

SOIL CONSERVATION SERVICE
Reservoir Operation Study Computer Program (RESOP)
Microcomputer Version -- November 30, 1987

MS DOS Operating System

Instructions

Operation

Insert the diskette in the A drive and set the default drive to A by entering "A: <return>". When the A prompt appears, enter the command "dir <return>" to get a list of files on the diskette.

RESOP may be run from a single disk drive by entering "RESOP <return>". However, it is recommended that the README.1ST file be viewed before running the program.

To view the file on the screen, enter the command "TYPE README.1ST|MORE <return>" and the first page will be listed on the screen. Pressing any key will result in the next page being listed.

To become familiar with the program operation, data for six sample jobs are included on the diskette. It is recommended that the sample jobs be run and output sent to the screen, printer, and/or a file and the results checked against the output in the User Manual.

SOIL CONSERVATION SERVICE
Reservoir Operation Study Computer Program (RESOP)
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UNIX Operating System

Instructions

The RESOP program and associated files may be transferred from the diskette to the AT&T 3B2 according to the following instructions.

The following files are on the diskette.

```
resop (shell command file to run program)
readme.lst (instructions)
resop.ld (executable program)
sample.1 (sample job data set 1)
sample.2 ( " " " " 2)
sample.3 ( " " " " 3)
sample.4 ( " " " " 4)
sample.5 ( " " " " 5)
sample.6 ( " " " " 6)
```

The remaining files on the diskette are associated with the data input program. (See readme.lst file for description.)

These files may be transferred to a directory on the 3B2 by accessing the "sysadm" menu then selecting "file management" and "restore" options. (See pages 30 and 49 of the Guide for System Administrators Using FOCAS, November 1986.)

Operation

The shell command "resop" can be used to run the program and direct output to the screen, printer, or file. It is recommended that the README.LST file be viewed before running the program.

To become familiar with program operation, data for six sample jobs are included. It is recommended that the sample jobs be run and output sent to the screen, printer, and/or a file and the results checked against the output in the User Manual.

United States
Department of Agriculture

Reservoir Operation
Study Computer Program (RESOP)

Soil
Conservation
Service

User Manual

Technical Release No. 19
Appendix A

Engineering Division
Washington, D.C.

November 1987

Technical Release No. 19
Appendix A

Reservoir Operation Study Computer Program (RESOP)
User Manual

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TECHNICAL RELEASE 19 DETERMINATION OF STORAGE REQUIREMENTS TO MEET WATER SUPPLY-DEMAND RELATIONSHIPS

USER MANUAL

RESERVOIR OPERATION STUDY COMPUTER PROGRAM (RESOP)

Introduction

The Reservoir Operation Study Computer Program (RESOP) can assist in the planning, design, and evaluation of reservoirs which must meet water supply and demand requirements. Reservoir operation and management has become an important issue in many areas due to increasing competition for water supplies.

RESOP will compute a monthly water balance for a reservoir system based upon inflow, outflow and reservoir storage data. The inflow minus the outflow equals the remaining storage in the reservoir. The inflow to the reservoir consists of runoff from the watershed, rainfall on the water surface of the reservoir, any outside pumping, and releases from an upstream reservoir. The outflow includes seepage, evaporation, demand and spill. The demand may consist of low flow, irrigation, municipal or other requirements. Figure A-1 shows the water balance components used in RESOP. The storage data consists of a storage-surface area relation and upper and lower limits of reservoir storage. The reservoir surface area is continuously changing as the storage in the reservoir changes. The program assumes spill occurs when the inflow minus outflow is positive and the reservoir storage is at the spill level. An estimate of seepage for each site should be made. Multiple reservoirs in series may be analyzed. Up to 50 years of reservoir operation may be computed by the program.

The RESOP program is data intensive and the mathematics are relatively simple. The advantages of using the program are that the water balance for many years may be computed quickly and any number of alternatives may be computed and compared efficiently.

Several different approaches may be used in modeling reservoir systems with RESOP. One approach is to use historical records. If the record is long enough, it may contain both wet and dry years. A range of storage limits, demands, and starting storages can be analyzed for this one period of record.

Another approach is to base all or some of the monthly input data on probabilistic analysis. This way the reservoir operation during a series of wet, dry, and normal years may be studied. Conservative evaporation values can be entered based on probability studies published in Reference 2. An example of probabilistic analysis of runoff and its effects on reservoir operation begins on page 4 of this Technical Release (TR).

More background information on reservoir operation studies is contained in pages 1 to 4 of this TR.

The remainder of this User Manual is organized into five parts, Input Requirements, Program Computations, Output Description, Sample Jobs, and Data Input Sheets.

