVOIR PRIORITY DATE FROM MMDDYYYY TO YYYYMMDD.
1600         C
1601    624.   645 IF(IRESSWI(IRESCD).EQ.0) GO TO 635
1602         C
1603    625.       RESDAT=IRDATE(1)+(IRDATE(2)*10000)
1604         C
1605         C------ GO TO DATE COMPARISON
1606         C
1607    626.       GO TO 310
1608         C
1609         C-------------------------------------------------------------------------
1610         C-------------------------------------------------------------------------
1611         C
1612         C      END RESERVOIR SECTION
1613         C
1614         C-------------------------------------------------------------------------
1615         C
1616         C-------------------------------------------------------------------------*
1617         C
1618         C------     START JPR(NO SPILL) FROM RIVER   SECTION
1619         C
1620         C-----------------------------------------------------------------
1621         C
1622    627. 650   IF(IJ.EQ.0) GO TO 295
1623         C
1624         C------  IF COUNTER OF JPRS NOT MET BY THE RESERVOIR IS ZERO,
1WAT12S  PAGE 29                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 29
WAT12S

1625         C------     GO TO READ OF NEXT DIVERSION.
1626    628.       DO 655 IJP=1,IJ
1627         C
1628         C------  CHECK IF PERMIT OF CURRENT JPR MATCHES ONE OF THOSE IN
1629         C------   LIST OF JPRS NOT MET BY ITS RESERVOIR.
1630         C
1631    629.       IF(DIVPMT(1).NE.JPREMP(IJP,1).OR.DIVPMT(2).NE.JPREMP(IJP,2))
1632              +                                    GO TO 655
1633    630.       NPROJ=IJP
```

```
1634    631.        GO TO 660
1635         C
1636    632. 655    CONTINUE
1637         C
1638         C------  IF NO PERMITS MATCH, GO TO READ OF NEXT DIVERSION.
1639         C
1640    633.        GO TO 295
1641         C
1642         C------  FIND JPR STATION INDEX
1643         C
1644    634. 660    DO 665 IS=1,NUMSTA
1645    635.        IF(ISTATA(IS,1).NE.DIVSTA) GO TO 665
1646    636.        ORDER=ISTATA(IS,2)
1647    637.        ORD=ORDER
1648    638.        NSTATJ=IS
1649    639.        GO TO 670
1650         C
1651    640. 665    CONTINUE
1652         C
1653         C------  IF JPR STATION NUMBER IS NOT FOUND, WRITE ERROR MESSAGE
1654         C------   AND STOP PROGRAM
1655         C
1656    641.        WRITE(6,5100) DIVSTA
1657    642.        STOP 11
1658         C
1659         C------  CHECK WATER AVAILABLE AT JPR STATION.
1660         C
1661         C
1662    643. 670    IF(AVAIL(NSTATJ).GT.0.) GO TO 680
1663    644.        NSTJ=NSTATJ
1664    645. 675    IF(ILINE.GE.LINPPAG) CALL PAGE11
1665    646.        ILINE=ILINE+1
1666    647.        WRITE(11,5290) DIVSTA,DIVPMT,IDDATE,(ISTATA(NSTATJ,J),J=3,12),
1667                +   REMJPR(NPROJ),ISTATA(NSTJ,1)
1668    648. 5290   FORMAT(" NO JPR    RIV ",I6,2X,A4,A3,3X,I4,1X,I4,3X,
1669                +  "100.0",6X,10A4,1X,F7.1," REQ      0.0 AVAIL AT ",I6)
1670         C
1671    649.        PCTCAL=100.-(100.*(DIVER(MON)-REMJPR(NPROJ))/DIVER(MON))
1672    650.        WRITE(12,5360) IMO,DIVPMT,PCTCAL,DIVSTA
1673         C
1674    651.        ID=ID+1
1675    652.        NODIV(ID)=DIVSTA
```

```
 1676    653.       GO TO 295
 1677         C
 1678         C------   CHECK IF ALL SENIOR DOWNSTREAM RIGHTS HAVE BEEEN FULLY MET
 1679         C
 1680         C------  IF ANY HAVE BEEN CALLED OUT,
 1681         C------         WRITE MESSAGE TO TAPE11,
 1682         C------         INCREMENT COUNTER OF DIVERSIONS CALLED OUT THIS MONTH,
1WAT12S    PAGE 30               ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 30
WAT12S

 1683         C------         STORE STATION NUMBEROF JPR,
 1684         C------         GO TO READ OF NEXT DIVERSION.
 1685         C
 1686         C
 1687    654. 680   IF(II.EQ.0.AND.ID.EQ.0.AND.IR.EQ.0) GO TO 725
 1688         C
 1689    655.       DO 720 ISS=NSTATJ,NUMSTA
 1690    656.       IF(ISTATA(ISS,2).EQ.ORDER) GO TO 690
 1691    657.       IF(ISTATA(ISS,2).EQ.ORDER-1) GO TO 685
 1692    658.       GO TO 720
 1693         C
 1694    659. 685   ORDER=ORDER-1
 1695         C
 1696         C------   CHECK DIVERSIONS
 1697         C
 1698    660. 690   IF(ID.EQ.0) GO TO 700
 1699    661.       IEND=ID
 1700         C
 1701    662.       DO 695 IDV=1,IEND
 1702    663.       IF(NODIV(IDV).NE.ISTATA(ISS,1)) GO TO 695
 1703    664.       IF(ILINE.GE.LINPPAG) CALL PAGE11
 1704    665.       ILINE=ILINE+1
 1705    666.       WRITE(11,5300) DIVSTA,DIVPMT,IDDATE,(ISTATA(NSTATJ,J),J=3,12),
 1706              +  NODIV(IDV)
 1707    667. 5300  FORMAT(" NO JPR    RIV ",I6,2X,A4,A3,3X,I4,1X,I4,3X,
 1708              +  "100.0",6X,10A4,2X," SEN DS DIV NOT FULLY MET AT ",I6)
 1709         C
 1710    668.       PCTCAL=100.-(100.*(DIVER(MON)-REMJPR(NPROJ))/DIVER(MON))
 1711    669.       WRITE(12,5360) IMO,DIVPMT,PCTCAL,DIVSTA
 1712         C
 1713    670.       ID=ID+1
 1714    671.       NODIV(ID)=DIVSTA
```

```
1715    672.        GO TO 295
1716         C
1717    673. 695    CONTINUE
1718    674. 700    IF(II.EQ.0) GO TO 710
1719         C
1720         C------  CHECK IFRS
1721         C
1722    675.        DO 705 IFR=1,II
1723    676.        IF(NOFLOW(IFR).NE.ISTATA(ISS,1)) GO TO 705
1724    677.        IF(ILINE.GE.LINPPAG) CALL PAGE11
1725    678.        ILINE=ILINE+1
1726    679.        WRITE(11,5310) DIVSTA,DIVPMT,IDDATE,(ISTATA(NSTATJ,J),J=3,12),
1727               +  NOFLOW(IFR)
1728    680. 5310   FORMAT(" NO JPR    RIV ",I6,2X,A4,A3,3X,I4,1X,I4,3X,
1729               +  "100.0",6X,10A4,2X," SEN DS IFR NOT FULLY MET AT ",I6)
1730         C
1731    681.        PCTCAL=100.-(100.*(DIVER(MON)-REMJPR(NPROJ))/DIVER(MON))
1732    682.        WRITE(12,5360) IMO,DIVPMT,PCTCAL,DIVSTA
1733         C
1734    683.        ID=ID+1
1735    684.        NODIV(ID)=DIVSTA
1736    685.        GO TO 295
1737         C
1738    686. 705    CONTINUE
1739         C
1740         C-----   CHECK RESERVOIRS
1WAT12S  PAGE 31                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 31
WAT12S

1741         C
1742    687. 710    IF(IR.EQ.0) GO TO 720
1743         C
1744    688.        DO 715 IRS=1,IR
1745    689.        IF(NORES(IRS).NE.ISTATA(ISS,1)) GO TO 715
1746    690.        IF(ILINE.GE.LINPPAG) CALL PAGE11
1747    691.        ILINE=ILINE+1
1748    692.        WRITE(11,5320) DIVSTA,DIVPMT,IDDATE,(ISTATA(NSTATJ,J),J=3,12),
1749               +  NORES(IRS)
1750    693. 5320   FORMAT(" NO JPR    RIV ",I6,2X,A4,A3,3X,I4,1X,I4,3X,
1751               +  "100.0",6X,10A4,2X," SEN DS RES NOT FULLY MET AT ",I6)
1752         C
1753    694.        PCTCAL=100.-(100.*(DIVER(MON)-REMJPR(NPROJ))/DIVER(MON))
```

```
1754    695.        WRITE(12,5360) IMO,DIVPMT,PCTCAL,DIVSTA
1755         C
1756    696.        ID=ID+1
1757    697.        NODIV(ID)=DIVSTA
1758    698.        GO TO 295
1759         C
1760    699. 715    CONTINUE
1761         C
1762    700. 720    CONTINUE
1763         C
1764         C
1765         C--------   FIND MAX WATER AVAIL DOWNSTREAM
1766         C
1767    701. 725    ORDER=ORD
1768    702.        REQJPR=REMJPR(NPROJ)
1769         C
1770    703.        DO 740 ISS=NSTATJ,NUMSTA
1771         C
1772    704.        IF(ISTATA(ISS,2).EQ.ORDER) GO TO 735
1773    705.        IF(ISTATA(ISS,2).EQ.ORDER-1) GO TO 730
1774    706.        GO TO 740
1775         C
1776    707. 730    ORDER=ORDER-1
1777    708. 735    IF(REMJPR(NPROJ).LE.AVAIL(ISS)) GO TO 740
1778    709.        REMJPR(NPROJ)=AVAIL(ISS)
1779    710.        NSTJ=ISS
1780    711. 740    CONTINUE
1781         C
1782         C------  IF NO WATER IS AVAILABLE FROM THE STREAM,
1783         C------            WRITE MESSAGE TO TAPE11,
1784         C------            INCREMENT COUNTER OF DIVERSIONS CALLED OUT THIS MONTH
1785         C------            STORE STATION NUMBER ,
1786         C------            GO TO READ OF NEXT DIVERSION.
1787         C
1788         C
1789    712.        IF(REMJPR(NPROJ).EQ.0.) GO TO 675
1790         C
1791         C------  REMOVE WATER DIVERTED FROM STREAM, FROM STATIONS DOWNSTREAM
1792         C
1793    713.        ORDER=ORD
1794         C
1795    714.        IST1 = NSTATJ + 1
```

```
   1796    715.       NORD(NSTATJ) = ORDER
   1797         C
   1798    716.       DO 750 ISS=IST1,NUMSTA
1WAT12S    PAGE 32                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 32
WAT12S

   1799    717.           IF(ISTATA(ISS-1,2) .EQ. (ORDER-1)) ORDER=ORDER-1
   1800    718.           NORD(ISS) = ORDER
   1801    719.     750 CONTINUE
   1802         C
   1803    720.       IF(ISTATA(NUMSTA,2) .EQ. (ORDER-1)) ORDER=ORDER-1
   1804         C
   1805    721.       DO 755 ISS=NSTATJ,NUMSTA
   1806    722.           BITV = ISTATA(ISS,2) .EQ. NORD(ISS)  .OR.
   1807              1           ISTATA(ISS,2) .EQ. (NORD(ISS)-1)
   1808    723.           AVAIL(ISS)=CVMGT(AVAIL(ISS)-REMJPR(NPROJ),AVAIL(ISS),BITV)
   1809    724.           RIVER(ISS,MON)=CVMGT(RIVER(ISS,MON)-REMJPR(NPROJ)
   1810              1                           ,RIVER(ISS,MON),BITV)
   1811    725.     755 CONTINUE
   1812         C
   1813    726.       IF(REQJPR.EQ.REMJPR(NPROJ)) GO TO 760
   1814         C
   1815         C------  IF JPR WAS PARTIALLY MET,
   1816         C------           WRITE MESSAGE TO TAPE11 AND TAPE12
   1817         C------           INCREMENT COUNTER OF DIVERSIONS CALLED OUT THIS MONTH,
   1818         C------           STORE STATION NUMBER,
   1819         C------           GO TO CONVERSION OF RELEASE FROM AF TO CFS.
   1820         C
   1821    727.       PCTCAL=100.-(100.*REMJPR(NPROJ)/REQJPR)
   1822    728.       IF(ILINE.GE.LINPPAG) CALL PAGE11
   1823    729.       ILINE=ILINE+1
   1824    730.       WRITE(11,5330) DIVSTA,DIVPMT,IDDATE,PCTCAL,(ISTATA(NSTATJ,J),
   1825              + J=3,12),REQJPR,REMJPR(NPROJ),ISTATA(NSTJ,1)
   1826    731. 5330  FORMAT(" PART JPR  RIV ",I6,2X,A4,A3,3X,I4,1X,I4,3X,F5.1,
   1827              +  6X,10A4,1X,F7.1," REQ  ",F7.1," AVAIL AT ",I6)
   1828         C
   1829    732.       JPRTOT=(DIVER(MON)-REQJPR)+REMJPR(NPROJ)
   1830    733.       PCTCAL=100.-(100.*JPRTOT/DIVER(MON))
   1831    734.       WRITE(12,5360) IMO,DIVPMT,PCTCAL,DIVSTA
   1832         C
   1833    735.       ID=ID+1
   1834    736.       NODIV(ID)=DIVSTA
```

```
1835         C
1836         C------   CALCULATE TOTAL RETURN AND
1837         C-------    GO TO DIVERSION AND PROJECT RETURN FLOW SECTION
1838         C
1839    737. 760    TOTRET=REMJPR(NPROJ)*((100.-DIVEFF)/100.)
1840    738.        GO TO 995
1841         C
1842         C-------------------------------------------------------------------
1843         C
1844         C-----      END   JPR(NO SPILL) FROM RIVER SECTION
1845         C
1846         C-------------------------------------------------------------------8
1847         C
1848         C-------------------------------------------------------------------*
1849         C-------------------------------------------------------------------
1850         C------DIVERSION DECISION  SECTION  ---------------------------------
1851         C-------------------------------------------------------------------
1852         C-------------------------------------------------------------------*
1853         C
1854         C------  IF DIVTYP = 1  THEN GO TO NORMAL DIVERSION SECTION
1855         C
1856    739. 765    IF(DIVTYP.EQ.1) GO TO 770
1WAT12S     PAGE 33                 ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 33
 WAT12S

1857         C
1858         C------  IF NO RESERVOIRS, AND DIVTYPE GREATER THAN 1,  GO TO READ
1859         C------    OF NEXT DIVERSION
1860         C
1861    740.        IF(IRESOPT.EQ.3HNOR) GO TO 295
1862         C
1863         C
1864         C--------  IF DIV TYPE 2 IS  'D1'  THEN IT IS A SENIOR PROJECT RIGHT
1865         C--------     WITH A PRIORITY DATE JUNIOR TO THE ASSOC RESERVOIR.
1866         C
1867         C--------     GO TO THE SEN PROJ/JUN PROJ(SPILL) SECTION
1868    741.        IF(DVTYP2.EQ.2HD1) GO TO 1085
1869         C
1870         C------  IF IF DIVTYP IS GREATER THAN 1, THEN ITS A JUNIOR OR SENIOR PRO
1871         C------   IF RESFLG IS TRUE THEN GO TO JUNIOR PROJECT(NO SPILL) FROM RIV
1872         C
1873    742.        IF(IRESSWI(DIVTYP).EQ.0) GO TO 295
```

```
1874    743.       IF(RESFLG(DIVTYP)) GO TO 650
1875         C
1876         C------  IF RESFLG IS FALSE, GO TO SENIOR PROJECT/JUNIOR PROJECT(SPILL)
1877         C
1878    744.       GO TO 1085
1879         C
1880         C-------------------------------------------------------------------
1881         C-------------------------------------------------------------------*
1882         C
1883         C-----     NORMAL DIVERSION SECTION
1884         C
1885         C-------------------------------------------------------------------
1886         C-------------------------------------------------------------------
1887         C
1888         C------IF AMOUNT TO BE DIVERTED IS ZERO, GO TO READ OF NEXT DIVERSION
1889         C
1890    745. 770   IF(DIVER(MON).EQ.0.) GO TO 295
1891         C
1892         C------ SET DIVREQ TO THE REQUESTED DIVERSION AMOUNT
1893         C
1894    746.       DIVREQ=DIVER(MON)
1895         C
1896         C------FIND DIVERSION STATION INDEX IN ISTATA ARRAY
1897         C
1898    747.       DO 775 IS=1,NUMSTA
1899    748.       IF(DIVSTA.NE.ISTATA(IS,1)) GO TO 775
1900         C------   NSTAT - DIVERSION STATION
1901    749.       NSTAT=IS
1902    750.       ORDER=ISTATA(IS,2)
1903    751.       ORD=ORDER
1904    752.       GO TO 780
1905    753. 775   CONTINUE
1906         C
1907         C------IF STATION IS NOT FOUND, WRITE ERROR MESSAGE TO OUTPUT
1908         C------ AND STOP PROGRAM.
1909         C
1910    754.       WRITE(6,5100) DIVSTA
1911    755.       STOP 13
1912         C
1913         C------CHECK WATER AVAILABLE AT THE CURRENT STATION,
1914         C
```

```
1915    756. 780   IF(AVAIL(NSTAT).GT.0.) GO TO 785
1916    757.       CONSTA=DIVSTA
1917    758.       GO TO 970
1918         C
1919         C------ALL SENIOR DOWNSTREAM DIV, RES AND IFR MUST HAVE BEEN FULLY MET
1920         C------THIS MONTH IN ORDER FOR THE CURRENT DIVERSION TO BE TAKEN OUT.
1921         C
1922         C------  IF ANY WERE CALLED OUT,
1923         C------            WRITE MESSAGE TO TAPE11 AND TAPE12,
1924         C------            INCREMENT COUNTER OF DIVERSIONS CALLED OUT THIS MONTH
1925         C------            STORE STATION NUMBER,
1926         C------            GO TO READ OF NEXT DIVERSION.
1927         C
1928         C
1929    759. 785   IF(II.EQ.0.AND.ID.EQ.0.AND.IR.EQ.0) GO TO 830
1930         C
1931         C------STEP THROUGH EACH STATION DOWNSTREAM OF THE CURRENT
1932         C------DIVERSION AND CHECK IF ANY MATCH A LIST OF STATIONS OF
1933         C------SENIOR DIVERSIONS AND I F RS WHICH WERE CALLED OUT.
1934         C
1935    760.       DO 825 ISS=NSTAT,NUMSTA
1936    761.       IF(ISTATA(ISS,2).EQ.ORDER)  GO TO 795
1937    762.       IF(ISTATA(ISS,2).EQ.ORDER-1) GO TO 790
1938    763.       GO TO 825
1939    764. 790   ORDER=ORDER-1
1940         C
1941         C------CHECK DIVERSIONS
1942         C
1943    765. 795   IF(ID.EQ.0) GO TO 805
1944    766.       IEND=ID
1945    767.       DO 800 IDV=1,IEND
1946    768.       IF(NODIV(IDV).NE.ISTATA(ISS,1)) GO TO 800
1947    769.       IF(ILINE.GE.LINPPAG) CALL PAGE11
1948    770.       ILINE=ILINE+1
1949    771.       WRITE(11,5340) DIVSTA,DIVPMT,IDDATE,(ISTATA(NSTAT,J),J=3,12),
1950              +              NODIV(IDV)
1951    772. 5340  FORMAT(" NO DIVERSION  ",I6,2X,A4,A3,3X,I4,1X,I4,
1952              + "   100.0",6X,10A4,"   SEN DS DIV NOT FULLY MET AT ",I6)
1953    773.       PCTCAL=100.
```

```
 1954    774.       WRITE(12,5360) IMO,DIVPMT,PCTCAL,DIVSTA
 1955         C
 1956         C------INCREMENT COUNTER OF DIVERSIONS CALLED OUT AND STORE
 1957         C------THE STATION NUMBER .
 1958         C
 1959    775.       ID=ID+1
 1960    776.       NODIV(ID)=DIVSTA
 1961         C
 1962         C------GO TO READ OF NEXT DIVERSION.
 1963         C
 1964    777.       GO TO 295
 1965    778. 800   CONTINUE
 1966         C
 1967         C------CHECK IFR'S
 1968         C
 1969    779. 805   IF(II.EQ.0) GO TO 815
 1970    780.       DO 810 IFR=1,II
 1971    781.       IF(NOFLOW(IFR).NE.ISTATA(ISS,1)) GO TO 810
 1972    782.       IF(ILINE.GE.LINPPAG) CALL PAGE11
1WAT12S  PAGE 35                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 35
WAT12S
 1973    783.       ILINE=ILINE+1
 1974    784.       WRITE(11,5350) DIVSTA,DIVPMT,IDDATE,(ISTATA(NSTAT,J),J=3,12),
 1975              +              NOFLOW(IFR)
 1976    785. 5350  FORMAT(" NO DIVERSION  ",I6,2X,A4,A3,3X,I4,1X,I4,
 1977              +       "   100.0",6X,10A4,"   SEN DS IFR NOT FULLY MET AT "
 1978              + ,I6)
 1979    786.       PCTCAL=100.
 1980    787.       WRITE(12,5360) IMO,DIVPMT,PCTCAL,DIVSTA
 1981    788. 5360  FORMAT(I3,A4,A3,1X,F5.1,1X,I6)
 1982         C
 1983         C------INCREMENT COUNTER OF DIVERSIONS CALLED OUT AND STORE
 1984         C------THE STATION NUMBER .
 1985         C
 1986    789.       ID=ID+1
 1987    790.       NODIV(ID)=DIVSTA
 1988         C
 1989         C------GO TO READ OF NEXT DIVERSION.
 1990         C
 1991    791.       GO TO 295
 1992    792. 810   CONTINUE
```

```
1993          C
1994          C------     CHECK RESERVOIR RIGHTS.
1995          C
1996     793. 815    IF(IR.EQ.0) GO TO 825
1997     794.        DO 820 IRS=1,IR
1998     795.        IF(NORES(IRS).NE.ISTATA(ISS,1) ) GO TO 820
1999     796.        IF(ILINE.GE.LINPPAG) CALL PAGE11
2000     797.        ILINE=ILINE+1
2001     798.        WRITE(11,5370) DIVSTA,DIVPMT,IDDATE,(ISTATA(NSTAT,J),J=3,12),
2002                + NORES(IRS)
2003     799. 5370   FORMAT(" NO DIVERSION  ",I6,2X,A4,A3,3X,I4,1X,I4,
2004                + "   100.0",6X,10A4,"   SEN DS RES NOT FULLY MET AT ",I6)
2005     800.        PCTCAL =100.
2006     801.        WRITE(12,5360) IMO,DIVPMT,PCTCAL,DIVSTA
2007     802.        ID=ID+1
2008     803.        NODIV(ID)=DIVSTA
2009     804.        GO TO 295
2010     805. 820    CONTINUE
2011          C
2012     806. 825    CONTINUE
2013          C
2014          C------IF ALL DOWNSTREAM DIVERSIONS AND I F RS ARE FULLY MET,
2015          C------CHECK IF THERE IS ENOUGH WATER DOWNSTREAM FOR THE DIVERSION
2016          C
2017     807. 830    ORDER=ORD
2018     808.        DO 845 ISS=NSTAT,NUMSTA
2019     809.        IF(ISTATA(ISS,2).EQ.ORDER) GO TO 840
2020     810.        IF(ISTATA(ISS,2).EQ.ORDER-1) GO TO 835
2021     811.        GO TO 845
2022     812. 835    ORDER=ORDER-1
2023     813. 840    IF(DIVER(MON).LE.AVAIL(ISS)) GO TO 845
2024     814.        NST=ISS
2025     815.        GO TO 850
2026     816. 845    CONTINUE
2027          C
2028          C------ DIVERSION CAN BE MADE.
2029          C
2030     817.        GO TO 960
1WAT12S  PAGE 36                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 36
WAT12S

2031          C
```

```
2032          C------  IF THERE IS INSUFFICIENT WATER IN THE RIVER TO MEET THE DIVERSI
2033          C------AND IF THERE IS RETURN FLOW FROM THE CURRENT DIVERSION,
2034          C------AN ATTEMPT WILL BE MADE TO MEET THE DIVERSION BY ADDING
2035          C------ITS RETURN FLOW TO THE AMOUNT AVAILABLE IN THE CURRENT
2036          C------MONTH.  OTHERWISE, REDUCE DIVERSION AMOUNT TO WHAT IS
2037          C------AVAILABLE DOWNSTREAM.
2038          C
2039     818. 850    IF(NRET.GT.0) GO TO 860
2040     819.        ORDER=ORD
2041     820.        DIVER(MON)=AVAIL(NST)
2042     821.        IF(DIVER(MON).GT.0.) GO TO 855
2043     822.        DIVER(MON)=0.
2044     823.        CONSTA=ISTATA(NST,1)
2045     824.        GO TO 970
2046     825.    855 CONSTA=ISTATA(NST,1)
2047     826.        GO TO 830
2048          C
2049          C-------------------------------------------------------------------
2050          C------ADD RETURN FLOW, THEN CHECK IF DIVERSION CAN BE MET DOWNSTREAM
2051          C------IF NOT, REDUCE DIVERSION TO SMALLEST AMOUNT AVAILABLE AND TRY AGA
2052          C-------------------------------------------------------------------
2053          C
2054     827. 860    DO 955 ITRY=1,1000
2055     828.        ORDER=ORD
2056     829.        IF(DIVER(MON).LE.0.) GO TO 970
2057          C
2058          C------INITIALIZE AVAIL W/RETURN ARRAY.
2059          C
2060     830.        DO 865 IS=1,NUMSTA
2061     831.        AVWRET(IS)=AVAIL(IS)
2062     832.    865 CONTINUE
2063          C
2064          C------STEP THROUGH RETURN FLOWS FOR CURRENT DIVERSION.
2065          C
2066     833.        DO 925 IRT=1,NRET
2067          C
2068          C------FIND STATION FOR CURRENT RET FLOW
2069          C
2070     834.        DO 870 IS=1,NUMSTA
2071     835.        IF(RETSTA(IRT).NE.ISTATA(IS,1)) GO TO 870
2072     836.        NSTATR=IS
2073     837.        ORDERR=ISTATA(IS,2)
```

```
2074    838.        GO TO 875
2075    839. 870    CONTINUE
2076    840.        WRITE(6,5100) RETSTA(IRT)
2077    841.        GO TO 1615
2078         C
2079         C------FIND DELAY TABLE FOR CURRENT RETURN FLOW
2080         C
2081    842. 875    DO 880 IDL=1,99
2082    843.        IF(RETDLY(IRT).NE.DLYNUM(IDL)) GO TO 880
2083    844.        DLY=IDL
2084    845.        GO TO 885
2085    846. 880    CONTINUE
2086    847.        WRITE(6,5380) RETDLY(IRT)
2087    848. 5380   FORMAT("1 DELAY TYPE ",I2," NOT FOUND")
2088    849.        STOP 14
1WAT12S PAGE 37                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 37
WAT12S

2089         C
2090         C------CHECK DELAY TYPE
2091         C
2092    850. 885    TOTRET=DIVER(MON)*((100.-DIVEFF)/100.)
2093    851.        IF(RETDLY(IRT).GT.50) GO TO 905
2094         C
2095         C------ADD RETURN FLOW FOR NORMAL DELAY DOWNSTREAM. (RETDLY(M) LE 50)
2096         C------ IN CURRENT MONTH ONLY
2097         C
2098    852.        IST1 = NSTATR + 1
2099    853.        NORD(NSTATR) = ORDERR
2100         C
2101    854.        DO 895 ISS=IST1,NUMSTA
2102    855.            IF(ISTATA(ISS-1,2) .EQ. (ORDERR-1)) ORDERR=ORDERR-1
2103    856.            NORD(ISS) = ORDERR
2104         C
2105    857.   895 CONTINUE
2106         C
2107    858.        IF(ISTATA(NUMSTA,2) .EQ. (ORDERR-1)) ORDERR=ORDERR-1
2108         C
2109    859.        RET = TOTRET*PCTTOT(IRT)/100.*(DLYRAT(DLY,1)/100.)
2110         C
2111    860.        DO 900 ISS=NSTATR,NUMSTA
2112    861.            BITV = ISTATA(ISS,2) .EQ. NORD(ISS)  .OR.
```

```
2113              1           ISTATA(ISS,2) .EQ. (NORD(ISS)-1)
2114    862.            AVWRET(ISS) = CVMGT(AVWRET(ISS)+RET,AVWRET(ISS),BITV)
2115    863.     900 CONTINUE
2116          C
2117    864.         GO TO 925
2118          C
2119          C------ADD RETURN FLOW USING CURRENT MONTH OF DELAY TABLE(RETDLY(M) GT 5
2120          C------IN CURRENT MONTH ONLY
2121          C
2122    865.     905 IST1 = NSTATR + 1
2123    866.         NORD(NSTATR) = ORDERR
2124    867.         DO 910 ISS=IST1,NUMSTA
2125    868.             IF(ISTATA(ISS-1,2) .EQ. (ORDERR-1)) ORDERR=ORDERR-1
2126    869.             NORD(ISS) = ORDERR
2127    870.     910 CONTINUE
2128          C
2129    871.         IF(ISTATA(NUMSTA,2) .EQ. (ORDERR-1)) ORDERR=ORDERR-1
2130    872.         RET = TOTRET*PCTTOT(IRT)/100.*(DLYRAT(DLY,MON)/100.)
2131          C
2132    873.         DO 920 ISS=NSTATR,NUMSTA
2133    874.             BITV = ISTATA(ISS,2) .EQ. NORD(ISS)  .OR.
2134              1           ISTATA(ISS,2) .EQ. (NORD(ISS)-1)
2135    875.             AVWRET(ISS) = CVMGT(AVWRET(ISS)+RET,AVWRET(ISS),BITV)
2136    876.     920 CONTINUE
2137          C
2138    877. 925     CONTINUE
2139          C
2140          C------CHECK IF DIVERSION CAN NOW BE MET DOWNSTREAM WITH RET FLOW ADDED
2141          C
2142    878. 930     IFLAG=0
2143    879.         ORDER=ORD
2144          C
2145    880.         DO 950 ISS=NSTAT,NUMSTA
2146          C
1WAT12S    PAGE 38                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 38
WAT12S

2147    881.         IF(ISTATA(ISS,2).EQ.ORDER) GO TO 940
2148    882.         IF(ISTATA(ISS,2).EQ.ORDER-1) GO TO 935
2149    883.         GO TO 950
2150    884. 935     ORDER=ORDER-1
2151    885. 940     IF(DIVER(MON).LE.AVWRET(ISS)) GO TO 950
```

```
2152    886.        CONSTA=ISTATA(ISS,1)
2153    887.        DIFFER=DIVER(MON)-AVWRET(ISS)
2154    888.        IF(DIFFER.GT.1.) GO TO 945
2155    889.        DIVER(MON)=AVWRET(ISS)-.05
2156    890.        IF(DIVER(MON).LE.0.) DIVER(MON)=0.
2157    891.        IFLAG=1
2158    892.        GO TO 950
2159    893. 945    DIVER(MON)=AVWRET(ISS)
2160    894.        IFLAG=1
2161    895. 950    CONTINUE
2162         C
2163         C------ A DIVERSION CAN BE MADE
2164         C
2165    896.        IF(IFLAG.EQ.0) GO TO 960
2166         C
2167    897. 955    CONTINUE
2168         C
2169         C------  IF AFTER 1000 TRIES TO MEET THE DIVERSION WITH ITS RETURN
2170         C------    FLOW (EACH TIME REDUCING THE DIVERSION TO THE SMALLEST AMOUNT
2171         C------    AVAILABLE ALL THE WAY DOWNSTREAM). REDUCE THE DIVERSION
2172         C------    BY 3 AND TRY ANOUTHER 1000 TIMES
2173         C
2174    898.        DIVER(MON)=DIVER(MON)-3.
2175         C
2176    899.        IF(DIVER(MON).LE.0.) GO TO 970
2177    900.        GO TO 860
2178         C
2179         C------DIVERSION CAN BE MADE
2180         C
2181    901. 960    IF(DIVER(MON).LE.0.) GO TO 970
2182    902.        IF(DIVER(MON).EQ.DIVREQ) GO TO 975
2183         C
2184         C------IF FULL DIVERSION CAN'T BE MET, AS MUCH AS POSSIBLE WILL BE DIVER
2185         C------            WRITE MESSAGE TO TAPE11 AND TAPE12,
2186         C------            INCREMENT COUNTER OF DIVERSIONS CALLED OUT THIS MONTH
2187         C------            STORE STATION NUMBER,
2188         C------            GO TO REMOVE DIVERSION FROM RIVER.
2189         C
2190    903. 965    PCTCAL=100.-(100.*DIVER(MON)/DIVREQ)
2191    904.        IF(ILINE.GE.LINPPAG) CALL PAGE11
2192    905.        ILINE=ILINE+1
2193    906.        WRITE(11,5390) DIVSTA,DIVPMT,IDDATE,PCTCAL,(ISTATA(NSTAT,J),
```

```
2194              +              J=3,12),DIVREQ,DIVER(MON),CONSTA
2195     907. 5390  FORMAT(" PART DIVERSN  ",I6,2X,A4,A3,3X,I4,1X,I4,3X,F5.1,
2196              +       6X,10A4,1X,F7.1," REQ  ",F7.1," AVAIL AT ",I6)
2197     908.       WRITE(12,5360) IMO,DIVPMT,PCTCAL,DIVSTA
2198     909.       ID=ID+1
2199     910.       NODIV(ID)=DIVSTA
2200          C
2201          C------GO TO DIVERT
2202          C
2203     911.       GO TO 975
2204          C
1WAT12S  PAGE 39                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 39
WAT12S

2205          C
2206          C------  IF NO WATER IS AVAILABLE FROM THE RIVER,
2207          C------            WRITE MESSAGE TO TAPE11 AND TAPE12,
2208          C------            INCREMENT COUNTER OF DIVERSIONS CALLED OUT THIS MONTH
2209          C------            STORE STATION NUMBER,
2210          C------            GO TO READ OF NEXT DIVERSION.
2211          C
2212          C
2213     912. 970   IF(ILINE.GE.LINPPAG) CALL PAGE11
2214     913.       ILINE=ILINE+1
2215     914.       WRITE(11,5400) DIVSTA,DIVPMT,IDDATE,(ISTATA(NSTAT,J),J=3,12),
2216              +             DIVREQ,CONSTA
2217     915. 5400  FORMAT(" NO DIVERSION  ",I6,2X,A4,A3,3X,I4,1X,I4,
2218              + "   100.0",6X,10A4,1X,F7.1," REQ      0.0 AVAIL AT ",I6)
2219     916.       PCTCAL=100.
2220     917.       WRITE(12,5360) IMO,DIVPMT,PCTCAL,DIVSTA
2221     918.       ID=ID+1
2222     919.       NODIV(ID)=DIVSTA
2223     920.       GO TO 295
2224          C
2225          C------  IF ANY WATER WAS DIVERTED,
2226          C------REFLECT DIVERSION EFFECT DOWNSTREAM
2227          C------AMOUNT DIVERTED IS TAKEN OUT AT AND DOWNSTREAM OF THE
2228          C------DIVERSION STATION.
2229          C
2230     921. 975   ORDER=ORD
2231     922.       IST1 = NSTAT + 1
2232     923.       NORD(NSTAT) = ORDER
```

```
2233          C
2234     924.       DO 985 ISS=IST1,NUMSTA
2235     925.           IF(ISTATA(ISS-1,2) .EQ. (ORDER-1)) ORDER=ORDER-1
2236     926.           NORD(ISS) = ORDER
2237     927.    985 CONTINUE
2238          C
2239     928.       IF(ISTATA(NUMSTA,2) .EQ. (ORDER-1)) ORDER=ORDER-1
2240          C
2241     929.       DO 990 ISS=NSTAT,NUMSTA
2242     930.           BITV = ISTATA(ISS,2) .EQ. NORD(ISS)  .OR.
2243               1          ISTATA(ISS,2) .EQ. (NORD(ISS)-1)
2244     931.           AVAIL(ISS) = CVMGT(AVAIL(ISS)-DIVER(MON),AVAIL(ISS),BITV)
2245     932.           RIVER(ISS,MON) = CVMGT(RIVER(ISS,MON)-DIVER(MON)
2246               1                          ,RIVER(ISS,MON),BITV)
2247     933.    990 CONTINUE
2248          C
2249          C------  CALCULATE TOTAL AMOUNT OF DIVERSION TO BE RETURNED
2250          C
2251     934.       TOTRET=DIVER(MON)*((100.-DIVEFF)/100.)
2252          C
2253          C------    GO TO DIV AND PROJ RETURN FLOW SECTION
2254          C
2255          C
2256          C-------------------------------------------------------------*
2257          C
2258          C-----    END   NORMAL DIVERSION SECTION
2259          C
2260          C-----------------------------------------------------------------
2261          C-----------------------------------------------------------------
2262          C--------
1WAT12S   PAGE 40                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 40
WAT12S

2263          C------------   START  DIVERSION AND PROJECT RETURN FLOW SECTION
2264          C--------
2265          C-----------------------------------------------------------------
2266          C
2267          C------  IF WATER RIGHT HAS NO RETURN FLOW STATIONS,GO TO READ OF NEXT D
2268          C
2269     935. 995    IF(NRET.EQ.0) GO TO 295
2270     936.       DO 1080 IRT=1,NRET
2271          C
```

```
      C------FIND STATION AND STREAM ORDER IN ARRAY ISTATA
      C
  937.       DO 1000 IS=1,NUMSTA
  938.       IF(RETSTA(IRT).NE.ISTATA(IS,1)) GO TO 1000
  939.       NSTATR=IS
  940.       ORDERR=ISTATA(IS,2)
  941.       GO TO 1005
  942. 1000  CONTINUE
  943.       WRITE(6,5100) RETSTA(IRT)
  944.       GO TO 1615
      C
      C------FIND DELAY TABLE FOR CURRENT RETURN FLOW
      C
  945. 1005  DO 1010 IDL=1,99
  946.       IF(RETDLY(IRT).NE.DLYNUM(IDL)) GO TO 1010
  947.       DLY=IDL
  948.       GO TO 1015
  949. 1010  CONTINUE
  950.       WRITE(6,5410) RETDLY(IRT)
  951. 5410  FORMAT("1 DELAY TABLE NOT FOUND ",I3)
  952.       STOP 15
      C
      C------  IF DELAY TYPE IS LESS THAN OR EQUAL TO 50,
      C------ADD RETURN FLOW FOR NEXT 12 MONTH PERIOD
      C------  STARTING WITH THE FIRST VALUE IN DELAY TABLE IN THE CURRENT MON
      C
  953. 1015  IF(RETDLY(IRT).GT.50) GO TO 1045
  954.       IEND=MON+12
  955.       I=0
      C
  956.       DO 1040 ISS=NSTATR,NUMSTA
      C
  957.       IF(ISTATA(ISS,2).EQ.ORDERR) GO TO 1025
  958.       IF(ISTATA(ISS,2).EQ.ORDERR-1) GO TO 1020
  959.       GO TO 1040
  960. 1020  ORDERR=ORDERR-1
  961. 1025  I=0
  962.       AVAIL(ISS) = AVAIL(ISS) + TOTRET*PCTTOT(IRT)/100.*
           1           (DLYRAT(DLY,1)/100.)
      C
  963.       DO 1035 IM=MON,IEND
  964. 1030  I=I+1
```

```
 2314    965.       RET=TOTRET*PCTTOT(IRT)/100.*(DLYRAT(DLY,I)/100.)
 2315    966.       RIVER(ISS,IM)=RIVER(ISS,IM)+RET
 2316         C
 2317    967. 1035  CONTINUE
 2318         C
 2319    968. 1040  CONTINUE
 2320         C
1WAT12S  PAGE 41                ON=ABCDELMPQRSTVX          11/28/84-13:24:09     CFT 1.11(11/19/84)  PAGE 41
WAT12S

 2321    969.       GO TO 1080
 2322         C
 2323         C------  IF DELAY TYPE IS GREATER THAN 50,
 2324         C------  ADD RETURN FLOW FOR THE NEXT 12 MONTHS, STARTING WITH THE
 2325         C------  CURRENT MONTH VALUE OF DELAY TABLEIN CURRENT MONTH.
 2326         C
 2327    970. 1045  DO 1070 ISS=NSTATR,NUMSTA
 2328    971.       K=MON
 2329    972.       IF(ISTATA(ISS,2).EQ.ORDERR) GO TO 1055
 2330    973.       IF(ISTATA(ISS,2).EQ.ORDERR-1) GO TO 1050
 2331    974.       GO TO 1070
 2332    975. 1050  ORDERR=ORDERR-1
 2333         C
 2334    976. 1055  DO 1060 IM=MON,12
 2335    977.       RET=TOTRET*PCTTOT(IRT)/100.*(DLYRAT(DLY,IM)/100.)
 2336    978.       RIVER(ISS,K)=RIVER(ISS,K)+RET
 2337    979.       IF(K.EQ.MON) AVAIL(ISS)=AVAIL(ISS)+RET
 2338    980.       K=K+1
 2339    981. 1060  CONTINUE
 2340    982.       IEND=MON-1
 2341         C
 2342    983.       DO 1065 IM=1,IEND
 2343    984.       RET=TOTRET*PCTTOT(IRT)/100.*(DLYRAT(DLY,IM)/100.)
 2344    985.       RIVER(ISS,K)=RIVER(ISS,K)+RET
 2345    986.       K=K+1
 2346    987. 1065  CONTINUE
 2347         C
 2348    988. 1070  CONTINUE
 2349         C
 2350    989. 1075  CONTINUE
 2351         C
 2352    990. 1080  CONTINUE
```

```
 2353         C
 2354         C------GO TO READ NEXT DIVERSION AND RETURN FLOW DATA FROM TAPE4
 2355         C
 2356    991.       GO TO 295
 2357         C
 2358         C-----------------------------------------------------------------
 2359         C
 2360         C------           END DIVER AND PROJ RETURN FLOW SECTION
 2361         C
 2362         C-----------------------------------------------------------------
 2363         C
 2364         C-----------------------------------------------------------------
 2365         C-----------------------------------------------------------------*
 2366         C
 2367         C----            START   PROJECT RIGHT SECTION
 2368         C
 2369         C----        SENIOR PROJECT RIGHTS
 2370         C----        JUNIOR PROJECT RIGHTS(SPILL)
 2371         C-----------------------------------------------------------------
 2372         C-----------------------------------------------------------------
 2373         C
 2374         C
 2375         C------  IF RIGHT IS ZERO FOR THE CURRENT MONTH, GO TO READ OF NEXT DIVE
 2376         C
 2377    992. 1085  IF(DIVER(MON).EQ.0.) GO TO 295
 2378         C
1WAT12S    PAGE 42                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 42
WAT12S

 2379         C------  SET DIVREQ TO REQUESTED DIVERSION AMOUNT
 2380         C
 2381    993.       DIVREQ=DIVER(MON)
 2382    994.       RETCFS=0.
 2383    995.       RESREL=0.
 2384         C
 2385         C------- FIND PROJECT STATION INDEX.
 2386         C
 2387    996.       DO 1090 IS=1,NUMSTA
 2388    997.       IF(ISTATA(IS,1).NE.DIVSTA) GO TO 1090
 2389    998.       ORDER=ISTATA(IS,2)
 2390    999.       ORD=ORDER
 2391         C-------   NSTATP - PROJECT STATION
```

```
2392   1000.       NSTATP=IS
2393   1001.       GO TO 1095
2394   1002. 1090  CONTINUE
2395         C
2396   1003.       WRITE(6,5100) DIVSTA
2397   1004.       STOP 16
2398         C
2399         C------ IF NO WATER AVAILABLE AT CUR STATION
2400         C------        WRITE MESSAGE TO TAPE11,
2401         C------        GO TO RESERVOIR FOR REMAINDER OF RIGHT.
2402         C
2403         C
2404   1005. 1095  IF(AVAIL(NSTATP).GT.0.) GO TO 1105
2405   1006.       NSTP=NSTATP
2406   1007. 1100  IF(ILINE.GE.LINPPAG) CALL PAGE11
2407   1008.       ILINE=ILINE+1
2408   1009.       WRITE(11,5420) DIVSTA,DIVPMT,IDDATE,(ISTATA(NSTATP,J),J=3,12),
2409              + DIVER(MON),ISTATA(NSTP,1)
2410   1010. 5420  FORMAT(" NO PROJ   RIV ",I6,2X,A4,A3,3X,I4,1X,I4,3X,
2411              + "100.0",6X,10A4,1X,F7.1," REQ      0.0 AVAIL AT ",I6)
2412         C
2413   1011.       REMDIV=DIVREQ
2414   1012.       GO TO 1190
2415         C
2416         C------  CHECK IF ALL DOWNSTREAM, SENIOR RIGHTS HAVE BEEN FULLY MET
2417         C
2418         C------   IF ANY WERE CALLED OUT,
2419         C------             WRITE MESSAGE TO TAPE11,
2420         C------             GO TO RESERVOIR FOR REMAINDER OF RIGHT.
2421   1013. 1105  IF(II.EQ.0.AND.ID.EQ.0.AND.IR.EQ.0) GO TO 1150
2422         C
2423   1014.       DO 1145 ISS=NSTATP,NUMSTA
2424   1015.       IF(ISTATA(ISS,2).EQ.ORDER) GO TO 1115
2425   1016.       IF(ISTATA(ISS,2).EQ.ORDER-1) GO TO 1110
2426   1017.       GO TO 1145
2427         C
2428   1018. 1110  ORDER=ORDER-1
2429         C
2430         C------ CHECK DIV S
2431         C
2432   1019. 1115  IF(ID.EQ.0) GO TO 1125
2433         C
```

```
   2434   1020.       IEND=ID
   2435   1021.       DO 1120 IDV=1,IEND
   2436   1022.       IF(NODIV(IDV).NE.ISTATA(ISS,1)) GO TO 1120
1WAT12S    PAGE 43                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 43
WAT12S

   2437   1023.       IF(ILINE.GE.LINPPAG) CALL PAGE11
   2438   1024.       ILINE=ILINE+1
   2439   1025.       WRITE(11,5430) DIVSTA,DIVPMT,IDDATE,(ISTATA(NSTATP,J),J=3,12),
   2440              + NODIV(IDV)
   2441   1026. 5430  FORMAT(" NO PROJ   RIV ",I6,2X,A4,A3,3X,I4,1X,I4,3X,
   2442              + "100.0",6X,10A4,2X," SEN DS DIV NOT FULLY MET AT ",I6)
   2443         C
   2444   1027.       REMDIV=DIVREQ
   2445         C
   2446         C------  GO TO RESERVOIR
   2447         C
   2448   1028.       GO TO 1190
   2449         C
   2450   1029. 1120  CONTINUE
   2451         C
   2452         C-----  CHECK IFR S
   2453         C
   2454   1030. 1125  IF(II.EQ.0) GO TO 1135
   2455         C
   2456   1031.       DO 1130 IFR=1,II
   2457   1032.       IF(NOFLOW(IFR).NE.ISTATA(ISS,1)) GO TO 1130
   2458   1033.       IF(ILINE.GE.LINPPAG) CALL PAGE11
   2459   1034.       ILINE=ILINE+1
   2460   1035.       WRITE(11,5440) DIVSTA,DIVPMT,IDDATE,(ISTATA(NSTATP,J),J=3,12),
   2461              + NOFLOW(IFR)
   2462   1036. 5440  FORMAT(" NO PROJ   RIV ",I6,2X,A4,A3,3X,I4,1X,I4,3X,
   2463              + "100.0",6X,10A4,2X," SEN DS IFR NOT FULLY MET AT ",I6)
   2464         C
   2465   1037.       REMDIV=DIVREQ
   2466         C
   2467         C------GO TO RESERVOIR
   2468         C
   2469   1038.       GO TO 1190
   2470         C
   2471   1039. 1130  CONTINUE
   2472         C
```

```
2473          C
2474          C------  CHECK RESERVOIRS
2475          C
2476    1040. 1135  IF(IR.EQ.0) GO TO 1145
2477    1041.       DO 1140 IRS=1,IR
2478    1042.       IF(NORES(IRS).NE.ISTATA(ISS,1) ) GO TO 1140
2479    1043.       IF(ILINE.GE.LINPPAG) CALL PAGE11
2480    1044.       ILINE=ILINE+1
2481    1045.       WRITE(11,5450) DIVSTA,DIVPMT,IDDATE,(ISTATA(NSTATP,J),J=3,12),
2482                + NORES(IRS)
2483    1046. 5450  FORMAT(" NO PROJ   RIV ",I6,2X,A4,A3,3X,I4,1X,I4,3X,
2484                + "100.0",6X,10A4,2X," SEN DS RES NOT FULLY MET AT ",I6)
2485          C
2486    1047.       REMDIV=DIVREQ
2487          C
2488    1048.       GO TO 1190
2489    1049. 1140  CONTINUE
2490          C
2491    1050. 1145  CONTINUE
2492          C
2493          C------  IF ALL SENIOR DOWNSTREAM RIGHTS WERE MET,
2494          C------ FIND MAX WATER AVAILABLE DOWNSTREAM
```



```
2495          C
2496    1051. 1150  ORDER=ORD
2497          C
2498    1052.       DO 1165 ISS=NSTATP,NUMSTA
2499    1053.       IF(ISTATA(ISS,2).EQ.ORDER) GO TO 1160
2500    1054.       IF(ISTATA(ISS,2).EQ.ORDER-1) GO TO 1155
2501    1055.       GO TO 1165
2502          C
2503    1056. 1155  ORDER=ORDER-1
2504    1057. 1160  IF(DIVER(MON).LE.AVAIL(ISS)) GO TO 1165
2505    1058.       DIVER(MON)=AVAIL(ISS)
2506    1059.       NSTP=ISS
2507          C
2508    1060. 1165  CONTINUE
2509          C
2510          C------  IF NO WATER IS AVAILABLE FROM THE RIVER,
2511          C------           WRITE MESSAGE TO TAPE11,
```

```
2512        C------            GO TO RESERVOIR FOR REMAINDER OF RIGHT.
2513        C
2514   1061.       IF(DIVER(MON).EQ.0.) GO TO 1100
2515        C
2516        C------  REMOVE DIVERSION (FROM STREAM) FROM RIVER DOWNSTREAM
2517        C
2518   1062.       ORDER=ORD
2519   1063.       IST1 = NSTATP + 1
2520   1064.       NORD(NSTATP) = ORDER
2521        C
2522   1065.       DO 1175 ISS=IST1,NUMSTA
2523   1066.           IF(ISTATA(ISS-1,2) .EQ. (ORDER-1)) ORDER=ORDER-1
2524   1067.           NORD(ISS)=ORDER
2525   1068.  1175 CONTINUE
2526        C
2527   1069.       IF(ISTATA(NUMSTA,2) .EQ. (ORDER-1)) ORDER=ORDER-1
2528        C
2529   1070.       DO 1180 ISS=NSTATP,NUMSTA
2530   1071.           BITV = ISTATA(ISS,2) .EQ. NORD(ISS)  .OR.
2531             1           ISTATA(ISS,2) .EQ. (NORD(ISS)-1)
2532   1072.           AVAIL(ISS) = CVMGT(AVAIL(ISS)-DIVER(MON),AVAIL(ISS),BITV)
2533   1073.           RIVER(ISS,MON) = CVMGT(RIVER(ISS,MON)-DIVER(MON),
2534             1                            RIVER(ISS,MON),BITV)
2535   1074.  1180 CONTINUE
2536        C
2537   1075.       REMDIV=DIVREQ-DIVER(MON)
2538   1076.       RETCFS=DIVER(MON)
2539   1077.       IF(REMDIV.GT.0.) GO TO 1185
2540   1078.       TOTRET=DIVER(MON)*((100.-DIVEFF)/100.)
2541   1079.       GO TO 995
2542   1080. 1185  PCTCAL=100.-(100.*DIVER(MON)/DIVREQ)
2543   1081.       IF(ILINE.GE.LINPPAG) CALL PAGE11
2544   1082.       ILINE=ILINE+1
2545   1083.       WRITE(11,5460) DIVSTA,DIVPMT,IDDATE,PCTCAL,(ISTATA(NSTATP,J),
2546             + J=3,12),DIVREQ,DIVER(MON),ISTATA(NSTP,1)
2547   1084. 5460  FORMAT(" PART PROJ RIV ",I6,2X,A4,A3,3X,I4,1X,I4,3X,F5.1,
2548             + 6X,10A4,1X,F7.1," REQ  ",F7.1," AVAIL AT ",I6)
2549        C
2550        C
2551        C------ REMAINING PROJECT RIGHT FROM RESERVOIR
2552        C
```

```
2553  1085. 1190  NSTATR=IRSTAN(DIVTYP)
2554  1086.       ORDERR=IRSORD(DIVTYP)
2555        C
2556        C------  CALCULATE VOLUME AVAILABLE FROM RESERVOIR.
2557        C
2558  1087.       RESAVL=CURSTO(DIVTYP)-VOLMIN(DIVTYP)
2559  1088.       IF(RESAVL.LT.0.) RESAVL=0.
2560  1089.       RAVCFS=RESAVL/MTHDAY(MON)/FACTOR
2561  1090.       IF(MSPILL(DIVTYP)) GO TO 1195
2562        C
2563        C------  CALCULATE FLOW AVAILABLE FROM RESERVOIR.
2564        C
2565        C------   IF SPILL CONDITION EXISTS THIS MONTH, SKIP FLOW CHECK.
2566        C
2567  1091.       FLOAVL=FLOMAX(DIVTYP)-RIVER(NSTATR+1,MON)
2568  1092.       IF(FLOAVL.LT.0.) FLOAVL=0.
2569  1093.       IF(FLOAVL.LE.RAVCFS) GO TO 1210
2570        C
2571        C------  IF FLOW AVAILABLE IS GREATER THAN VOLUME AVAILABLE,
2572        C------  MIN VOL IS LIMITING FACTOR
2573        C
2574  1094. 1195  IF(RAVCFS.GT.0.) GO TO 1200
2575        C
2576        C------  IF VOLUME AVAILABLE IS ZERO,
2577        C------            WRITE MESSAGE TO TAPE11 AND TAPE12,
2578        C------            INCREMENT COUNTER OF DIVERSIONS CALLED OUT,
2579        C------            STORE STATION NUMBER,
2580        C------            GO TO CALCULATE TOTAL RETURN FLOW.
2581        C
2582        C
2583  1095.       IF(ILINE.GE.LINPPAG) CALL PAGE11
2584  1096.       ILINE=ILINE+1
2585  1097.       WRITE(11,5470) DIVSTA,DIVPMT,IDDATE,(ISTATA(NSTATP,J),
2586             + J=3,12),REMDIV,DIVTYP
2587  1098. 5470  FORMAT(" NO PROJ   RES ",I6,2X,A4,A3,3X,I4,1X,I4,3X,
2588            + "100.0",6X,10A4,1X,F7.1," REQ      0.0 AVAIL AT RES ",I2)
2589  1099.       PCTCAL=100.-(100.*(DIVREQ-REMDIV)/DIVREQ)
2590  1100.       WRITE(12,5360) IMO,DIVPMT,PCTCAL,DIVSTA
2591  1101.       ID=ID+1
```

```
 2592   1102.       NODIV(ID)=DIVSTA
 2593   1103.       RESREL=0.
 2594   1104.       GO TO 1250
 2595         C
 2596   1105. 1200  IF(RAVCFS.LT.REMDIV) GO TO 1205
 2597   1106.       RESREL=REMDIV
 2598   1107.       GO TO 1225
 2599         C
 2600         C------  IF PARTIAL PROJECT DIVERSION IS MADE,
 2601         C------            WRITE MESSAGE TO TAPE11 AND TAPE12,
 2602         C------            INCREMENT COUNTER OF DIVERSIONS CALLED OUT THIS MONTH
 2603         C------            STORE STATION NUMBER,
 2604         C------            GO TO MAKE RELEASE.
 2605         C
 2606         C
 2607   1108. 1205  PCTCAL=100.-(100.*RAVCFS/REMDIV)
 2608   1109.       IF(ILINE.GE.LINPPAG) CALL PAGE11
 2609   1110.       ILINE=ILINE+1
 2610   1111.       WRITE(11,5480) DIVSTA,DIVPMT,IDDATE,PCTCAL,
1WAT12S  PAGE 46                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 46
WAT12S
 2611              +  (ISTATA(NSTATP,J),J=3,12),REMDIV,RAVCFS,DIVTYP
 2612   1112. 5480  FORMAT(" PART PROJ RES ",I6,2X,A4,A3,3X,I4,1X,I4,3X,F5.1,
 2613              +  6X,10A4,1X,F7.1," REQ  ",F7.1," AVAIL AT RES ",I2)
 2614   1113.       PCTCAL=100.-(100.*((DIVREQ-REMDIV)+RAVCFS)/DIVREQ)
 2615   1114.       WRITE(12,5360) IMO,DIVPMT,PCTCAL,DIVSTA
 2616   1115.       ID=ID+1
 2617   1116.       NODIV(ID)=DIVSTA
 2618         C
 2619   1117.       RESREL=RAVCFS
 2620   1118.       GO TO 1225
 2621         C
 2622         C------  MAX FLOW IS LIMITING FACTOR
 2623         C
 2624   1119. 1210  IF(FLOAVL.GT.0.) GO TO 1215
 2625         C
 2626         C------  IF FLOW AVAILABLE IS ZERO,
 2627         C------            WRITE MESSAGE TO TAPE11 AND TAPE12,
 2628         C------            INCREMENT COUNTER OF DIVERSIONS CALLED OUT THIS MONTH
 2629         C------            STORE STATION NUMBER,
 2630         C------            GO TO CALCULATE TOTAL RETURN FLOW.
```

```
2631          C
2632    1120.       IF(ILINE.GE.LINPPAG) CALL PAGE11
2633    1121.       ILINE=ILINE+1
2634    1122.       WRITE(11,5490) DIVSTA,DIVPMT,IDDATE,(ISTATA(NSTATP,J),J=3,12),
2635                +  REMDIV,DIVTYP
2636    1123. 5490  FORMAT(" NO PROJ   RES ",I6,2X,A4,A3,3X,I4,1X,I4,2X,
2637                +  " 100.0",6X,10A4,1X,F7.1," REQ  OUTFLOW AT MAX - RES ",I2)
2638    1124.       PCTCAL=100.-(100.*(DIVREQ-REMDIV)/DIVREQ)
2639    1125.       WRITE(12,5360) IMO,DIVPMT,PCTCAL,DIVSTA
2640    1126.       ID=ID+1
2641    1127.       NODIV(ID)=DIVSTA
2642    1128.       RESREL=0.
2643    1129.       GO TO 1250
2644          C
2645    1130. 1215  IF(FLOAVL.LT.REMDIV) GO TO 1220
2646    1131.       RESREL=REMDIV
2647    1132.       GO TO 1225
2648          C
2649          C------  IF PARTIAL PROJECT DIVERSION IS MADE,
2650          C------            WRITE MESSAGE TO TAPE11 AND TAPE12,
2651          C------            INCREMENT COUNTER OF DIVERSIONS CALLED OUT,
2652          C------N           STORE STATION NUMBER,
2653          C------            GO TO MAKE RELEASE.
2654          C
2655    1133. 1220  PCTCAL=100.-(100.*FLOAVL/REMDIV)
2656    1134.       IF(ILINE.GE.LINPPAG) CALL PAGE11
2657    1135.       ILINE=ILINE+1
2658    1136.       WRITE(11,5500) DIVSTA,DIVPMT,IDDATE,PCTCAL,
2659                +  (ISTATA(NSTATP,J),J=3,12),REMDIV,FLOAVL,DIVTYP
2660    1137. 5500  FORMAT(" PART PROJ RES ",I6,2X,A4,A3,3X,I4,1X,I4,3X,F5.1,
2661                +  6X,10A4,1X,F7.1," REQ  ",F7.1," OUTFLOW  RES ",I2)
2662    1138.       PCTCAL=100.-(100.*((DIVREQ-REMDIV)+FLOAVL)/DIVREQ)
2663    1139.       WRITE(12,5360) IMO,DIVPMT,PCTCAL,DIVSTA
2664    1140.       ID=ID+1
2665    1141.       NODIV(ID)=DIVSTA
2666    1142.       RESREL=FLOAVL
2667          C
2668          C------  MAKE RESERVOIR RELEASE .
1WAT12S    PAGE 47                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 47
WAT12S

2669          C------ ADD WATER TO STREAM BETWEEN RESERV AND PROJ STATION
```

```
2670         C
2671    1143. 1225  IF(NSTATR.EQ.NSTATP) GO TO 1245
2672    1144.       ISTART=NSTATR+1
2673    1145.       IEND=NSTATP-1
2674    1146.       IF(ISTART.GT.IEND) GO TO 1245
2675    1147.       IST1 = ISTART + 1
2676    1148.       NORD(ISTART) = ORDERR
2677         C
2678    1149.       DO 1235 ISS=IST1,IEND
2679    1150.           IF(ISTATA(ISS-1,2) .EQ. (ORDERR-1)) ORDERR=ORDERR-1
2680    1151.           NORD(ISS) = ORDERR
2681    1152.  1235 CONTINUE
2682         C
2683    1153.       IF(ISTATA(IEND,2) .EQ. (ORDERR-1)) ORDERR=ORDERR-1
2684         C
2685    1154.       DO 1240 ISS=ISTART,IEND
2686    1155.           BITV = ISTATA(ISS,2) .EQ. NORD(ISS)  .OR.
2687              1           ISTATA(ISS,2) .EQ. (NORD(ISS)-1)
2688    1156.           AVAIL(ISS) = CVMGT(AVAIL(ISS)+RESREL,AVAIL(ISS),BITV)
2689    1157.           RIVER(ISS,MON)=CVMGT(RIVER(ISS,MON)+RESREL,RIVER(ISS,MON),
2690              1                         BITV)
2691    1158.  1240 CONTINUE
2692         C
2693         C------- REDUCE RESERVOIR STORAGE BY AMOUNT RELEASED
2694         C
2695    1159. 1245  RELAF=RESREL*MTHDAY(MON)*FACTOR
2696    1160.       CURSTO(DIVTYP)=CURSTO(DIVTYP)-RELAF
2697         C
2698         C------  ADD TO MONTHLY TOTAL PROJECT FLOW
2699         C
2700    1161.       PROJTF(DIVTYP)=PROJTF(DIVTYP)+RESREL
2701         C
2702         C------- CALCULATE TOTAL RETURN FLOW
2703         C
2704    1162. 1250  TOTRET=(RETCFS+RESREL)*((100.-DIVEFF)/100.)
2705         C
2706         C------  GO TO DIVERSION-PROJECT RETURN FLOW SECTION.
2707         C
2708    1163.       GO TO 995
2709         C
2710         C
2711         C-----------------------------------------------------------------------
```

```
2712          C
2713          C----     END PROJECT RIGHTS SECTION
2714          C
2715          C-------------------------------------------------------------------
2716          C
2717          C
2718          C-------------------------------------------------------------------
2719          C
2720          C----     END  WATER RIGHT READING AND PROCESSING SECTION
2721          C
2722          C-------------------------------------------------------------------
2723          C
2724          C-----------------------------------------------------------*
2725          C
2726          C     START END-OF MONTH SECTION
1WAT12S   PAGE 48                  ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 48
WAT12S
2727          C
2728          C-------------------------------------------------------------------
2729          C
2730          C------IF EOF ON DIV FILE, IFR FILE AND RES FILE, REWIND INPUT FILES.
2731          C
2732    1164. 1255  REWIND 3
2733    1165.       REWIND 4
2734    1166.       REWIND 16
2735          C
2736          C------PUT CURRENT MONTHS AVAIL ARRAY INTO AVOUT ARRAY
2737          C
2738    1167.       DO 1260 IS=1,NUMSTA
2739    1168.       AVOUT(IS,MON)=AVAIL(IS)
2740    1169. 1260  CONTINUE
2741          C
2742          C
2743          C------  IF NO RESERVOIRS, SKIP EVAPORATION SECTION.
2744          C
2745    1170.       IF(IRESOPT.EQ.3HNOR) GO TO 1575
2746          C
2747          C--------   RESERVOIR EVAPORATION SECTION
2748          C
2749    1171.       DO 1340 NR=2,NUMR
2750          C
```

```
2751   1172.       IF(IRESSWI(NR).EQ.0) GO TO 1340
2752         C
2753   1173.       IF(NRANGE(NR).GE.2) GO TO 1285
2754         C
2755         C-----------------------------------------------------------------
2756         C
2757         C--------  SINGLE RANGE
2758         C
2759   1174.       CALL EVAPSUB(VOLINT(NR),NEQTYPE(NR,1),ACOEF(NR,1,1),ACOEF(NR,1,2),
2760              +   ACOEF(NR,1,3),AREA1)
2761         C
2762   1175.       CALL EVAPSUB(CURSTO(NR),NEQTYPE(NR,1),ACOEF(NR,1,1),ACOEF(NR,1,2),
2763              +   ACOEF(NR,1,3),AREA2)
2764         C
2765   1176.       GO TO 1335
2766         C
2767         C
2768   1177.  1285 IF(NRANGE(NR).GE.3) GO TO 1305
2769         C
2770         C-----------------------------------------------------------------
2771         C
2772         C--------   DOUBLE RANGE
2773         C
2774   1178.       IF(VOLINT(NR).GT.RLIMIT(NR,1)) GO TO 1290
2775         C
2776   1179.       CALL EVAPSUB(VOLINT(NR),NEQTYPE(NR,1),ACOEF(NR,1,1),ACOEF(NR,1,2)
2777              +   ,ACOEF(NR,1,3),AREA1)
2778         C
2779   1180.       GO TO 1295
2780         C
2781   1181.  1290 CALL EVAPSUB(VOLINT(NR),NEQTYPE(NR,2),ACOEF(NR,2,1),ACOEF(NR,2,2)
2782              +   ,ACOEF(NR,2,3),AREA1)
2783         C
2784   1182.  1295 IF(CURSTO(NR).GT.RLIMIT(NR,1)) GO TO 1300
1WAT12S    PAGE 49                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 49
WAT12S

2785         C
2786   1183.       CALL EVAPSUB(CURSTO(NR),NEQTYPE(NR,1),ACOEF(NR,1,1),ACOEF(NR,1,2)
2787              +   ,ACOEF(NR,1,3),AREA2)
2788         C
2789   1184.       GO TO 1335
```

```
2790          C
2791    1185.  1300 CALL EVAPSUB(CURSTO(NR),NEQTYPE(NR,2),ACOEF(NR,2,1),ACOEF(NR,2,2)
2792               +    ,ACOEF(NR,2,3),AREA2)
2793          C
2794    1186.        GO TO 1335
2795          C
2796          C---------------------------------------------------------------
2797          C
2798          C--------   TRIPLE RANGE
2799          C
2800    1187.  1305 IF(NRANGE(NR).GT.3) STOP 20
2801          C
2802    1188.        IF(VOLINT(NR).GT.RLIMIT(NR,1)) GO TO 1310
2803          C
2804    1189.        CALL EVAPSUB(VOLINT(NR),NEQTYPE(NR,1),ACOEF(NR,1,1),ACOEF(NR,1,2)
2805               +    ,ACOEF(NR,1,3),AREA1)
2806    1190.        GO TO 1320
2807          C
2808    1191.  1310 IF(VOLINT(NR).GT.RLIMIT(NR,2)) GO TO 1315
2809          C
2810    1192.        CALL EVAPSUB(VOLINT(NR),NEQTYPE(NR,2),ACOEF(NR,2,1),ACOEF(NR,2,2)
2811               +    ,ACOEF(NR,2,3),AREA1)
2812    1193.        GO TO 1320
2813          C
2814    1194.  1315 CALL EVAPSUB(VOLINT(NR),NEQTYPE(NR,3),ACOEF(NR,3,1),ACOEF(NR,3,2)
2815               +    ,ACOEF(NR,3,3),AREA1)
2816          C
2817    1195.  1320 IF(CURSTO(NR).GT.RLIMIT(NR,1)) GO TO 1325
2818          C
2819    1196.        CALL EVAPSUB(CURSTO(NR),NEQTYPE(NR,1),ACOEF(NR,1,1),ACOEF(NR,1,2)
2820               +    ,ACOEF(NR,1,3),AREA2)
2821          C
2822    1197.        GO TO 1335
2823          C
2824    1198.  1325 IF(CURSTO(NR).GT.RLIMIT(NR,2)) GO TO 1330
2825          C
2826    1199.        CALL EVAPSUB(CURSTO(NR),NEQTYPE(NR,2),ACOEF(NR,2,1),ACOEF(NR,2,2)
2827               +    ,ACOEF(NR,2,3),AREA2)
2828          C
2829    1200.        GO TO 1335
2830          C
2831    1201.  1330 CALL EVAPSUB(CURSTO(NR),NEQTYPE(NR,3),ACOEF(NR,3,1),ACOEF(NR,3,2)
```

```
2832              +    ,ACOEF(NR,3,3),AREA2)
2833         C
2834         C--------   CALC EVAPORATION
2835         C
2836   1202.  1335 EVAP(NR)=((AREA1+AREA2)/2.)*EVAPRT(NR,MON)
2837         C
2838   1203.        IF(EVAP(NR).LT.0.) EVAP(NR)=0.
2839   1204.        CURSTO(NR)=CURSTO(NR)-EVAP(NR)
2840         C
2841   1205.        IF(CURSTO(NR).GE.0.) GO TO 1340
2842         C
1WAT12S    PAGE 50                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 50
WAT12S

2843   1206.        EVAP(NR)=EVAP(NR)+CURSTO(NR)
2844   1207.        CURSTO(NR)=0.
2845         C
2846         C-------  GO TO NEXT RESERVOIR
2847         C
2848   1208.  1340 CONTINUE
2849         C
2850         C-------------------------------------------------------------------
2851         C
2852         C--------       END RESERVOIR EVAPORATION SECTION
2853         C
2854         C-------------------------------------------------------------------
2855         C
2856         C-------------------------------------------------------------------*
2857         C
2858         C
2859         C-----   END EVAPORATION SECTION
2860         C
2861         C-----------------------------
2862         C
2863         C------  WRITE END OF MONTH RESERVOIR STATUS REPORT
2864         C
2865         C
2866   1209. 1560  DO 1570 NUMR=2,NUMREST
2867   1210.        IF(IRESSWI(NUMR).EQ.0) GO TO 1570
2868         C
2869         C
2870   1211.        NS=IRSTAN(NUMR)+1
```

```
2871   1212.       WRITE(19,5510) (RESNAM(NUMR,J),J=1,4),STOMON(NUMR),RIVER(NS,MON),
2872               + POWREQ(NUMR),POWREL(NUMR),REQNP(NUMR),RELNP(NUMR),PROJTF(NUMR),
2873               + EVAP(NUMR),CURSTO(NUMR),RSRMET(NUMR)
2874   1213. 5510  FORMAT(1X,4A4,F10.0,F10.1,4F10.0,F10.1,2F10.0,A4)
2875         C
2876         C-----   RESET MONTHLY FLAGS AND SUBTOTALS.
2877         C
2878   1214.       PROJTF(NUMR)=0.
2879   1215.       STOMON(NUMR)=0.
2880   1216.       MSPILL(NUMR)=.FALSE.
2881   1217.       RESFLG(NUMR)=.FALSE.
2882         C
2883         C-----   POWER SECTION
2884         C-----       CALCULATE POWER RELEASE FOR BEGINNING OF NEXT MONTH.
2885         C-----       TO REACH GOAL VOLUME
2886         C
2887   1218.       IF(GOALDT(NUMR).GT.0) GO TO 1565
2888   1219.       POWREL(NUMR)=0.
2889   1220.       POWREQ(NUMR)=0.
2890   1221.       GO TO 1570
2891   1222. 1565  GOALRL=CURSTO(NUMR)-GOALVL(NUMR)
2892   1223.       GLDATE=GOALDT(NUMR)
2893         C
2894   1224.       IF(GOALDT(NUMR).LE.MON) GLDATE=GOALDT(NUMR)+12
2895   1225.       NUMMON=GLDATE-MON
2896   1226.       POWREL(NUMR)=GOALRL/NUMMON
2897   1227.       IF(POWREL(NUMR).LT.0.)  POWREL(NUMR)=0.
2898   1228.       POWREQ(NUMR)=POWREL(NUMR)
2899         C
2900         C
1WAT12S    PAGE 51                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 51
WAT12S

2901   1229. 1570  CONTINUE
2902         C
2903   1230. 1575  IMO=IMO+1
2904         C
2905         C------  IF END OF YEAR GO TO END OF YEAR SECTION,
2906         C------  OTHERWISE GO TO BEGINNING OF MONTH SECTION.
2907         C
2908         C
2909   1231. 1580  CONTINUE
```

```
2910          C
2911          C
2912          C-------------------------------------------------------------------
2913          C
2914          C-----   END  END-OF-MONTH SECTION
2915          C
2916          C-------------------------------------------------------------------
2917          C
2918          C
2919          C-------------------------------------------------------------------*
2920          C------   START END-OF-YEAR SECTION
2921          C-------------------------------------------------------------------
2922          C
2923          C------WRITE FIRST YEAR OF ARRAY RIVER OUT TO TAPE9
2924          C
2925    1232.       WRITE(9,5520) IYR,IHEAD,HEAD2
2926    1233. 5520  FORMAT("1",*YEAR *,I2,33X,"FINAL RIVER SYSTEM STATUS MONTHLY",
2927               +" CFS IN RIVER " ,/,31X,10A4,A8," PST ",A8,/)
2928    1234.       WRITE(9,5120)
2929    1235.       DO 1590 IS=1,NUMSTA
2930    1236.       DO 1585 IM=1,12
2931    1237.       YTOT=YTOT+(RIVER(IS,IM)*MTHDAY(IM)*FACTOR)
2932    1238. 1585  CONTINUE
2933    1239.       WRITE(9,5130) (ISTATA(IS,KK),KK=1,2),(RIVER(IS,J),J=1,12)
2934               +,YTOT
2935    1240.       YTOT=0.
2936    1241. 1590  CONTINUE
2937          C
2938          C------ WRITE AVOUT ARRAY ON TAPE10 ( CFS IN THE STREAM WHICH IS AVAILAB
2939          C------ FOR USE BY IFR OR DIV).
2940          C
2941    1242.       WRITE(10,5530) IYR,IHEAD,HEAD2
2942    1243. 5530  FORMAT("1","YEAR ",I2,28X,"FINAL RIVER SYSTEM STATUS MONTHLY CFS"
2943               +," AVAILABLE IN RIVER",/,30X,10A4,A8," PST ",A8,/
2944               +39X,"(WATER AVAILABLE FOR DIVERSIONS MAY BE CONTROLED",/,
2945               +38X,"BY DOWNSTREAM FLOWS.  WATER AVAILABLE FOR INSTREAM",/,
2946               +37X,"FLOWS IS CONTROLED BY FLOW AT INTERESTED STATION ONLY.)",/)
2947    1244.       WRITE(10,5120)
2948    1245.       DO 1600 IS=1,NUMSTA
2949          C
2950    1246.       DO 1595 IM=1,12
2951    1247.       YTOT=YTOT+(AVOUT(IS,IM)*MTHDAY(IM)*FACTOR)
```

```
   2952   1248. 1595  CONTINUE
   2953   1249.       WRITE(10,5130) (ISTATA(IS,KK),KK=1,2),(AVOUT(IS,J),J=1,12)
   2954              +,YTOT
   2955   1250.       YTOT=0.
   2956   1251. 1600  CONTINUE
   2957         C
   2958         C------IF RNFLAG IS TRUE, THERE IS NO MORE RUNOFF DATA.
1WAT12S    PAGE 52                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 52
WAT12S

   2959         C------  GO TO END OF RUN SECTION.
   2960         C
   2961   1252.       IF(RNFLAG) GO TO 1615
   2962         C
   2963         C------  IF RNFLAG IS FALSE,
   2964         C------MOVE SECOND YEAR OF RIVER TO THE FIRST YEAR, AND
   2965         C------SET VALUES IN THE SECOND YEAR TO ZERO.
   2966         C
   2967   1253.       DO 1610 IS=1,NUMSTA
   2968   1254.       DO 1605 IM=1,12
   2969   1255.       RIVER(IS,IM)=RIVER(IS,IM+12)
   2970   1256.       RIVER(IS,IM+12)=0.
   2971   1257. 1605  CONTINUE
   2972   1258. 1610  CONTINUE
   2973         C
   2974         C------  GO TO BEGINNING OF YEAR SECTION.
   2975         C
   2976   1259.       GO TO 125
   2977         C
   2978         C
   2979         C-------------------------------------------------------------------*8
   2980         C
   2981         C-----    END  END-OF-YEAR SECTION
   2982         C
   2983         C-------------------------------------------------------------------
   2984         C
   2985         C
   2986         C-------------------------------------------------------------------
   2987         C
   2988         C-------          START END-OF-RUN SECTION
   2989         C
   2990         C-------------------------------------------------------------------
```

```
 2991         C
 2992         C------  IF NO RESERVOIRS, STOP PROGRAM.
 2993         C
 2994   1260. 1615  IF(IRESOPT.EQ.3HNOR) STOP
 2995         C
 2996         C-----  RESORT MONTHLY RESERVOIR STATUS REPORT(TAPE19) BY RES THEN MONTH
 2997         C
 2998   1261.       NSKIP=0
 2999   1262.       MSKIP=NUMRES-1
 3000   1263.       DO 1670 NUMR=1,NUMREST
 3001   1264.       IF(IRESSWI(NUMR).EQ.0) GO TO 1670
 3002   1265.       IPAGE=1
 3003   1266.       REWIND 19
 3004         C
 3005         C------  WRITE HEADINGS FOR CURRENT RESERVOIR.
 3006         C
 3007   1267.       WRITE(18,5540) NUMR,(RESNAM(NUMR,J),J=1,4),
 3008              +   VOLMAX(NUMR),VOLMIN(NUMR),IHEAD
 3009              +  ,HEAD2
 3010   1268. 5540  FORMAT("1",/,1X,I2,2X,4A4," (MAX CAP ",F8.0," AF)",13X,
 3011              +"RESERVOIR STATUS REPORT", /,22X,"(MIN CAP ",F8.0," AF)",9X,10A4,
 3012              + 10X,A8," PST  ",A8,/)
 3013   1269.       WRITE(18,5550)
 3014   1270. 5550  FORMAT(92X,"RELEASE")
 3015   1271.       WRITE(18,5560)
 3016   1272. 5560  FORMAT(28X,"DOWNSTREAM     POWER",7X,"ACTUAL   NON-PROJECT",
1WAT12S    PAGE 53                ON=ABCDELMPQRSTVX           11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 53
WAT12S

 3017              + 5X,"ACTUAL",8X,"FOR",19X,"END OF    ALL RES")
 3018   1273.       WRITE(18,5570)
 3019   1274. 5570  FORMAT(17X,"STORAGE     FLOW AT      RELEASE      POWER",
 3020              + 6X,"RELEASE    NON-PROJECT    PROJECT   EVAPORATION",
 3021              + 3X,"MONTH      RIGHTS")
 3022   1275.       WRITE(18,5580)
 3023   1276. 5580  FORMAT(" MONTH  YEAR      ADDED     RESERVOIR    REQUESTED",
 3024              + 4X,"RELEASE    REQUESTED     RELEASE      RIGHTS",
 3025              + 7X,"LOSS       VOLUME      MET")
 3026   1277.       WRITE(18,5590)
 3027   1278. 5590  FORMAT(" ------------------------------------------------",
 3028              + "------------------------------------------------",
 3029              + "--------------------------------")
```

```
3030   1279.       WRITE(18,5600)
3031   1280. 5600  FORMAT(19X,"AF",10X,"CFS",10X,"AF",11X,"AF",9X,"AF",11X,"AF",
3032                + 10X,"CFS",10X,"AF",10X,"AF")
3033   1281.       WRITE(18,5590)
3034   1282.       WRITE(18,5610)
3035         C
3036         C
3037         C-----  SET TOTALS TO ZERO.
3038         C
3039   1283.       DO 1620 IT=1,8
3040   1284.       RTOTAL(IT)=0.
3041   1285. 1620  CONTINUE
3042         C
3043         C-----   SKIP TO FIRST RECORD OF CURRENT RESERVOIR.
3044         C
3045   1286.       IF(NSKIP.EQ.0) GO TO 1630
3046         C
3047   1287.       DO 1625 ISK=1,NSKIP
3048   1288.       READ(19,5610)
3049   1289. 5610  FORMAT(3X)
3050   1290. 1625  CONTINUE
3051         C
3052   1291. 1630  IMTH=1
3053   1292.       IYEAR=1
3054   1293.       NSKIP=NSKIP+1
3055         C
3056         C------  READ RESERVOIR RECORDS FROM TAPE19 AND WRITE TO TAPE18,
3057         C------    SKIPPING RECORDS FOR OTHER RESERVOIRS.
3058         C
3059   1294.       DO 1660 IM=1,IMO
3060   1295.       READ(19,5620) RSDATA
3061   1296. 5620  FORMAT(17X,F10.0,F10.1,4F10.0,F10.1,2F10.0,A4)
3062   1297.       IF(EOF(19)) 1665,1635
3063   1298. 1635  IF(IMTH.LE.12) GO TO 1650
3064         C
3065   1299.       WRITE(18,5630)
3066   1300. 5630  FORMAT(16X,4("----------",2X),2("----------",3X),
3067                +  2("----------",2X))
3068   1301.       WRITE(18,5640) RTOTAL
3069   1302. 5640  FORMAT(1X,"TOTALS(AF)",5X,F10.0,2X,F10.1,2X,F10.0,2X,
3070                + F10.0,2X,F10.0,3X,F10.0,3X,F10.1,2X,F10.0,//)
3071         C
```

```
   3072         C
   3073   1303.        IMTH=IMTH-12
   3074   1304.        IYEAR=IYEAR+1
1WAT12S    PAGE 54                  ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 54
WAT12S