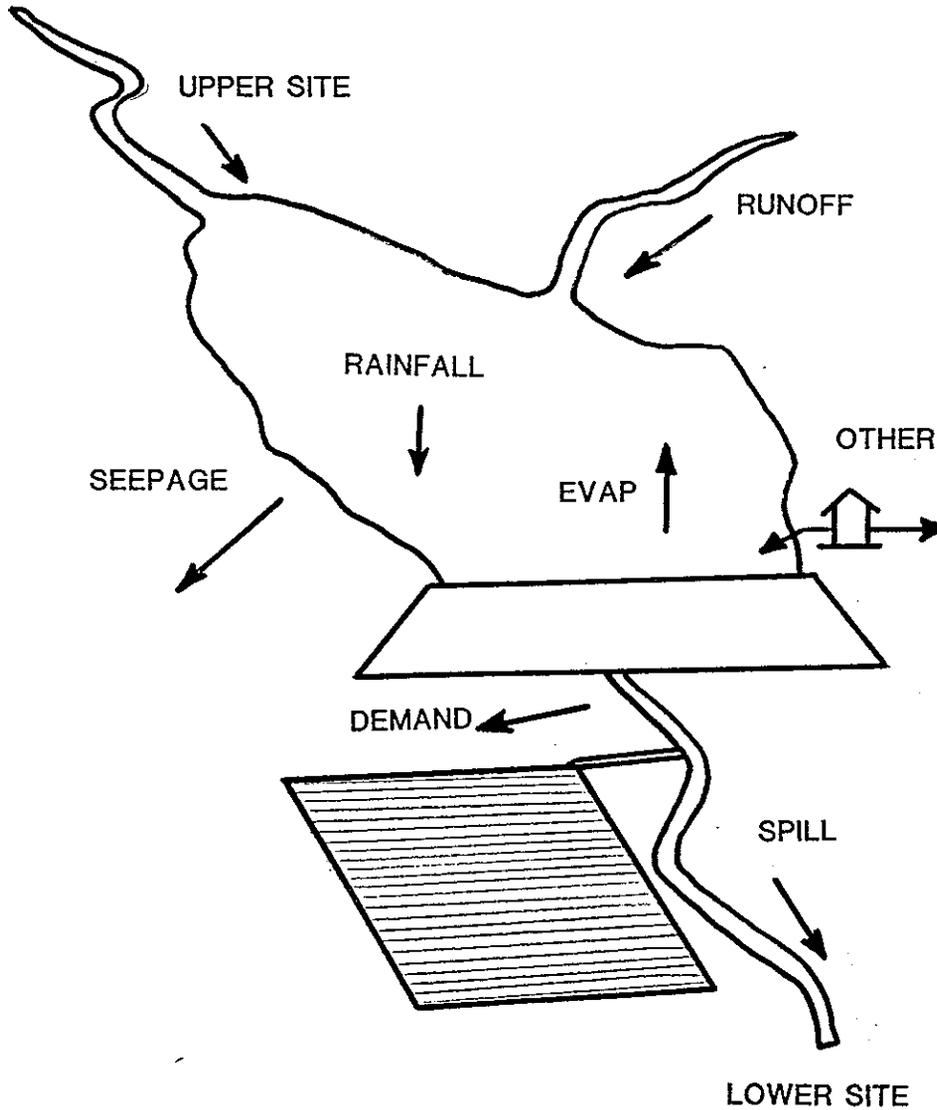


Figure A-1.--Water balance components.

Input Requirements

This program requires two types of input data. The first type is used once for each site. The second type is needed for each year of study and for each site. The program handles up to a maximum of 50 years of operation per study. All data fields should contain either alphanumeric characters or be blank. Numeric fields are not required to contain a decimal point. Input data is entered in standard 10 column fields (see input data forms and sample jobs). Each line of the record is explained by a control word. Only the first four letters of a control word are required and the word need not begin in the first column. When analyzing multiple sites, enter the data for each site in upstream to downstream order.

INPUT DATA FORM 1CONTROL WORD

- RESERVOIR** First record of a job. Enter once only.
- TITLE** A title record is required for each operation study. This will be the information used as the heading on each output sheet. This would normally be the watershed name and type of operation, i.e., "Recreation Only", "M&I", etc. The title can contain up to 60 characters per record. Two TITLE records per job are allowed.
- STO-AREA** Reservoir storage-surface area curve data. Twelve (12) sets of coordinate points (acre-feet and surface area) may be used to describe the curve; a minimum of 4 sets of points are recommended. If less than 3 points are used on the last record, the extra spaces can be left blank. Coordinate points must be shown in descending order (highest to lowest).
- LIMITS**
- Data Field 1
- Upper Limit -- The storage in acre-feet representing the maximum usable or permissible storage in the reservoir, such as the top of a municipal riser or legal limit. The storage will not exceed this value. Excess water is spilled.
- Data Field 2
- Starting Storage -- The storage in acre-feet of the reservoir at which the study is to begin. This can be the same as the Upper Limit in urban areas and can be the same as the Lower Limit in irrigated areas. This also may depend on the starting month.
- Data Field 3
- Lower Limit -- The lowest storage level in acre-feet that the reservoir is to be depleted (such as the recreation pool level or the sediment pool level). Reservoir storage is permitted to go below this limit. If this happens, the deficit is printed.

Data Field 4

Drainage Area -- The uncontrolled drainage area in square miles for the reservoir under study.

GENERAL

Data Field 1

Evaporation Coefficient (Annual) -- Depending on the type of evaporation data used, a different coefficient is entered.

1. If monthly Class A pan evaporation is used, enter the pan coefficient (in percent). The program will convert the pan evaporation data to free water surface (FWS) evaporation. This coefficient may be obtained from Plate 3 in Weather Bureau Technical Paper No. 37, or the more recent NWS Technical Report 33 (Reference 1).
2. If free water surface (FWS) evaporation data are used, enter 100.0 for the evaporation coefficient. FACTOR records may or may not be needed depending on significance of seasonal heat storage in the reservoir. (See FACTOR record.)
3. If actual lake evaporation data are used, enter 100.0 for the evaporation coefficient. FACTOR records should not be used.
4. If Texas Bulletin -- 6006 is used for evaporation, enter the annual pan coefficient as 6XX.X where XX.X is the correct coefficient. The computer sets up a ratio of this coefficient to the value of 78.0.

Data Field 2

First Year of Record -- The calendar year in which the record begins, such as 1940. Each study may have up to 50 years of record. This value must match the first year for which data such as RUNOFF, RAINFALL, etc. is entered.

Data Field 3

Code -- Enter a "0" when no other sites above or below this site are being considered (or the field may be left blank).

Enter a "1" when spill from this site is to be saved as inflow to a lower site. Use this code for the first site of a multi-site run.

Enter a "2" when spill from an upper site is to be added as inflow to this site. Use this code for the last site of a multi-site run.

Enter a "3" when both "1" and "2" apply. Use this code for any sites between the first and last sites of a multi-site run.

Data Field 4

Optimize Demand -- "0" indicates a normal run. "1" indicates that the lowest storage will be checked against the lower limit and the demand modified until the maximum demand is reached and no deficiency occurs. A "2" performs the same function as a "1" except all printing is suppressed until the maximum demand is found.

Data Field 5

Demand Factor -- A factor used to increase or decrease the demand (from DEMAND records) by a constant percentage may be entered. For example, if demand is to be cut in half, enter 0.5 and if demand is to be doubled, enter 2.0. All demand values on the DEMAND records are multiplied by this factor. The Demand Factor should not be used with Optimize Demand on the same reservoir. If they are, then the demand factor is not used.

For multi-site operation studies, one site is analyzed at a time and optimize demand and demand factor may be used on different sites.

Data Field 6

Duplicate Demand -- Enter "1" and demand will be repeated for all years based on the first year of record. For example, if the same demand is desired for all years, enter a "1" in column 61-70 of the GENERAL record and enter the demand for the first year of record only.

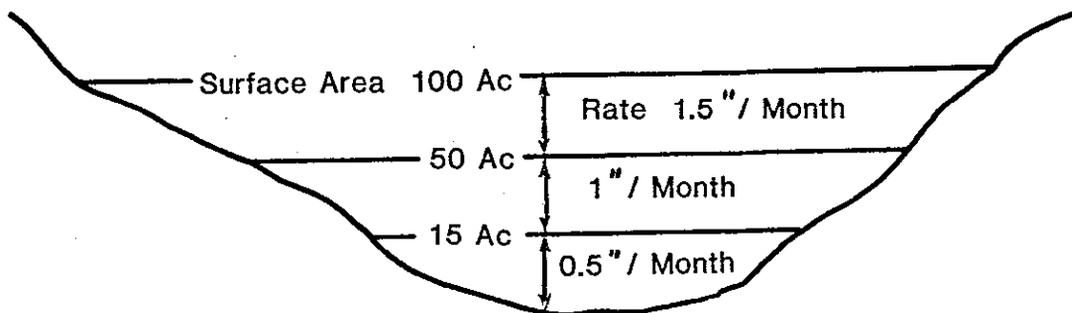
SEEPAGE

Enter up to twelve paired values of surface area in acres and a seepage rate in inches per month. Enter values in descending order. The seepage rate represents the rate between two consecutive surface area values. For example, if the surface areas of 200 acres and 100 acres are entered along with seepage rates of 1 inch/month and 0.5 inch/month, the seepage rate for all surface areas below 100 acres is 0.5 inch/month. For the area between 100 and 200 acres, the seepage rate is 1.0 inch/month. An example of seepage input is shown in Figure A-2. The program computes seepage with a similar procedure as that used in Table 2 (page 15) of this TR.

At least one pair of values must be given. The first value for surface area should be at or above that for the upper limit. If there is only one pair, the seepage rate is assumed constant. Zeros at the end of each table need not be entered.

FACTOR

Use of this control word will permit entry of a monthly evaporation coefficient. Factors represent the ratio of the monthly to annual evaporation coefficient.



SEEPAGE	100	1.5	50	1	15	0.5
---------	-----	-----	----	---	----	-----

FOR CONSTANT RATE OF 1.5 , ENTER :

SEEPAGE	100	1.5
---------	-----	-----

Figure A-2.--Seepage rate input.

The values are multiplied by the annual evaporation coefficient entered on the GENERAL record. The result is a set of monthly evaporation coefficients. If no FACTOR records are included, the evaporation coefficient is assumed to be constant throughout the year (FACTOR values default to 1.0).

For very shallow water with negligible heat storage, the factors are 1.0. The greater the depth of the lake, the larger the fall factors and the lower the spring factors will be. Data from which monthly factors may be calculated are reported in Reference 3 for four lakes. These lakes are: Lake Okeechobee, Florida; Lake Hefner, Oklahoma; Fort Collins Reservoir, Colorado; and Lake Elsinore, California. Lake Hefner, located near Oklahoma City, has a maximum depth of approximately 85 feet, average surface area of 2,300 acres and volume of 60,000 acre-feet. Fort Collins Reservoir also has a depth of approximately 85 feet. From one to three years of evaporation data are reported for each lake. The following table of monthly factors represents the annual trend at the four lakes.

January	0.986	July	1.014
February	0.857	August	1.079
March	0.821	September	1.129
April	0.821	October	1.166
May	0.871	November	1.179
June	0.937	December	1.143

These factors are recommended for use with lakes of similar characteristics to the four lakes mentioned above. Very limited data for defining the monthly factors are available for either smaller or larger lakes.

If different factors are desired, all twelve factors must be entered on the FACTOR records. FACTOR records are not used with the Texas Bulletin 6006 procedure.

CHANGE

This control word allows selected information to be modified. Enter the control word that has data to be changed (TITLE, STO-AREA, LIMITS, GENERAL, SEEPAGE, FACTOR, RAINFALL, RUNOFF, EVAP, DEMAND, OTHERIN, or OTHER). All applicable data must be re-entered following the CHANGE record. Multiple CHANGE records may be used. Data only for selected years may be changed if desired. Sample Job 4 illustrates use of the CHANGE record.

INPUT DATA FORM 2

Data on this form consists of data for each calendar year. Data for January to June is entered on the first record and July to December on the second record of each year. The data may be entered either by year or by data type. For example, enter all RAINFALL, RUNOFF, EVAP, etc., data for one year at a time, or enter all RAINFALL data, then all RUNOFF data, etc. The year is needed in columns 71 to 80 for each data type and year of record. The data should be checked by the user to make sure the data is entered by consecutive years, and each data type has values for the same years. If data for any year is missing, it is set to zero. DEMAND, OTHERIN, and OTHER data are not required for program operation. However, in most cases, the user will want to look at the effects of various demands and other inflows or outflows on the reservoir operation. END DATA and END JOB records are required.

CONTROL WORD

RAINFALL The monthly rainfall amount in inches taken from Climatological Data National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce.