   3075   1305.        IPAGE=IPAGE+1
   3076   1306.        IF(IPAGE.LE.3) GO TO 1640
   3077   1307.        IPAGE=1
   3078   1308.        WRITE(18,5540) NUMR,(RESNAM(NUMR,J),J=1,4),VOLMAX(NUMR),
   3079                +     VOLMIN(NUMR)
   3080                + ,IHEAD,HEAD2
   3081   1309.        WRITE(18,5550)
   3082   1310.        WRITE(18,5560)
   3083   1311.        WRITE(18,5570)
   3084   1312.        WRITE(18,5580)
   3085   1313.        WRITE(18,5590)
   3086   1314.        WRITE(18,5600)
   3087   1315.        WRITE(18,5590)
   3088   1316.        WRITE(18,5610)
   3089         C
   3090         C
   3091   1317. 1640   DO 1645 IT=1,8
   3092   1318.        RTOTAL(IT)=0.
   3093   1319. 1645   CONTINUE
   3094         C
   3095   1320. 1650   RTOTAL(1)=RTOTAL(1)+RSDATA(1)
   3096   1321.        RTOTAL(2)=RTOTAL(2)+(RSDATA(2)*MTHDAY(IMTH)*FACTOR)
   3097   1322.        RTOTAL(3)=RTOTAL(3)+RSDATA(3)
   3098   1323.        RTOTAL(4)=RTOTAL(4)+RSDATA(4)
   3099   1324.        RTOTAL(5)=RTOTAL(5)+RSDATA(5)
   3100   1325.        RTOTAL(6)=RTOTAL(6)+RSDATA(6)
   3101   1326.        RTOTAL(7)=RTOTAL(7)+(RSDATA(7)*MTHDAY(IMTH)*FACTOR)
   3102   1327.        RTOTAL(8)=RTOTAL(8)+RSDATA(8)
   3103         C
   3104   1328.        WRITE(18,5650) MONTHN(IMTH),IYEAR,RSDATA
   3105   1329. 5650   FORMAT(1X,A4,4X,I2,5X,F10.0,2X,F10.1,2X,F10.0,2X,F10.0,2X,
   3106                + F10.0,3X,F10.0,3X,F10.1,2X,F10.0,2X,F10.0,4X,A4)
   3107   1330.        IMTH=IMTH+1
   3108   1331.        IF(MSKIP.EQ.0) GO TO 1660
   3109   1332.        DO 1655 ISK=1,MSKIP
   3110   1333.        READ(19,5610)
```

```
   3111   1334.       IF(EOF(19))  1660,1655
   3112   1335. 1655  CONTINUE
   3113         C
   3114   1336. 1660  CONTINUE
   3115         C
   3116   1337. 1665  WRITE(18,5630)
   3117   1338.       WRITE(18,5640) RTOTAL
   3118   1339. 1670  CONTINUE
   3119         C
   3120   1340.       STOP
   3121   1341.       END
  WAT12S                BLOCK BEGINS AT SEQ. NO.       1, P=  267246A
  WAT12S                BLOCK BEGINS AT SEQ. NO.      38, P=  267251B
  WAT12S                BLOCK BEGINS AT SEQ. NO.      51, P=  267312C
  WAT12S                BLOCK BEGINS AT SEQ. NO.      55, P=  267335C
  WAT12S                BLOCK BEGINS AT SEQ. NO.      56, P=  267341B
  WAT12S                BLOCK BEGINS AT SEQ. NO.      56, P=  267341B
  WAT12S                BLOCK BEGINS AT SEQ. NO.      56, P=  267343A
  WAT12S                BLOCK BEGINS AT SEQ. NO.      62, P=  267365C
  WAT12S                BLOCK BEGINS AT SEQ. NO.      63, P=  267371B
  WAT12S                BLOCK BEGINS AT SEQ. NO.      66, P=  267400A
  WAT12S                BLOCK BEGINS AT SEQ. NO.      71, P=  267434D
1 WAT12S    PAGE 55                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 55
  WAT12S

  WAT12S                BLOCK BEGINS AT SEQ. NO.      76, P=  267446A
  WAT12S                BLOCK BEGINS AT SEQ. NO.      79, P=  267450D
  WAT12S     SHORT VECTOR LOOP BEGINS AT SEQ. NO.      97, P=  267473B
  WAT12S                BLOCK BEGINS AT SEQ. NO.      85, P=  267473B
  WAT12S                BLOCK BEGINS AT SEQ. NO.     119, P=  267537B
  WAT12S                BLOCK BEGINS AT SEQ. NO.     124, P=  267544B
  WAT12S                BLOCK BEGINS AT SEQ. NO.     125, P=  267550A
  WAT12S                BLOCK BEGINS AT SEQ. NO.     127, P=  267561A
  WAT12S                BLOCK BEGINS AT SEQ. NO.     128, P=  267564D
  WAT12S                BLOCK BEGINS AT SEQ. NO.     131, P=  267575B
  WAT12S                BLOCK BEGINS AT SEQ. NO.     131, P=  267575B
  WAT12S                BLOCK BEGINS AT SEQ. NO.     131, P=  267600B
  WAT12S                BLOCK BEGINS AT SEQ. NO.     138, P=  267626A
  WAT12S                BLOCK BEGINS AT SEQ. NO.     144, P=  267662C
  WAT12S                BLOCK BEGINS AT SEQ. NO.     145, P=  267666B
  WAT12S                BLOCK BEGINS AT SEQ. NO.     145, P=  267666B
  WAT12S                BLOCK BEGINS AT SEQ. NO.     145, P=  267666B
```

```
WAT12S                BLOCK BEGINS AT SEQ. NO.     145, P=  267671B
WAT12S                BLOCK BEGINS AT SEQ. NO.     149, P=  267711C
WAT12S                BLOCK BEGINS AT SEQ. NO.     152, P=  267720C
WAT12S     SHORT VECTOR LOOP BEGINS AT SEQ. NO.     152, P=  267720C
WAT12S                BLOCK BEGINS AT SEQ. NO.     152, P=  267720C
WAT12S                BLOCK BEGINS AT SEQ. NO.     155, P=  267734C
WAT12S                BLOCK BEGINS AT SEQ. NO.     160, P=  267741A
WAT12S                BLOCK BEGINS AT SEQ. NO.     161, P=  267744D
WAT12S                BLOCK BEGINS AT SEQ. NO.     164, P=  267755B
WAT12S                BLOCK BEGINS AT SEQ. NO.     164, P=  267755B
WAT12S                BLOCK BEGINS AT SEQ. NO.     164, P=  267760C
WAT12S                BLOCK BEGINS AT SEQ. NO.     168, P=  267764C
WAT12S                BLOCK BEGINS AT SEQ. NO.     169, P=  267766A
WAT12S     SHORT VECTOR LOOP BEGINS AT SEQ. NO.     169, P=  267766A
WAT12S                BLOCK BEGINS AT SEQ. NO.     169, P=  267766A
WAT12S                BLOCK BEGINS AT SEQ. NO.     172, P=  267775D
WAT12S                BLOCK BEGINS AT SEQ. NO.     173, P=  270001C
WAT12S                BLOCK BEGINS AT SEQ. NO.     174, P=  270005B
WAT12S                BLOCK BEGINS AT SEQ. NO.     179, P=  270037B
WAT12S                BLOCK BEGINS AT SEQ. NO.     187, P=  270101C
WAT12S                BLOCK BEGINS AT SEQ. NO.     187, P=  270101C
WAT12S                BLOCK BEGINS AT SEQ. NO.     188, P=  270106A
WAT12S                BLOCK BEGINS AT SEQ. NO.     193, P=  270127A
WAT12S     SHORT VECTOR LOOP BEGINS AT SEQ. NO.     193, P=  270127A
WAT12S                BLOCK BEGINS AT SEQ. NO.     193, P=  270127A
WAT12S                BLOCK BEGINS AT SEQ. NO.     196, P=  270143A
WAT12S                BLOCK BEGINS AT SEQ. NO.     201, P=  270147C
WAT12S                BLOCK BEGINS AT SEQ. NO.     202, P=  270153B
WAT12S                BLOCK BEGINS AT SEQ. NO.     204, P=  270163D
WAT12S                BLOCK BEGINS AT SEQ. NO.     204, P=  270163D
WAT12S                BLOCK BEGINS AT SEQ. NO.     204, P=  270167A
WAT12S                BLOCK BEGINS AT SEQ. NO.     208, P=  270173A
WAT12S                BLOCK BEGINS AT SEQ. NO.     209, P=  270174C
WAT12S     SHORT VECTOR LOOP BEGINS AT SEQ. NO.     209, P=  270174C
WAT12S                BLOCK BEGINS AT SEQ. NO.     209, P=  270174C
WAT12S                BLOCK BEGINS AT SEQ. NO.     212, P=  270204B
WAT12S                BLOCK BEGINS AT SEQ. NO.     213, P=  270210A
WAT12S                BLOCK BEGINS AT SEQ. NO.     214, P=  270213D
WAT12S                BLOCK BEGINS AT SEQ. NO.     217, P=  270246D
WAT12S                BLOCK BEGINS AT SEQ. NO.     224, P=  270311D
WAT12S                BLOCK BEGINS AT SEQ. NO.     224, P=  270311D
```

```
WAT12S
 WAT12S                BLOCK BEGINS AT SEQ. NO.     224, P=  270311D
 WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.     229, P=  270313C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     224, P=  270313C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     232, P=  270356A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     241, P=  270370B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     253, P=  270402D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     254, P=  270406C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     254, P=  270406C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     254, P=  270406C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     254, P=  270411C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     265, P=  270422B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     271, P=  270432A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     273, P=  270437A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     276, P=  270442B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     278, P=  270445A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     290, P=  270463A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     291, P=  270464C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     292, P=  270466D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     297, P=  270504B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     299, P=  270507C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     301, P=  270514C
 WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.     302, P=  270517D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     302, P=  270517D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     307, P=  270546A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     307, P=  270546A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     308, P=  270551D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     308, P=  270551D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     311, P=  270605D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     316, P=  270615C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     321, P=  270655A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     328, P=  270734C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     329, P=  270740B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     333, P=  270747C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     334, P=  270754A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     338, P=  270757C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     339, P=  270763B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     341, P=  270773D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     344, P=  271004A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     352, P=  271070B
```

```
WAT12S                BLOCK BEGINS AT SEQ. NO.     353, P=  271073A
WAT12S                BLOCK BEGINS AT SEQ. NO.     355, P=  271126C
WAT12S                BLOCK BEGINS AT SEQ. NO.     359, P=  271132C
WAT12S                BLOCK BEGINS AT SEQ. NO.     361, P=  271136D
WAT12S                BLOCK BEGINS AT SEQ. NO.     375, P=  271167D
WAT12S                BLOCK BEGINS AT SEQ. NO.     379, P=  271173D
WAT12S                BLOCK BEGINS AT SEQ. NO.     380, P=  271175B
WAT12S                BLOCK BEGINS AT SEQ. NO.     381, P=  271201B
WAT12S                BLOCK BEGINS AT SEQ. NO.     384, P=  271206D
WAT12S                BLOCK BEGINS AT SEQ. NO.     390, P=  271247B
WAT12S                BLOCK BEGINS AT SEQ. NO.     391, P=  271253A
WAT12S                BLOCK BEGINS AT SEQ. NO.     391, P=  271253A
WAT12S                BLOCK BEGINS AT SEQ. NO.     392, P=  271257A
WAT12S                BLOCK BEGINS AT SEQ. NO.     395, P=  271264C
WAT12S                BLOCK BEGINS AT SEQ. NO.     401, P=  271325A
WAT12S                BLOCK BEGINS AT SEQ. NO.     402, P=  271330D
WAT12S                BLOCK BEGINS AT SEQ. NO.     402, P=  271330D
WAT12S                BLOCK BEGINS AT SEQ. NO.     404, P=  271335B
WAT12S                BLOCK BEGINS AT SEQ. NO.     407, P=  271342D
1WAT12S    PAGE 57                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 57
WAT12S
```



```
WAT12S                BLOCK BEGINS AT SEQ. NO.     413, P=  271403B
WAT12S                BLOCK BEGINS AT SEQ. NO.     414, P=  271407A
WAT12S                BLOCK BEGINS AT SEQ. NO.     414, P=  271407A
WAT12S                BLOCK BEGINS AT SEQ. NO.     415, P=  271412D
WAT12S                BLOCK BEGINS AT SEQ. NO.     415, P=  271412D
WAT12S                BLOCK BEGINS AT SEQ. NO.     419, P=  271421C
WAT12S                BLOCK BEGINS AT SEQ. NO.     423, P=  271425C
WAT12S                BLOCK BEGINS AT SEQ. NO.     424, P=  271427A
WAT12S                BLOCK BEGINS AT SEQ. NO.     428, P=  271433B
WAT12S                BLOCK BEGINS AT SEQ. NO.     429, P=  271437A
WAT12S                BLOCK BEGINS AT SEQ. NO.     430, P=  271437C
WAT12S                BLOCK BEGINS AT SEQ. NO.     431, P=  271442B
WAT12S                BLOCK BEGINS AT SEQ. NO.     438, P=  271511C
WAT12S                BLOCK BEGINS AT SEQ. NO.     443, P=  271526C
WAT12S                BLOCK BEGINS AT SEQ. NO.     449, P=  271574A
WAT12S                BLOCK BEGINS AT SEQ. NO.     452, P=  271577C
WAT12S                BLOCK BEGINS AT SEQ. NO.     455, P=  271605B
WAT12S                BLOCK BEGINS AT SEQ. NO.     461, P=  271625A
WAT12S                BLOCK BEGINS AT SEQ. NO.     463, P=  271630B
WAT12S                BLOCK BEGINS AT SEQ. NO.     465, P=  271635B
```

```
 WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.     466, P=  271640C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     466, P=  271640C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     471, P=  271667A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     471, P=  271667A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     475, P=  271675B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     478, P=  271710A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     481, P=  271717D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     485, P=  272001C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     489, P=  272005A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     490, P=  272010D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     492, P=  272021B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     500, P=  272044C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     508, P=  272111A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     510, P=  272120A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     519, P=  272171B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     522, P=  272177A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     530, P=  272243C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     532, P=  272252C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     540, P=  272323B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     550, P=  272345A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     552, P=  272350B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     554, P=  272355B
 WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.     555, P=  272360C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     555, P=  272360C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     560, P=  272406C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     560, P=  272406C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     562, P=  272416D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     563, P=  272421D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     569, P=  272427B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     570, P=  272433A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     572, P=  272444A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     572, P=  272444A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     572, P=  272445D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     576, P=  272451D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     579, P=  272466C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     582, P=  272476C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     586, P=  272502C
 WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.     589, P=  272504A
1WAT12S    PAGE 58                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 58
WAT12S

 WAT12S                BLOCK BEGINS AT SEQ. NO.     587, P=  272504A
```

```
WAT12S                BLOCK BEGINS AT SEQ. NO.     594, P=  272537B
WAT12S                BLOCK BEGINS AT SEQ. NO.     594, P=  272537B
WAT12S                BLOCK BEGINS AT SEQ. NO.     595, P=  272543A
WAT12S                BLOCK BEGINS AT SEQ. NO.     596, P=  272543C
WAT12S                BLOCK BEGINS AT SEQ. NO.     596, P=  272543C
WAT12S                BLOCK BEGINS AT SEQ. NO.     596, P=  272546D
WAT12S                BLOCK BEGINS AT SEQ. NO.     601, P=  272553D
WAT12S                BLOCK BEGINS AT SEQ. NO.     602, P=  272555B
WAT12S                BLOCK BEGINS AT SEQ. NO.     603, P=  272567A
WAT12S                BLOCK BEGINS AT SEQ. NO.     603, P=  272572A
WAT12S                BLOCK BEGINS AT SEQ. NO.     607, P=  272607A
WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.     610, P=  272614B
WAT12S                BLOCK BEGINS AT SEQ. NO.     609, P=  272614B
WAT12S                BLOCK BEGINS AT SEQ. NO.     615, P=  272644D
WAT12S                BLOCK BEGINS AT SEQ. NO.     615, P=  272644D
WAT12S                BLOCK BEGINS AT SEQ. NO.     616, P=  272650C
WAT12S                BLOCK BEGINS AT SEQ. NO.     616, P=  272650C
WAT12S                BLOCK BEGINS AT SEQ. NO.     617, P=  272654B
WAT12S                BLOCK BEGINS AT SEQ. NO.     618, P=  272654D
WAT12S                BLOCK BEGINS AT SEQ. NO.     620, P=  272706C
WAT12S                BLOCK BEGINS AT SEQ. NO.     624, P=  272712C
WAT12S                BLOCK BEGINS AT SEQ. NO.     627, P=  272720B
WAT12S                BLOCK BEGINS AT SEQ. NO.     628, P=  272724B
WAT12S                BLOCK BEGINS AT SEQ. NO.     632, P=  272732D
WAT12S                BLOCK BEGINS AT SEQ. NO.     633, P=  272736C
WAT12S                BLOCK BEGINS AT SEQ. NO.     634, P=  272737A
WAT12S                BLOCK BEGINS AT SEQ. NO.     634, P=  272737A
WAT12S                BLOCK BEGINS AT SEQ. NO.     634, P=  272742A
WAT12S                BLOCK BEGINS AT SEQ. NO.     640, P=  272747A
WAT12S                BLOCK BEGINS AT SEQ. NO.     641, P=  272752D
WAT12S                BLOCK BEGINS AT SEQ. NO.     643, P=  272763B
WAT12S                BLOCK BEGINS AT SEQ. NO.     645, P=  272765D
WAT12S                BLOCK BEGINS AT SEQ. NO.     646, P=  272770C
WAT12S                BLOCK BEGINS AT SEQ. NO.     654, P=  273057A
WAT12S                BLOCK BEGINS AT SEQ. NO.     655, P=  273067A
WAT12S                BLOCK BEGINS AT SEQ. NO.     659, P=  273073A
WAT12S                BLOCK BEGINS AT SEQ. NO.     660, P=  273074C
WAT12S                BLOCK BEGINS AT SEQ. NO.     662, P=  273101A
WAT12S                BLOCK BEGINS AT SEQ. NO.     665, P=  273106C
WAT12S                BLOCK BEGINS AT SEQ. NO.     673, P=  273173C
WAT12S                BLOCK BEGINS AT SEQ. NO.     674, P=  273177B
WAT12S                BLOCK BEGINS AT SEQ. NO.     674, P=  273177B
```

```
 WAT12S                BLOCK BEGINS AT SEQ. NO.     675, P=  273203B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     678, P=  273210D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     686, P=  273275D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     687, P=  273301C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     687, P=  273301C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     688, P=  273305C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     691, P=  273313A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     699, P=  273400A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     700, P=  273403D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     700, P=  273403D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     701, P=  273407C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     701, P=  273407C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     703, P=  273415B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     707, P=  273421B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     708, P=  273422D
1WAT12S  PAGE 59                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 59
 WAT12S

 WAT12S                BLOCK BEGINS AT SEQ. NO.     711, P=  273426D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     712, P=  273432C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     716, P=  273442B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     718, P=  273445C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     720, P=  273452C
 WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.     721, P=  273455D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     721, P=  273455D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     726, P=  273504D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     729, P=  273514C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     737, P=  273610B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     739, P=  273615A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     745, P=  273624D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     747, P=  273632A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     753, P=  273637A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     754, P=  273642D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     756, P=  273653B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     759, P=  273656C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     760, P=  273666C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     764, P=  273672C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     765, P=  273674A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     767, P=  273700C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     770, P=  273706A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     778, P=  273767B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     779, P=  273773A
```

```
 WAT12S                BLOCK BEGINS AT SEQ. NO.     779, P=  273773A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     780, P=  273777A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     783, P=  274004C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     792, P=  274065D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     793, P=  274071C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     793, P=  274071C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     794, P=  274075C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     797, P=  274103A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     805, P=  274164B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     806, P=  274170A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     806, P=  274170A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     807, P=  274173D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     807, P=  274173D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     808, P=  274200A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     812, P=  274204A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     813, P=  274205C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     816, P=  274211C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     817, P=  274215B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     818, P=  274215D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     825, P=  274225A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     827, P=  274227A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     827, P=  274227A
 WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.     830, P=  274230D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     827, P=  274230D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     833, P=  274246C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     833, P=  274251C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     834, P=  274254C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     839, P=  274261C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     840, P=  274265B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     842, P=  274274D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     842, P=  274274D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     842, P=  274276C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     846, P=  274302C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     850, P=  274317B
1WAT12S    PAGE 60                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 60
WAT12S

 WAT12S                BLOCK BEGINS AT SEQ. NO.     854, P=  274333C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     856, P=  274336D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     858, P=  274343D
 WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.     860, P=  274347A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     859, P=  274347A
```

```
WAT12S                BLOCK BEGINS AT SEQ. NO.     864, P=  274376C
WAT12S                BLOCK BEGINS AT SEQ. NO.     865, P=  274377A
WAT12S                BLOCK BEGINS AT SEQ. NO.     867, P=  274404D
WAT12S                BLOCK BEGINS AT SEQ. NO.     869, P=  274410A
WAT12S                BLOCK BEGINS AT SEQ. NO.     871, P=  274415A
WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.     873, P=  274420B
WAT12S                BLOCK BEGINS AT SEQ. NO.     872, P=  274420B
WAT12S                BLOCK BEGINS AT SEQ. NO.     877, P=  274451A
WAT12S                BLOCK BEGINS AT SEQ. NO.     877, P=  274451A
WAT12S                BLOCK BEGINS AT SEQ. NO.     878, P=  274454D
WAT12S                BLOCK BEGINS AT SEQ. NO.     880, P=  274461D
WAT12S                BLOCK BEGINS AT SEQ. NO.     884, P=  274465D
WAT12S                BLOCK BEGINS AT SEQ. NO.     885, P=  274467B
WAT12S                BLOCK BEGINS AT SEQ. NO.     893, P=  274501B
WAT12S                BLOCK BEGINS AT SEQ. NO.     895, P=  274504A
WAT12S                BLOCK BEGINS AT SEQ. NO.     896, P=  274507D
WAT12S                BLOCK BEGINS AT SEQ. NO.     901, P=  274520B
WAT12S                BLOCK BEGINS AT SEQ. NO.     905, P=  274530D
WAT12S                BLOCK BEGINS AT SEQ. NO.     912, P=  274615B
WAT12S                BLOCK BEGINS AT SEQ. NO.     913, P=  274620A
WAT12S                BLOCK BEGINS AT SEQ. NO.     921, P=  274702B
WAT12S                BLOCK BEGINS AT SEQ. NO.     924, P=  274710C
WAT12S                BLOCK BEGINS AT SEQ. NO.     926, P=  274713D
WAT12S                BLOCK BEGINS AT SEQ. NO.     928, P=  274720D
WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.     929, P=  274724A
WAT12S                BLOCK BEGINS AT SEQ. NO.     929, P=  274724A
WAT12S                BLOCK BEGINS AT SEQ. NO.     934, P=  274752C
WAT12S                BLOCK BEGINS AT SEQ. NO.     935, P=  274756D
WAT12S                BLOCK BEGINS AT SEQ. NO.     936, P=  274762D
WAT12S                BLOCK BEGINS AT SEQ. NO.     937, P=  274765D
WAT12S                BLOCK BEGINS AT SEQ. NO.     942, P=  274772D
WAT12S                BLOCK BEGINS AT SEQ. NO.     943, P=  274776C
WAT12S                BLOCK BEGINS AT SEQ. NO.     945, P=  275006A
WAT12S                BLOCK BEGINS AT SEQ. NO.     945, P=  275006A
WAT12S                BLOCK BEGINS AT SEQ. NO.     945, P=  275007D
WAT12S                BLOCK BEGINS AT SEQ. NO.     949, P=  275013D
WAT12S                BLOCK BEGINS AT SEQ. NO.     953, P=  275030C
WAT12S                BLOCK BEGINS AT SEQ. NO.     956, P=  275040C
WAT12S                BLOCK BEGINS AT SEQ. NO.     960, P=  275044C
WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.     963, P=  275046A
WAT12S                BLOCK BEGINS AT SEQ. NO.     961, P=  275046A
WAT12S                BLOCK BEGINS AT SEQ. NO.     968, P=  275101B
```

```
 WAT12S                BLOCK BEGINS AT SEQ. NO.     968, P=  275101B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     969, P=  275105A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     970, P=  275105C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     970, P=  275105C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     970, P=  275110D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     975, P=  275115D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     976, P=  275117B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     976, P=  275117B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     976, P=  275122B
 WAT12S                BLOCK BEGINS AT SEQ. NO.     980, P=  275137B
 WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.     983, P=  275144C
1WAT12S    PAGE 61                 ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 61
WAT12S

 WAT12S                BLOCK BEGINS AT SEQ. NO.     982, P=  275144C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     988, P=  275175A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     988, P=  275175A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     989, P=  275200D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     990, P=  275200D
 WAT12S                BLOCK BEGINS AT SEQ. NO.     991, P=  275204C
 WAT12S                BLOCK BEGINS AT SEQ. NO.     992, P=  275205A
 WAT12S                BLOCK BEGINS AT SEQ. NO.     996, P=  275213C
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1002, P=  275220C
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1003, P=  275224B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1005, P=  275234D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1007, P=  275237B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1008, P=  275242A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1013, P=  275303B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1014, P=  275313B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1018, P=  275317B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1019, P=  275320D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1021, P=  275325B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1024, P=  275332D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1029, P=  275372A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1030, P=  275375D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1030, P=  275375D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1031, P=  275401D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1034, P=  275407B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1039, P=  275446C
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1040, P=  275452B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1040, P=  275452B
```

```
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1041, P=  275456B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1044, P=  275463D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1049, P=  275523A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1050, P=  275526D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1050, P=  275526D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1051, P=  275532C
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1051, P=  275532C
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1052, P=  275536D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1056, P=  275542D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1057, P=  275544B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1060, P=  275550B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1061, P=  275554A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1065, P=  275563D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1067, P=  275567A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1069, P=  275574A
 WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.    1070, P=  275577B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1070, P=  275577B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1075, P=  275625D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1080, P=  275635A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1082, P=  275644A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1085, P=  275706D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1094, P=  275730B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1096, P=  275734B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1105, P=  276022A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1108, P=  276024D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1110, P=  276033B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1119, P=  276124D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1121, P=  276130D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1130, P=  276216C
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1133, P=  276221B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1135, P=  276227D
1WAT12S  PAGE 62                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 62
WAT12S

 WAT12S                BLOCK BEGINS AT SEQ. NO.    1143, P=  276320D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1149, P=  276331D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1151, P=  276335A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1153, P=  276342A
 WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.    1154, P=  276345B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1154, P=  276345B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1159, P=  276373B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1159, P=  276373B
```

```
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1162, P=  276402A
 WAT12S          VECTOR LOOP BEGINS AT SEQ. NO.    1167, P=  276407A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1164, P=  276407A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1170, P=  276434C
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1171, P=  276441B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1177, P=  276465A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1181, P=  276501D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1182, P=  276512C
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1185, P=  276525C
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1187, P=  276536D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1188, P=  276543A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1191, P=  276556A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1194, P=  276571A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1195, P=  276601D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1198, P=  276614D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1201, P=  276627D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1202, P=  276640C
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1208, P=  276653B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1209, P=  276657A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1209, P=  276662A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1222, P=  276732D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1225, P=  276740C
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1229, P=  276750A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1230, P=  276753D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1230, P=  276753D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1235, P=  277012C
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1242, P=  277061B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1245, P=  277113B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1252, P=  277162A
0   AT SEQUENCE NUMBER -  1255.
 PRNAME WAT12S   COMMENT -     DEPENDENCY INVOLVING ARRAY "RIVER" IN SEQUENCE NUMBER 1256     ****************************
P=0002117B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1253, P=  277166A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1259, P=  277201B
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1260, P=  277201D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1261, P=  277205C
 WAT12S     SHORT VECTOR LOOP BEGINS AT SEQ. NO.    1283, P=  277212D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1263, P=  277212D
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1291, P=  277346C
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1291, P=  277346C
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1294, P=  277354A
 WAT12S                BLOCK BEGINS AT SEQ. NO.    1317, P=  277527B
```

```
 WAT12S     SHORT VECTOR LOOP BEGINS AT SEQ. NO.    1317, P=  277527B
 WAT12S                   BLOCK BEGINS AT SEQ. NO.    1317, P=  277527B
 WAT12S                   BLOCK BEGINS AT SEQ. NO.    1320, P=  277534C
 WAT12S                   BLOCK BEGINS AT SEQ. NO.    1332, P=  277602C
 WAT12S                   BLOCK BEGINS AT SEQ. NO.    1335, P=  277613D
 WAT12S                   BLOCK BEGINS AT SEQ. NO.    1336, P=  277617C
 WAT12S                   BLOCK BEGINS AT SEQ. NO.    1336, P=  277617C
 WAT12S                   BLOCK BEGINS AT SEQ. NO.    1337, P=  277623B
1WAT12S    PAGE 63                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 63
WAT12S

 WAT12S                   BLOCK BEGINS AT SEQ. NO.    1337, P=  277623B
 WAT12S                   BLOCK BEGINS AT SEQ. NO.    1339, P=  277642D
 WAT12S                   BLOCK BEGINS AT SEQ. NO.    1340, P=  277646C
1WAT12S    PAGE 64                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 64
WAT12S

OTABLE OF STATEMENT NUMBERS (ALL ADDRESSES IN TABLES ARE IN OCTAL)
 -------------------------
0  NUMBER USE   SOURCE PROGRAM REFERENCES

      10 267335C    55L     54L     54J     51E
      15 267341B    56L     54J
      20 SN         60L     59L     59J
      25 267365C    62L     59J     56E
      30 267371B    63L     61J
      35 SN         70L     69L     69J
      36 267434D    76J     71L
      37 267446A    76L     72J
      40 267450D    79L     69J
      42 267473B    85L     81J
      43 SN        100L     97E
      45 SN        104L
      50 267544B   124L    120J    119E
      55 267561A   127L    123J     84J     66E
      60 267575B   131L     78J     63J
      61 SN        135L    134L    134J
      62 SN        143L    138E
      63 267666B   145L    134J
      64 SN        144L    131E
      65 267711C   149L    147J
      70 267720C   152L    147J
```

```
  75 SN          154L     152E
  80 267741A     160L     156J     155E
  85 267755B     164L     159J
  90 267764C     168L     166J
  95 267766A     169L     165J
 100 SN          171L     169E
 105 267775D     172L     167J     164E
 110 SN          173L     145E
 115 SN          182L     180E
 120 SN          186L     179E
 125 270101C    1259J     187L
 130 SN          191L     190L     190J
 135 270127A     193L     190J
 140 SN          195L     193E
 145 270147C     201L     197J     196E
 150 270163D     204L     200J
 155 270173A     208L     206J
 160 270174C     209L     205J
 165 SN          211L     209E
 170 270204B     212L     207J     204E
 175 SN          213L     188E
 180 SN          220L     218E
 185 SN          223L     217E
 190 270311D     224L     192J
 195 SN          231L     229E
 200 270402D     253L     242J     241E
 205 270406C     254L     240J
 210 270422B     265L     261J
 215 270432A     271L     267J
 220 270437A     273L     265J
 225 270442B     276L     272J
1WAT12S    PAGE 65              ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 65
WAT12S

 230 270445A     278L     276J     275J     273J     270J     264J
 235 SN          287L
 240 270463A     290L     287J     284J
 245 270464C     291L     289J
 250 270466D     292L     286J     283J
 260 SN          300L     297E
 265 SN          306L     302E
 270 270546A     307L     255J     254E
```

275	270551D	308L	239J							
280	270605D	311L	309J							
285	270615C	319J	316L	312J						
290	SN	319L	318L	318J						
295	270655A	992J	991J	935J	920J	804J	791J	777J	745J	742J
		740J	698J	685J	672J	653J	633J	627J	321L	315J
300	SN	324L	323L	323J						
305	270734C	328L	323J							
310	270740B	626J	623J	360J	358J	329L	327J			
315	270747C	333L	330J							
320	SN	334L								
325	270757C	338L	335J	334E						
330	270773D	341L	337J							
335	SN	342L								
340	271070B	352L	341J							
345	271073A	353L	351J	333J						
350	271126C	355L	354L	354J	309J					
355	271132C	359L	354J							
360	271136D	361L	331J							
365	271173D	379L	377J							
370	271175B	380L	376J							
375	271247B	390L	382J	381E						
380	271253A	391L	380J							
385	271325A	401L	393J	392E						
390	271330D	402L	391J							
395	271403B	413L	405J	404E						
400	271407A	414L	402J	378J	375E					
405	271412D	415L	374J							
410	271425C	423L	421J							
415	271427A	424L	420J							
420	271433B	428L	424J	422J	419E					
425	271437C	430L	427J	418J						
430	271511C	438L	429J							
435	SN	439L								
440	271574A	449L	439J							
445	271577C	452L	449J							
455	SN	464L	461E							
460	SN	470L	466E							
465	271667A	471L	437J	412J	400J	389J	373J	370J	366J	
470	SN	474L								
475	271675B	478J	475L							
480	271710A	478L	476J							

485	271717D	617J	560J	529J	507J	484J	481L	
490	SN	483L	482L	482J				
495	SN	484L						
500	272005A	489L	486J	485E				
505	272021B	492L	488J					
510	SN	497L						
515	272111A	508L	498J					
520	272171B	519L	496J					

525	272243C	530L	520J					
530	272323B	540L	519J	518J	497J			
540	SN	553L	550E					
545	SN	559L	555E					
550	272406C	560L	547J	543J				
555	SN	561L						
560	272427B	569L	564J	563E				
565	272444A	572L	568J					
570	272451D	576L	573J	572E				
575	272466C	579L	575J					
580	272502C	586L	584J					
585	272504A	587L	583J					
590	SN	593L	589E					
595	272537B	594L	585J	582E				
600	272543C	596L	579J					
605	272553D	601L	599J					
610	272555B	602L	598J					
615	SN	608L	603E					
620	SN	614L	610E					
625	272644D	615L	600J	596E				
630	272650C	616L	595J	562E				
635	272654D	624J	618L	483J	482J	476J	472J	471J
640	272706C	620L	619L	619J	318J			
645	272712C	624L	619J					
650	272720B	743J	627L					
655	272732D	632L	629J	628E				
660	272737A	634L	631J					
665	272747A	640L	635J	634E				
670	272763B	643L	639J					
675	272765D	712J	645L					
680	273057A	654L	643J					

```
    685 273073A   659L    657J
    690 273074C   660L    656J
    695 273173C   673L    663J    662E
    700 273177B   674L    660J
    705 273275D   686L    676J    675E
    710 273301C   687L    674J
    715 273400A   699L    689J    688E
    720 273403D   700L    687J    658J    655E
    725 273407C   701L    654J
    730 273421B   707L    705J
    735 273422D   708L    704J
    740 273426D   711L    708J    706J    703E
    750 SN        719L    716E
    755 SN        725L    721E
    760 273610B   737L    726J
    765 273615A   739L    329J
    770 273624D   745L    739J
    775 273637A   753L    748J    747E
    780 273653B   756L    752J
    785 273656C   759L    756J
    790 273672C   764L    762J
    795 273674A   765L    761J
    800 273767B   778L    768J    767E
    805 273773A   779L    765J
    810 274065D   792L    781J    780E
    815 274071C   793L    779J
    820 274164B   805L    795J    794E
```



```
    825 274170A   806L    793J    763J    760E
    830 274173D   826J    807L    759J
    835 274204A   812L    810J
    840 274205C   813L    809J
    845 274211C   816L    813J    811J    808E
    850 274215D   818L    815J
    855 274225A   825L    821J
    860 274227A   900J    827L    818J
    865 SN        832L    830E
    870 274261C   839L    835J    834E
    875 274274D   842L    838J
    880 274302C   846L    843J    842E
```

885	274317B	850L	845J				
895	SN	857L	854E				
900	SN	863L	860E				
905	274377A	865L	851J				
910	SN	870L	867E				
920	SN	876L	873E				
925	274451A	877L	864J	833E			
930	SN	878L					
935	274465D	884L	882J				
940	274467B	885L	881J				
945	274501B	893L	888J				
950	274504A	895L	892J	885J	883J	880E	
955	SN	897L	827E				
960	274520B	901L	896J	817J			
965	SN	903L					
970	274615B	912L	901J	899J	829J	824J	758J
975	274702B	921L	911J	902J			
985	SN	927L	924E				
990	SN	933L	929E				
995	274756D	1163J	1079J	935L	738J		
1000	274772D	942L	938J	937E			
1005	275006A	945L	941J				
1010	275013D	949L	946J	945E			
1015	275030C	953L	948J				
1020	275044C	960L	958J				
1025	275046A	961L	957J				
1030	SN	964L					
1035	SN	967L	963E				
1040	275101B	968L	959J	956E			
1045	275105C	970L	953J				
1050	275115D	975L	973J				
1055	275117B	976L	972J				
1060	SN	981L	976E				
1065	SN	987L	983E				
1070	275175A	988L	974J	970E			
1075	SN	989L					
1080	275200D	990L	969J	936E			
1085	275205A	992L	744J	741J			
1090	275220C	1002L	997J	996E			
1095	275234D	1005L	1001J				
1100	275237B	1061J	1007L				
1105	275303B	1013L	1005J				

```
   1110 275317B  1018L   1016J
   1115 275320D  1019L   1015J
   1120 275372A  1029L   1022J   1021E
   1125 275375D  1030L   1019J
1WAT12S    PAGE 68                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 68
WAT12S

   1130 275446C  1039L   1032J   1031E
   1135 275452B  1040L   1030J
   1140 275523A  1049L   1042J   1041E
   1145 275526D  1050L   1040J   1017J   1014E
   1150 275532C  1051L   1013J
   1155 275542D  1056L   1054J
   1160 275544B  1057L   1053J
   1165 275550B  1060L   1057J   1055J   1052E
   1175 SN       1068L   1065E
   1180 SN       1074L   1070E
   1185 275635A  1080L   1077J
   1190 275706D  1085L   1048J   1038J   1028J   1012J
   1195 275730B  1094L   1090J
   1200 276022A  1105L   1094J
   1205 276024D  1108L   1105J
   1210 276124D  1119L   1093J
   1215 276216C  1130L   1119J
   1220 276221B  1133L   1130J
   1225 276320D  1143L   1132J   1118J   1107J
   1235 SN       1152L   1149E
   1240 SN       1158L   1154E
   1245 276373B  1159L   1146J   1143J
   1250 276402A  1162L   1129J   1104J
   1255 276407A  1164L    620J    355J    324J
   1260 SN       1169L   1167E
   1285 276465A  1177L   1173J
   1290 276501D  1181L   1178J
   1295 276512C  1182L   1180J
   1300 276525C  1185L   1182J
   1305 276536D  1187L   1177J
   1310 276556A  1191L   1188J
   1315 276571A  1194L   1191J
   1320 276601D  1195L   1193J   1190J
   1325 276614D  1198L   1195J
   1330 276627D  1201L   1198J
```

1335	276640C	1202L	1200J	1197J	1186J	1184J	1176J
1340	276653B	1208L	1205J	1172J	1171E		
1560	SN	1209L					
1565	276732D	1222L	1218J				
1570	276750A	1229L	1221J	1210J	1209E		
1575	276753D	1230L	1170J				
1580	SN	1231L	224E				
1585	SN	1238L	1236E				
1590	SN	1241L	1235E				
1595	SN	1248L	1246E				
1600	SN	1251L	1245E				
1605	SN	1257L	1254E				
1610	SN	1258L	1253E				
1615	277201D	1260L	1252J	944J	841J		
1620	SN	1285L	1283E				
1625	SN	1290L	1287E				
1630	277346C	1291L	1286J				
1635	SN	1298L	1297L	1297J			
1640	277527B	1317L	1306J				
1645	SN	1319L	1317E				
1650	277534C	1320L	1298J				
1655	277613D	1335L	1334L	1334J	1332E		
1660	277617C	1336L	1334J	1331J	1294E		

1665	277623B	1337L	1297J				
1670	277642D	1339L	1264J	1263E			
5000	FN	39L	38R				
5010	FN	41L	40R				
5020	FN	43L	42R				
5030	FN	53L	52R				
5040	FN	58L	57R				
5050	FN	68L	67R				
5055	FN	74L	73W				
5060	FN	80L	79R				
5070	FN	129L	128W				
5073	FN	133L	132R				
5075	FN	136L	135R				
5077	FN	140L	139R				
5078	FN	142L	141R				
5080	FN	189R	148L	147L	146R		

5090 FN	150L	149W							
5100 FN	1003W	943W	840W	754W	641W	570W	490W	339W	202W
	162L	161W	125W						
5110 FN	215W	176L	175W						
5120 FN	1244W	1234W	216W	178L	177W				
5130 FN	1249W	1239W	221W	184L	183W				
5140 FN	226L	225W							
5150 FN	353R	310L	309L	308R					
5160 FN	618R	317L	316R						
5170 FN	481R	322L	321R						
5180 FN	346L	345W							
5190 FN	386L	385W							
5200 FN	397L	396W							
5210 FN	409L	408W							
5220 FN	434L	433W							
5230 FN	445L	444W							
5240 FN	477L	476L	475R						
5250 FN	502L	501W							
5260 FN	512L	511W							
5270 FN	524L	523W							
5280 FN	534L	533W							
5290 FN	648L	647W							
5300 FN	667L	666W							
5310 FN	680L	679W							
5320 FN	693L	692W							
5330 FN	731L	730W							
5340 FN	772L	771W							
5350 FN	785L	784W							
5360 FN	1139W	1125W	1114W	1100W	917W	908W	801W	788L	787W
	774W	734W	695W	682W	669W	650W	347W		
5370 FN	799L	798W							
5380 FN	848L	847W							
5390 FN	907L	906W							
5400 FN	915L	914W							
5410 FN	951L	950W	577W						
5420 FN	1010L	1009W							
5430 FN	1026L	1025W							
5440 FN	1036L	1035W							
5450 FN	1046L	1045W							
5460 FN	1084L	1083W							
5470 FN	1098L	1097W							
5480 FN	1112L	1111W							