RUNOFF The monthly inflow in watershed inches into the reservoir. Generally taken from USGS stream gage records. At ungaged reservoir sites, runoff data may be transferred or adjusted from a nearby gaged watershed if hydrologically similar. A source of data for runoff includes the WATSTORE system. If the mean daily flow file is retrieved at a gage, the mean monthly flow can be converted to inches over the drainage area and entered into RESOP.

EVAP Enter monthly Class A pan, free water surface, or actual lake evaporation in inches. A data source for average monthly Class A pan evaporation is Reference 2. Pan evaporation at a limited number of locations is available from Climatological Data publications from NOAA.

DEMAND The monthly demand in acre-feet that the reservoir is required to satisfy. Used for municipal supply, irrigation, etc. If there is a minimum required reservoir release rate, convert the rate to acre-feet per month and add it to any other demand.

OTHER This control word may be used to input other types of inflow (positive value) or outflow (negative value) in acre-feet for the reservoir. An example would be pumped inflow.

OTHERIN As an alternative to using the OTHER record, other inflow or outflow may be entered in inches over the drainage area. The program converts this data to acre-feet of volume. Do not use OTHER and OTHERIN for the same year of record.

END DATA This control word terminates individual studies and is entered one time following the last year to be analyzed. This record lets the program know when to begin processing the data for the given site. For multiple sites an END DATA should be entered after data for each site. For various CHANGE options, END DATA should follow the changed data.

END JOB This control word may be used to separate jobs within one program execution.

END RUN After reading this control word the reservoir operation study program stops.

Program Computations

The RESOP program computes a water balance for one or more reservoirs through an accounting procedure using beginning reservoir storage, various inflows, losses, and outflows.

1. Total Inflow (TI) in acre-feet is the sum of all inflows to the reservoir for the given month. The equation used in the program is:

$$TI = (\text{RUNOFF} \times \text{DA} \times \frac{640}{12}) + (\text{UP. SITE}) + (\text{OTHER}) + \frac{(\text{RAINFALL} - \text{RUNOFF}) \times \text{SURFACE}}{12} \quad \text{Eq. 1}$$

where:

RUNOFF = watershed inches;
 DA = total uncontrolled drainage area in square miles above the dam;
 UP. SITE = spill from upper site if present (AF);
 OTHER = other inflow input by user (AF);
 RAINFALL = rainfall in inches; and
 SURFACE = reservoir surface area (acres) at beginning of month.

The fourth term in equation 1 represents additional water falling on the reservoir surface. Essentially all rainfall on the reservoir surface can be considered as an inflow. Runoff is subtracted because it is included in the first term.

2. A table of seepage in acre-feet per month versus surface area is calculated as shown for the example in Table 2. The seepage rate in acre-feet per month is interpolated linearly.
3. Evaporation from the reservoir surface in acre-feet for each month is computed from the equation:

$$\text{EVAPORATION} = (\text{EVAP} \times \text{COEF} \times \text{FACTOR}) \times \frac{\text{SURFACE}}{12} \quad \text{Eq. 2a}$$

where:

EVAP = input from EVAP. records in inches for each month.
 COEF = pan coefficient entered on the GENERAL record divided by 100.
 FACTOR = value of monthly factor from the FACTOR records or default value.
 SURFACE = reservoir surface area at beginning of month in acres.

If Texas Bulletin 6006 is used in the evaporation analysis, evaporation in acre-feet is:

$$\text{EVAPORATION} = (\text{EVAP} \times \text{RATIO}) \times \frac{\text{SURFACE}}{12} \quad \text{Eq. 2b}$$

where:

EVAP = input from EVAP records in inches for each month.

$$\text{RATIO} = \frac{(\text{Pan Coefficient}/100.) - 6}{0.78}$$

The Texas Pan Coefficient entered on the GENERAL record (columns 11-20) must be greater than 600.

4. Demand is that volume of water allocated to meet the various water uses. The demand as input on the DEMAND records is not modified unless:
- A. the optimize demand option is selected or,
 - B. the demand factor option is selected or,
 - C. the reservoir storage is totally depleted.

If the user desires to optimize demand, the demand will be altered by a percentage such that the reservoir storage will not drop below the lower storage limit entered on the LIMITS record. It will normally take several trials before the minimum reservoir storage falls between 1.0 to 1.05 times the lower storage limit. If the lower limit is less than 1 acre-foot, demand is changed until the minimum storage is between zero and 1 acre-foot.

If the user desires that the demand be altered by a certain factor (demand factor option), a single reservoir operation trial will be run with demand altered (see Input Requirements, GENERAL record).

If a certain demand will result in a dry reservoir at the end of the month, the demand is set equal to the remaining storage. The demand will increase again if sufficient inflow is available.

5. Reservoir operation monthly water balance is computed by the following equations (all units in acre-feet):

$$STO_E = STO_B + TI - SEEPAGE - EVAPORATION - DEMAND \quad \text{Eq. 3}$$

Spill:

$$SPILL = STO_E - UPPER \text{ LIMIT} \quad \text{Eq. 4}$$

Deficit:

$$DEFICIT = STO_E - LOWER \text{ LIMIT} \quad \text{Eq. 5}$$

where:

STO_E = storage at end of month.

STO_B = storage at beginning of month.

TI = total inflow.

SEEPAGE = seepage.

EVAPORATION = evaporation.

DEMAND = demand

SPILL = outflow from reservoir.

UPPER LIMIT = upper reservoir storage limit.

DEFICIT = storage depletion below lower limit (negative value).

LOWER LIMIT = lower reservoir storage limit.

Output Description

Output from the RESOP program contains detailed information on each of the water balance aspects for each reservoir and year of operation of a job. The types of information contained in the output table and important explanation follows.

1. Month and year analyzed.
2. Rainfall in inches (repeated from input).
3. Runoff in inches (repeated from input).
4. Evaporation in inches (repeated from input).
5. Other inflow in acre-feet (repeated from input).
6. Demand in acre-feet as computed by program.
7. Up. Site in acre-feet. Spill from the upstream reservoir is considered as an additional inflow to the current reservoir.
8. Total inflow in acre-feet. See Program Computations above.
9. Seepage in acre-feet is calculated based on the surface area at the beginning of the month.
10. Surface Area in acres is the reservoir area at the end of the month. It is interpolated from the STO-AREA table input by the user based on end of the month storage.
11. Evaporation in acre-feet is the monthly evaporation based on the reservoir surface area at the beginning of the month.
12. Storage in acre-feet represents the amount of water in the reservoir at the end of the month. This value will not be greater than the upper limit of reservoir storage entered on the LIMITS record. It may fall below the lower limit if the optimize demand option is not used.
13. Deficit in acre-feet represents the difference between the end of month storage and the lower storage limit entered on the LIMITS record.
14. Spill in acre-feet represents outflow from the reservoir when the end of month storage equals the upper limit entered on the LIMITS record.

At the end of each year, totals are printed for all output except surface area and storage.

For multiple site runs and CHANGE options, similar output tables are also printed.

References

1. National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS), Technical Report NWS 33, Evaporation Atlas for the Contiguous 48 United States, June 1982.
2. NOAA, NWS, Technical Report NWS 34, Mean Monthly, Seasonal, and Annual Pan Evaporation for the United States, December 1982.
3. Harbeck, G.E. and F.W. Kennon, U.S. Geological Survey, Professional Paper 269, Lake Hefner Studies, Technical Report, 1954.

Sample Jobs

Six sample jobs are included to show the features and options available with RESOP.

Sample Job 1. This sample job shows the type of data needed and the organization of data for a reservoir operation calculation for a single site.

Sample Job 2. This sample job illustrates use of the optimize demand feature. The demand is maximized such that there will be no deficits in reservoir storage.

Sample Job 3. Demand may be entered for the first year of record and the program duplicates it for all years as is shown in this sample job. This option can be specified on the GENERAL record.

Sample Job 4. This sample job shows how data may be changed in a single run. Various data types may be changed for certain years if desired. This sample job also illustrates flexibility of data organization (RAINFALL data records are entered as a group).

Sample Job 5. Reservoir operation calculations begin in the month of January. However, input data may be set up so calculations may be started in any month. This sample job shows how calculations can be started in October by entering OTHER inflow to offset the seepage loss for the months of January to September. RAINFALL, RUNOFF, EVAP and DEMAND are zero for the first nine months.

Sample Job 6. Any number of sites can be studied in series. This sample job shows two sites. The demand at the upper site is multiplied by a factor of 2.0 (see GENERAL record) and demand at the lower site is optimized (see also GENERAL record). The spill from the upper site appears as inflow to the lower site. An END DATA record must be entered at the end of data for each site.

For each sample job, there is a listing of the input data and reservoir operation results. Echo listings of input data appear in program output. These pages are omitted from the attached examples in order to reduce the size of this document.

SAMPLE JOB 1

RESERVOIR OPERATION PROGRAM							
TITLE	SAMPLE JOB NUMBER 1						
TITLE	ROUTINE APPLICATION						
STO-AREA	10000.	820.	5200.	450.	2000.	190.	
STO-AREA	400.	65.	150.	35.	0.0	0.0	
LIMITS	2500.	425.	310.	31.			
GENERAL	70.	1949.					
SEEPAGE	280.	1.44	148.	1.08	56.	0.36	
RAINFALL	1.14	1.27	2.16	3.53	4.83	4.08	1949
RAINFALL	3.36	2.11	3.73	2.62	2.19	1.57	1949
RUNOFF	0.05	0.31	0.10	0.05	2.70	0.07	1949
RUNOFF	0.06	0.0	0.17	0.02	0.01	0.01	1949
EVAP.	2.04	1.86	4.40	5.51	6.12	8.16	1949
EVAP.	8.65	8.22	6.08	3.71	2.42	1.81	1949
DEMAND	60.	60.	60.	60.	60.	274.	1949
DEMAND	238.	242.	60.	60.	60.	60.	1949
RAINFALL	1.21	1.07	1.67	3.45	4.21	4.02	1950
RAINFALL	5.70	4.80	3.03	2.85	2.01	1.35	1950
RUNOFF	0.04	0.04	0.03	0.09	0.30	0.23	1950
RUNOFF	3.04	0.71	0.06	0.01	0.02	0.02	1950
EVAP.	1.46	2.00	4.45	7.27	6.37	7.69	1950
EVAP.	4.98	5.96	4.22	4.63	2.74	1.68	1950
DEMAND	60.	60.	60.	60.	184.	413.	1950
DEMAND	60.	107.	100.	60.	60.	60.	1950
END DATA							
END JOB							
END RUN							

RESOP XEQ 11/18/87 10:54:34
 REV 11/30/87

PAGE 2

SAMPLE JOB NUMBER 1
 ROUTINE APPLICATION

YEAR 1949

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.14	.05	2.04	.00	60.00	.00	88.75
FEB	1.27	.31	1.86	.00	60.00	.00	518.00
MAR	2.16	.10	4.40	.00	60.00	.00	183.08
APR	3.53	.05	5.51	.00	60.00	.00	114.69
MAY	4.83	2.70	6.12	.00	60.00	.00	4483.78
JUN	4.08	.07	8.16	.00	274.00	.00	192.80
JUL	3.36	.06	8.65	.00	238.00	.00	157.91
AUG	2.11	.00	8.22	.00	242.00	.00	34.60
SEP	3.73	.17	6.08	.00	60.00	.00	332.01
OCT	2.62	.02	3.71	.00	60.00	.00	73.63
NOV	2.19	.01	2.42	.00	60.00	.00	49.95
DEC	1.57	.01	1.81	.00	60.00	.00	39.94
YR TOTAL	32.59	3.55	58.98	.00	1294.00	.00	6269.13