```
   5490 FN       1123L   1122W
   5500 FN       1137L   1136W
   5510 FN       1213L   1212W
   5520 FN       1233L   1232W
   5530 FN       1243L   1242W
   5540 FN       1308W   1268L   1267W
   5550 FN       1309W   1270L   1269W
   5560 FN       1310W   1272L   1271W
   5570 FN       1311W   1274L   1273W
   5580 FN       1312W   1276L   1275W
   5590 FN       1315W   1313W   1281W   1278L   1277W
   5600 FN       1314W   1280L   1279W
   5610 FN       1333R   1316W   1289L   1288R   1282W
   5620 FN       1296L   1295R
   5630 FN       1337W   1300L   1299W
   5640 FN       1338W   1302L   1301W
   5650 FN       1329L   1328W
0  (SN=STATEMENT NUMBER, GSN=GENERATED STATEMENT NUMBER)
   (FN=FORMAT NUMBER, UNDEF*=UNDEFINED STATEMENT NUMBER)
OTABLE OF NAMES ENCOUNTERED (ADDRESS FOR DUMMY ARGUMENT IS THE ARGUMENT NUMBER)
 -------------------------

  ADDRESS NAME     TYPE MAIN USAGE  BLOCK        SOURCE PROGRAM REFERENCES

          $BACK        EXTERNAL                  480U    479U
          $MAIN        ENTRY
          $REWF        EXTERNAL                 1266U   1166U   1165U   1164U    474U
          $RFA         EXTERNAL                 1295U    618U/2  481U/2  353U/2  321U/2  316U/2  308U/2  189U    146U
                                                  38U
          $RFF         EXTERNAL                 1333U   1295U   1288U    618U    481U    475U    353U    321U    316U
                                                 308U    189U    146U    141U    139U    135U    132U     79U     67U
                                                  57U     52U     42U     40U     38U
          $RFI         EXTERNAL                 1333U   1295U   1288U    618U    481U    475U    353U    321U    316U
                                                 308U    189U    146U    141U    139U    135U    132U     79U     67U
                                                  57U     52U     42U     40U     38U
          $RFV         EXTERNAL                  618U/4  481U/9  475U    353U/2  321U/9  316U/4  308U/2  189U    146U
                                                 141U    139U/2  135U    132U     79U/3   67U/3   57U     52U/2   42U
                                                  40U
          $STOP        EXTERNAL                 1340U   1260U   1187U   1004U    952U    849U    755U    642U    578U
```

```
                                                571U    491U    340U    332U    203U    163U    151U    130U    126U
                                                 75U
          $WFA          EXTERNAL                1338U   1328U   1308U/2 1301U   1267U/2 1242U/2 1232U/2 1139U   1136U/2
                                                1125U   1122U/2 1114U   1111U/2 1100U   1097U/2 1083U/2 1045U/2 1035U/2
                                                1025U/2 1009U/2 917U    914U/2  908U    906U/2  801U    798U/2  787U
                                                 784U/2  774U   771U/2  734U    730U/2  695U    692U/2  682U    679U/2
                                                 669U    666U/2  650U    647U/2  533U/2  523U/2  511U/2  501U/2  444U/2
                                                 433U/2  408U/2  396U/2  385U/2  347U    345U/2  225U/2  215U/2  175U/2
          $WFF          EXTERNAL                1338U   1337U   1328U   1316U   1315U   1314U   1313U   1312U   1311U
                                                1310U   1309U   1308U   1301U   1299U   1282U   1281U   1279U   1277U
                                                1275U   1273U   1271U   1269U   1267U   1249U   1244U   1242U   1239U
                                                1234U   1232U   1212U   1139U   1136U   1125U   1122U   1114U   1111U
                                                1100U   1097U   1083U   1045U   1035U   1025U   1009U   1003U    950U
                                                 943U    917U    914U    908U    906U    847U    840U    801U    798U
                                                 787U    784U    774U    771U    754U    734U    730U    695U    692U
                                                 682U    679U    669U    666U    650U    647U    641U    577U    570U
                                                 533U    523U    511U    501U    490U    444U    433U    408U    396U
1WAT12S     PAGE 71                 ON=ABCDELMPQRSTVX          11/28/84-13:24:09       CFT 1.11(11/19/84)  PAGE 71
WAT12S

                                                385U    347U    345U    339U    225U    221U    216U    215U    202U
                                                 183U    177U    175U    161U    149U    128U    125U     73U
          $WFI          EXTERNAL                1338U   1337U   1328U   1316U   1315U   1314U   1313U   1312U   1311U
                                                1310U   1309U   1308U   1301U   1299U   1282U   1281U   1279U   1277U
                                                1275U   1273U   1271U   1269U   1267U   1249U   1244U   1242U   1239U
                                                1234U   1232U   1212U   1139U   1136U   1125U   1122U   1114U   1111U
                                                1100U   1097U   1083U   1045U   1035U   1025U   1009U   1003U    950U
                                                 943U    917U    914U    908U    906U    847U    840U    801U    798U
                                                 787U    784U    774U    771U    754U    734U    730U    695U    692U
                                                 682U    679U    669U    666U    650U    647U    641U    577U    570U
                                                 533U    523U    511U    501U    490U    444U    433U    408U    396U
                                                 385U    347U    345U    339U    225U    221U    216U    215U    202U
                                                 183U    177U    175U    161U    149U    128U    125U     73U
          $WFV          EXTERNAL                1328U/2 1308U/4 1267U/4 1249U/3 1242U   1239U/3 1232U   1212U/? 1139U/3
                                                1136U/6 1125U/3 1122U/4 1114U/3 1111U/6 1100U/3 1097U/4 1083U/6 1045U/3
                                                1035U/3 1025U/3 1009U/4 1003U    950U    943U    917U/3  914U/4  908U/3
                                                 906U/6  847U    840U    801U/3  798U/3  787U/3  784U/3  774U/3  771U/3
                                                 754U    734U/3  730U/6  695U/3  692U/3  682U/3  679U/3  669U/3  666U/3
                                                 650U/3  647U/4  641U    577U    570U    533U/6  523U/4  511U/6  501U/4
                                                 490U    444U/6  433U/4  408U/3  396U/3  385U/3  347U/3  345U/5  339U
                                                 225U/2  221U/4  215U    202U    183U/4  175U    161U    128U    125U
     236222 ACOEF     R  3DIM ARRAY              1201P/3 1199P/3 1196P/3 1194P/3 1192P/3 1189P/3 1185P/3 1183P/3 1181P/3
```

```
                                                1179P/3 1175P/3 1174P/3  141S    15D
267205 AREA1     R  VARIABLE                    1202U   1194P   1192P   1189P   1181P   1179P   1174P
267206 AREA2     R  VARIABLE                    1202U   1201P   1199P   1196P   1185P   1183P   1175P
156446 AVAIL     R  1DIM ARRAY                  1168U   1156P/2 1156S   1072P/2 1072S   1058U   1057U   1005U   979U
                                                979S    962U    962S    931P/2  931S    831U    820U    813U    756U
                                                723P/2  723S    709U    708U    643U    606U    606S    602U    602S
                                                588U    588S    557P/2  557S    468P/2  468S    425U    424U    418U
                                                416U    352U    352S    350S    345U    342U    341U    304P/2  304S
                                                230S      3D
267015 AVAILR    R  VARIABLE                    444U    441U    438U    427U    425S    424U    416S
164502 AVOUT     R  2DIM ARRAY                  1249U   1247U   1168S     3D
267022 AVRAF     R  VARIABLE                    448U    439U    438S
161464 AVWRET    R  1DIM ARRAY                  893U    889U    887U    885U    875P/2  875S    862P/2  862S    831S
                                                  3D
237434 BEGVOL    R  1DIM ARRAY                  115U     96S     16D
266635 BITV      L  VARIABLE                    1157P   1156P   1155S   1073P   1072P   1071S   932P    931P    930S
                                                875P    874S    862P    861S    724P    723P    722S    558P    557P
                                                556S    469P    468P    467S    305P    304P    303S     34D
       CLOCK        EXTERNAL                    44U
256006 CONSTA    I  VARIABLE                    914U    906U    886S    825S    823S    757S     32D
237270 CURSTO    R  1DIM ARRAY                  1222U   1212U   1207S   1206U   1205U   1204U   1204S   1201P   1199P
                                                1198U   1196P   1195U   1185P   1183P   1182U   1175P   1160U   1160S
                                                1087U   541U    541S    492U    452U    452S    371U    292U    292S
                                                260U    257U    251U    115S     16D
       CVMGM        INLINE FUNCT.               252U
       CVMGT        INLINE FUNCT.               1157U   1156U   1073U   1072U   932U    931U    875U    862U    724U
                                                723U    558U    557U    469U    468U    305U    304U
       DATE         EXTERNAL                    45U
232302 DCRMAX    R  1DIM ARRAY                  454U    368U    252S    116S     11D
232364 DECREE    R  1DIM ARRAY                  252U    252P    116U    101S     11D
267134 DIFFER    R  VARIABLE                    888U    887S
255775 DIVDAT    I  VARIABLE                    331U    330U    329U/2  328S    326S     30D
266766 DIVEFF    R  VARIABLE                    1162U   1078U   934U    850U    737U    321S
230766 DIVER     R  1DIM ARRAY                  1083U   1080U   1078U   1076U   1075U   1073U   1072U   1061U   1058S
                                                1057U   1009U   993U    992U    934U    932U    931U    906U    903U
                                                902U    901U    899U    898U    898S    893S    890S    890U    889S
1WAT12S    PAGE 72              ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 72
WAT12S

                                                887U    885U    850U    829U    822S    821U    820S    813U    746U
                                                745U    733U    732U    694U/2  681U/2  668U/2  649U/2  321S      5D
231002 DIVPMT    I  1DIM ARRAY                  1139U   1136U   1125U   1122U   1114U   1111U   1100U   1097U   1083U
```

				1045U 1035U 1025U 1009U 917U 914U 908U 906U 801U 798U 787U 784U 774U 771U 734U 730U 695U 692U 682U 679U 669U 666U 650U 647U 629U/2 321S 29D 5D
267104	DIVREQ	R	VARIABLE	1138U/2 1124U/2 1113U/2 1099U/2 1083U 1080U 1075U 1047U 1037U 1027U 1011U 993S 914U 906U 903U 902U 746S
256007	DIVSTA	I	VARIABLE	1141U 1139U 1136U 1127U 1125U 1122U 1116U 1114U 1111U 1102U 1100U 1097U 1083U 1045U 1035U 1025U 1009U 1003U 997U 919U 917U 914U 910U 908U 906U 803U 801U 798U 790U 787U 784U 776U 774U 771U 757U 754U 748U 736U 734U 730U 697U 695U 692U 684U 682U 679U 671U 669U 666U 652U 650U 647U 641U 635U 321S 32D
256004	DIVTYP	I	VARIABLE	1161U/2 1160U/2 1136U 1122U 1111U 1097U 1091U 1090U 1087U/2 1086U 1085U 743U 742U 739U 321S 31D
255774	DLY	I	VARIABLE	984U 977U 965U 962U 947S 872U 859U 844S 611U 604U 602U 591U 588U 574S 29D
255332	DLYNUM	I	1DIM ARRAY	946U 843U 573U 52S 31D 23D
253052	DLYRAT	R	2DIM ARRAY	984U 977U 965U 962U 872U 859U 611U 604U 602U 591U 588U 52S 23D
267027	DUMJPR	*R	VARIABLE	481S
266765	DVTYP2	R	VARIABLE	741U 321S
267031	EFFJPR	R	VARIABLE	561U 481S
	EOF	R	EXTERNAL	1334U 1297U 619U 482U 476U 354U 323U 318U 309U 190U 147U 134U 69U 59U 54U
234106	EVAP	R	1DIM ARRAY	1212U 1206U 1206S 1204U 1203S 1203U 1202S 13D
232756	EVAPRT	R	2DIM ARRAY	1202U 98S 13D
	EVAPSUB		EXTERNAL	1201U 1199U 1196U 1194U 1192U 1189U 1185U 1183U 1181U 1179U 1175U 1174U
266636	FACTOR	R	VARIABLE	1326U 1321U 1247U 1237U 1159U 1089U 540U 492U 457U 440U 438U 432U 293U 271U 219U 194U 181U 153U 37S
266750	FAVLAF	R	VARIABLE	288U 287U 286U 285U 285S 277U 276U 272U 271S
266747	FLOAVL	R	VARIABLE	1142U 1138U 1136U 1133U 1130U 1119U 1093U 1092S 1092U 1091S 539U 536U 533U 530U 520U 519U 496U 495S 495U 494S 271U 268S 267U 266S
232220	FLOMAX	R	1DIM ARRAY	1091U 494U 266U 95S 11D
231044	FLOWRQ	R	1DIM ARRAY	353S 352U 345U 342U 341U 333U 308S 7D
256010	GLDATE	I	VARIABLE	1225U 1224S 1223S 32D
232612	GOALDT	I	1DIM ARRAY	1224U/2 1223U 1218U 102S 31D 12D
267212	GOALRL	R	VARIABLE	1226U 1222S
232674	GOALVL	R	1DIM ARRAY	1222U 103S 12D

255540	HEAD2	R	1DIM ARRAY	1308U	1267U	1242U	1232U	225U	215U	175U	45P	44P
				25D								
266661	I	I	VARIABLE	965U	964U	964S	961S	955S	591U	590U	590S	587S
				581S	481U	481I	353U	353I	321U	321I	308U	308I
				183U	183I	79U	79I	67U	67I			
266704	IC	I	VARIABLE	141U	141I							
266740	ID	I	VARIABLE	1141U	1140U	1140S	1127U	1126U	1126S	1116U	1115U	1115S
				1102U	1101U	1101S	1020U	1019U	1013U	919U	918U	918S
				910U	909U	909S	803U	802U	802S	790U	789U	789S
				776U	775U	775S	766U	765U	759U	736U	735U	735S
				697U	696U	696S	684U	683U	683S	671U	670U	670S
				661U	660U	654U	652U	651U	651S	381N	380U	374U
				233S								

231004	IDDATE	I	1DIM ARRAY	1136U	1122U	1111U	1097U	1083U	1045U	1035U	1025U	1009U
				914U	906U	798U	784U	771U	730U	692U	679U	666U
				647U	328U/2	321S	5D					
255543	IDFLAG	L	VARIABLE	620U	355U	325S	237S	26D				
266645	IDL	I	VARIABLE	947U	946U	945I	844U	843U	842I	574U	573U	572I
				52U/2	51I							
267003	IDV	I	VARIABLE	1025U	1022U	1021I	771U	768U	767I	666U	663U	662I
				385U	382U	381I						
267011	IEND	I	VARIABLE	1154N	1153U	1149N	1146U	1145S	1021N	1020S	983N	982S
				963N	954S	767N	766S	662N	661S	610N	609S	589N
				580S	555N	554U	550N	547U	546S	404N	403S	
231062	IFDATE	I	1DIM ARRAY	359U/2	353S	345U	311U/2	308S	7D			
255542	IFFLAG	L	VARIABLE	620U	356S	324U	236S	26D				
267132	IFLAG	I	VARIABLE	896U	894S	891S	878S					
267006	IFR	I	VARIABLE	1035U	1032U	1031I	784U	781U	780I	679U	676U	675I
				396U	393U	392I						
266761	IFRDAT	I	VARIABLE	359S	357S	331U	330U/2	329U	311S			
231060	IFRPMT	I	1DIM ARRAY	353S	347U	345U	308S	7D				
266757	IFRSTA	I	VARIABLE	353S	349U	347U	345U	339U	335U	308S		
255526	IHEAD	I	1DIM ARRAY	1308U	1267U	1242U	1232U	225U	215U	175U	38S	25D
266737	II	I	VARIABLE	1031N	1030U	1013U	780N	779U	759U	675N	674U	654U
				392N	391U	374U	349U	348U	348S	232S		
266741	IJ	I	VARIABLE	628N	627U	538U	537U	536U	535U	535S	528U	527U
				526U	525U	525S	516U	515U	514U	513U	513S	506U
				505U	504U	503U	503S	235S				
240150	IJDATE	I	1DIM ARRAY	533U	523U	511U	501U	481S	18D			

267047	IJP	I	VARIABLE		630U	629U/2	628I	611U	604U	602U	591U	588U	579U
					577U	573U	570U	564U	562I				
0	ILINE	I	VARIABLE	//	1135U	1135S	1134U	1121U	1121S	1120U	1110U	1110S	1109U
					1096U	1096S	1095U	1082U	1082S	1081U	1044U	1044S	1043U
					1034U	1034S	1033U	1024U	1024S	1023U	1008U	1008S	1007U
					913U	913S	912U	905U	905S	904U	797U	797S	796U
					783U	783S	782U	770U	770S	769U	729U	729S	728U
					691U	691S	690U	678U	678S	677U	665U	665S	664U
					646U	646S	645U	532U	532S	531U	522U	522S	521U
					510U	510S	509U	500U	500S	499U	443U	443S	442U
					431U	431S	430U	407U	407S	406U	395U	395S	394U
					384U	384S	383U	344U	344S	343U	228S	28D	
266647	IM	I	VARIABLE		1294I	1256U	1255U/2	1254I	1247U/2	1246I	1237U/2	1236I	984U
					983I	977U	976I	966U/2	963I	611U	610I	604U	603I
					592U/2	589I	219U/2	218I	210U/3	209I	194U/3	193I	181U/2
					180I	170U/3	169I	153U/3	152I	57U	57I	52U	52I
266644	IMO	I	VARIABLE		1294N	1230U	1230S	1139U	1125U	1114U	1100U	917U	908U
					801U	787U	774U	734U	695U	682U	669U	650U	347U
					49S								
266673	IMTH	I	VARIABLE		1330U	1330S	1328U	1326U	1321U	1303U	1303S	1298U	1291S
					99U/2	98U/2	97I						
231710	INDXRR	I	1DIM ARRAY		365U	364U	364S	256S	107S	9D			
267232	IPAGE	I	VARIABLE		1307S	1306U	1305U	1305S	1265S				
266676	IR	I	VARIABLE		1041N	1040U	1013U	794N	793U	759U	688N	687U	654U
					447U	446U	446S	436U	435U	435S	411U	410U	410S
					403U	402U	399U	398U	398S	388U	387U	387S	374U
					234S	131I							
266700	IRC	I	VARIABLE		141U	139U/2	137U	135U	132S				
231376	IRDATE	I	1DIM ARRAY		625U/2	618S	444U	433U	408U	396U	385U	320U/2	316S
					8D								
266762	IRESCD	I	VARIABLE		624U	618S	483U	478U	473U	471U	456U/2	455U/2	454U/3
					453U/2	452U/2	451U	450U	444U	433U	408U	396U	385U

					371U/2	368U/2	367U	366U	365U	364U/2	362U	361U	319U
					316S								
266640	IRESOPT	I	VARIABLE		1260U	1170U	740U	312U	239U	63U	42S		
231772	IRESSWI	I	1DIM ARRAY		1264U	1210U	1172U	742U	624U	319U	255U	242U	92S
					83S	76U	10D						
255630	IRFILL	L	1DIM ARRAY		451S	366U	243S	117S	27D				
255545	IRFLAG	L	VARIABLE		621S	355U	324U	313S	238S	26D			

266702	IRG	I	VARIABLE	141U	139U/2	138I						
266706	IRN	I	VARIABLE	188I	145I							
267012	IRS	I	VARIABLE	1045U	1042U	1041I	798U	795U	794I	692U	689U	688I
				408U	405U	404I						
266672	IRSNUM	I	VARIABLE	125U	122U	121U	120U	118U	117U	116U/2	115U/2	114U
				113U	112U	111U	110U	109U	108U	107U	106U	105U
				104U	103U	102U	101U	99U	98U	96U	95U	94U
				93U	92U	91U	90U	89U	88U	87U	86S	83U
				82S								
231626	IRSORD	I	1DIM ARRAY	1086U	362U	259U	122S	9D				
231544	IRSTAN	I	1DIM ARRAY	1211U	1085U	361U	258U	121S	9D			
267121	IRT	I	VARIABLE	984U	977U	965U	962U	953U	950U	946U	943U	938U
				936I	872U	859U	851U	847U	843U	840U	835U	833I
253042	IRTEMP	I	1DIM ARRAY	102U	92U	91U	90U	89U	88U	87U	86U	82U
				81U	79S	67S/2	22D					
266717	IRUNYR	I	VARIABLE	215U	214S	175U	174S					
266651	IS	I	VARIABLE	1256U	1255U/2	1253I	1249U/2	1247U	1245I	1239U/2	1237U	1235I
				1168U/2	1167I	1000U	998U	997U	996I	940U	939U	938U
				937I	837U	836U	835U	834I	831U/2	830I	750U	749U
				748U	747I	638U	636U	635U	634I	567U	565U	564U
				563I	487U	486U	485I	336U	335U	334I	230U/2	229I
				221U/3	219U	217I	199U	198U	197U	196I	183U/3	181U
				179I	158U	157U	156U	155I	122U	121U	120U	119I
				60U	57U	56I						
267236	ISK	I	VARIABLE	1332I	1287I							
266714	ISS	I	VARIABLE	1157U/3	1156U/3	1155U/4	1154I	1151U	1150U	1149I	1073U/3	1072U/3
				1071U/4	1070I	1067U	1066U	1065I	1059U	1058U	1057U	1054U
				1053U	1052I	1042U	1032U	1022U	1016U	1015U	1014I	985U/2
				979U/2	978U/2	973U	972U	970I	966U/2	962U/2	958U	957U
				956I	932U/3	931U/3	930U/4	929I	926U	925U	924I	893U
				889U	887U	886U	885U	882U	881U	880I	875U/3	874U/4
				873I	869U	868U	867I	862U/3	861U/4	860I	856U	855U
				854I	814U	813U	810U	809U	808I	795U	781U	768U
				762U	761U	760I	724U/3	723U/3	722U/4	721I	718U	717U
				716I	710U	709U	708U	705U	704U	703I	689U	676U
				663U	657U	656U	655I	612U/2	606U/2	605U/2	602U/2	599U
				598U	596I	592U/2	588U/2	584U	583U	582I	558U/3	557U/3
				556U/4	555I	552U	551U	550I	469U/3	468U/3	467U/4	466I
				463U	462U	461I	426U	425U	424U	421U	420U	419I
				405U	393U	382U	377U	376U	375I	305U/3	304U/3	303U/4
				302I	299U	298U	297I	210U/2	206U	205U	204I	170U/2
				166U	165U	164I						

266754	IST1	I	VARIABLE	1149N	1147S	1065N	1063S	924N	922S	867N	865S	854N
				852S	716N	714S	550N	548S	461N	459S	297N	295S
266753	ISTART	I	VARIABLE	1154N	1148U	1147U	1146U	1144S	555N	549U	548U	547U
				545S	302N	296U	295U	294S				
266710	ISTAT	I	VARIABLE	202U	197U	189S	161U	156U	146S			
1456	ISTATA	I	2DIM ARRAY	1249U	1239U	1155U/2	1153U	1150U	1136U	1122U	1111U	1097U
				1083U/2	1071U/2	1069U	1066U	1054U	1053U	1045U	1042U	1035U
				1032U	1025U	1022U	1016U	1015U	1009U/2	998U	997U	973U
				972U	958U	957U	940U	938U	930U/2	928U	925U	914U

				906U	886U	882U	881U	874U/2	871U	868U	861U/2	858U
				855U	837U	835U	825U	823U	810U	809U	798U	795U
				784U	781U	771U	768U	762U	761U	750U	748U	730U/2
				722U/2	720U	717U	705U	704U	692U	689U	679U	676U
				666U	663U	657U	656U	647U/2	636U	635U	599U	598U
				584U	583U	565U	564U	556U/2	554U	551U	533U	523U
				511U	501U	486U	467U/2	465U	462U	444U	433U	421U
				420U	405U	393U	382U	377U	376U	345U	335U	303U/2
				301U	298U	221U/2	206U	205U	198U	197U	183U/2	166U
				165U	157U	156U	122U	120U	57S	2D		
267234	IT	I	VARIABLE	1318U	1317I	1284U	1283I					
267116	ITRY	I	VARIABLE	827I								
267240	IYEAR	I	VARIABLE	1328U	1304U	1304S	1292S					
266643	IYR	I	VARIABLE	1242U	1232U	225U	214U	187U	187S	48S		
266663	J	I	VARIABLE	1308U	1308I	1267U	1267I	1249U	1249I	1239U	1239I	1212U
				1212I	1136U	1136I	1122U	1122I	1111U	1111I	1097U	1097I
				1083U	1083I	1045U	1045I	1035U	1035I	1025U	1025I	1009U
				1009I	914U	914I	906U	906I	798U	798I	784U	784I
				771U	771I	730U	730I	692U	692I	679U	679I	666U
				666I	647U	647I	533U	533I	523U	523I	511U	511I
				501U	501I	481U/3	481I	444U	444I	433U	433I	408U
				408I	396U	396I	385U	385I	345U	345I	321U/3	321I
				67U	67I							
267043	JPRAF	I	VARIABLE	541U	540S							
240164	JPRDLY	I	1DIM ARRAY	579U	577U	573U	481S	19D				
240354	JPREMP	I	2DIM ARRAY	629U/2	538S	537S	528S	527S	516S	515S	506S	505S
				20D								
240152	JPRETS	I	1DIM ARRAY	570U	564U	481S	19D					
240146	JPRPMT	I	1DIM ARRAY	538U	537U	533U	528U	527U	523U	516U	515U	511U
				506U	505U	501U	481S	18D				

```
   267030 JPRSTA    I  VARIABLE                533U    523U    511U    501U    490U    486U    481S
   267103 JPRTOT    I  VARIABLE                733U    732S
   266665 K         I  VARIABLE                986U    986S    985U/2  980U    980S    979U    978U/2  971S    613U
                                               613S    612U/2  607U    607S    606U    605U/2  602U    597S    221U
                                               221I    67U     67I
   267216 KK        I  VARIABLE               1249U   1249I   1239U   1239I
   266642 LINPPAG   I  VARIABLE               1134U   1120U   1109U   1095U   1081U   1043U   1033U   1023U   1007U
                                               912U    904U    796U    782U    769U    728U    690U    677U    664U
                                               645U    531U    521U    509U    499U    442U    430U    406U    394U
                                               383U    343U     47S
   266764 LR        I  VARIABLE                618S    472U    316S
   266641 MAXRES    I  VARIABLE                128U     70U     65U     46S
   266656 MAXRESD   I  VARIABLE                131N     66N     65S
   266734 MON       I  VARIABLE               1225U   1224U   1212U   1202U   1168U   1159U   1157U/3 1091U   1089U
                                              1083U   1080U   1078U   1076U   1075U   1073U/4 1072U   1061U   1058U
                                              1057U   1009U    993U    992U    982U    979U    976N    971U    963N
                                               954U    934U   932U/4   931U    906U    903U    902U    901U    899U
                                              898U/2   893U   890U/2   889U    887U    885U    872U    850U    829U
                                               822U    821U    820U    813U    746U    745U    733U    732U   724U/3
                                              694U/2  681U/2  668U/2  649U/2   609U    606U    603N   602U/2   597U
                                               589N    580U    561U   558U/4   557U    542U   540U/2   539U    536U
                                               533U    530U    526U    523U    519U    517U    514U    511U    508U
                                               504U    501U    497U    494U    492U    484U   469U/3   457U    440U
                                               438U    432U    352U    345U    342U    341U    333U   305U/3   293U
                                               281U    271U    266U    240U    230U    225U    224I
   255476 MONTHN    I  1DIM ARRAY              1328U    225U     36S     24D
   266667 MR        I  VARIABLE                 77U     76U     72U     71U     71S     70S
   267230 MSKIP     I  VARIABLE               1332N   1331U   1262S
1WAT12S    PAGE 76                ON=ABCDELMPQRSTVX          11/28/84-13:24:09       CFT 1.11(11/19/84)  PAGE 76
WAT12S

   255712 MSPILL    L  1DIM ARRAY              1216S   1090U    471U    450S    284U    265U    244S    118S     27D
   255512 MTHDAY    I  1DIM ARRAY              1326U   1321U   1247U   1237U   1159U   1089U    540U    492U    457U
                                               440U    438U    432U    293U    271U    219U    194U    181U    153U
                                                35S     24D
   235774 NEQTYPE   I  2DIM ARRAY              1201P   1199P   1196P   1194P   1192P   1189P   1185P   1183P   1181P
                                              1179P   1175P   1174P    139S     15D
   267032 NJPRET    I  VARIABLE                562N    560U    481S
   240664 NODIV     I  1DIM ARRAY              1141S   1127S   1116S   1102S   1025U   1022U    919S    910S    803S
                                               790S    776S    771U    768U    736S    697S    684S    671S    666U
                                               663U    652S    385U    382U     21D
   251510 NOFLOW    I  1DIM ARRAY              1035U   1032U    784U    781U    679U    676U    396U    393U    349S
```

256011	NORD	I	1DIM ARRAY	21D 1155U/2 1151S 1148S 1071U/2 1067S 1064S 930U/2 926S 923S 874U/2 869S 866S 861U/2 856S 853S 722U/2 718S 715S 556U/2 552S 549S 467U/2 463S 460S 303U/2 299S 296S 33D
252474	NORES	I	1DIM ARRAY	1045U 1042U 798U 795U 692U 689U 447S 436S 411S 408U 405U 399S 388S 21D
267063	NPROJ	I	VARIABLE	737U 732U 730U 727U 726U 724U 723U 712U 709U 708U 702U 694U 681U 668U 649U 647U 630S
266701	NR	I	VARIABLE	1207U 1206U/3 1205U 1204U/3 1203U/2 1202U/2 1201U/5 1199U/5 1198U/2 1196U/5 1195U/2 1194U/5 1192U/5 1191U/2 1189U/5 1188U/2 1187U 1185U/5 1183U/5 1182U/2 1181U/5 1179U/5 1178U/2 1177U 1175U/5 1174U/5 1173U 1172U 1171I 138N 137S
235464	NRANGE	I	1DIM ARRAY	1187U 1177U 1173U 137U 135S 15D
266767	NRET	I	VARIABLE	936N 935U 833N 818U 321S
266776	NRIGHT	I	VARIABLE	456U/2 367U 365S
267210	NS	I	VARIABLE	1212U 1211S
267227	NSKIP	I	VARIABLE	1293U 1293S 1287N 1286U 1261S
267016	NST	I	VARIABLE	825U 823U 820U 814S 444U 433U 426S 417S
266713	NSTAT	I	VARIABLE	929N 923U 922U 914U 906U 880N 808N 798U 784U 771U 760N 756U 749S 545U 543U 533U 523U 494U 466N 460U 459U 419N 418U 417U 416U 375N 361S 352U/2 350U 345U/2 342U 341U 336S 204N 199S 164N 158S
267036	NSTATJ	I	VARIABLE	730U 721N 715U 714U 703N 692U 679U 666U 655N 647U 644U 643U 638S 546U 543U 511U 501U 487S
267154	NSTATP	I	VARIABLE	1145U 1143U 1136U 1122U 1111U 1097U 1083U 1070N 1064U 1063U 1052N 1045U 1035U 1025U 1014N 1009U 1006U 1005U 1000S
267124	NSTATR	I	VARIABLE	1144U 1143U 1091U 1085S 970N 956N 939S 873N 866U 865U 860N 853U 852U 836S
267065	NSTJ	I	VARIABLE	730U 710S 647U 644S
267052	NSTJR	I	VARIABLE	596N 582N 567S
267155	NSTP	I	VARIABLE	1083U 1059S 1009U 1006S
266745	NSTR	I	VARIABLE	294U 266U 258S
267213	NUMMON	I	VARIABLE	1226U 1225S
266657	NUMR	I	VARIABLE	1308U/4 1267U/4 1264U 1263I 1228U/2 1227U/2 1226U 1224U/2 1223U 1222U/2 1220U 1219U 1218U 1217U 1216U 1215U 1214U 1212U/? 1211U 1210U 1209I 1171N 292U/2 291U 290U/2 288U 287U 284U 283U 282U/2 281U/2 280U 278U 277U 276U 274U 273U 269U 266U 265U 263U 260U/2 259U 258U 257U/2 256U 255U 254I 252U/3 251U/2 250U 249U 248U 247U

```
                                                246U     245U     244U     243U     242U     241I      66I
   266655 NUMRES    I  VARIABLE                 1262U     85U      85S      64S
   266670 NUMREST   I  VARIABLE                 1263N   1209N     254N     241N      77S
   266637 NUMRUNS   I  VARIABLE                  188N    145N      40S
   266654 NUMSTA    I  VARIABLE                 1253N   1245N    1235N    1167N    1070N    1069U    1065N    1052N    1014N
1WAT12S    PAGE 77                ON=ABCDELMPQRSTVX          11/28/84-13:24:09       CFT 1.11(11/19/84)  PAGE 77
WAT12S

                                                996N     970N     956N     937N     929N     928U     924N     880N     873N
                                                871U     867N     860N     858U     854N     834N     830N     808N     760N
                                                747N     721N     720U     716N     703N     655N     634N     596N     582N
                                                563N     485N     466N     465U     461N     419N     375N     334N     302N
                                                301U     297N     229N     217N     204N     196N     179N     164N     155N
                                                119N      60S
   256002 ORD       I  VARIABLE                1062U    1051U     999S     921U     879U     828U     819U     807U     751S
                                                713U     701U     637S     544U     458U     415U     363S      31D
   256000 ORDER     I  VARIABLE                1069U    1069S    1069U    1067U    1066U    1066S    1066U    1064U    1062S
                                               1056U    1056S    1054U    1053U    1051S    1018U    1018S    1016U    1015U
                                                999U     998S     928U     928S     928U     926U     925U     925S     925U
                                                923U     921S     884U     884S     882U     881U     879S     828S     819S
                                                812U     812S     810U     809U     807S     764U     764S     762U     761U
                                                751U     750S     720U     720S     720U     718U     717U     717S     717U
                                                715U     713S     707U     707S     705U     704U     701S     659U     659S
                                                657U     656U     637U     636S     554U     554S     554U     552U     551U
                                                551S     551U     549U     544S     465U     465S     465U     463U     462U
                                                462S     462U     460U     458S     423U     423S     421U     420U     415S
                                                379U     379S     377U     376U     363U     362S     301U     301S     301U
                                                299U     298U     298S     298U     296U     259S     208U     208S     206U
                                                205U     198S     168U     168S     166U     165U     157S      31D
   256001 ORDERR    I  VARIABLE                1153U    1153S    1153U    1151U    1150U    1150S    1150U    1148U    1086S
                                                975U     975S     973U     972U     960U     960S     958U     957U     940S
                                                871U     871S     871U     869U     868U     868S     868U     866U     858U
                                                858S     858U     856U     855U     855S     855U     853U     837S     601U
                                                601S     599U     598U     586U     586S     584U     583U     566U     565S
                                                 31D
   256003 ORDR     *I  VARIABLE                 566S      31D
          PAGE11       EXTERNAL                1134U    1120U    1109U    1095U    1081U    1043U    1033U    1023U    1007U
                                                912U     904U     796U     782U     769U     728U     690U     677U     664U
                                                645U     531U     521U     509U     499U     442U     430U     406U     394U
                                                383U     343U     227U
   266773 PCTCAL    R  VARIABLE                1139U    1138S    1136U    1133S    1125U    1124S    1114U    1113S    1111U
                                               1108S    1100U    1099S    1083U    1080S     917U     916S     908U     906U
```

				903S	801U	800S	787U	786S	774U	773S	734U	733S
				730U	727S	695U	694S	682U	681S	669U	668S	650U
				649S	533U	530S	511U	508S	444U	441S	347U	345U
				342S								
240176	PCTJPR	R	1DIM ARRAY	611U	604U	602U	591U	588U	481S	19D		
231032	PCTTOT	R	1DIM ARRAY	984U	977U	965U	962U	872U	859U	321S	6D	
232530	POWREL	R	1DIM ARRAY	1228U	1227S	1227U	1226S	1219S	1212U	278U	277S	276U
				274S	273U	269S	263S	105S	12D			
232446	POWREQ	R	1DIM ARRAY	1228S	1220S	1212U	106S	12D				
240026	PROJTF	R	1DIM ARRAY	1214S	1212U	1161U	1161S	542U	542S	17D		
267173	RAVCFS	R	VARIABLE	1117U	1113U	1111U	1108U	1105U	1094U	1093U	1089S	
267202	RELAF	R	VARIABLE	1160U	1159S							
266752	RELCFS	R	VARIABLE	305U	304U	293S						
266751	RELINT	R	VARIABLE	293U	292U	291U	291S	285U	279U	278S		
235402	RELNP	R	1DIM ARRAY	1212U	291U	290S	288S	280S	14D			
267001	REMCAP	R	VARIABLE	449U	372U/2	371S						
266743	REMCP	R	VARIABLE	252P/2	251S							
267000	REMDCR	R	VARIABLE	369U/2	368S							
267157	REMDIV	R	VARIABLE	1138U	1136U	1133U	1131U	1130U	1124U	1122U	1113U	1111U
				1108U	1106U	1105U	1099U	1097U	1077U	1075S	1047S	1037S
				1027S	1011S							
240210	REMJPR	R	1DIM ARRAY	737U	732U	730U	727U	726U	724U	723U	712U	709S
				708U	702U	694U	681U	668U	649U	647U	536S	526S
				514S	504S	20D						

266777	REMRIT	R	VARIABLE	457U	456U	455U	453U	452U	449U	448S	440U	439U
				432U	373U	372S	372U	370U	369S	369U	367S	
267076	REQJPR	R	VARIABLE	732U	730U	727U	726U	702S				
235320	REQNP	R	1DIM ARRAY	1212U	290U	287U	283U	282S	282U	281S	14D	
266746	RESAVL	R	VARIABLE	1089U	1088S	1088U	1087S	517U	514U	511U	508U	498U
				497U	496U	493S	493U	492S	281U	279U	279S	274U
				273U	272U	262S	261U	260S				
255776	RESDAT	I	VARIABLE	625S	622S	331U/2	330U	329U	320S	314S	30D	
255546	RESFLG	L	1DIM ARRAY	1217S	743U	473S	104S	26D				
231064	RESNAM	I	2DIM ARRAY	1308U	1267U	1212U	444U	433U	408U	396U	385U	90S
				89S	88S	87S	29D	8D				
255777	RESNUM	I	VARIABLE	542U/2	541U/2	533U	523U	511U	501U	494U	492U/2	483U
				481S	478U	475S	31D					
231374	RESPMT	I	1DIM ARRAY	618S	444U	433U	408U	396U	385U	316S	29D	8D
267152	RESREL	R	VARIABLE	1162U	1161U	1159U	1157U	1156U	1142S	1131S	1128S	1117S

				1106S 1103S 995S
266763	RESRIT	R	VARIABLE	618S 367U 316S
256005	RESTAT	I	VARIABLE	618S 447U 444U 436U 433U 411U 408U 399U 396U 388U 385U 316S 32D
267056	RET	R	VARIABLE	985U 984S 979U 978U 977S 966U 965S 875U 872S 862U 859S 612U 611S 606U 605U 604S 592U 591S
267151	RETCFS	R	VARIABLE	1162U 1076S 994S
231020	RETDLY	I	1DIM ARRAY	953U 950U 946U 851U 847U 843U 321S 29D 6D
231006	RETSTA	I	1DIM ARRAY	943U 938U 840U 835U 321S 29D 6D
267020	RITCFS	R	VARIABLE	444U 441U 440S 433U 432S
240132	RITJPR	R	1DIM ARRAY	561U 558U 557U 542U 540U 539S 536U 533U 530U 526U 523U 519U 517S 514U 511U 508U 504U 501U 497U 484U 481S 18D
45726	RIVER	R	2DIM ARRAY	1256S 1255U 1255S 1239U 1237U 1212U 1157P/2 1157S 1091U 1073P/2 1073S 985U 985S 978U 978S 966U 966S 932P/2 932S 724P/2 724S 612U 612S 605U 605S 592U 592S 558P/2 558S 494U 469P/2 469S 305P/2 305S 266U 230U 221U 219U 210U 210S 183U 181U 170U 170S 2D
235546	RLIMIT	R	2DIM ARRAY	1198U 1195U 1191U 1188U 1182U 1178U 139S 15D
255544	RNFLAG	L	VARIABLE	1252U 191S 50S 26D
234170	RNPJRL	R	2DIM ARRAY	281U 99S 14D
237516	RRYTD	R	2DIM ARRAY	456U 456S 367U 248S 247S 246S 245S 111S 110S 109S 108S 17D
240110	RSDATA	R	1DIM ARRAY	1328U 1327U 1326U 1325U 1324U 1323U 1322U 1321U 1320U 1295S 17D
231462	RSRMET	I	1DIM ARRAY	1212U 454S 250S 114S 29D 9D
231400	RSTNUM	I	1DIM ARRAY	125U 120U 91S 29D 8D
253004	RTEMP	R	1DIM ARRAY	103U 101U 99U 98U 96U 95U 94U 93U 79S/2 67S 22D
240122	RTOTAL	R	1DIM ARRAY	1338U 1327U 1327S 1326U 1326S 1325U 1325S 1324U 1324S 1323U 1323S 1322U 1322S 1321U 1321S 1320U 1320S 1318S 1301U 1284S 17D
230752	RUNOFF	R	1DIM ARRAY	210U 194U 194S 189S 170U 153U 153S 146S 4D
267024	STOCFS	R	VARIABLE	469U 468U 457S
237206	STOMON	R	1DIM ARRAY	1215S 1212U 455U 455S 112S 16D
267046	TOTRET	R	VARIABLE	1162S 1078S 984U 977U 965U 962U 934S 872U 859U 850S 737S 611U 604U 602U 591U 588U 561S
237124	VOLINT	R	1DIM ARRAY	1194P 1192P 1191U 1189P 1188U 1181P 1179P 1178U 1174P 257S 16D
232136	VOLMAX	R	1DIM ARRAY	1308U 1267U 371U 251U 94S 11D
232054	VOLMIN	R	1DIM ARRAY	1308U 1267U 1087U 492U 260U 93S 11D
267246	WAT12S		ENTRY	1D/2

```
   237352 YTDSTO   R  1DIM ARRAY                    454U    453U    453S    368U    .249S    113S     16D
1WAT12S    PAGE 79                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 79
WAT12S

   266722 YTOT     R  VARIABLE                   1250S   1249U   1247U   1247S   1240S   1239U   1237U   1237S    222S
                                                  221U    219U    219S    185S    183U    181U    181S

OTABLE OF EXTERNAL NAMES
 ----------------------

         $BACK        EXTERNAL                   480U    479U
         $REWF        EXTERNAL                  1266U   1166U   1165U   1164U    474U
         $RFA         EXTERNAL                  1295U    618U/2  481U/2  353U/2  321U/2  316U/2  308U/2  189U     146U
                                                  38U
         $RFF         EXTERNAL                  1333U   1295U   1288U    618U    481U    475U    353U    321U     316U
                                                 308U    189U    146U    141U    139U    135U    132U     79U      67U
                                                  57U     52U     42U     40U     38U
         $RFI         EXTERNAL                  1333U   1295U   1288U    618U    481U    475U    353U    321U     316U
                                                 308U    189U    146U    141U    139U    135U    132U     79U      67U
                                                  57U     52U     42U     40U     38U
         $RFV         EXTERNAL                   618U/4  481U/9  475U    353U/2  321U/9  316U/4  308U/2  189U     146U
                                                 141U    139U/2  135U    132U     79U/3   67U/3   57U     52U/2    42U
                                                  40U
         $STOP        EXTERNAL                  1340U   1260U   1187U   1004U    952U    849U    755U    642U     578U
                                                 571U    491U    340U    332U    203U    163U    151U    130U     126U
                                                  75U
         $WFA         EXTERNAL                  1338U   1328U   1308U/2 1301U   1267U/2 1242U/2 1232U/2 1139U    1136U/2
                                                1125U   1122U/2 1114U   1111U/2 1100U   1097U/2 1083U/2 1045U/2  1035U/2
                                                1025U/2 1009U/2  917U    914U/2  908U    906U/2  801U    798U/2   787U
                                                 784U/2  774U    771U/2  734U    730U/2  695U    692U/2  682U     679U/2
                                                 669U    666U/2  650U    647U/2  533U/2  523U/2  511U/2  501U/2   444U/2
                                                 433U/2  408U/2  396U/2  385U/2  347U    345U/2  225U/2  215U/2   175U/2
         $WFF         EXTERNAL                  1338U   1337U   1328U   1316U   1315U   1314U   1313U   1312U    1311U
                                                1310U   1309U   1308U   1301U   1299U   1282U   1281U   1279U    1277U
                                                1275U   1273U   1271U   1269U   1267U   1249U   1244U   1242U    1239U
                                                1234U   1232U   1212U   1139U   1136U   1125U   1122U   1114U    1111U
                                                1100U   1097U   1083U   1045U   1035U   1025U   1009U   1003U     950U
                                                 943U    917U    914U    908U    906U    847U    840U    801U     798U
                                                 787U    784U    774U    771U    754U    734U    730U    695U     692U
                                                 682U    679U    669U    666U    650U    647U    641U    577U     570U
                                                 533U    523U    511U    501U    490U    444U    433U    408U     396U
                                                 385U    347U    345U    339U    225U    221U    216U    215U     202U
                                                 183U    177U    175U    161U    149U    128U    125U     73U
```

```
          $WFI          EXTERNAL                    1338U   1337U   1328U   1316U   1315U   1314U   1313U   1312U   1311U
                                                    1310U   1309U   1308U   1301U   1299U   1282U   1281U   1279U   1277U
                                                    1275U   1273U   1271U   1269U   1267U   1249U   1244U   1242U   1239U
                                                    1234U   1232U   1212U   1139U   1136U   1125U   1122U   1114U   1111U
                                                    1100U   1097U   1083U   1045U   1035U   1025U   1009U   1003U    950U
                                                     943U    917U    914U    908U    906U    847U    840U    801U    798U
                                                     787U    784U    774U    771U    754U    734U    730U    695U    692U
                                                     682U    679U    669U    666U    650U    647U    641U    577U    570U
                                                     533U    523U    511U    501U    490U    444U    433U    408U    396U
                                                     385U    347U    345U    339U    225U    221U    216U    215U    202U
                                                     183U    177U    175U    161U    149U    128U    125U     73U
          $WFV          EXTERNAL                   1328U/2 1308U/4 1267U/4 1249U/3 1242U   1239U/3 1232U   1212U/? 1139U/3
                                                   1136U/6 1125U/3 1122U/4 1114U/3 1111U/6 1100U/3 1097U/4 1083U/6 1045U/3
                                                   1035U/3 1025U/3 1009U/4 1003U    950U    943U    917U/3  914U/4  908U/3
                                                    906U/6  847U    840U    801U/3  798U/3  787U/3  784U/3  774U/3  771U/3
                                                    754U    734U/3  730U/6  695U/3  692U/3  682U/3  679U/3  669U/3  666U/3
                                                    650U/3  647U/4  641U    577U    570U    533U/6  523U/4  511U/6  501U/4
                                                    490U    444U/6  433U/4  408U/3  396U/3  385U/3  347U/3  345U/5  339U
                                                    225U/2  221U/4  215U    202U    183U/4  175U    161U    128U    125U
1WAT12S    PAGE 80                ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 80
WAT12S

          CLOCK         EXTERNAL                     44U
          DATE          EXTERNAL                     45U
          EOF       R   EXTERNAL                   1334U   1297U    619U    482U    476U    354U    323U    318U    309U
                                                     190U    147U    134U     69U     59U     54U
          EVAPSUB       EXTERNAL                   1201U   1199U   1196U   1194U   1192U   1189U   1185U   1183U   1181U
                                                    1179U   1175U   1174U
          PAGE11        EXTERNAL                   1134U   1120U   1109U   1095U   1081U   1043U   1033U   1023U   1007U
                                                     912U    904U    796U    782U    769U    728U    690U    677U    664U
                                                     645U    531U    521U    509U    499U    442U    430U    406U    394U
                                                     383U    343U    227U

0         ABBREVIATIONS USED ABOVE (THESE ARE KEYED TO THE SOURCE LISTING LINE NUMBER)
          -------------------------

          A  USED IN FORTRAN  ASSIGN STATEMENT     P  USED IN CALL/FUNC CALL OR ARRAY DEF
          D  DEFINED IN  DECLARATIVE STATEMENT     R  FORMAT  USED  IN A  READ  STATEMENT
          E  STATEMENT NUMBER ENDING A DO LOOP     S  STORED  SO CONTENTS  MAY BE CHANGED
          I  INDEX OF A DO  OR IMPLIED DO LOOP     U  NAME  USED IN EXECUTABLE  STATEMENT
          J  STATEMENT NUMBER USED IN TRANSFER     W  FORMAT  USED IN A  WRITE  STATEMENT
          L  SOURCE LINE OF A STATEMENT NUMBER     *  DEFINED  OR DECLARED  BUT NOT  USED
          N  NAME USED AS A  DO LOOP PARAMETER     ?  TEN OR  MORE REFERENCES  TO  SYMBOL
0
```

OTABLE OF LOOPS ENCOUNTERED

O LABEL	INDEX	FROM -	TO	ADDRESS -	LENGTH
10	IDL	51	54	267312C	27
	IM	52	52	267322C	6
25	IS	56	62	267343A	26
	IM	57	57	267351B	6
55	NUMR	66	127	267400A	165
	I	67	67	267406A	4
	J	67	67	267414A	4
	K	67	67	267422A	4
	I	79	79	267456D	5
43	IMTH	97	100		INLINE
50	IS	119	124	267537B	11
64	IR	131	144	267600B	66
62	IRG	138	143	267626A	35
	IC	141	141	267650A	5
110	IRN	145	173	267671B	114
75	IM	152	154		INLINE
80	IS	155	160	267734C	11
105	ISS	164	172	267760C	22
100	IM	169	171		INLINE
120	IS	179	186	270037B	43
115	IM	180	182	270043D	7
	I	183	183	270064C	6
175	IRN	188	213	270106A	106
140	IM	193	195		INLINE
145	IS	196	201	270143A	10
170	ISS	204	212	270167A	21
165	IM	209	211		INLINE
185	IS	217	223	270246D	44
180	IM	218	220	270253C	7
	K	221	221	270274D	6

1580	MON	224	1231	270313C	6446
195	IS	229	231	270350C	6
200	NUMR	241	253	270370B	17
270	NUMR	254	307	270411C	141
260	ISS	297	300	270504B	11

265	ISS	302	306	270527B	16
	I	308	308	270574A	4
	I	321	321	270705B	4
	J	321	321	270713B	10
325	IS	334	338	270754A	7
	J	345	345	271032B	6
	I	353	353	271115B	4
400	ISS	375	414	271167D	224
375	IDV	381	390	271201B	52
	J	385	385	271233B	6
385	IFR	392	401	271257A	52
	J	396	396	271311A	5
395	IRS	404	413	271335B	52
	J	408	408	271367B	6
420	ISS	419	428	271421C	16
	J	433	433	271474A	5
	J	444	444	271554C	6
455	ISS	461	464	271625A	10
460	ISS	466	470	271650A	16
	I	481	481	271750A	4
	J	481	481	271756A	10
500	IS	485	489	272001C	10
	J	501	501	272071B	6
	J	511	511	272146B	6
	J	523	523	272223D	6
	J	533	533	272300D	6
540	ISS	550	553	272345A	10
545	ISS	555	559	272370A	16
630	IJP	562	616	272416D	236
560	IS	563	569	272421D	12
570	IDL	572	576	272445D	11
595	ISS	582	594	272476C	45
590	IM	589	593	272522C	14
625	ISS	596	615	272546D	103
615	IM	603	608	272572A	22
620	IM	610	614	272631A	12
655	IJP	628	632	272724B	13
665	IS	634	640	272742A	11
	J	647	647	273015B	6
720	ISS	655	700	273067A	321
695	IDV	662	673	273101A	76
	J	666	666	273133B	6

705	IFR	675	686	273203B	77
	J	679	679	273235C	6
715	IRS	688	699	273305C	77
	J	692	692	273337D	6
740	ISS	703	711	273415B	16
750	ISS	716	719	273442B	11
755	ISS	721	725	273465D	17
	J	730	730	273542D	6
775	IS	747	753	273632A	11
825	ISS	760	806	273666C	306
800	IDV	767	778	273700C	73

	J	771	771	273732D	6
810	IFR	780	792	273777A	73
	J	784	784	274031B	6
820	IRS	794	805	274075C	73
	J	798	798	274127D	6
845	ISS	808	816	274200A	15
955	ITRY	827	897	274230D	265
865	IS	830	832	274241C	5
925	IRT	833	877	274251C	204
870	IS	834	839	274254C	11
880	IDL	842	846	274276C	10
895	ISS	854	857	274333C	11
900	ISS	860	863	274362D	14
910	ISS	867	870	274404D	11
920	ISS	873	876	274435C	13
950	ISS	880	895	274461D	27
	J	906	906	274557A	6
	J	914	914	274644D	6
985	ISS	924	927	274710C	11
990	ISS	929	933	274733C	17
1080	IRT	936	990	274762D	223
1000	IS	937	942	274765D	12
1010	IDL	945	949	275007D	11
1040	ISS	956	968	275040C	45
1035	IM	963	967	275064C	14
1070	ISS	970	988	275110D	71
1060	IM	976	981	275122B	23
1065	IM	983	987	275161B	13

```
1090 IS          996  1002   275213C       11
     J          1009  1009   275266D        6
1145 ISS        1014  1050   275313B      220
1120 IDV        1021  1029   275325B       51
     J          1025  1025   275357C        6
1130 IFR        1031  1039   275401D       51
     J          1035  1035   275434A        6
1140 IRS        1041  1049   275456B       51
     J          1045  1045   275510C        6
1165 ISS        1052  1060   275536D       16
1175 ISS        1065  1068   275563D       11
1180 ISS        1070  1074   275606D       17
     J          1083  1083   275672B        6
     J          1097  1097   275761A        6
     J          1111  1111   276061C        6
     J          1122  1122   276155C        6
     J          1136  1136   276256A        6
1235 ISS        1149  1152   276331D       11
1240 ISS        1154  1158   276354D       16
1260 IS         1167  1169   276426D        6
1340 NR         1171  1208   276441B      216
1570 NUMR       1209  1229   276662A       72
     J          1212  1212   276673C        6
1590 IS         1235  1241   277012C       47
1585 IM         1236  1238   277016D        7
     KK         1239  1239   277034A        6
     J          1239  1239   277044B        6
1600 IS         1245  1251   277113B       47
1595 IM         1246  1248   277117C        6
     KK         1249  1249   277134D        6
1WAT12S    PAGE 83              ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 83
WAT12S

     J          1249  1249   277145A        6
1610 IS         1253  1258   277166A       13
1605 IM         1254  1257   277171A        4
1670 NUMR       1263  1339   277212D      435
     J          1267  1267   277230B        6
1620 IT         1283  1285          INLINE
1625 ISK        1287  1290   277336D       10
1660 IM         1294  1336   277354A      247
     J          1308  1308   277432A        5
```

```
   1645 IT        1317  1319             INLINE
   1655 ISK       1332  1334   277602C       16
0 BLOCK NAMES AND LENGTHS IN OCTAL

   277651-WAT12S          42-#TB            3525-#CL              1-//
1          PAGE 1                   ON=ABCDELMPQRSTVX           11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 84


   3122      1.       SUBROUTINE PAGE11
   3123         C
   3124      2.       COMMON ILINE
   3125         C
   3126      3.       WRITE(11,5000)
   3127      4. 5000  FORMAT(/,
   3128               +       35X,"DATE",7X,"PERCENT",/,
   3129               +       14X,"STATION",3X,"PERMIT",3X,"MMDD YEAR",2X,"CALLED OUT",
   3130               +     6X,"STATION DESCRIPTION",24X,"DETAILS (VALUES IN CFS)",//)
   3131      5.       ILINE=5
   3132      6.       RETURN
   3133      7.       END
 PAGE11                 BLOCK BEGINS AT SEQ. NO.       1, P=      26A
 PAGE11                 BLOCK BEGINS AT SEQ. NO.       3, P=      31B
1PAGE11    PAGE 2                   ON=ABCDELMPQRSTVX           11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 85
PAGE11

OTABLE OF STATEMENT NUMBERS (ALL ADDRESSES IN TABLES ARE IN OCTAL)
 -------------------------
0  NUMBER USE   SOURCE PROGRAM REFERENCES

   5000 FN          4L      3W
0  (SN=STATEMENT NUMBER, GSN=GENERATED STATEMENT NUMBER)
   (FN=FORMAT NUMBER, UNDEF*=UNDEFINED STATEMENT NUMBER)
OTABLE OF NAMES ENCOUNTERED (ADDRESS FOR DUMMY ARGUMENT IS THE ARGUMENT NUMBER)
 -------------------------

  ADDRESS NAME    TYPE MAIN USAGE  BLOCK        SOURCE PROGRAM REFERENCES

          $MAIN       ENTRY
          $WFF        EXTERNAL                    3U
          $WFI        EXTERNAL                    3U
        0 ILINE   *I  VARIABLE     //             5S      2D
       26 PAGE11      ENTRY                       1D/2
```

```
OTABLE OF EXTERNAL NAMES
 ----------------------

          $WFF        EXTERNAL                      3U
          $WFI        EXTERNAL                      3U
0       ABBREVIATIONS USED ABOVE (THESE ARE KEYED TO THE SOURCE LISTING LINE NUMBER)
        ------------------------
        A  USED IN FORTRAN  ASSIGN STATEMENT    P  USED IN CALL/FUNC CALL OR ARRAY DEF
        D  DEFINED IN  DECLARATIVE STATEMENT    R  FORMAT  USED  IN A  READ  STATEMENT
        E  STATEMENT NUMBER ENDING A DO LOOP    S  STORED  SO CONTENTS  MAY BE CHANGED
        I  INDEX OF A DO  OR IMPLIED DO LOOP    U  NAME  USED IN EXECUTABLE  STATEMENT
        J  STATEMENT NUMBER USED IN TRANSFER    W  FORMAT  USED IN A  WRITE  STATEMENT
        L  SOURCE LINE OF A STATEMENT NUMBER    *  DEFINED  OR DECLARED  BUT NOT  USED
        N  NAME USED AS A  DO LOOP PARAMETER    ?  TEN OR  MORE REFERENCES  TO  SYMBOL
0
0 BLOCK NAMES AND LENGTHS IN OCTAL

     42-PAGE11           5-#TB              10-#CL              1-//
1         PAGE 1                 ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 86
```



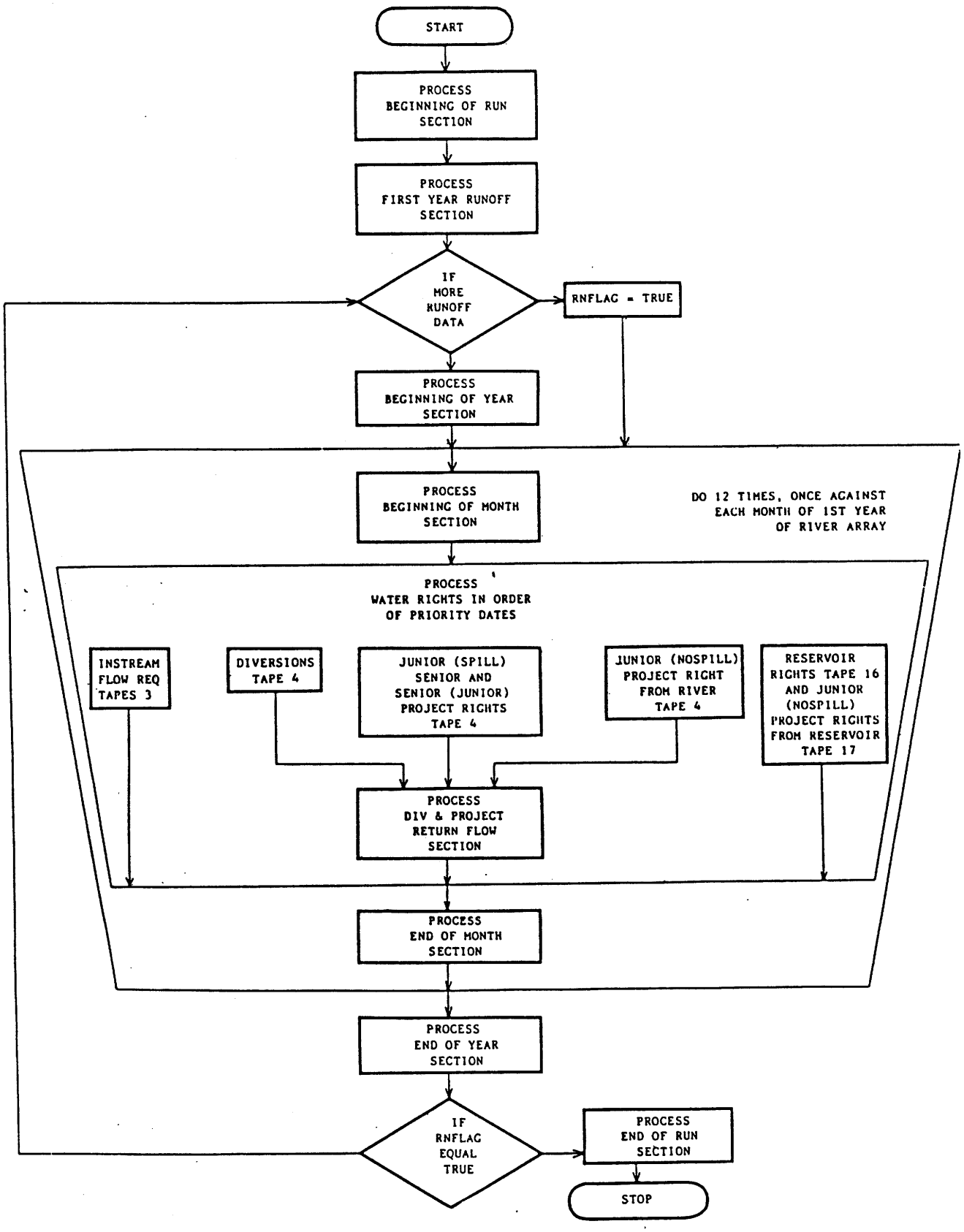
```
   3134          C
   3135          C-----------------------------------------------------------------
   3136          C
   3137       1.       SUBROUTINE EVAPSUB(VOL,NEQTY,CF1,CF2,CF3,AREA)
   3138          C
   3139       2.       IF(NEQTY.GT.1) GO TO 10
   3140          C
   3141       3.       AREA=CF1+CF2*(VOL**CF3)
   3142          C
   3143       4.       RETURN
   3144          C
   3145       5.    10 IF(NEQTY.GT.2) GO TO 20
   3146          C
   3147       6.       AREA=CF1+(CF2*(ALOG(VOL)))
   3148          C
   3149       7.       RETURN
   3150          C
   3151       8.    20 IF(NEQTY.GT.3) STOP 21
   3152          C
   3153       9.       AREA=CF1*(CF2**(CF3*VOL))
   3154          C
```

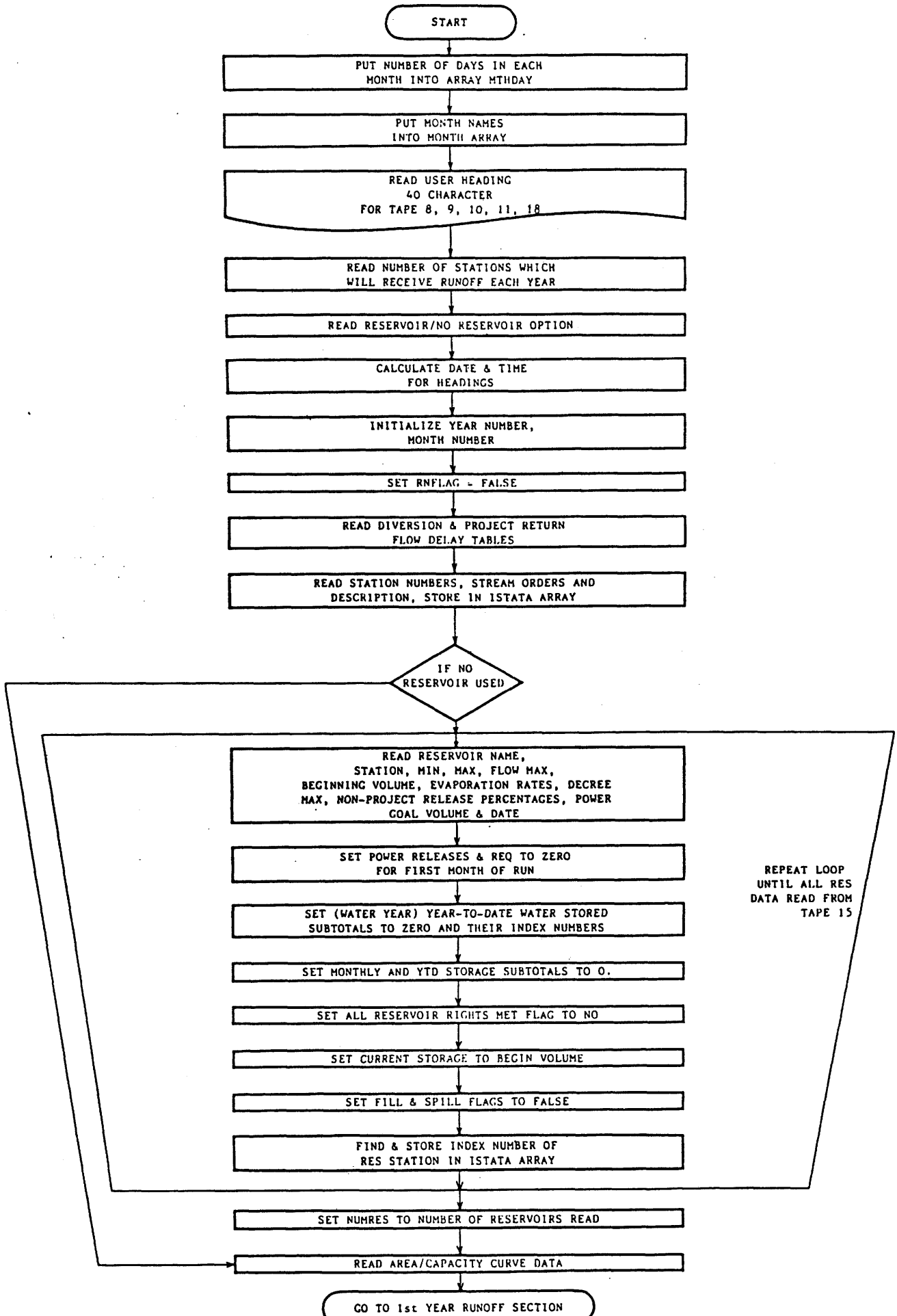
```
   3155     10.       RETURN
   3156     11.       END
 EVAPSUB                BLOCK BEGINS AT SEQ. NO.       1, P=       6A
 EVAPSUB                BLOCK BEGINS AT SEQ. NO.       2, P=      11B
 EVAPSUB                BLOCK BEGINS AT SEQ. NO.       5, P=      24D
 EVAPSUB                BLOCK BEGINS AT SEQ. NO.       8, P=      37C
 EVAPSUB                BLOCK BEGINS AT SEQ. NO.       9, P=      44A
1EVAPSUB   PAGE 2                  ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 87
EVAPSUB

OTABLE OF STATEMENT NUMBERS (ALL ADDRESSES IN TABLES ARE IN OCTAL)
 -------------------------
0  NUMBER USE   SOURCE PROGRAM REFERENCES

     10 24D         5L      2J
     20 37C         8L      5J
0  (SN=STATEMENT NUMBER, GSN=GENERATED STATEMENT NUMBER)
   (FN=FORMAT NUMBER, UNDEF*=UNDEFINED STATEMENT NUMBER)
OTABLE OF NAMES ENCOUNTERED (ADDRESS FOR DUMMY ARGUMENT IS THE ARGUMENT NUMBER)
 -------------------------

  ADDRESS NAME    TYPE MAIN USAGE  BLOCK       SOURCE PROGRAM REFERENCES

          $MAIN       ENTRY
          $STOP       EXTERNAL                    8U
          ALOG     R  EXTERNAL                    6U
        6 AREA    *R  VARIABLE     DUM.ARG.       9S      6S      3S      1D
        3 CF1      R  VARIABLE     DUM.ARG.       9U      6U      3U      1D
        4 CF2      R  VARIABLE     DUM.ARG.       9U      6U      3U      1D
        5 CF3      R  VARIABLE     DUM.ARG.       9U      3U      1D
        6 EVAPSUB     ENTRY                      1D/2
        2 NEQTY    I  VARIABLE     DUM.ARG.       8U      5U      2U      1D
        1 VOL      R  VARIABLE     DUM.ARG.       9U      6P      3U      1D
OTABLE OF EXTERNAL NAMES
 ----------------------

          $STOP       EXTERNAL                    8U
          ALOG     R  EXTERNAL                    6U
0       ABBREVIATIONS USED ABOVE (THESE ARE KEYED TO THE SOURCE LISTING LINE NUMBER)
        ----------------------
        A  USED IN FORTRAN  ASSIGN STATEMENT    P  USED IN CALL/FUNC CALL OR ARRAY DEF
        D  DEFINED IN  DECLARATIVE STATEMENT    R  FORMAT  USED  IN A  READ  STATEMENT
```

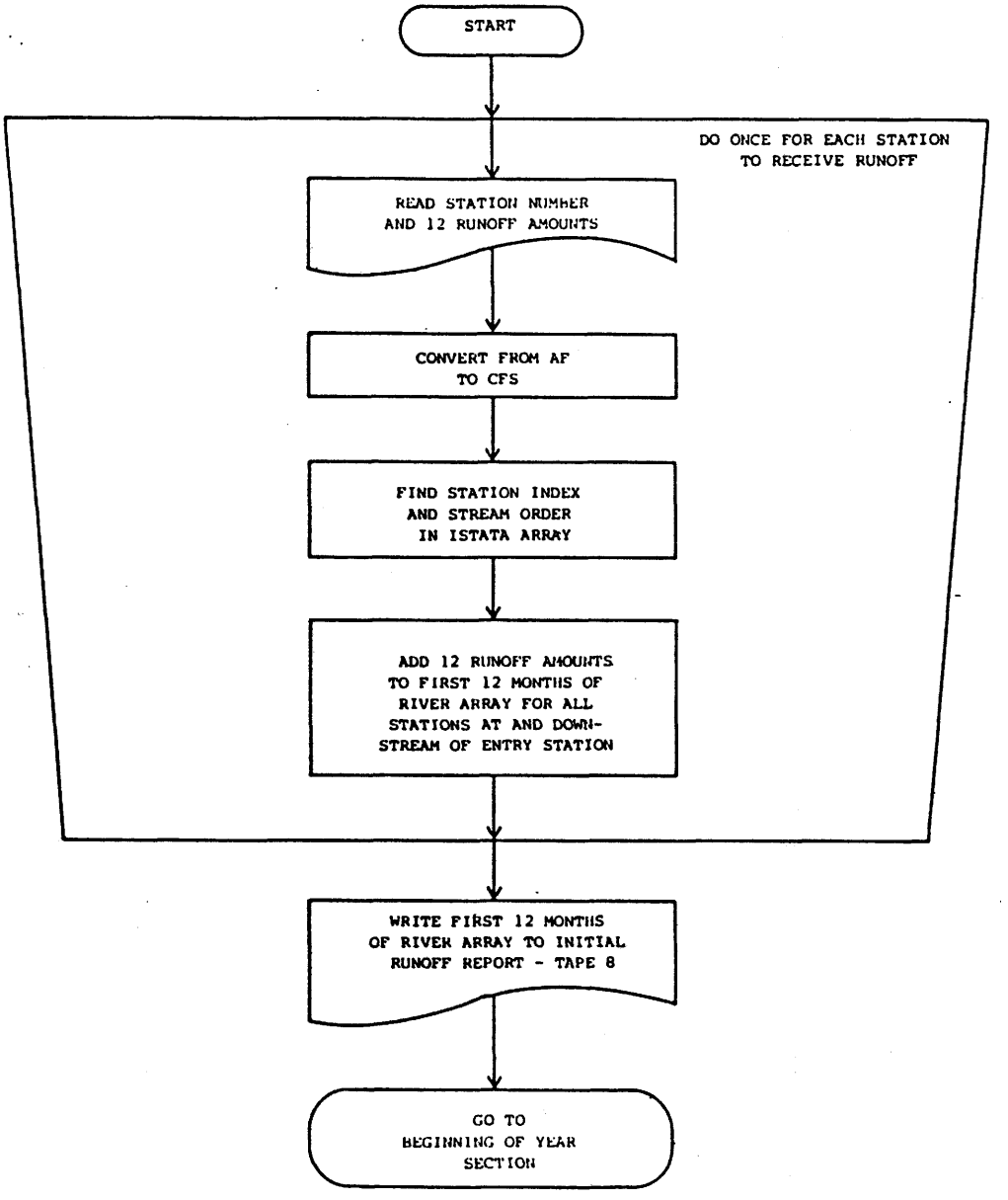
```
        E  STATEMENT NUMBER ENDING A DO LOOP    S  STORED  SO CONTENTS  MAY BE CHANGED
        I  INDEX OF A DO  OR IMPLIED DO LOOP    U  NAME  USED IN EXECUTABLE  STATEMENT
        J  STATEMENT NUMBER USED IN TRANSFER    W  FORMAT  USED IN A  WRITE  STATEMENT
        L  SOURCE LINE OF A STATEMENT NUMBER    *  DEFINED  OR DECLARED  BUT NOT  USED
        N  NAME USED AS A  DO LOOP PARAMETER    ?  TEN OR  MORE REFERENCES  TO  SYMBOL
0
0 BLOCK NAMES AND LENGTHS IN OCTAL

      56-EVAPSUB          4-#TB               5-#CL
1         PAGE 1                  ON=ABCDELMPQRSTVX          11/28/84-13:24:09      CFT 1.11(11/19/84)  PAGE 88