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	2.67	68.37	7.97	443.12	.00	.00
FEB	2.79	103.35	7.42	890.91	.00	.00
MAR	5.94	110.43	26.53	981.51	.00	.00
APR	6.58	111.42	35.49	994.13	.00	.00
MAY	6.67	230.63	39.78	2500.00	.00	2871.46
JUN	19.88	213.49	109.78	2289.15	.00	.00
JUL	17.82	196.79	107.73	2083.51	.00	.00
AUG	15.81	171.71	94.36	1765.94	.00	.00
SEP	12.81	187.21	60.90	1964.24	.00	.00
OCT	14.66	183.96	40.51	1922.69	.00	.00
NOV	14.28	180.03	25.97	1872.40	.00	.00
DEC	13.80	175.90	19.01	1819.53	.00	.00
YR TOTAL	133.70		575.44		.00	2871.46

RESOP XEQ 11/18/87 10:54:34
 REV 11/30/87

PAGE 3

SAMPLE JOB NUMBER 1
 ROUTINE APPLICATION

YEAR 1950

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.21	.04	1.46	.00	60.00	.00	83.28
FEB	1.07	.04	2.00	.00	60.00	.00	81.20
MAR	1.67	.03	4.45	.00	60.00	.00	73.45
APR	3.45	.09	7.27	.00	60.00	.00	196.68
MAY	4.21	.30	6.37	.00	184.00	.00	553.03
JUN	4.02	.23	7.69	.00	413.00	.00	442.82
JUL	5.70	3.04	4.98	.00	60.00	.00	5068.69
AUG	4.80	.71	5.96	.00	107.00	.00	1252.47
SEP	3.03	.06	4.22	.00	100.00	.00	156.28
OCT	2.85	.01	4.63	.00	60.00	.00	70.72
NOV	2.01	.02	2.74	.00	60.00	.00	70.08
DEC	1.35	.02	1.68	.00	60.00	.00	57.41
YR TOTAL	35.37	4.59	53.45	.00	1284.00	.00	8106.12

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	13.31	175.51	14.98	1814.52	.00	.00
FEB	13.26	174.53	20.48	1801.98	.00	.00
MAR	13.14	171.01	45.31	1756.99	.00	.00
APR	12.72	175.03	72.52	1808.42	.00	.00
MAY	13.20	198.06	65.04	2099.21	.00	.00
JUN	15.97	191.97	88.85	2024.22	.00	.00
JUL	15.24	230.63	55.77	2500.00	.00	4461.90
AUG	19.88	230.63	80.18	2500.00	.00	1045.42
SEP	19.88	228.97	56.77	2479.63	.00	.00
OCT	19.68	223.22	61.84	2408.84	.00	.00
NOV	18.99	219.60	35.68	2364.26	.00	.00
DEC	18.55	216.13	21.52	2321.59	.00	.00
YR TOTAL	193.81		618.93		.00	5507.32

SAMPLE JOB 2

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RESERVOIR OPERATION PROGRAM
TITLE SAMPLE JOB NUMBER 2
TITLE OPTIMIZE DEMAND -- PRINT FINAL OPERATION TABLE
STO-AREA 10000. 820. 5200. 450. 2000. 190.
STO-AREA 400. 65. 150. 35. 0.0 0.0
LIMITS 2500. 425. 310. 31.
GENERAL 69. 1983. 2
SEEPAGE 820. 2.0 400. 1.7 100. 1.0
FACTOR 0.986 0.857 0.821 0.821 0.871 0.937
FACTOR 1.014 1.079 1.129 1.166 1.179 1.143
RAINFALL 1.14 1.27 2.16 3.53 4.83 4.08 1983
RAINFALL 3.36 2.11 3.73 2.62 2.19 1.57 1983
RUNOFF 0.05 0.31 0.10 0.05 2.70 0.07 1983
RUNOFF 0.06 0.0 0.17 0.02 0.01 0.01 1983
EVAP. 2.04 1.86 4.40 5.51 6.12 8.16 1983
EVAP. 8.65 8.22 6.08 3.71 2.42 1.81 1983
DEMAND 60. 60. 60. 60. 60. 274. 1983
DEMAND 238. 242. 60. 60. 60. 60. 1983
RAINFALL 1.21 1.07 1.67 3.45 4.21 4.02 1984
RAINFALL 5.70 4.80 3.03 2.85 2.01 1.35 1984
RUNOFF 0.04 0.04 0.03 0.09 0.30 0.23 1984
RUNOFF 3.04 0.71 0.06 0.01 0.02 0.02 1984
EVAP. 1.46 2.00 4.45 7.27 6.37 7.69 1984
EVAP. 4.98 5.96 4.22 4.63 2.74 1.68 1984
DEMAND 60. 60. 60. 60. 184. 413. 1984
DEMAND 60. 107. 100. 60. 60. 60. 1984
RAINFALL 1.24 2.37 2.26 3.53 4.63 3.78 1985
RAINFALL 2.96 2.56 3.73 2.45 2.54 1.97 1985
RUNOFF 0.05 0.22 0.10 0.17 2.11 0.07 1985
RUNOFF 0.06 0.02 0.17 0.02 0.03 0.04 1985
EVAP. 1.71 1.91 4.40 6.53 6.70 8.49 1985
EVAP. 6.94 6.47 5.44 3.96 2.72 1.77 1985
DEMAND 60. 60. 60. 60. 80. 360. 1985
DEMAND 253. 231. 60. 60. 60. 60. 1985
END DATA
END JOB
END RUN