 INITIAL PAGES OF PROGRAM UNITS
0         NAME          PAGE
          ----          ----
        .EVAPSUB        86
         PAGE11         84
         WAT12S         1
           ----         ----
```

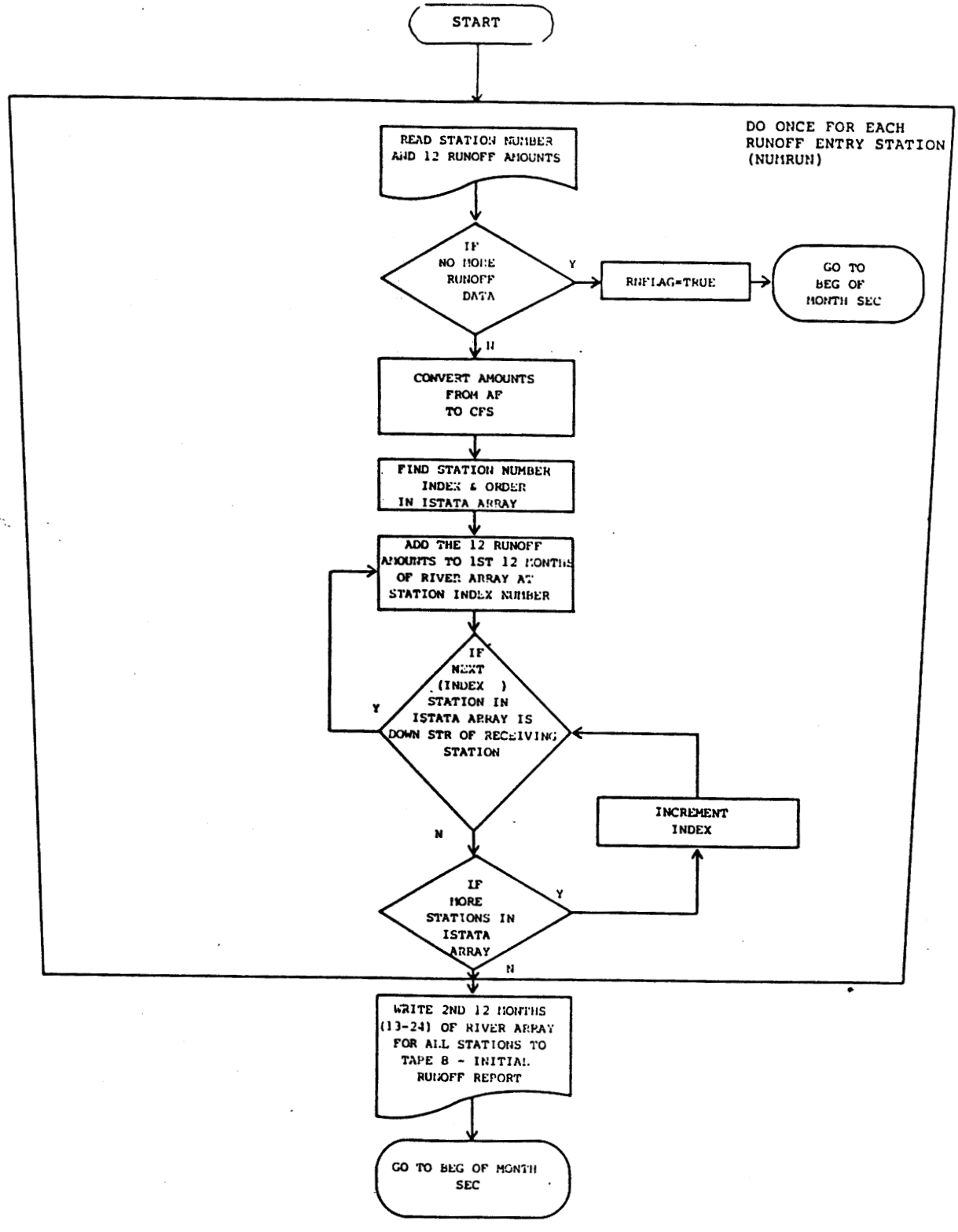
APPENDIX B

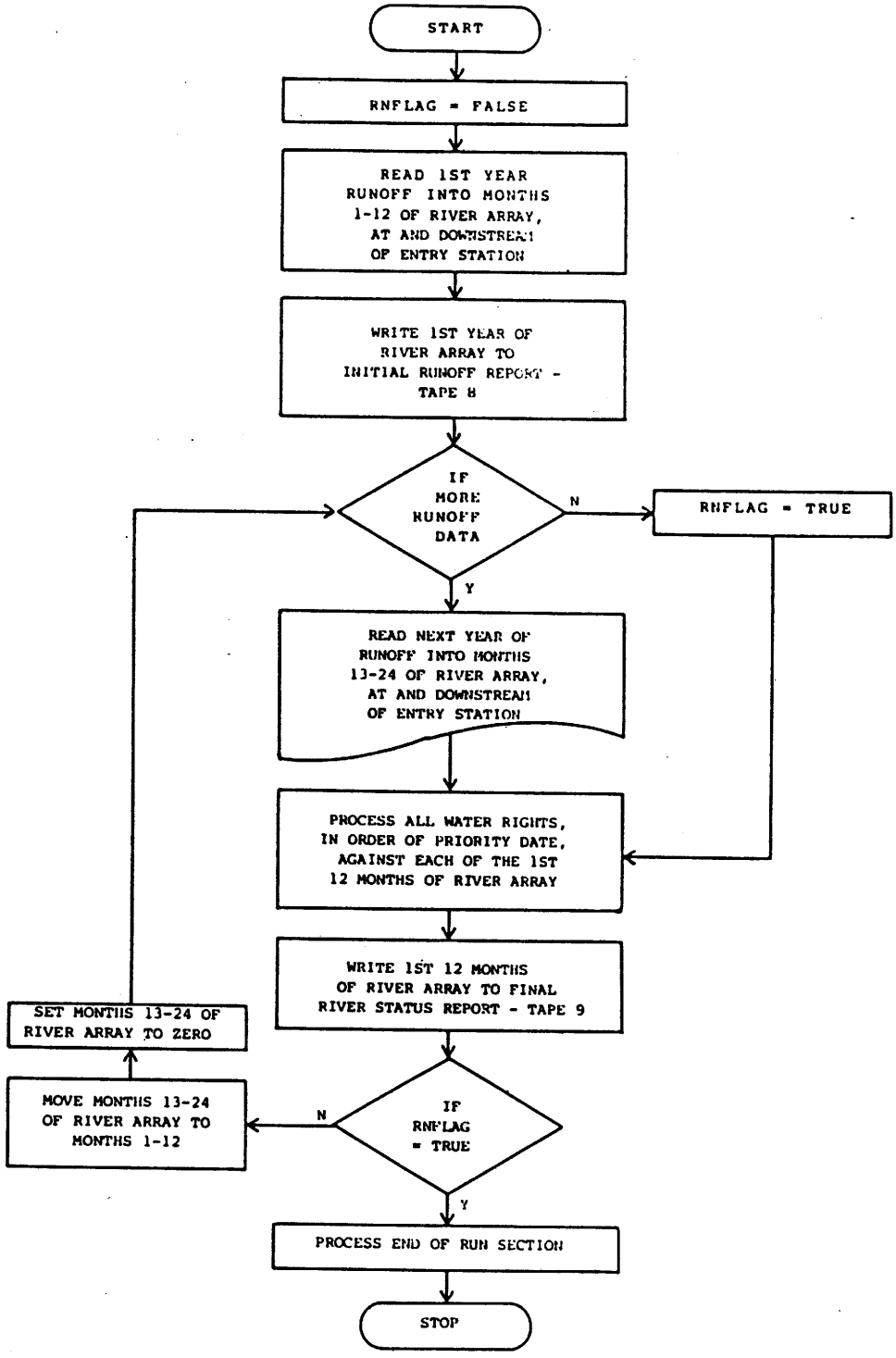
WIRSOS FLOWCHARTS

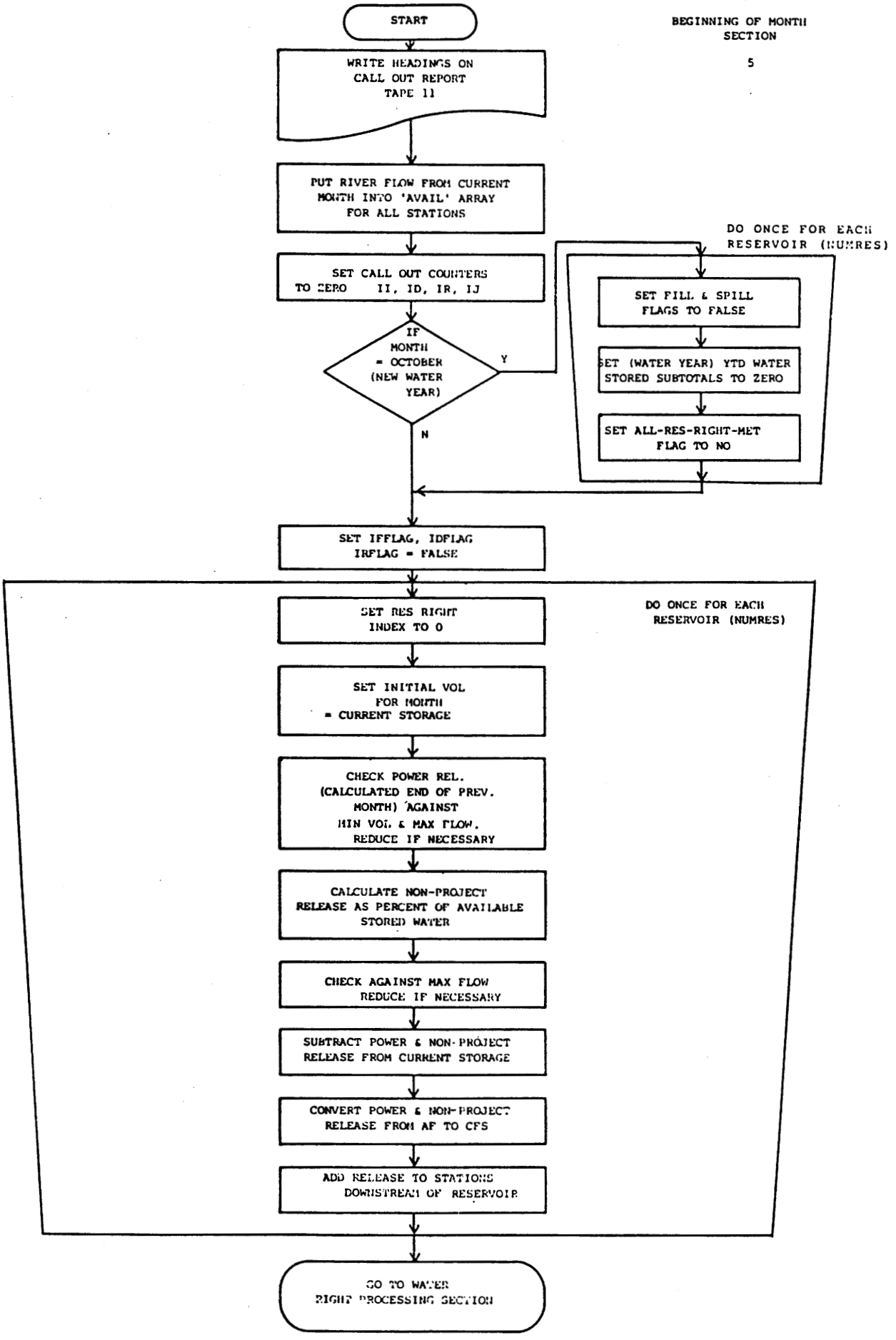

START
PROCESS BEGINNING OF RUN SECTION
PROCESS FIRST YEAR RUNOFF SECTION
IF MORE RUNOFF DATA
RNFLAG = TRUE
PROCESS BEGINNING OF YEAR SECTION
PROCESS BEGINNING OF MONTH SECTION
DO 12 TIMES, ONCE AGAINST EACH MONTH OF 1ST YEAR OF RIVER ARRAY
PROCESS WATER RIGHTS IN ORDER OF PRIORITY DATES
INSTREAM FLOW REQ TAPES 3
DIVERSIONS TAPE 4
JUNIOR (SPILL) SENIOR AND SENIOR (JUNIOR) PROJECT RIGHTS TAPE 4
JUNIOR (NOSPILL) PROJECT RIGHT FROM RIVER TAPE 4
RESERVOIR RIGHTS TAPE 16 AND JUNIOR (NOSPILL) PROJECT RIGHTS FROM RESERVOIR TAPE 17
PROCESS DIV & PROJECT RETURN FLOW SECTION
PROCESS END OF MONTH SECTION
PROCESS END OF YEAR SECTION
IF RNFLAG EQUAL TRUE
PROCESS END OF RUN SECTION
STOP

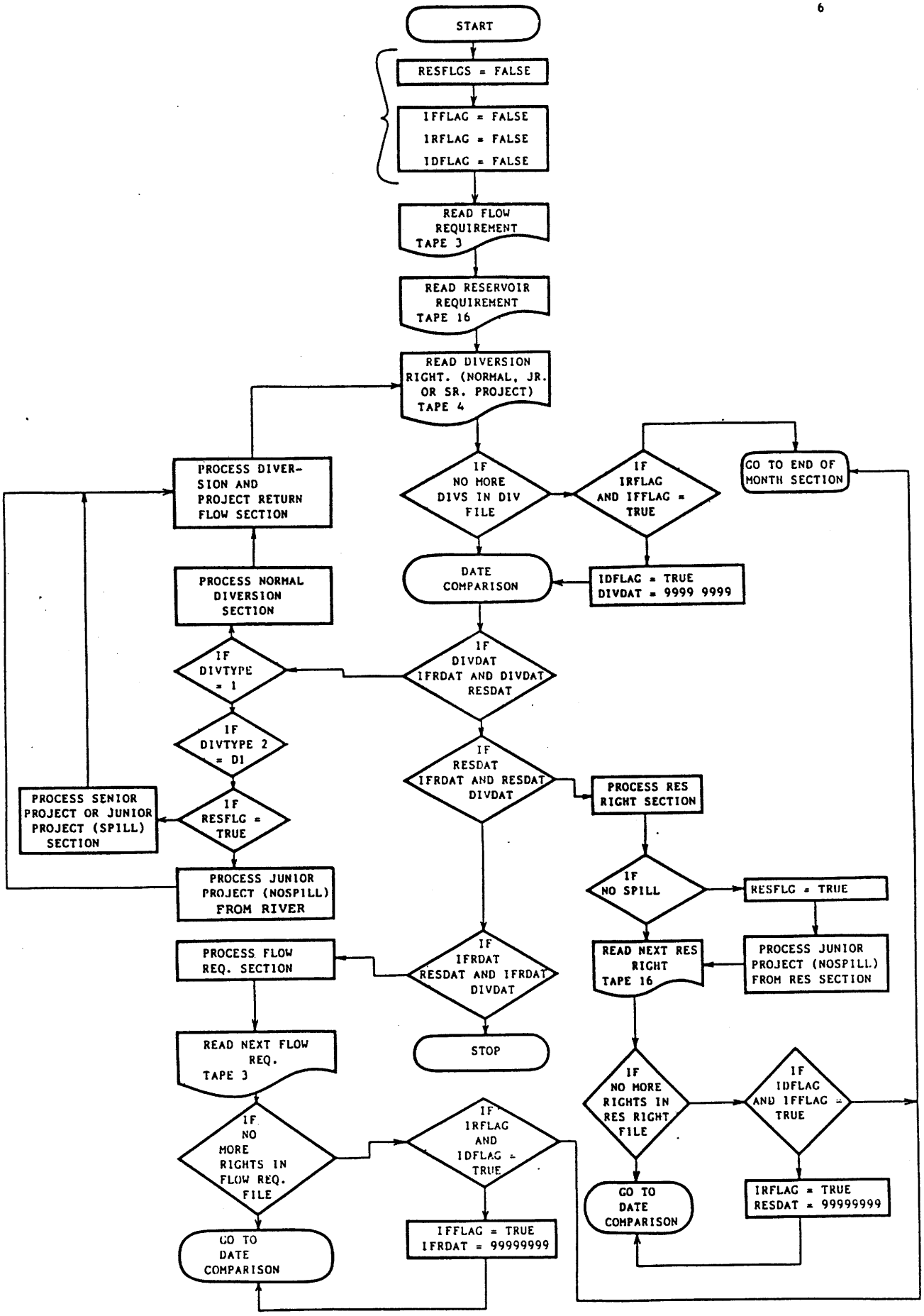

START
PUT NUMBER OF DAYS IN EACH MONTH INTO ARRAY MTHDAY
PUT MONTH NAMES INTO MONTH ARRAY
READ USER HEADING 40 CHARACTER FOR TAPE 8, 9, 10, 11, 18
READ NUMBER OF STATIONS WHICH WILL RECEIVE RUNOFF EACH YEAR
READ RESERVOIR/NO RESERVOIR OPTION
CALCULATE DATE & TIME FOR HEADINGS
INITIALIZE YEAR NUMBER, MONTH NUMBER
SET RNFLAG = FALSE
READ DIVERSION & PROJECT RETURN FLOW DELAY TABLES
READ STATION NUMBERS, STREAM ORDERS AND DESCRIPTION, STORE IN ISTATA ARRAY
IF NO RESERVOIR USED
READ RESERVOIR NAME, STATION, MIN, MAX, FLOW MAX, BEGINNING VOLUME, EVAPORATION RATES, DECREE MAX, NON-PROJECT RELEASE PERCENTAGES, POWER GOAL VOLUME & DATE
SET POWER RELEASES & REQ TO ZERO FOR FIRST MONTH OF RUN
SET (WATER YEAR) YEAR-TO-DATE WATER STORED SUBTOTALS TO ZERO AND THEIR INDEX NUMBERS
SET MONTHLY AND YTD STORAGE SUBTOTALS TO 0.
SET ALL RESERVOIR RIGHTS MET FLAG TO NO
SET CURRENT STORAGE TO BEGIN VOLUME
SET FILL & SPILL FLAGS TO FALSE
FIND & STORE INDEX NUMBER OF RES STATION IN ISTATA ARRAY
REPEAT LOOP UNTIL ALL RES DATA READ FROM TAPE 15
SET NUMRES TO NUMBER OF RESERVOIRS READ
READ AREA/CAPACITY CURVE DATA
GO TO 1st YEAR RUNOFF SECTION

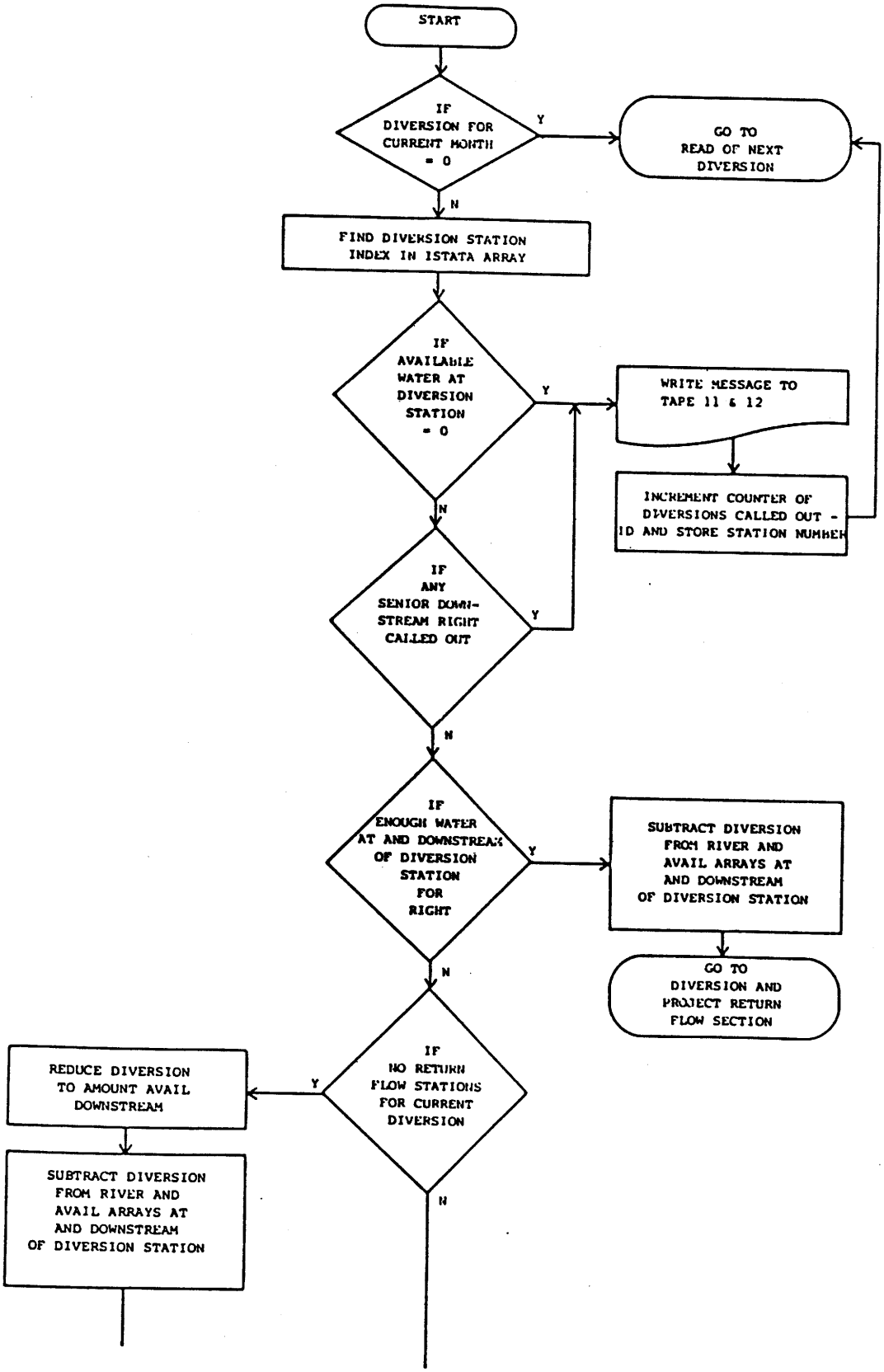

START
DO ONCE FOR EACH STATION TO RECEIVE RUNOFF
READ STATION NUMBER AND 12 RUNOFF AMOUNTS
CONVERT FROM AF TO CFS
FIND STATION INDEX AND STREAM ORDER IN ISTATA ARRAY
ADD 12 RUNOFF AMOUNTS TO FIRST 12 MONTHS OF RIVER ARRAY FOR ALL STATIONS AT AND DOWN-STREAM OF ENTRY STATION
WRITE FIRST 12 MONTHS OF RIVER ARRAY TO INITIAL RUNOFF REPORT - TAPE 8
GO TO BEGINNING OF YEAR SECTION

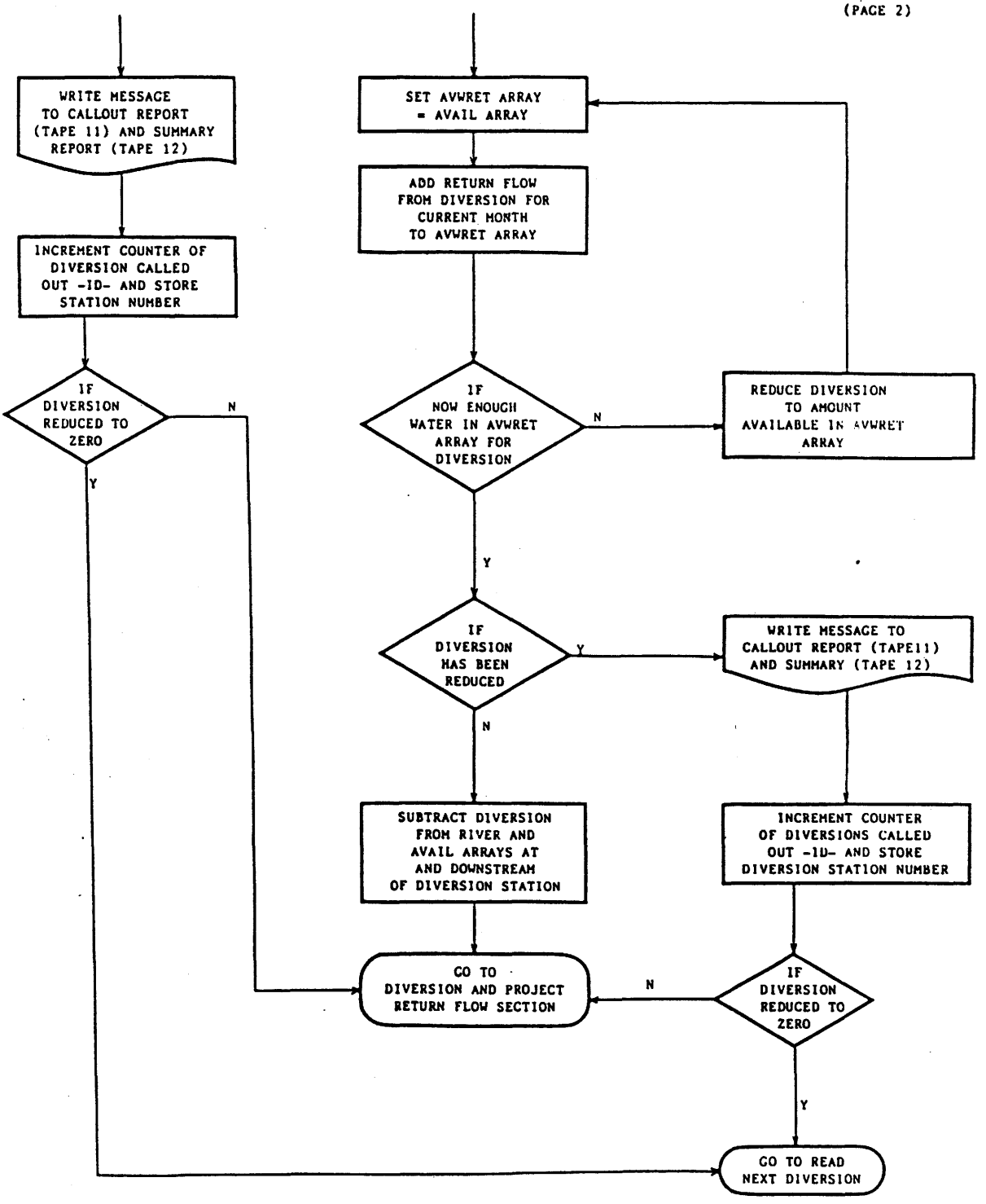

START
DO ONCE FOR EACH RUNOFF ENTRY STATION (NUMRUN)
READ STATION NUMBER AND 12 RUNOFF AMOUNTS
IF NO MORE RUNOFF DATA
Y
RUNFLAG=TRUE
GO TO BEG OF MONTH SEC
N
CONVERT AMOUNTS FROM AF TO CFS
FIND STATION NUMBER INDEX & ORDER IN ISTATA ARRAY
ADD THE 12 RUNOFF AMOUNTS TO 1ST 12 MONTHS OF RIVER ARRAY AT STATION INDEX NUMBER
IF NEXT (INDEX) STATION IN ISTATA ARRAY IS DOWN STR OF RECEIVING STATION
Y
N
INCREMENT INDEX
IF MORE STATIONS IN ISTATA ARRAY
Y
N
WRITE 2ND 12 MONTHS (13-24) OF RIVER ARRAY FOR ALL STATIONS TO TAPE 8 - INITIAL RUNOFF REPORT
GO TO BEG OF MONTH SEC

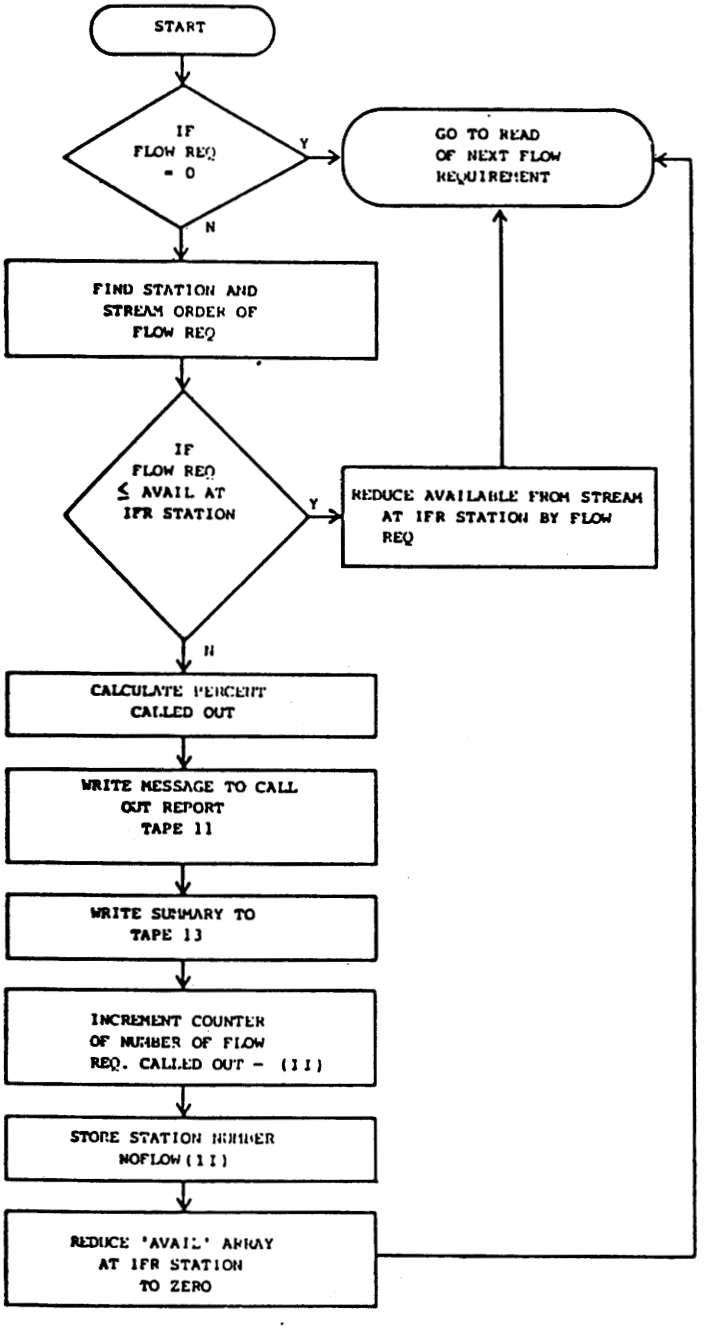

START
RNFLAG = FALSE
READ 1ST YEAR RUNOFF INTO MONTHS 1-12 OF RIVER ARRAY, AT AND DOWNSTREAM OF ENTRY STATION
WRITE 1ST YEAR OF RIVER ARRAY TO INITIAL RUNOFF REPORT - TAPE 8
IF MORE RUNOFF DATA
N
RNFLAG = TRUE
Y
READ NEXT YEAR OF RUNOFF INTO MONTHS 13-24 OF RIVER ARRAY, AT AND DOWNSTREAM OF ENTRY STATION
PROCESS ALL WATER RIGHTS, IN ORDER OF PRIORITY DATE, AGAINST EACH OF THE 1ST 12 MONTHS OF RIVER ARRAY
WRITE 1ST 12 MONTHS OF RIVER ARRAY TO FINAL RIVER STATUS REPORT - TAPE 9
SET MONTHS 13-24 OF RIVER ARRAY TO ZERO
MOVE MONTHS 13-24 OF RIVER ARRAY TO MONTHS 1-12
N
IF RNFLAG = TRUE
Y
PROCESS END OF RUN SECTION
STOP

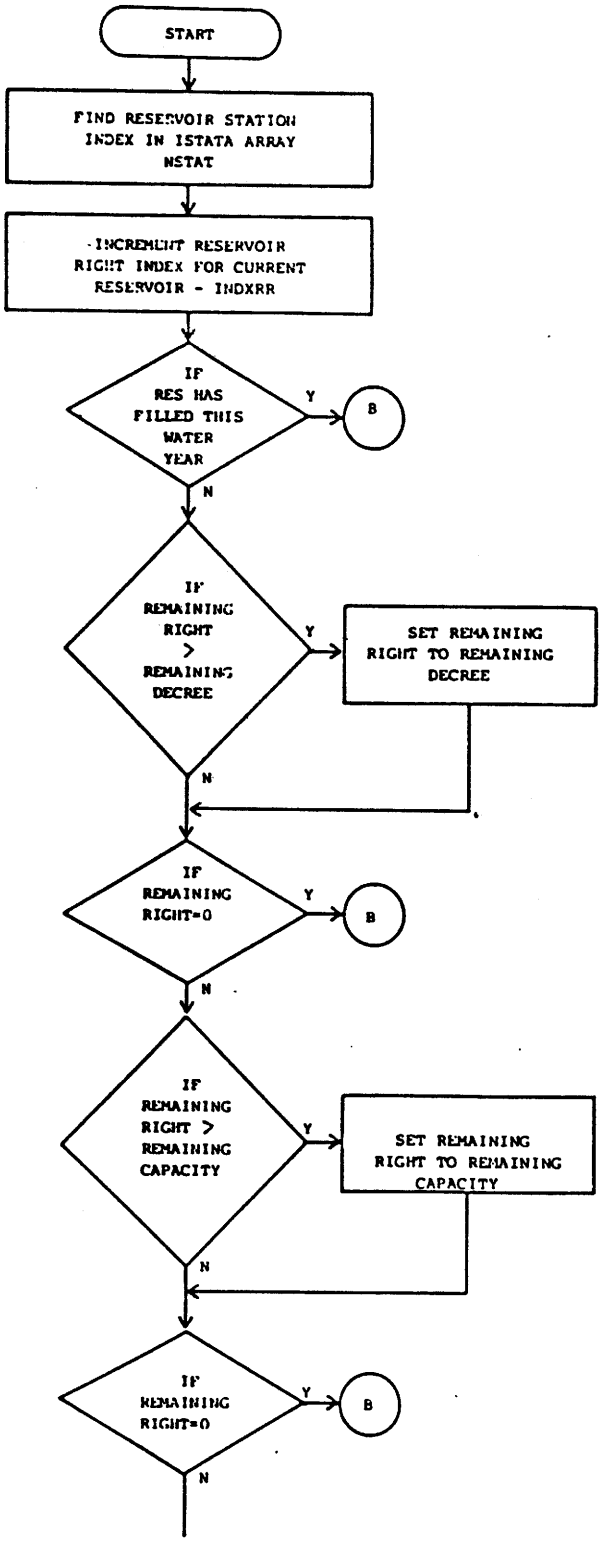

START
WRITE HEADINGS ON CALL OUT REPORT TAPE 11
PUT RIVER FLOW FROM CURRENT MONTH INTO 'AVAIL' ARRAY FOR ALL STATIONS
SET CALL OUT COUNTERS TO ZERO II, ID, IR, IJ
IF MONTH = OCTOBER (NEW WATER YEAR)
Y
N
DO ONCE FOR EACH RESERVOIR (NUMRES)
SET FILL & SPILL FLAGS TO FALSE
SET (WATER YEAR) YTD WATER STORED SUBTOTALS TO ZERO
SET ALL-RES-RIGHT-MET FLAG TO NO
SET IFFLAG, IDFLAG IRFLAG = FALSE
DO ONCE FOR EACH RESERVOIR (NUMRES)
SET RES RIGHT INDEX TO 0
SET INITIAL VOL FOR MONTH = CURRENT STORAGE
CHECK POWER REL. (CALCULATED END OF PREV. MONTH) AGAINST MIN VOL & MAX FLOW. REDUCE IF NECESSARY
CALCULATE NON-PROJECT RELEASE AS PERCENT OF AVAILABLE STORED WATER
CHECK AGAINST MAX FLOW REDUCE IF NECESSARY
SUBTRACT POWER & NON-PROJECT RELEASE FROM CURRENT STORAGE
CONVERT POWER & NON-PROJECT RELEASE FROM AF TO CFS
ADD RELEASE TO STATIONS DOWNSTREAM OF RESERVOIR
GO TO WATER RIGHT PROCESSING SECTION

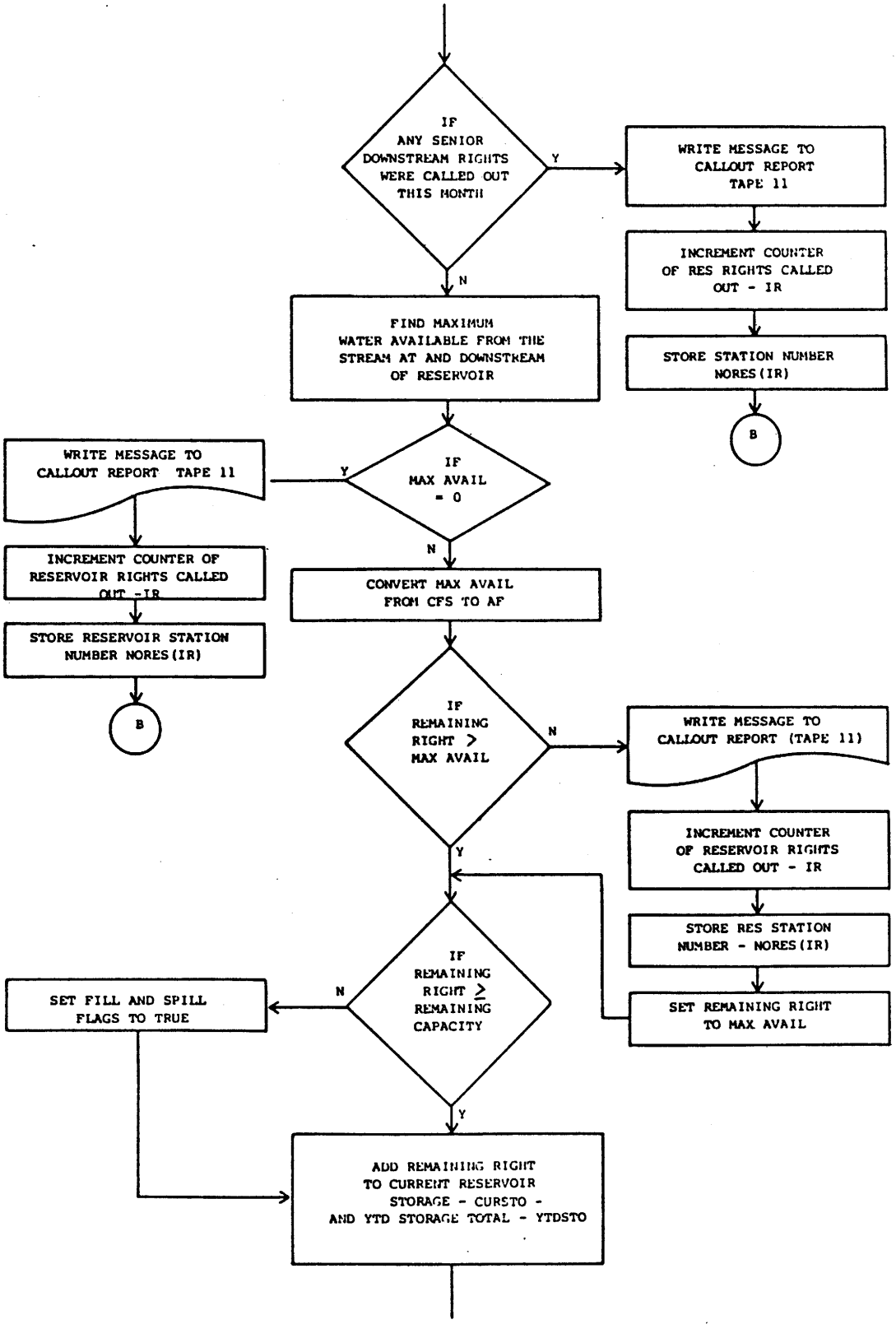

START
RESFLGS = FALSE
IFFLAG = FALSE
IRFLAG = FALSE
IDFLAG = FALSE
READ FLOW REQUIREMENT TAPE 3
READ RESERVOIR REQUIREMENT TAPE 16
READ DIVERSION RIGHT. (NORMAL, JR. OR SR. PROJECT) TAPE 4
IF NO MORE DIVS IN DIV FILE
IF IRFLAG AND IFFLAG = TRUE
GO TO END OF MONTH SECTION
PROCESS DIVER-SION AND PROJECT RETURN FLOW SECTION
DATE COMPARISON
IDFLAG = TRUE DIVDAT = 9999 9999
PROCESS NORMAL DIVERSION SECTION
IF DIVDAT IFRDAT AND DIVDAT RESDAT
IF DIVTYPE = 1
IF DIVTYPE 2 = DI
IF RESDAT IFRDAT AND RESDAT DIVDAT
PROCESS RES RIGHT SECTION
PROCESS SENIOR PROJECT OR JUNIOR PROJECT (SPILL) SECTION
IF RESFLG = TRUE
IF NO SPILL
RESFLG = TRUE
PROCESS JUNIOR PROJECT (NOSPILL) FROM RIVER
PROCESS FLOW REQ. SECTION
IF IFRDAT RESDAT AND IFRDAT DIVDAT
READ NEXT RES RIGHT TAPE 16
PROCESS JUNIOR PROJECT (NOSPILL) FROM RES SECTION
READ NEXT FLOW REQ. TAPE 3
STOP
IF NO MORE RIGHTS IN FLOW REQ. FILE
IF IRFLAG AND IDFLAG = TRUE
IF NO MORE RIGHTS IN RES RIGHT FILE
IF IDFLAG AND IFFLAG = TRUE
GO TO DATE COMPARISON
IFFLAG = TRUE IFRDAT = 99999999
IRFLAG = TRUE RESDAT = 99999999
GO TO DATE COMPARISON

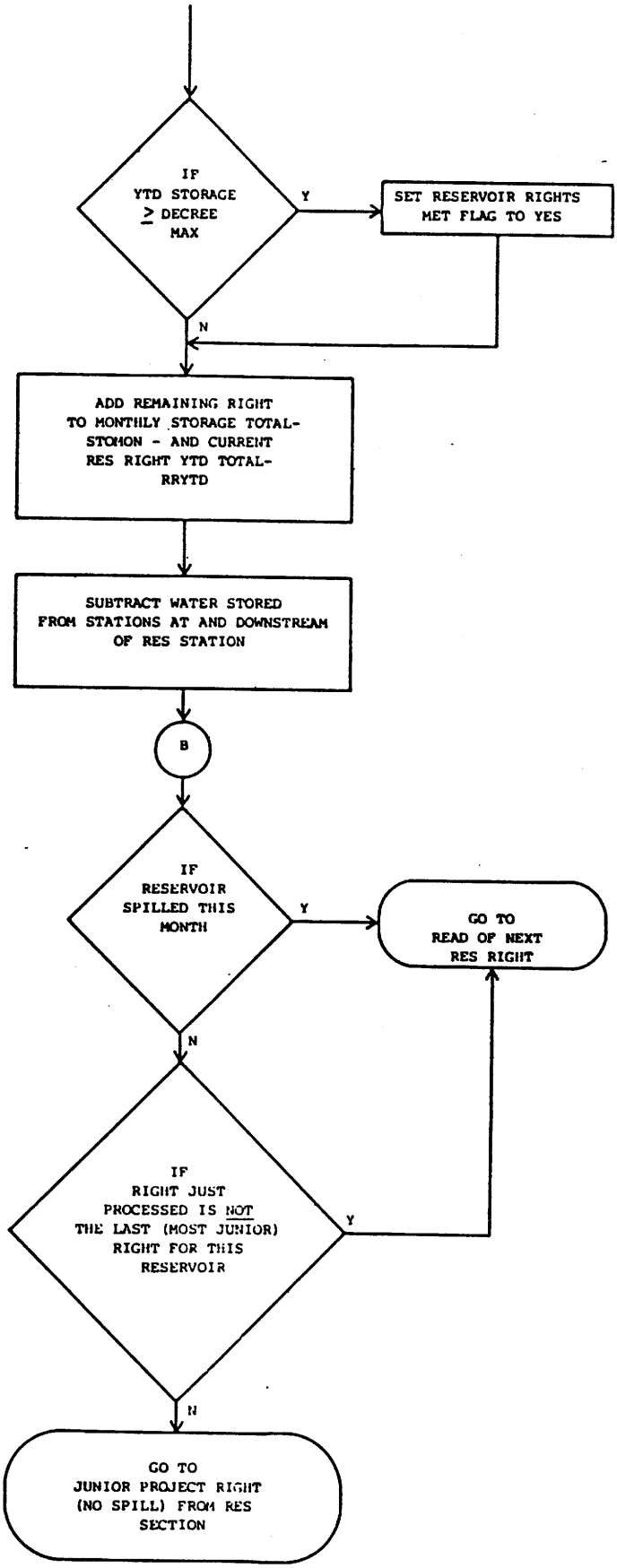

START
IF DIVERSION FOR CURRENT MONTH = 0
Y
GO TO READ OF NEXT DIVERSION
N
FIND DIVERSION STATION INDEX IN ISTATA ARRAY
IF AVAILABLE WATER AT DIVERSION STATION = 0
Y
WRITE MESSAGE TO TAPE 11 & 12
INCREMENT COUNTER OF DIVERSIONS CALLED OUT - ID AND STORE STATION NUMBER
N
IF ANY SENIOR DOWN-STREAM RIGHT CALLED OUT
Y
N
IF ENOUGH WATER AT AND DOWNSTREAM OF DIVERSION STATION FOR RIGHT
Y
SUBTRACT DIVERSION FROM RIVER AND AVAIL ARRAYS AT AND DOWNSTREAM OF DIVERSION STATION
GO TO DIVERSION AND PROJECT RETURN FLOW SECTION
N
IF NO RETURN FLOW STATIONS FOR CURRENT DIVERSION
Y
REDUCE DIVERSION TO AMOUNT AVAIL DOWNSTREAM
SUBTRACT DIVERSION FROM RIVER AND AVAIL ARRAYS AT AND DOWNSTREAM OF DIVERSION STATION
N

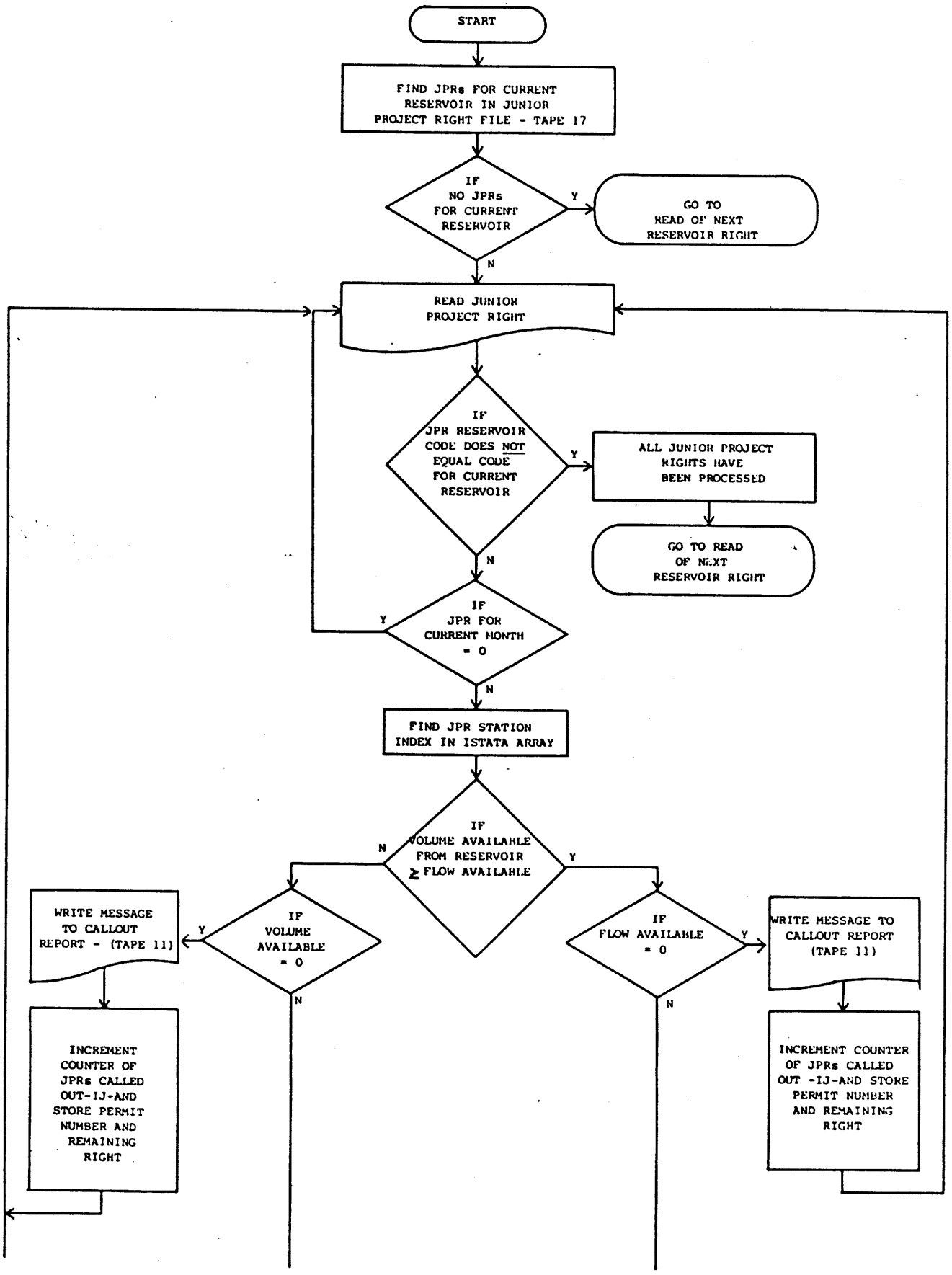

WRITE MESSAGE TO CALLOUT REPORT (TAPE 11) AND SUMMARY REPORT (TAPE 12)
INCREMENT COUNTER OF DIVERSION CALLED OUT -ID- AND STORE STATION NUMBER
IF DIVERSION REDUCED TO ZERO
N
Y
SET AVWRET ARRAY = AVAIL ARRAY
ADD RETURN FLOW FROM DIVERSION FOR CURRENT MONTH TO AVWRET ARRAY
IF NOW ENOUGH WATER IN AVWRET ARRAY FOR DIVERSION
N
REDUCE DIVERSION TO AMOUNT AVAILABLE IN AVWRET ARRAY
Y
IF DIVERSION HAS BEEN REDUCED
Y
WRITE MESSAGE TO CALLOUT REPORT (TAPE11) AND SUMMARY (TAPE 12)
N
SUBTRACT DIVERSION FROM RIVER AND AVAIL ARRAYS AT AND DOWNSTREAM OF DIVERSION STATION
INCREMENT COUNTER OF DIVERSIONS CALLED OUT -ID- AND STORE DIVERSION STATION NUMBER
GO TO DIVERSION AND PROJECT RETURN FLOW SECTION
N
IF DIVERSION REDUCED TO ZERO
Y
GO TO READ NEXT DIVERSION

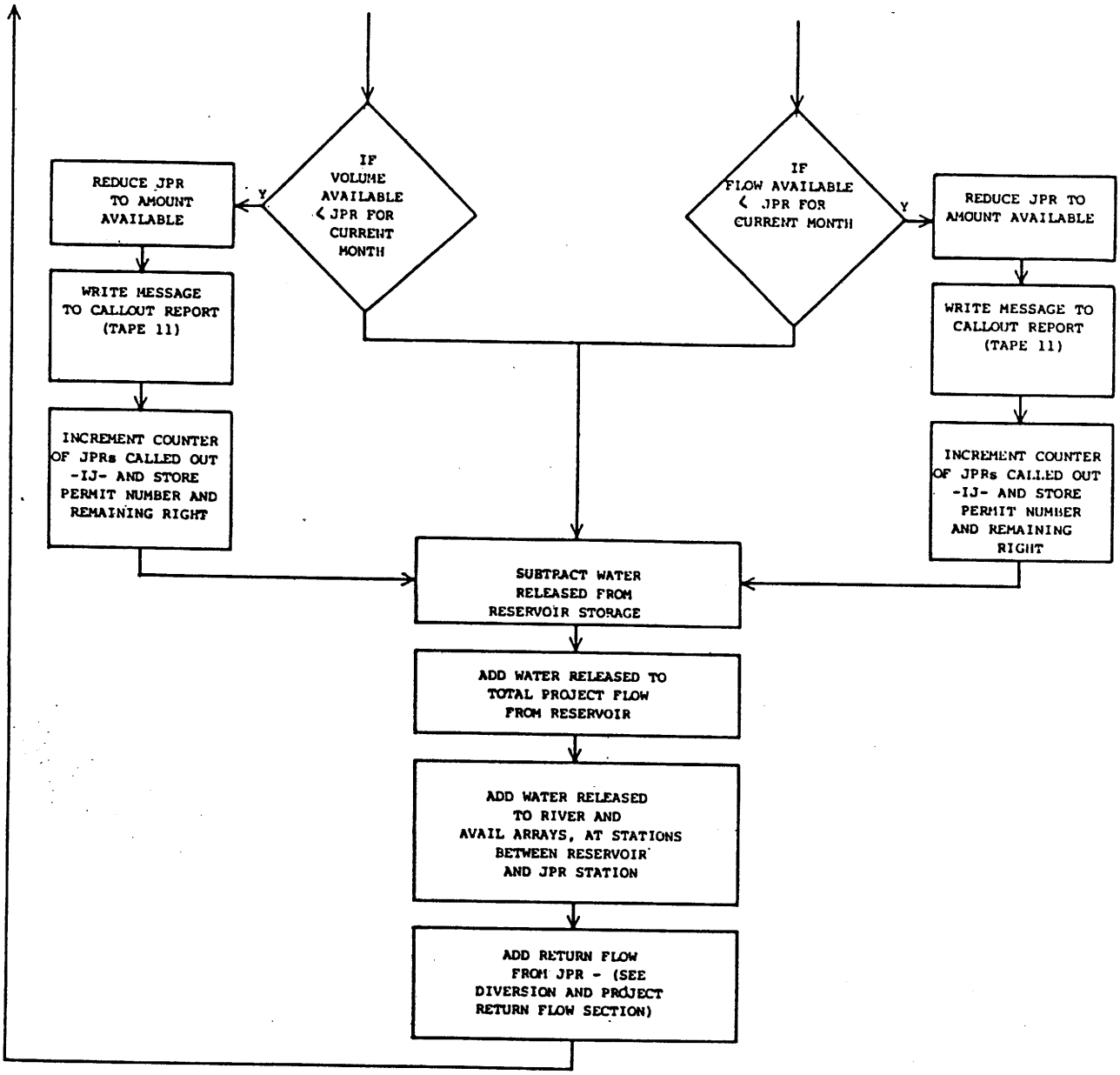

START
IF FLOW REQ = 0
Y
GO TO READ OF NEXT FLOW REQUIREMENT
N
FIND STATION AND STREAM ORDER OF FLOW REQ
IF FLOW REQ ≤ AVAIL AT IFR STATION
Y
REDUCE AVAILABLE FROM STREAM AT IFR STATION BY FLOW REQ
N
CALCULATE PERCENT CALLED OUT
WRITE MESSAGE TO CALL OUT REPORT TAPE 11
WRITE SUMMARY TO TAPE 13
INCREMENT COUNTER OF NUMBER OF FLOW REQ. CALLED OUT - (11)
STORE STATION NUMBER NOFLOW(11)
REDUCE 'AVAIL' ARRAY AT IFR STATION TO ZERO

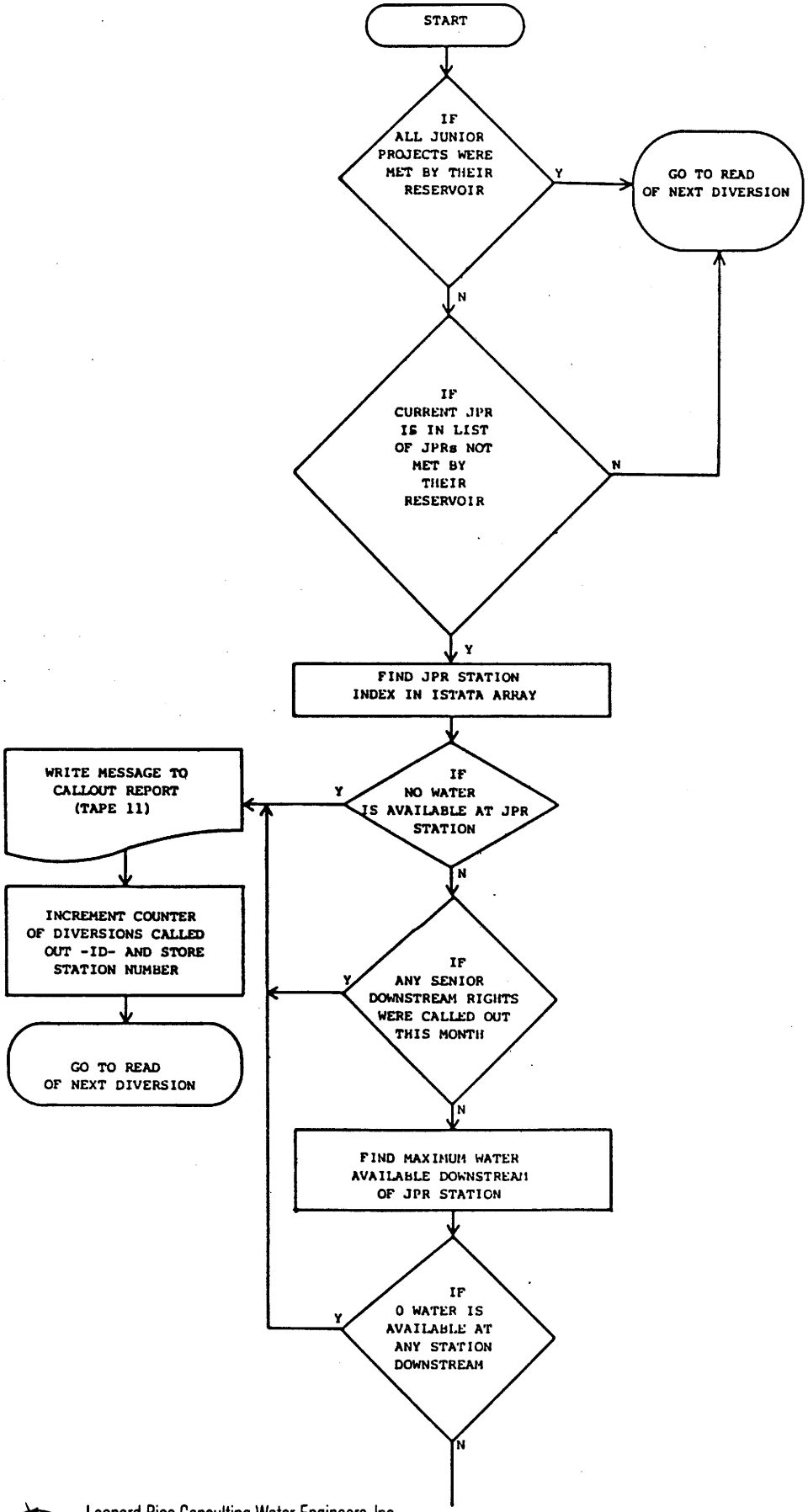

START
FIND RESERVOIR STATION INDEX IN ISTATA ARRAY NSTAT
INCREMENT RESERVOIR RIGHT INDEX FOR CURRENT RESERVOIR - INDXRR
IF RES HAS FILLED THIS WATER YEAR
Y
B
N
IF REMAINING RIGHT > REMAINING DECREE
Y
SET REMAINING RIGHT TO REMAINING DECREE
N
IF REMAINING RIGHT=0
Y
B
N
IF REMAINING RIGHT > REMAINING CAPACITY
Y
SET REMAINING RIGHT TO REMAINING CAPACITY
N
IF REMAINING RIGHT=0
Y
B
N

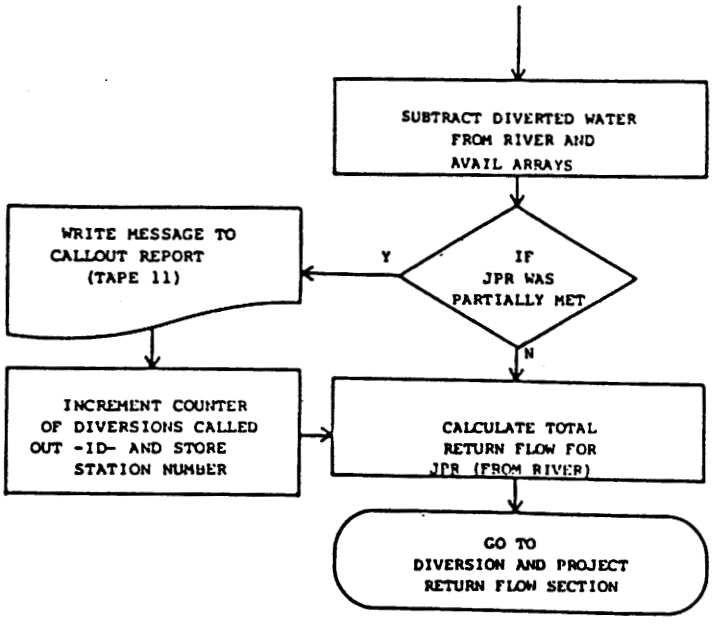

IF ANY SENIOR DOWNSTREAM RIGHTS WERE CALLED OUT THIS MONTH
Y
WRITE MESSAGE TO CALLOUT REPORT TAPE 11
INCREMENT COUNTER OF RES RIGHTS CALLED OUT - IR
STORE STATION NUMBER NORES(IR)
B
N
FIND MAXIMUM WATER AVAILABLE FROM THE STREAM AT AND DOWNSTREAM OF RESERVOIR
IF MAX AVAIL = 0
Y
WRITE MESSAGE TO CALLOUT REPORT TAPE 11
INCREMENT COUNTER OF RESERVOIR RIGHTS CALLED OUT -IR
STORE RESERVOIR STATION NUMBER NORES(IR)
B
N
CONVERT MAX AVAIL FROM CFS TO AF
IF REMAINING RIGHT > MAX AVAIL
N
WRITE MESSAGE TO CALLOUT REPORT (TAPE 11)
INCREMENT COUNTER OF RESERVOIR RIGHTS CALLED OUT - IR
STORE RES STATION NUMBER - NORES(IR)
SET REMAINING RIGHT TO MAX AVAIL
Y
IF REMAINING RIGHT ≥ REMAINING CAPACITY
N
SET FILL AND SPILL FLAGS TO TRUE
Y
ADD REMAINING RIGHT TO CURRENT RESERVOIR STORAGE - CURSTO - AND YTD STORAGE TOTAL - YTDSTO

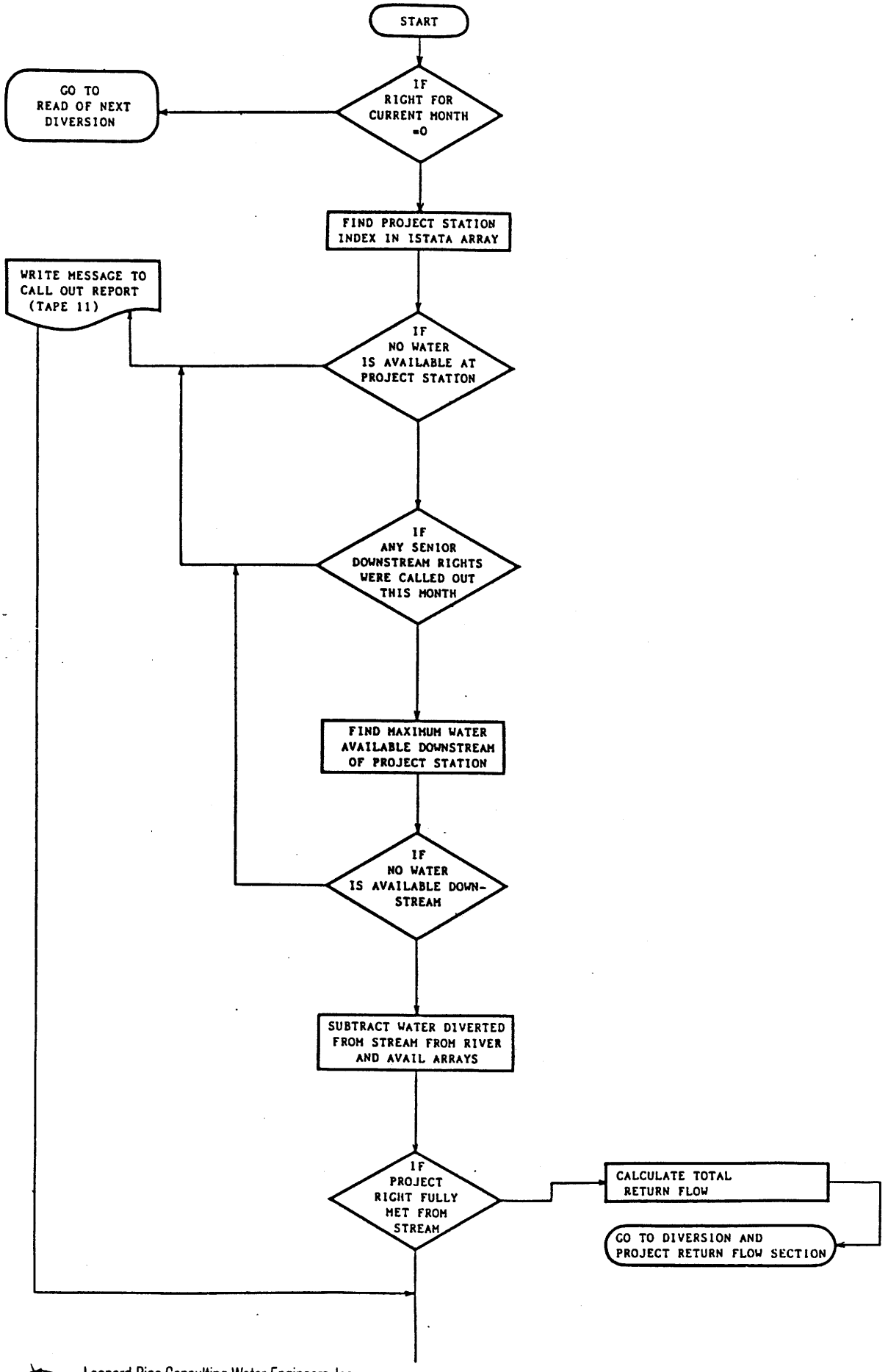

IF
YTD STORAGE
≥ DECREE
MAX
Y
SET RESERVOIR RIGHTS
MET FLAG TO YES
N
ADD REMAINING RIGHT
TO MONTHLY STORAGE TOTAL-
STOMON - AND CURRENT
RES RIGHT YTD TOTAL-
RRYTD
SUBTRACT WATER STORED
FROM STATIONS AT AND DOWNSTREAM
OF RES STATION
B
IF
RESERVOIR
SPILLED THIS
MONTH
Y
GO TO
READ OF NEXT
RES RIGHT
N
IF
RIGHT JUST
PROCESSED IS NOT
THE LAST (MOST JUNIOR)
RIGHT FOR THIS
RESERVOIR
Y
N
GO TO
JUNIOR PROJECT RIGHT
(NO SPILL) FROM RES
SECTION

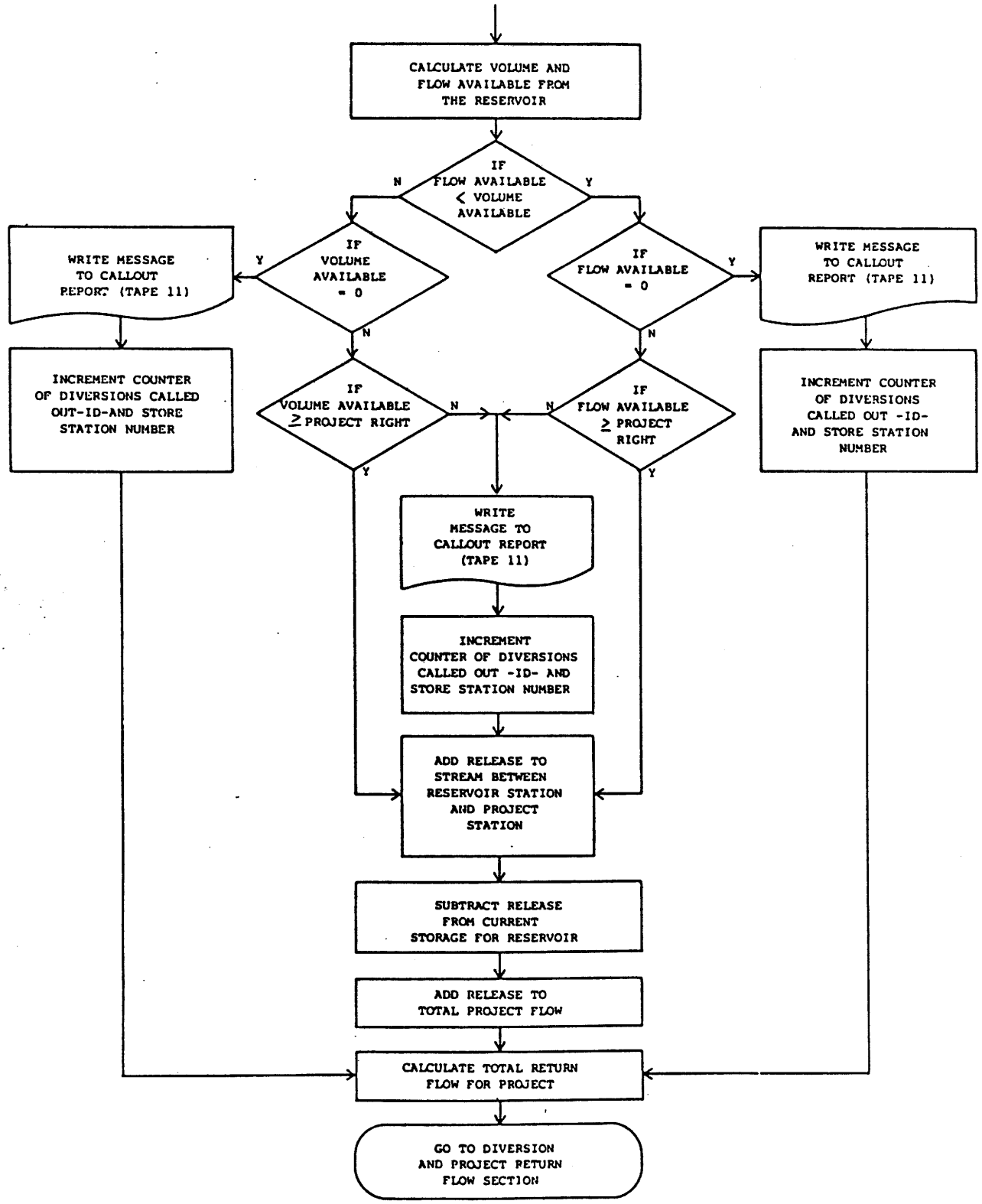

START
FIND JPRs FOR CURRENT RESERVOIR IN JUNIOR PROJECT RIGHT FILE - TAPE 17
IF NO JPRs FOR CURRENT RESERVOIR
Y
GO TO READ OF NEXT RESERVOIR RIGHT
N
READ JUNIOR PROJECT RIGHT
IF JPR RESERVOIR CODE DOES NOT EQUAL CODE FOR CURRENT RESERVOIR
Y
ALL JUNIOR PROJECT RIGHTS HAVE BEEN PROCESSED
GO TO READ OF NEXT RESERVOIR RIGHT
N
IF JPR FOR CURRENT MONTH = 0
Y
N
FIND JPR STATION INDEX IN ISTATA ARRAY
IF VOLUME AVAILABLE FROM RESERVOIR ≥ FLOW AVAILABLE
N
Y
IF VOLUME AVAILABLE = 0
Y
WRITE MESSAGE TO CALLOUT REPORT - (TAPE 11)
INCREMENT COUNTER OF JPRs CALLED OUT-IJ-AND STORE PERMIT NUMBER AND REMAINING RIGHT
N
IF FLOW AVAILABLE = 0
Y
WRITE MESSAGE TO CALLOUT REPORT (TAPE 11)
INCREMENT COUNTER OF JPRs CALLED OUT -IJ-AND STORE PERMIT NUMBER AND REMAINING RIGHT
N

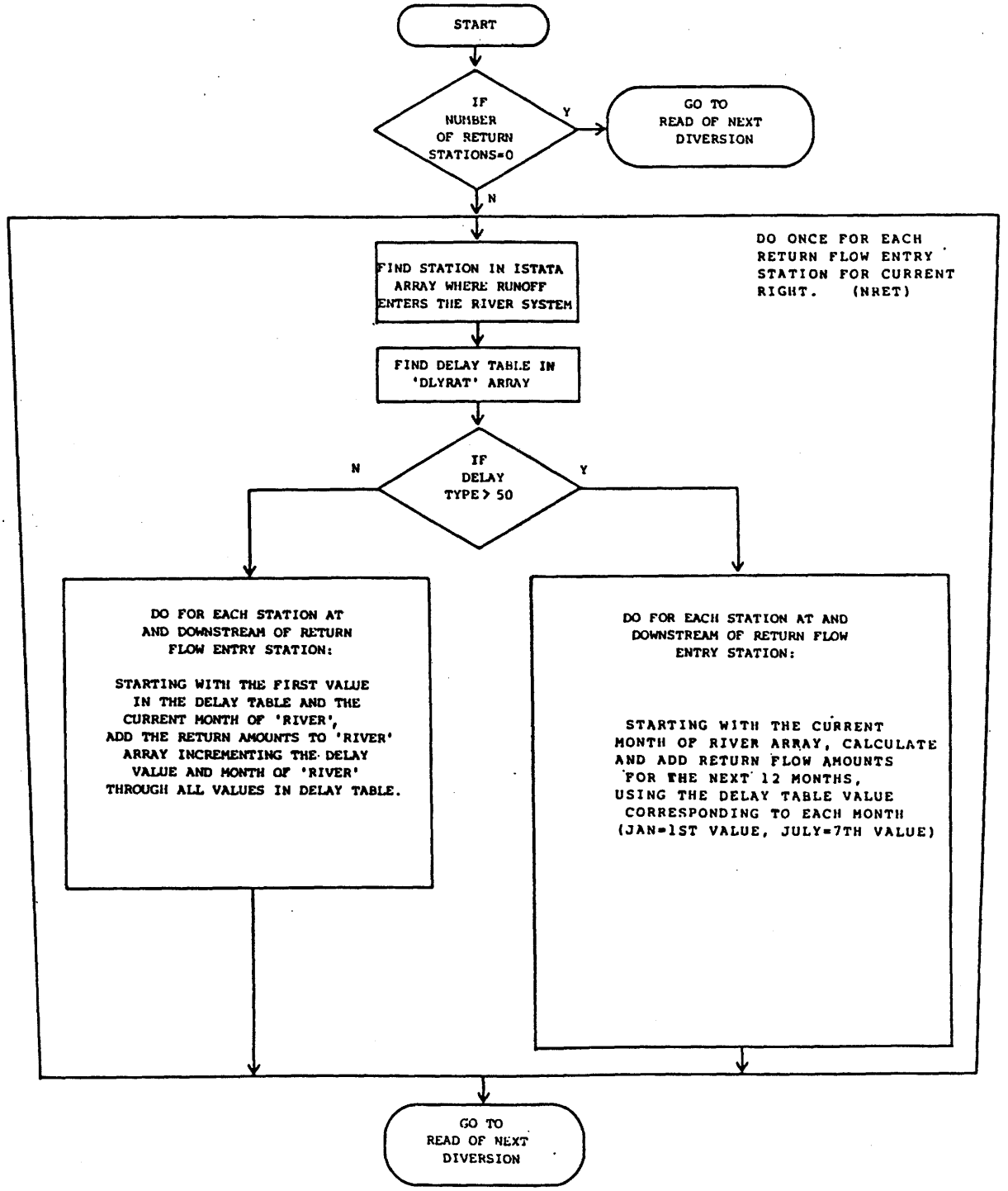

IF VOLUME AVAILABLE < JPR FOR CURRENT MONTH
Y
REDUCE JPR TO AMOUNT AVAILABLE
WRITE MESSAGE TO CALLOUT REPORT (TAPE 11)
INCREMENT COUNTER OF JPRs CALLED OUT -IJ- AND STORE PERMIT NUMBER AND REMAINING RIGHT
IF FLOW AVAILABLE < JPR FOR CURRENT MONTH
Y
REDUCE JPR TO AMOUNT AVAILABLE
WRITE MESSAGE TO CALLOUT REPORT (TAPE 11)
INCREMENT COUNTER OF JPRs CALLED OUT -IJ- AND STORE PERMIT NUMBER AND REMAINING RIGHT
SUBTRACT WATER RELEASED FROM RESERVOIR STORAGE
ADD WATER RELEASED TO TOTAL PROJECT FLOW FROM RESERVOIR
ADD WATER RELEASED TO RIVER AND AVAIL ARRAYS, AT STATIONS BETWEEN RESERVOIR AND JPR STATION
ADD RETURN FLOW FROM JPR - (SEE DIVERSION AND PROJECT RETURN FLOW SECTION)

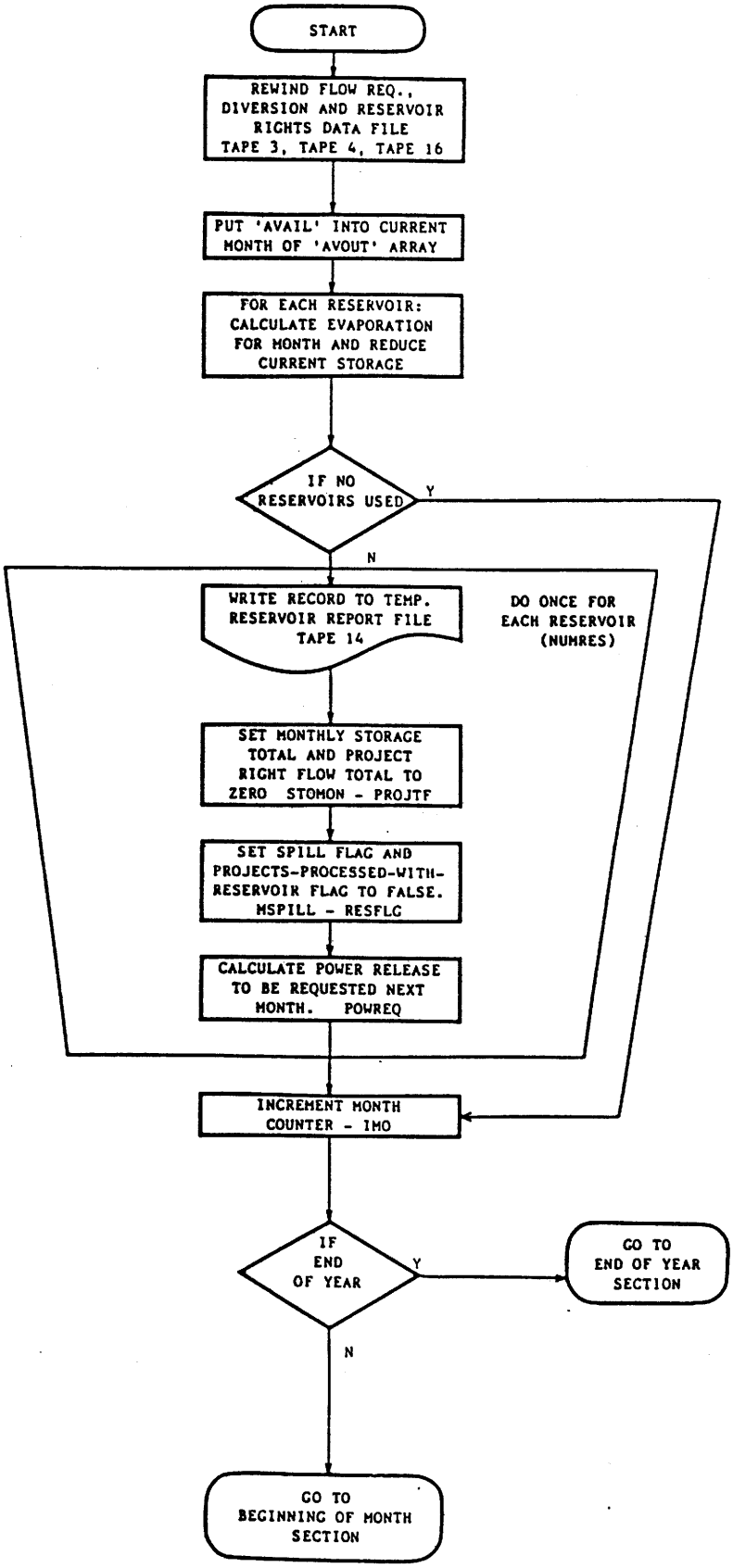

START
IF ALL JUNIOR PROJECTS WERE MET BY THEIR RESERVOIR
Y
GO TO READ OF NEXT DIVERSION
N
IF CURRENT JPR IS IN LIST OF JPRs NOT MET BY THEIR RESERVOIR
N
Y
FIND JPR STATION INDEX IN ISTATA ARRAY
IF NO WATER IS AVAILABLE AT JPR STATION
Y
WRITE MESSAGE TO CALLOUT REPORT (TAPE 11)
N
INCREMENT COUNTER OF DIVERSIONS CALLED OUT -ID- AND STORE STATION NUMBER
IF ANY SENIOR DOWNSTREAM RIGHTS WERE CALLED OUT THIS MONTH
Y
GO TO READ OF NEXT DIVERSION
N
FIND MAXIMUM WATER AVAILABLE DOWNSTREAM OF JPR STATION
IF 0 WATER IS AVAILABLE AT ANY STATION DOWNSTREAM
Y
N

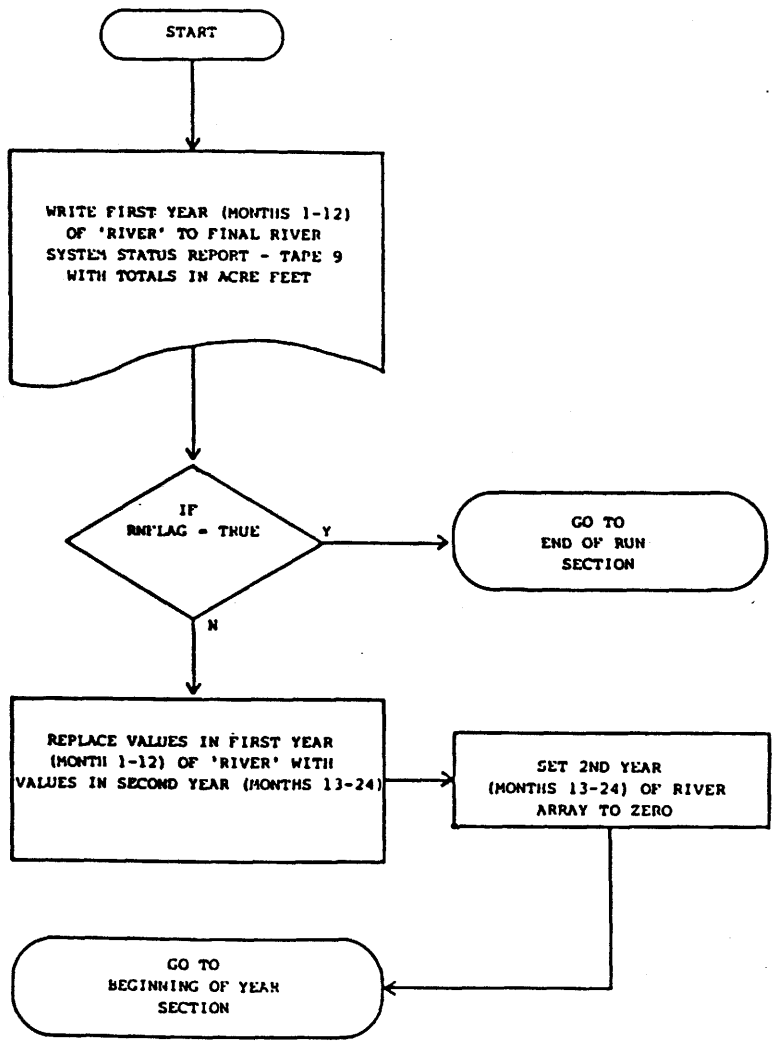

SUBTRACT DIVERTED WATER FROM RIVER AND AVAIL ARRAYS
IF JPR WAS PARTIALLY MET
Y
WRITE MESSAGE TO CALLOUT REPORT (TAPE 11)
N
INCREMENT COUNTER OF DIVERSIONS CALLED OUT -ID- AND STORE STATION NUMBER
CALCULATE TOTAL RETURN FLOW FOR JPR (FROM RIVER)
GO TO DIVERSION AND PROJECT RETURN FLOW SECTION

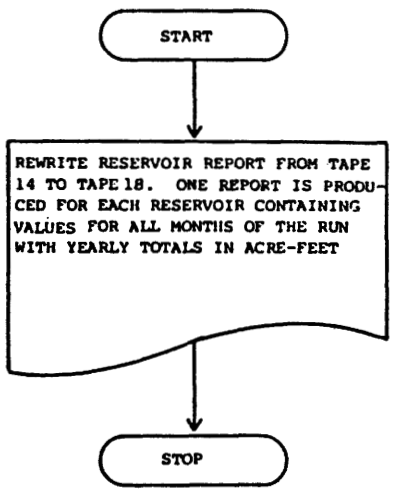

START
IF RIGHT FOR CURRENT MONTH =0
GO TO READ OF NEXT DIVERSION
FIND PROJECT STATION INDEX IN ISTATA ARRAY
WRITE MESSAGE TO CALL OUT REPORT (TAPE 11)
IF NO WATER IS AVAILABLE AT PROJECT STATION
IF ANY SENIOR DOWNSTREAM RIGHTS WERE CALLED OUT THIS MONTH
FIND MAXIMUM WATER AVAILABLE DOWNSTREAM OF PROJECT STATION
IF NO WATER IS AVAILABLE DOWN-STREAM
SUBTRACT WATER DIVERTED FROM STREAM FROM RIVER AND AVAIL ARRAYS
IF PROJECT RIGHT FULLY MET FROM STREAM
CALCULATE TOTAL RETURN FLOW
GO TO DIVERSION AND PROJECT RETURN FLOW SECTION

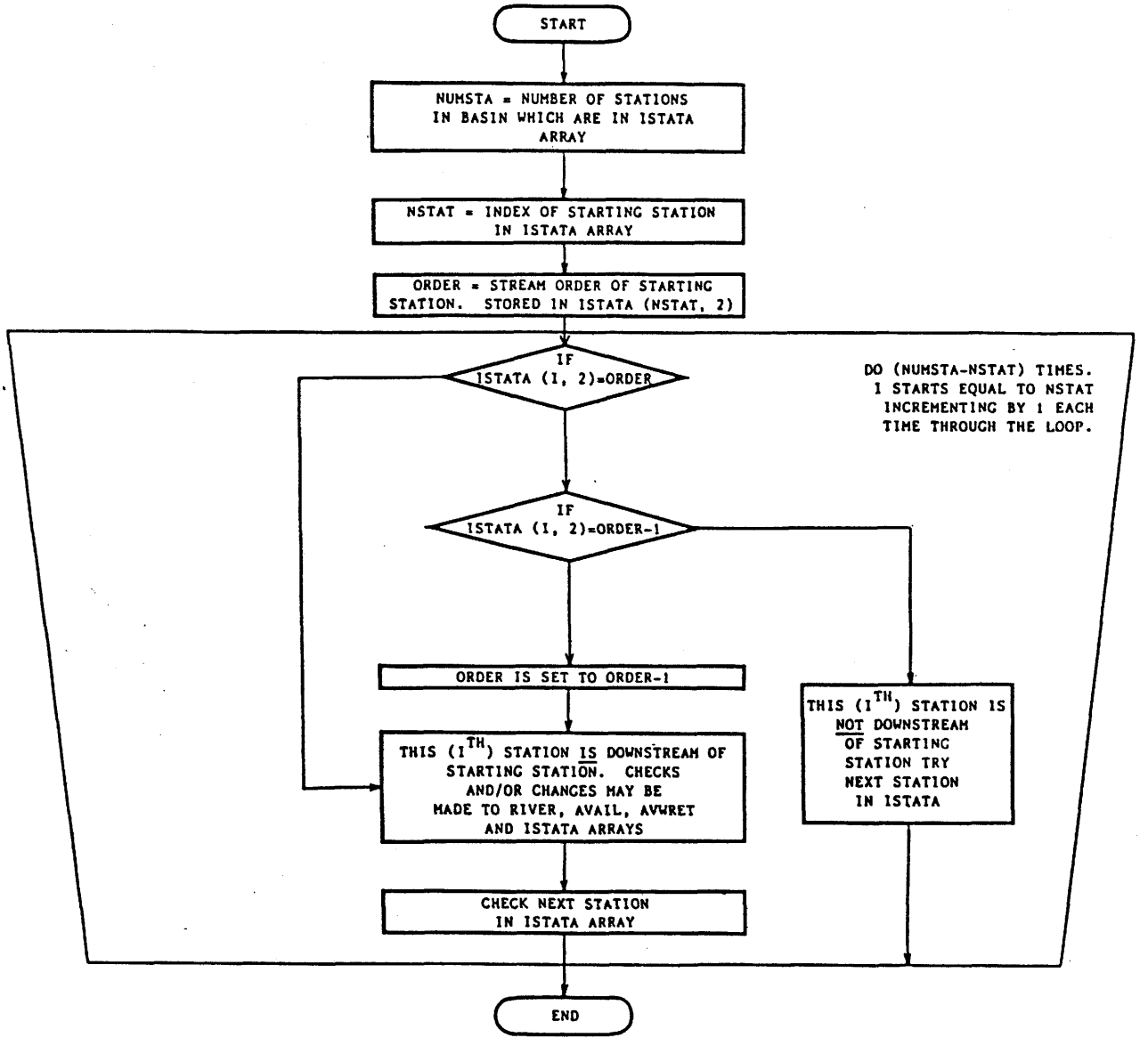

CALCULATE VOLUME AND FLOW AVAILABLE FROM THE RESERVOIR
IF FLOW AVAILABLE < VOLUME AVAILABLE
N
Y
IF VOLUME AVAILABLE = 0
Y
N
WRITE MESSAGE TO CALLOUT REPORT (TAPE 11)
INCREMENT COUNTER OF DIVERSIONS CALLED OUT-ID-AND STORE STATION NUMBER
IF FLOW AVAILABLE = 0
Y
N
WRITE MESSAGE TO CALLOUT REPORT (TAPE 11)
INCREMENT COUNTER OF DIVERSIONS CALLED OUT -ID- AND STORE STATION NUMBER
IF VOLUME AVAILABLE ≥ PROJECT RIGHT
N
Y
IF FLOW AVAILABLE ≥ PROJECT RIGHT
N
Y
WRITE MESSAGE TO CALLOUT REPORT (TAPE 11)
INCREMENT COUNTER OF DIVERSIONS CALLED OUT -ID- AND STORE STATION NUMBER
ADD RELEASE TO STREAM BETWEEN RESERVOIR STATION AND PROJECT STATION
SUBTRACT RELEASE FROM CURRENT STORAGE FOR RESERVOIR
ADD RELEASE TO TOTAL PROJECT FLOW
CALCULATE TOTAL RETURN FLOW FOR PROJECT
GO TO DIVERSION AND PROJECT RETURN FLOW SECTION

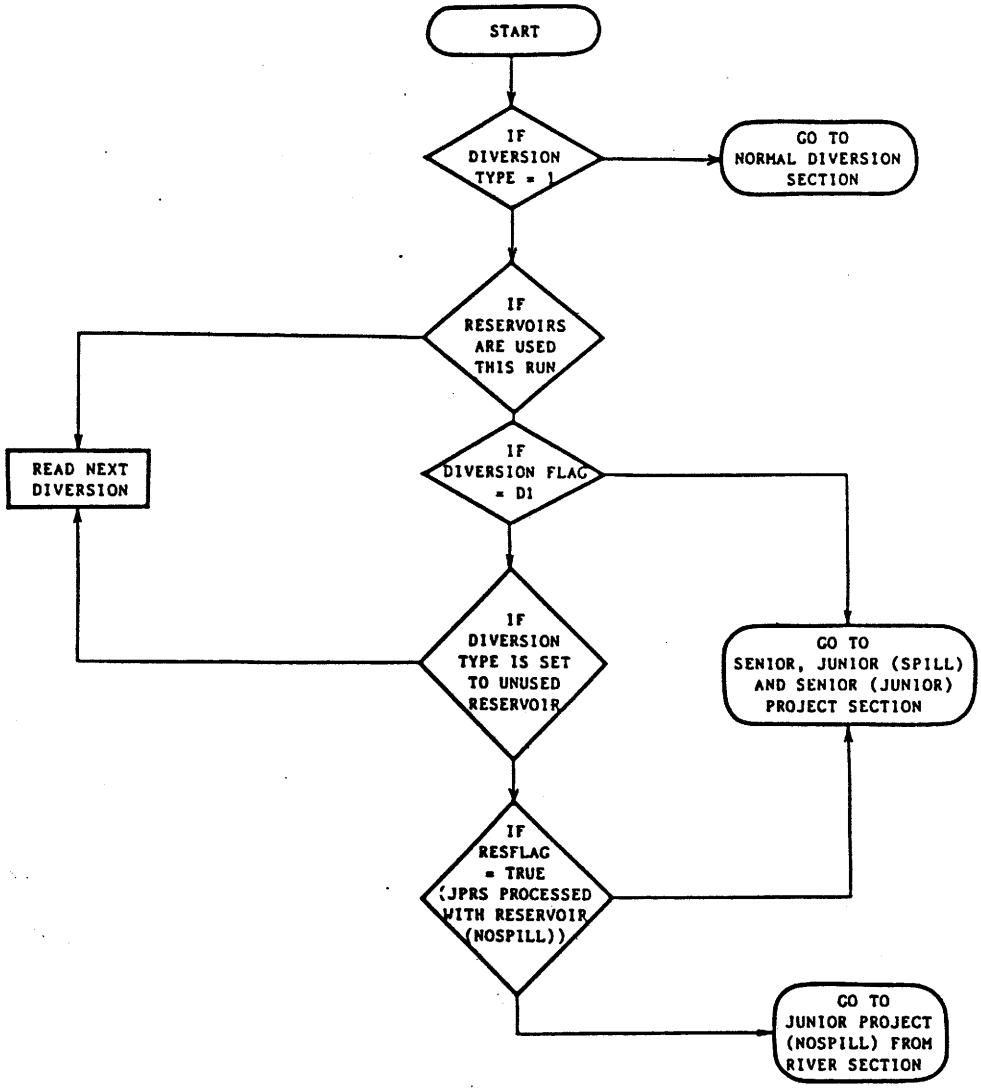

START
IF NUMBER OF RETURN STATIONS=0
Y
GO TO READ OF NEXT DIVERSION
N
DO ONCE FOR EACH RETURN FLOW ENTRY STATION FOR CURRENT RIGHT. (NRET)
FIND STATION IN ISTATA ARRAY WHERE RUNOFF ENTERS THE RIVER SYSTEM
FIND DELAY TABLE IN 'DLYRAT' ARRAY
IF DELAY TYPE > 50
N
Y
DO FOR EACH STATION AT AND DOWNSTREAM OF RETURN FLOW ENTRY STATION:
STARTING WITH THE FIRST VALUE IN THE DELAY TABLE AND THE CURRENT MONTH OF 'RIVER', ADD THE RETURN AMOUNTS TO 'RIVER' ARRAY INCREMENTING THE DELAY VALUE AND MONTH OF 'RIVER' THROUGH ALL VALUES IN DELAY TABLE.
DO FOR EACH STATION AT AND DOWNSTREAM OF RETURN FLOW ENTRY STATION:
STARTING WITH THE CURRENT MONTH OF RIVER ARRAY, CALCULATE AND ADD RETURN FLOW AMOUNTS FOR THE NEXT 12 MONTHS, USING THE DELAY TABLE VALUE CORRESPONDING TO EACH MONTH (JAN=1ST VALUE, JULY=7TH VALUE)
GO TO READ OF NEXT DIVERSION


START
REWIND FLOW REQ., DIVERSION AND RESERVOIR RIGHTS DATA FILE TAPE 3, TAPE 4, TAPE 16
PUT 'AVAIL' INTO CURRENT MONTH OF 'AVOUT' ARRAY
FOR EACH RESERVOIR: CALCULATE EVAPORATION FOR MONTH AND REDUCE CURRENT STORAGE
IF NO RESERVOIRS USED
Y
N
WRITE RECORD TO TEMP. RESERVOIR REPORT FILE TAPE 14
DO ONCE FOR EACH RESERVOIR (NUMRES)
SET MONTHLY STORAGE TOTAL AND PROJECT RIGHT FLOW TOTAL TO ZERO STOMON - PROJTF
SET SPILL FLAG AND PROJECTS-PROCESSED-WITH-RESERVOIR FLAG TO FALSE. MSPILL - RESFLG
CALCULATE POWER RELEASE TO BE REQUESTED NEXT MONTH. POWREQ
INCREMENT MONTH COUNTER - IMO
IF END OF YEAR
Y
GO TO END OF YEAR SECTION
N
GO TO BEGINNING OF MONTH SECTION


START
WRITE FIRST YEAR (MONTHS 1-12) OF 'RIVER' TO FINAL RIVER SYSTEM STATUS REPORT - TAPE 9 WITH TOTALS IN ACRE FEET
IF RNF'LAG = TRUE
Y
GO TO END OF RUN SECTION
N
REPLACE VALUES IN FIRST YEAR (MONTH 1-12) OF 'RIVER' WITH VALUES IN SECOND YEAR (MONTHS 13-24)
SET 2ND YEAR (MONTHS 13-24) OF RIVER ARRAY TO ZERO
GO TO BEGINNING OF YEAR SECTION


START
REWRITE RESERVOIR REPORT FROM TAPE 14 TO TAPE 18. ONE REPORT IS PRODUCED FOR EACH RESERVOIR CONTAINING VALUES FOR ALL MONTHS OF THE RUN WITH YEARLY TOTALS IN ACRE-FEET
STOP


START
NUMSTA = NUMBER OF STATIONS IN BASIN WHICH ARE IN ISTATA ARRAY
NSTAT = INDEX OF STARTING STATION IN ISTATA ARRAY
ORDER = STREAM ORDER OF STARTING STATION. STORED IN ISTATA (NSTAT, 2)
IF ISTATA (I, 2)=ORDER
DO (NUMSTA-NSTAT) TIMES. I STARTS EQUAL TO NSTAT INCREMENTING BY 1 EACH TIME THROUGH THE LOOP.
IF ISTATA (I, 2)=ORDER-1
ORDER IS SET TO ORDER-1
THIS (I TH) STATION IS NOT DOWNSTREAM OF STARTING STATION TRY NEXT STATION IN ISTATA
THIS (I TH) STATION IS DOWNSTREAM OF STARTING STATION. CHECKS AND/OR CHANGES MAY BE MADE TO RIVER, AVAIL, AVWRET AND ISTATA ARRAYS
CHECK NEXT STATION IN ISTATA ARRAY
END


START
IF DIVERSION TYPE = 1
GO TO NORMAL DIVERSION SECTION
IF RESERVOIRS ARE USED THIS RUN
READ NEXT DIVERSION
IF DIVERSION FLAG = D1
IF DIVERSION TYPE IS SET TO UNUSED RESERVOIR
GO TO SENIOR, JUNIOR (SPILL) AND SENIOR (JUNIOR) PROJECT SECTION
IF RESFLAG = TRUE (JPRS PROCESSED WITH RESERVOIR (NOSPILL))
GO TO JUNIOR PROJECT (NOSPILL) FROM RIVER SECTION

APPENDIX C

VARIABLE LIST

ACOEF	3DIM ARRAY -	Three coefficients for defining the area - capacity relationship for each reservoir.
AREA1	VARIABLE -	Surface area of reservoir at beginning of month.
AREA2	VARIABLE -	Surface area of reservoir at end of month.