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SAMPLE JOB NUMBER 2
 OPTIMIZE DEMAND -- PRINT FINAL OPERATION TABLE

YEAR 1983

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.14	.05	2.04	.00	119.40	.00	88.75
FEB	1.27	.31	1.86	.00	119.40	.00	517.55
MAR	2.16	.10	4.40	.00	119.40	.00	181.43
APR	3.53	.05	5.51	.00	119.40	.00	110.65
MAY	4.83	2.70	6.12	.00	119.40	.00	4480.54
JUN	4.08	.07	8.16	.00	545.26	.00	192.80
JUL	3.36	.06	8.65	.00	473.62	.00	151.88
AUG	2.11	.00	8.22	.00	481.58	.00	27.63
SEP	3.73	.17	6.08	.00	119.40	.00	314.93
OCT	2.62	.02	3.71	.00	119.40	.00	60.17
NOV	2.19	.01	2.42	.00	119.40	.00	37.81
DEC	1.57	.01	1.81	.00	119.40	.00	30.62
YR TOTAL	32.59	3.55	58.98	.00	2575.06	.00	6194.77

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	5.58	62.72	7.74	381.03	.00	.00
FEB	5.23	93.77	5.75	768.20	.00	.00
MAR	7.81	96.48	19.48	802.94	.00	.00
APR	8.04	93.21	25.10	761.05	.00	.00
MAY	7.77	230.63	28.57	2500.00	.00	2585.86
JUN	26.84	191.57	101.39	2019.31	.00	.00
JUL	21.31	157.16	96.62	1579.65	.00	.00
AUG	16.43	114.15	80.15	1029.12	.00	.00
SEP	10.34	125.10	45.05	1169.26	.00	.00
OCT	11.89	117.11	31.12	1067.03	.00	.00
NOV	10.76	108.40	19.21	955.47	.00	.00
DEC	9.52	99.71	12.89	844.27	.00	.00
YR TOTAL	141.51		473.07		.00	2585.86

RESOP XEQ 11/18/87 10:55:05
 REV 11/30/87

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SAMPLE JOB NUMBER 2
 OPTIMIZE DEMAND -- PRINT FINAL OPERATION TABLE

YEAR 1984

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.21	.04	1.46	.00	119.40	.00	75.85
FEB	1.07	.04	2.00	.00	119.40	.00	74.29
MAR	1.67	.03	4.45	.00	119.40	.00	61.92
APR	3.45	.09	7.27	.00	119.40	.00	172.20
MAY	4.21	.30	6.37	.00	366.16	.00	523.67
JUN	4.02	.23	7.69	.00	821.87	.00	410.13
JUL	5.70	3.04	4.98	.00	119.40	.00	5038.40
AUG	4.80	.71	5.96	.00	212.93	.00	1252.47
SEP	3.03	.06	4.22	.00	199.00	.00	156.28
OCT	2.85	.01	4.63	.00	119.40	.00	68.56
NOV	2.01	.02	2.74	.00	119.40	.00	67.58
DEC	1.35	.02	1.68	.00	119.40	.00	55.10
YR TOTAL	35.37	4.59	53.45	.00	2555.16	.00	7956.46

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	8.31	95.01	8.25	784.17	.00	.00
FEB	7.92	90.14	9.36	721.77	.00	.00
MAR	7.51	83.58	18.94	637.84	.00	.00
APR	6.97	84.92	28.69	655.00	.00	.00
MAY	7.08	94.56	27.09	778.34	.00	.00
JUN	7.88	55.35	39.18	319.54	.00	.00
JUL	4.61	230.63	16.07	2500.00	.00	2717.86
AUG	26.84	230.63	85.28	2500.00	.00	927.42
SEP	26.84	219.84	63.18	2367.26	.00	.00
OCT	25.31	208.11	68.24	2222.87	.00	.00
NOV	23.65	198.84	38.66	2108.74	.00	.00
DEC	22.34	190.01	21.95	2000.16	.00	.00
YR TOTAL	175.24		424.89		.00	3645.29

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 REV 11/30/87

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SAMPLE JOB NUMBER 2
 OPTIMIZE DEMAND -- PRINT FINAL OPERATION TABLE

YEAR 1985

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.24	.05	1.71	.00	119.40	.00	101.51
FEB	2.37	.22	1.91	.00	119.40	.00	396.97
MAR	2.26	.10	4.40	.00	119.40	.00	202.20
APR	3.53	.17	6.53	.00	119.40	.00	338.81
MAY	4.63	2.11	6.70	.00	159.20	.00	3534.10
JUN	3.78	.07	8.49	.00	716.40	.00	187.03
JUL	2.96	.06	6.94	.00	503.47	.00	142.06
AUG	2.56	.02	6.47	.00	459.69	.00	63.13
SEP	3.73	.17	5.44	.00	119.40	.00	312.36
OCT	2.45	.02	3.96	.00	119.40	.00	56.74
NOV	2.54	.03	2.72	.00	119.40	.00	72.35
DEC	1.97	.04	1.77	.00	119.40	.00	82.66
YR TOTAL	34.02	3.06	57.04	.00	2793.96	.00	5489.92

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	21.09	185.53	18.42	1942.76	.00	.00
FEB	20.45	204.82	17.46	2182.42	.00	.00
MAR	23.18	206.21	42.54	2199.50	.00	.00
APR	23.38	216.97	63.57	2331.96	.00	.00
MAY	24.90	230.63	72.81	2500.00	.00	3109.14
JUN	26.84	177.37	105.49	1838.30	.00	.00
JUL	19.29	142.02	71.77	1385.83	.00	.00
AUG	14.29	105.47	57.01	917.98	.00	.00
SEP	9.11	116.92	37.25	1064.58	.00	.00
OCT	10.73	108.76	31.04	960.15	.00	.00
NOV	9.57	102.77	20.06	883.47	.00	.00
DEC	8.73	98.29	11.96	826.05	.00	.00
YR TOTAL	211.56		549.37		.00	3109.14