AVAIL	1DIM ARRAY -	This array contains the average cfs of water which is available for diversion in the current month for each station in the basin. When an instream flow requirement is all or partially met, that water is no longer permitted to be used, although the water is still in the stream. This amount is subtracted from the appropriate station in AVAIL. The RIVER array is not affected by instream flow requirement, because it represents water actually in the stream.
AVAILR	VARIABLE -	Water available at reservoir station (average cubic feet per second).
AVOUT	2DIM ARRAY -	This array contains 12 months of data for each station in the river basin. At the end of each month's processing, the contents of the AVAIL array is stored

		in one column of this array. After a year is finished processing, the contents of the AVOUT array are written to output file TAPE10. The array is reused each year.
AVRAF	VARIABLE -	Water available at reservoir station (AVAILR) converted to acre-feet.
AVWRET	1DIM ARRAY -	This array contains data for each station in the river basin. AVWRET is used when diversions of a right, coded to return a portion of its diversions to the stream system, are limited by water availability in a downstream station. AVWRET reflects the water availability in downstream stations when assumed return flows are added in. The correct water availability for diversion is produced by iterations assuming various diversion rates (and, therefore, returns in downstream stations).
BEGVOL	1DIM ARRAY -	Initial reservoir storage volume (acre-feet).
BITV	VARIABLE -	True/False variable. True when processed station is physically downstream of diversion station.

CONSTA	VARIABLE -	Controlling station. Set to the station number whose flow constrains the diversion.
CURSTO	1DIM ARRAY -	Current storage volume of each reservoir. Initially set to BEGVOL.
DCRMAX	1DIM ARRAY -	Initially set to DECREE. Reduced to remaining capacity of reservoir if less than DECREE.
DECREE	1DIM ARRAY -	Total water (acre-feet) of all rights for each reservoir.
DIFFER	VARIABLE -	The excess of an assumed diversion amount over the downstream available flows (with return flows accounted).
DIVDAT	VARIABLE -	IDDATE converted to YYYYMMDD for comparison with other rights.
DIVEFF	VARIABLE -	Diversion return flow efficiency percentage. Percent of amount diverted which is not returned to the basin.
DIVER	1DIM ARRAY -	Monthly diversion amounts (average cubic feet per second) for one year (January-December).
DIVPMT	1DIM ARRAY -	Permit number for diversion read from TAPE4.
DIVREQ	VARIABLE -	Original requested diversion amount. Used to calculate percent called out if full diversion is not made.

DIVSTA	VARIABLE -	Station from which "Normal" diversion occurs.
DIVTYP	VARIABLE -	If equal to 1, right is a direct flow diversion. If equal to 2-21, then right is a project right and the number corresponds to its associated reservoir.
DLY	VARIABLE -	Location of delay table among all delay tables.
DLYNUM	1DIM ARRAY -	Delay table identification number.
DLYRAT	2DIM ARRAY -	Twelve months of delay rates as a percentage of the return flow amount.
DUMJPR	VARIABLE -	Identifies diversion type.
DVTYP2	VARIABLE -	Identifies if diversion is a type "D1" - (junior project right operated as a senior project right).
EFFJPR	VARIABLE -	Junior project return flow efficiency percentage. Set to the percent of water diverted which is <u>not</u> returned to the basin for junior project rights.
EVAP	1DIM ARRAY -	Total evaporation from reservoir at end of each month (acre-feet).
EVAPRT	2DIM ARRAY -	Evaporation rate (feet) for each month of year (January-December).
EVAPSUB	EXTERNAL -	Evaporation subroutine.

FACTOR	VARIABLE -	Conversion factor of 1.9835 for cubic feet per second into acre-feet per day or vice versa.
FAVLAF	VARIABLE -	FLOAVL in acre-feet.
FLOAVL	VARIABLE -	Maximum outlet capacity from a reservoir less the flow in the river (average cubic feet per second) (FLOMAX - RIVER).
FLOMAX	1DIM ARRAY -	Maximum outlet capacity of reservoir (average cubic feet per second).
FLOWRQ	1DIM ARRAY -	Monthly instream flow requirement (average cubic feet per second) for one year (January-December).
GLDATE	VARIABLE -	Goal date for power release (same as GOALDT).
GOALDT	1DIM ARRAY -	Month number (1-12) when power release goal volume is to be reached.
GOALRL	VARIABLE -	Current reservoir storage less power release goal volume (GOALVL).
GOALVL	1DIM ARRAY -	Reservoir power release goal volume (acre-feet).
HEAD2	1DIM ARRAY -	Date of computer model run; printed at top of output page.
I	VARIABLE -	Counter.
IC	VARIABLE -	Index for three coefficients in area-capacity equations.

ID	VARIABLE -	Counter of diversions called out each month. Used as index in NODIV array. Reset to zero at the beginning of each month.
IDDATE	1DIM ARRAY -	Priority date of "normal" diversion - MMDDYYYY. Read from TAPE4.
IDFLAG	VARIABLE -	End-of-file flag for diversion file.
IDL	VARIABLE -	Do loop index for delay table number.
IDV	VARIABLE -	Do loop index for NODIV array.
IEND	VARIABLE -	Counter.
IFDATE	1DIM ARRAY -	Instream flow right priority date - MMDDYYYY. Read from TAPE3.
IFFLAG	VARIABLE -	End-of-file flag for instream flow file.
IFLAG	VARIABLE -	Flag set to 0 or 1; determine whether diversion can be made.
IFR	VARIABLE -	Do loop index for NOFLOW array.
IFRDAT	VARIABLE -	IFDATE converted to YYYYMMDD for comparison with other rights.
IFRPMT	1DIM ARRAY -	Permit number for instream flow right, 7 alpha and/or numeric characters.
IFRSTA	VARIABLE -	Station number where an instream flow requirement must be met.
IHEAD	1DIM ARRAY -	Heading for output files TAPE8, TAPE9, TAPE10, TAPE11.

II	VARIABLE -	Counter of instream flows called out in current month, used as index in NOFLOW array.
IJ	VARIABLE -	Counter of Junior Project Rights called out from reservoir supply.
IJDATE	1DIM ARRAY -	Priority date of junior project right - MMDDYYYY.
IJP	VARIABLE -	Index for Junior Project Right's return flow station.
ILINE	VARIABLE -	Line counter for each page.
IM	VARIABLE -	Month Counter.
IMO	VARIABLE -	Current month being processed (1 through total number of months to be processed).
IMTH	VARIABLE -	Month Counter.
INDXRR	1DIM ARRAY -	Counter of which right is currently being processed for a reservoir of the (up to) four which are allowed. Reset at the beginning of each month. Used to control to which RRYTD subtotal the current storage amounts are to be added.
IPAGE	VARIABLE -	Page Counter.
IR	VARIABLE -	Counter of number of reservoir rights called out in current month. Reset each month.

IRC	VARIABLE -	Reservoir code identifying reservoir for area-capacity data.
IRDATE	1DIM ARRAY -	Reservoir priority date in the form MMDDYYYY. Read from TAPE16.
IRESCD	VARIABLE -	Reservoir code number. Used to associate project rights with their reservoir.
IRESOPT	VARIABLE -	Reservoir/No Reservoir Option.
IRESSWI	1DIM ARRAY -	Reservoir flag, set to 1 if modeled otherwise set to 0.
IRFILL	1DIM ARRAY -	Set to false at the beginning of each water year (October). Set to true when reservoir reaches maximum storage capacity.
IRFLAG	VARIABLE -	End-of-file flag for reservoir file.
IRG	VARIABLE -	Do loop index for number of area-capacity ranges for which evaporation is calculated.
IRN	VARIABLE -	Do loop index for reading runoff values at each input station.
IRS	VARIABLE -	Do loop index for NORES array (number of reservoirs called out).
IRSNUM	VARIABLE -	Reservoir code number.
IRSORD	1DIM ARRAY -	Reservoir stream order.
IRSTAN	1DIM ARRAY -	Reservoir station number.
IRT	VARIABLE -	Do loop index for number of return flows.

IRTEMP	1DIM ARRAY -	Temporary variable used in reading reservoir data. Variable is renamed for each data point.
IRUNYR	VARIABLE -	Year number printed on output.
IS	VARIABLE -	Index for station number arrays.
ISK	VARIABLE -	Index for reading reservoir information from temporary file and writing to permanent file.
ISS	VARIABLE -	Index for station number in station and river arrays.
IST1	VARIABLE -	Index for station numbers downstream of currently processed reservoir or right.
ISTART	VARIABLE -	Index for first station number and stream order downstream of reservoir or diversion station.
ISTAT	VARIABLE -	Station number where the runoff is to be input.
ISTATA	2DIM ARRAY -	This array contains the following information for each station in the river basin:

1. Station number
2. Stream order number

3-12. Station description

The stations are stored in ascending order by station number.

The information for a particular station is stored at the same position (row) in the arrays: ISTATA, RIVER, AVAIL, AVWRET and AVOUT. Once the position of the station in question is found in the ISTATA array (by comparing station numbers), the information about the station can be found at the same position in the other arrays. For example, if the station number for the station being considered is found in the first column of the 651st row of ISTATA, ISTATA (651,1), then the other information for that station is in:

ISTATA, (651, 2-12)

RIVER (651, 1-24)

AVAIL (651)

AVWRET (651)

AVOUT (651, 1-12)

and can be accessed for processing.

IT VARIABLE - Index to total eight monthly reservoir activities.

ITRY	VARIABLE -	Do loop index to calculate return flow plus available flow to determine if diversion can be made.
IYEAR	VARIABLE -	Counter for number of years processed.
IYR	VARIABLE -	Current year being processed.
J	VARIABLE -	Counter.
JPRAF	VARIABLE -	Junior project right diversion amount converted to acre-feet.
JPRDLY	1DIM ARRAY -	Return flow delay table for junior project right to be used for corresponding JPRETS station.
JPREMP	2DIM ARRAY -	Junior project right permit number in two segments.
JPRETS	1DIM ARRAY -	Return flow station numbers for junior project rights.
JPRPMT	1DIM ARRAY -	Junior project right permit number, alpha and/or numeric characters.
JPRSTA	VARIABLE -	Station number from where junior project right diverts.
JPRTOT	VARIABLE -	Amount of a junior project right called out.
K	VARIABLE -	Counter of months.
KK	VARIABLE -	Index in station array for station number (1) and stream order (2).
LINPPAG	VARIABLE -	Number of lines per page.

LR	VARIABLE -	Flag in the reservoir right record which indicates the last (most junior) right for each reservoir. 0 = There are more rights. 1 = This is the last (most junior) right.
MAXRES	VARIABLE -	Maximum number of reservoirs which can be processed.
MAXRESD	VARIABLE -	MAXRES + 1.
MON	VARIABLE -	Month counter.
MONTHN	1DIM ARRAY -	Month names for output reports.
MR	VARIABLE -	Highest code number of active reservoirs.
MSKIP	VARIABLE -	One value less than the number of reservoirs read.
MSPILL	1DIM ARRAY -	TRUE/FALSE flag. Set to **false** at the beginning of each water year (October). Set to **true** when reservoir reaches maximum storage capacity.
MTHDAY	1DIM ARRAY -	Number of days in each month.
NEQTYPE	2DIM ARRAY -	Type of equation for area-capacity relationship.
NJPRET	VARIABLE -	Number of return flow stations for a junior project right.

NODIV	1DIM ARRAY -	Contains station numbers of diversion rights which were called out during current time period.
NOFLOW	1DIM ARRAY -	Array containing station numbers of instream flows which were called out during current time period.
NORD	1DIM ARRAY -	Stream order at station of interest.
NORES	1DIM ARRAY -	Array of station numbers of reservoirs which were called out during current time period.
NPROJ	VARIABLE -	Permit number index for junior project right.
NRANGE	1DIM ARRAY -	Number of area-capacity relationships for reservoirs.
NRET	VARIABLE -	Number of return flow stations for the current diversion.
NRIGHT	VARIABLE -	Index of current reservoir right being processed.
NS	VARIABLE -	Index of current reservoir station number.
NSKIP	VARIABLE -	Counter for reading current reservoir data from temporary reservoir file and writing to permanent file (TAPE18).
NST	VARIABLE -	Controlling station number.
NSTAT	VARIABLE -	Station index for diversion station.

NSTATJ	VARIABLE -	Index for station numbers in station array which match junior project right station number.
NSTATP	VARIABLE -	Index for station number in station array which matches station of senior project, junior project (SPILL, FROM RIVER) or junior project operated from river first (as a senior project right).
NSTATR	VARIABLE -	Station number in station array which matches return flow station.
NSTJ	VARIABLE -	Index for station numbers in station array which match junior project right station number.
NSTJR	VARIABLE -	Junior project right return flow station index.
NSTP	VARIABLE -	Index for station number in station array which matches senior project, junior project (SPILL, FROM RIVER) or junior project operated from river first (as a senior project right).
NSTR	VARIABLE -	Index for reservoir station number.
NUMMON	VARIABLE -	Number of months remaining in which to achieve goal power release volume.
NUMR	VARIABLE -	Index of reservoir data for each reservoir.
NUMRES	VARIABLE -	Number of reservoirs read.

NUMREST	VARIABLE -	Highest code number of active reservoirs.
NUMRUNS	VARIABLE -	Number of stations per year in the runoff file.
NUMSTA	VARIABLE -	Number of stations read.
ORD	VARIABLE -	Stream order.
ORDER	VARIABLE -	Index for stream order.
ORDERR	VARIABLE -	Stream order variable used to determine where flow must be added to river arrays.
ORDR	VARIABLE -	Stream order for the station to which JPR return flow occurs.
PCTCAL	VARIABLE -	Percent called out for water right.
PCTJPR	1DIM ARRAY -	Percent of total return flow from junior project right to be returned to JPRETS return flow stations.
PCTTOT	1DIM ARRAY -	Percent of the total return flow from a "normal" diversion which enters the basin at the corresponding return flow station (RETSTA).
POWREL	1DIM ARRAY -	Power release actually made. Request may be constrained by minimum volume or maximum flow capacity of the reservoir.
POWREQ	1DIM ARRAY -	Power release requested (acre-feet) - calculated at the end of each month, based on goal date and volume. Release

		is made at the beginning of the next month.
PROJTF	1DIM ARRAY -	Total monthly project releases from reservoir.
RAVCFS	VARIABLE -	Reservoir storage available for release in average cubic feet per second.
RELAF	VARIABLE -	Reservoir releases in acre-feet used to adjust current storage.
RELCFS	VARIABLE -	Total of non-project and initial power release in cfs.
RELINT	VARIABLE -	Initial power release.
RELNP	1DIM ARRAY -	Non-project release (actual).
REMCAP	VARIABLE -	Remaining storage capacity of reservoir; maximum storage capacity less current storage.
REMCP	VARIABLE -	Remaining capacity of reservoir used to determine amount reservoir can store under water rights (one-filling rule).
REMDCR	VARIABLE -	Remaining decree; maximum decreed storage less year-to-date storage.
REMDIV	VARIABLE -	Requested diversion amount for project right which is called out due to unavailable river flow.
REMJPR	1DIM ARRAY -	Remaining portion of junior project right which has not been satisfied by

		reservoir releases and may subsequently be satisfied from available river flow.
REMRIT	VARIABLE -	Amount of reservoir water right not yet fully met in current year.
REQJPR	VARIABLE -	Amount of water a junior project right has requested to meet its demand.
REQNP	1DIM ARRAY -	Non-project release requested.
RESAVL	VARIABLE -	Reservoir volume available for releases.
RESDAT	VARIABLE -	IRDATE converted to YYYYMMDD for comparison with other rights.
RESFLG	1DIM ARRAY -	Flag indicating whether junior project rights are processed from reservoir storage. Set to false at the beginning of each month. Set to true if no spill condition exists and the junior project rights are processed at the reservoir date.
RESNAM	2DIM ARRAY -	Sixteen character descriptions of the reservoir.
RESNUM	VARIABLE -	Reservoir code of the reservoir from where the junior project right will get water.
RESPMT	1DIM ARRAY -	Permit number for reservoir water right.
RESREL	VARIABLE -	Amount released from reservoir for Project Right (SPR, JPR (SPILL), JPR (as SPR)).

RESRIT	VARIABLE -	Total water(acre-feet) allowed to be stored by the reservoir each water year, under this right.
RESTAT	VARIABLE -	Reservoir station number (reservoir rights file).
RET	VARIABLE -	Total amount of return flow from "normal" diversion occurring in current month.
RETCFS	VARIABLE -	Amount of water actually diverted from river by a Project Right (SPR, JPR (SPILL) and JPR (as SPR)) and for which return flow must be calculated.
RETDLY	1DIM ARRAY -	Return flow delay table code for "normal" diversion to be used from delay table file.
RETSTA	1DIM ARRAY -	Station number where return flows enter the basin.
RITCFS	VARIABLE -	Portion of reservoir right not satisfied; converted from acre-feet to cfs.
RITJPR	1DIM ARRAY -	Twelve months of diversion amounts (calendar year) for junior project right (cfs).
RIVER	2DIM ARRAY -	This array contains 24 months of data for each station in the river basin. The values correspond to the monthly average cubic feet of water per second

which is in the river at each station in the basin.

Since the data for all the years to be processed cannot be stored in the program at once, only two years (24 months) of data is stored at one time. The current year being processed and the next year to be processed are stored. This second year is needed to store delayed return flow from diversions which take place in current (first) year. After processing is finished for the current year, its final status is written to output files (TAPE9 and TAPE10). Then the data in the second year is moved to the corresponding months in the first year. The values in the second year are set to zero, and runoff for the next year is added to the stations in the second twelve months of RIVER. This cycle repeats until all runoff data has been processed.

RLIMIT	2DIM ARRAY -	Upper capacity limit for reservoir per each area-capacity relationship (acre-feet).
RNFLAG	VARIABLE -	Set to true when an end-of-file (EOF) is read from the runoff file (TAPE12). The program will process one more year and stop.
RNPJRL	2DIM ARRAY -	Non-project reservoir release percentages for 12 months (January-December). Monthly percentage to be applied to volume available from storage.
RRYTD	2DIM ARRAY -	Water year to date totals (acre-feet) for each of the (up to) four water rights of each reservoir. Reset each October, they are used each month to determine remaining water allowed to be stored under each right.
RSDATA	1DIM ARRAY -	Monthly reservoir activity data read from TAPE19 (temporary file) and written on file TAPE18.
RSRMET	1DIM ARRAY -	Set to NO each October. Set to YES if decree maximum has been reached by the total of all rights for each reservoir.
RSTNUM	1DIM ARRAY -	Station number of reservoir location.

RTEMP	1DIM ARRAY -	Temporary variable used to read reservoir data from file.
RTOTAL	1DIM ARRAY -	Total annual amounts (in acre-feet) of monthly activities of each reservoir. Read from TAPE19 and written to TAPE18.
RUNOFF	1DIM ARRAY -	Monthly runoff values beginning with January (acre-feet).
STOCFS	VARIABLE -	Amount stored in reservoir converted to cubic feet per second (cfs).
STOMON	1DIM ARRAY -	Monthly total of water (acre-feet) stored for each reservoir.
TOTRET	VARIABLE -	Total amount of water to be returned to the basin for a diversion at all its return flow stations.
VOLINT	1DIM ARRAY -	Initial volume for month in reservoir (acre-feet) for use in evaporation calculations.
VOLMAX	1DIM ARRAY -	Maximum reservoir storage volume (acre-feet).
VOLMIN	1DIM ARRAY -	Minimum reservoir storage volume (acre-feet).
YTDSTO	1DIM ARRAY -	Water year to date totals of water (acre-feet) stored for each reservoir.
YTOT	VARIABLE -	Annual flow in acre-feet at each station

for initial runoff, final river and available flows.

APPENDIX D

GLOSSARY

GLOSSARY

Abandonment - The loss of a water right based on non-use of that water right.

Acre-Foot - The volume of water required to cover one acre of land to a depth of one foot; 325,850 gallons or 1,233.5 cubic meters. One acre-foot supplies a family of four for about one year.

Adjudication - A judicial proceeding in which a priority is assigned to an appropriation and a certificate issued defining the water right.

Administrative Procedures - Proceedings before an officer of the executive branch of government as distinguished from proceeding before the judicial branch of government.

Appropriation - The diversion of a certain portion of the waters of the State and the application of same to a beneficial use (under certain conditions an appropriation for instream flow or minimum lake level maintenance may be accomplished without the act of diversion and application to beneficial use).

Beneficial Use - The use of that amount of water that is reasonable and appropriate under reasonable efficient practices to accomplish, without waste, the purpose for which the diversion is lawfully made and without limiting the generality of the foregoing, shall include impoundment of water for recreational purposes, including fishery or wildlife.

Call - The placing of a call by a senior priority to the Water Commissioner to shut down junior priorities so that the senior is able to divert its full entitlement. In such cases, junior priorities are curtailed or "called out."

Certificated Water Right - A water right that has been perfected and placed to beneficial use.

Certificate of Appropriation - An official document, issued by the State Board of Control, defining the priority, amount,

use and location of a water right or plan of augmentation. When issued, the certificate serves as a mandate to the State Engineer to administer the water rights involved in accordance with the certificate.

Consumptive Use - The amount of water consumed during use of the water and no longer available to the stream system. For irrigation, consumptive use is water used by crops in transpiration and building of plant tissue.

Conveyance Loss - The loss of water from a conduit due to leakage, seepage, evaporation or evapotranspiration.

Creek - A natural stream of water, normally smaller than, and often tributary to, a river.

Deep Percolation - The drainage of soil water by gravity below the maximum effective depth of the root zone.

Depletion - Net rate or quantity of water taken from a stream or ground water aquifer and consumed by beneficial and non-beneficial uses. For irrigation or municipal uses, the depletion is the headgate or well-head diversion less return flow to the same stream or ground water aquifer.

Developed Water - Water so situated that it would not, but for man's actions, contribute materially to either a natural stream or to non-tributary ground water, but is placed under control of man by some such artificial works as a mine or a tunnel.

Direct Flow Right - A right defined in terms of discharge and which must be put to use more or less promptly following diversion from the source.

Discharge, or Rate of Flow - The volume of water passing a particular point in a unit of time. Units of discharge commonly used include cubic feet per second (cfs) or gallons per minute (gpm).

Ditch - A narrow trench cut into the surface of the ground to transport water from a stream to a point of use away from the stream.

Divert - Removing water from its natural course or location, or controlling water in its natural course or location, by means of a ditch, canal, flume, reservoir, bypass, pipeline, conduit, well, pump or other structure or device.

Diversion Records - Record of the daily flow in cubic feet per second for a ditch or other diversion structure. Compiled by the District Water Commissioner, ditch rider or other water official, diversion records are generally on file and available for review at the State Engineer's Office.

Duty of Water - The total volume of irrigation water required to mature a particular type of crop. It includes consumptive use, evaporation and seepage from ditches and canals, and the water eventually returned to streams by percolation and surface runoff, usually expressed in acre-feet per acre.

Effective Precipitation - The amount of rain that falls during the growing season and is available for growth of crops. Effective precipitation is a portion of the total rain that falls during the growing season and is a function of the type of soil, the time period in which each rain falls, and its intensity. Thus, effective precipitation usually is less than precipitation measured at a given point.

Enlargement - A subsequent right awarded to a ditch or structure enlarging the amount granted originally. More than one enlargement may be awarded to a ditch or structure and each enlargement will have a priority related to the date it was appropriated and applied to beneficial use. Enlargements may be absolute or conditional.

Evaporation - The physical process by which a liquid or solid is transformed to the gaseous state which in irrigation usually is restricted to the change of water from liquid to gas.

Evapotranspiration - The combined processes by which water is transferred from the earth surface to the atmosphere; evaporation of liquid or solid water plus transpiration from plants (See Consumptive Use).

Futile Call - A situation in which a junior priority will be permitted to continue to divert in spite of demands by a senior appropriator in the same water shed, because to curtail the junior from diversion would not be effective to produce water for beneficial use for the senior.

Gage - (1) An instrument used to measure magnitude or position; gages may be used to measure the elevation of a water surface, the velocity of flowing water, the pressure of water, the amount of intensity of precipitation, the depth of snowfall, etc. (2) The act or operation of registering or measuring magnitude or position. (3) The operation, including both field and office work, of measuring the discharge of a stream of water in a waterway.

Gage Height - The height of the water surface above the gage datum. Gage height is often used interchangeably with the more general term, "stage", although gage height is more appropriate when used with a gage reading.

Gaging Station - A particular site on a stream, canal, lake or reservoir where systematic observations of gage height or discharge are made.

Ground Water - For administrative purposes, ground water is usually defined as any water not visible on the surface of the ground under natural conditions.

Ground-Water Hydrology - The branch of hydrology that treats ground water, its occurrence and movements, its replenishment and depletion, the properties of rocks that control ground-water movement and storage, and the methods of investigation and utilization of ground water.

Growing Season - That portion of the year, usually May through October, in which the plants are consuming water and nutrients.

Headgate - A physical structure on a stream through which water is diverted into a ditch.

Historic Use - The documented diversion and use of water by a water right holder in a ditch over a period of years.

Instream Flow Needs - Those habitat requirements within the running water ecosystem related to current velocity and depth which present the optimum conditions of density (or diversity) or physiological stability to the aquatic organism being examined.

Irrigated Area - The gross farm area upon which water is artificially applied for the production of crops, with no reduction for access roads, canals, or farm buildings.

Irrigation - The application of water to crops, lawns and gardens by artificial means to supplement natural precipitation. Water can be applied by spreading over the ground, by sprinkling or dripping.

Irrigation Efficiency - The ratio of the volume of water consumed by a specific beneficial use as compared to the volume of water delivered. Efficiency may be computed in terms of the water diverted at the ditch headgate or the water delivered to the farm headgate.

Irrigation Return Flow - Applied water which is not consumptively used and returns to a surface or ground-water supply. In water right litigation the definition may be restricted to measurable water returning to the stream from which it was derived.

Irrigation, Supplemental - An additional irrigation water supply which supplements the initial, or primary, supply.

Irrigation Water Requirement - The quantity of water, exclusive of effective precipitation, that is required for various beneficial uses.

Lateral - A minor ditch headgating off the main ditch used to direct water onto the land. A ditch may have many laterals,

depending on the amount of acreage irrigated, the slope of the land, and the rate of seepage losses.

Loss - The difference between the amount of water that is actually placed on the land and the amount of water that was physically diverted to the headgate. Losses usually are from seepage and evaporation.

Non-Consumptive Use - A use of water that does not reduce the supply, such as for hunting, fishing, boating, water-skiing, and swimming.

Original Right - The first right awarded to a ditch or storage structure.

Perfection of a Water Right - The process of meeting all of the legal requirements for establishing a legal right to the use of water. Once perfected, a water right receives a certificate of appropriation.

Permitted Water Right - A right to perfect a water right with a certain priority upon the completion of the appropriation upon which such water right is to be based.

Potential Evapotranspiration - The rate at which water, if available, would be removed from the soil and plant surface expressed as the rate of latent heat transfer per square centimeter or depth of water. For comparative purposes potential evapotranspiration refers to a well-watered crop like alfalfa (lucerne) with 30 to 50 centimeters of top growth and about 100 millimeters of fetch under given climatic conditions unless defined otherwise.

Prior Appropriation - A term describing the general process by which water rights are distributed among several claimants. The prior appropriation system developed in the Western United States, in contrast to the Riparian Right system in the East, which gives water rights to the owners of lands through which the water flows. In the West, however, the first person to use the water beneficially gets the

water right, whether or not that person owns land next to the river or lake from which the water is diverted.

Priority - The relative seniority of a water right as determined by its adjudication date and appropriation date. In some cases, other factors are also involved in determining priority. The priority of a water right determines its ability to divert in relation to other rights in periods of limited supply.

Reservoir - A pond, lake, or basin, either natural or artificial, used for the storage, regulation and control of water.

Return Flow - Unconsumed water which returns to its source or some other water body after its diversion as surface water or its extraction from the ground. Also, tailwater, drainage.

River Basin - The area drained by a river and its tributaries.

Runoff - Precipitation that flows to and in surface streams; renewable water.

Seepage - (1) The slow movement of water through small cracks, pores, interstices, etc., of a material into or out of a body of surface of subsurface water. (2) The loss of water by infiltration into the soil from a canal, reservoir, or other body of water, or from a field. Seepage is generally expressed as flow volume per unit time. During the process of priming, the loss is called "absorption loss".

State Engineer - The chief executive officer in the executive department of the State government who administers the permits and certificates defining water rights.

Storage Right - A right defined in terms of the volume of the water which may be diverted from the flow of the stream and stored in a reservoir or lake to be released and used at a later time either within the same year or a subsequent year.

Total Consumptive Use - The amount of water, regardless of its source, used by the crops during the growing season. It is the amount of water that is physically removed from

the stream's system and is not available for other users on the stream.

Trans-Basin Diversion - The removal of the water of a natural stream from its natural basin into the natural basin of another stream.

Transfer - The process of moving a water right originally decreed to one ditch, to another ditch, by court decree. A transferred water right generally retains its priority in the stream system and may or may not retain its right to divert its entire decreed amount.

Unit Consumptive Use (Irrigation) - The amount of water used by crops for growth, less effective precipitation, expressed in acre-feet per acre or feet of water. Unit consumptive use is considered synonymous with irrigation consumptive use and is less than total consumptive use. Water for consumptive use may be supplied from surface water diverted by a ditch and ground water occurring naturally beneath the crops.

Virgin Flow - The flow of a river that would occur in the absence of human activities; synonymous with native supply.

Volume - A specific quantity of water generally expressed in terms of acre-feet. An acre-foot is defined as the amount of water required to cover 1 acre of land to a depth of one foot and is equivalent to 43,560 cubic feet, or 325,900 gallons.

Water Commissioner - Public officials under the direction of the Division Engineers who carry out the detailed administration from day to day of the waters of portions of each water division.

Water Course - A place on the earth's surface where water flows, regularly or intermittently, in a defined channel.

Water Development - The process of building diversion, storage, pumping and/or conveyance facilities to apply water to beneficial use.

Water Division - A major water shed of the State.

Water Right - A right to use, in accordance with its priority, a certain portion of the waters of the State by reason of the appropriation of the same.

Watershed - The area from which water drains to a single point.

Water Year - The 12-month period October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. Thus, the year ending September 30, 1959, is the "1959 water year."

INDEX