SAMPLE JOB 3

RESERVOIR OPERATION PROGRAM

TITLE SAMPLE JOB NUMBER 3

TITLE DEMAND DUPLICATED FROM FIRST YEAR TO ALL YEARS

STO-AREA	10000.	820.	5200.	450.	2000.	190.	
STO-AREA	400.	65.	150.	35.	0.0	0.0	
LIMITS	2500.	425.	310.	31.			
GENERAL	100.	1983.					1
SEEPAGE	400.	3.3	300.	3.0	100.	2.5	
SEEPAGE	50.	2.2					
RAINFALL	1.14	1.27	2.16	3.53	4.83	4.08	1983
RAINFALL	3.36	2.11	3.73	2.62	2.19	1.57	1983
RUNOFF	0.05	0.31	0.10	0.05	2.70	0.07	1983
RUNOFF	0.06	0.0	0.17	0.02	0.01	0.01	1983
EVAP.	2.04	1.86	4.40	5.51	6.12	8.16	1983
EVAP.	8.65	8.22	6.08	3.71	2.42	1.81	1983
DEMAND	60.	60.	60.	60.	60.	274.	1983
DEMAND	238.	242.	60.	60.	60.	60.	1983
RAINFALL	1.21	1.07	1.67	3.45	4.21	4.02	1984
RAINFALL	5.70	4.80	3.03	2.85	2.01	1.35	1984
RUNOFF	0.04	0.04	0.03	0.09	0.30	0.23	1984
RUNOFF	3.04	0.71	0.06	0.01	0.02	0.02	1984
EVAP.	1.46	2.00	4.45	7.27	6.37	7.69	1984
EVAP.	4.98	5.96	4.22	4.63	2.74	1.68	1984
RAINFALL	1.24	2.37	2.26	3.53	4.63	3.78	1985
RAINFALL	2.96	2.56	3.73	2.45	2.54	1.97	1985
RUNOFF	0.05	0.22	0.10	0.17	2.11	0.07	1985
RUNOFF	0.06	0.02	0.17	0.02	0.03	0.04	1985
EVAP.	1.71	1.91	4.40	6.53	6.70	8.49	1985
EVAP.	6.94	6.47	5.44	3.96	2.72	1.77	1985
END DATA							
END JOB							
END RUN							

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SAMPLE JOB NUMBER 3
 DEMAND DUPLICATED FROM FIRST YEAR TO ALL YEARS

YEAR 1983

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.14	.05	2.04	.00	60.00	.00	88.75
FEB	1.27	.31	1.86	.00	60.00	.00	517.92
MAR	2.16	.10	4.40	.00	60.00	.00	182.72
APR	3.53	.05	5.51	.00	60.00	.00	113.53
MAY	4.83	2.70	6.12	.00	60.00	.00	4482.66
JUN	4.08	.07	8.16	.00	274.00	.00	192.80
JUL	3.36	.06	8.65	.00	238.00	.00	156.14
AUG	2.11	.00	8.22	.00	242.00	.00	32.48
SEP	3.73	.17	6.08	.00	60.00	.00	327.13
OCT	2.62	.02	3.71	.00	60.00	.00	69.33
NOV	2.19	.01	2.42	.00	60.00	.00	45.82
DEC	1.57	.01	1.81	.00	60.00	.00	36.66
YR TOTAL	32.59	3.55	58.98	.00	1294.00	.00	6245.94

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	12.70	67.32	11.38	429.67	.00	.00
FEB	12.77	101.28	10.43	864.38	.00	.00
MAR	19.90	106.41	37.14	930.06	.00	.00
APR	21.19	105.12	48.86	913.54	.00	.00
MAY	20.86	230.63	53.61	2500.00	.00	2761.72
JUN	52.24	207.04	156.82	2209.74	.00	.00
JUL	46.34	184.71	149.24	1932.29	.00	.00
AUG	40.76	155.27	126.53	1555.48	.00	.00
SEP	33.40	167.39	78.67	1710.54	.00	.00
OCT	36.43	161.23	51.75	1631.69	.00	.00
NOV	34.89	154.85	32.51	1550.11	.00	.00
DEC	33.30	148.60	23.36	1470.12	.00	.00
YR TOTAL	364.79		780.31		.00	2761.72

RESOP XEQ 11/18/87 10:55:31
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SAMPLE JOB NUMBER 3
 DEMAND DUPLICATED FROM FIRST YEAR TO ALL YEARS

YEAR 1984

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.21	.04	1.46	.00	60.00	.00	80.62
FEB	1.07	.04	2.00	.00	60.00	.00	78.69
MAR	1.67	.03	4.45	.00	60.00	.00	69.20
APR	3.45	.09	7.27	.00	60.00	.00	187.34
MAY	4.21	.30	6.37	.00	60.00	.00	541.22
JUN	4.02	.23	7.69	.00	274.00	.00	433.44
JUL	5.70	3.04	4.98	.00	238.00	.00	5063.71
AUG	4.80	.71	5.96	.00	242.00	.00	1252.47
SEP	3.03	.06	4.22	.00	60.00	.00	156.28
OCT	2.85	.01	4.63	.00	60.00	.00	70.40
NOV	2.01	.02	2.74	.00	60.00	.00	69.08
DEC	1.35	.02	1.68	.00	60.00	.00	56.33
YR TOTAL	35.37	4.59	53.45	.00	1294.00	.00	8058.78

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	31.73	146.32	18.08	1440.93	.00	.00
FEB	31.16	143.44	24.39	1404.07	.00	.00
MAR	30.44	137.63	53.19	1329.64	.00	.00
APR	28.99	138.80	83.38	1344.60	.00	.00
MAY	29.28	168.35	73.68	1722.87	.00	.00
JUN	36.67	169.51	107.88	1737.75	.00	.00
JUL	36.96	230.63	70.35	2500.00	.00	3956.15
AUG	52.24	230.63	114.54	2500.00	.00	843.69
SEP	52.24	227.61	81.10	2462.94	.00	.00
OCT	51.49	217.14	87.82	2334.03	.00	.00
NOV	48.87	209.88	49.58	2244.66	.00	.00
DEC	47.05	203.37	29.38	2164.55	.00	.00
YR TOTAL	477.13		793.38		.00	4799.84

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SAMPLE JOB NUMBER 3
 DEMAND DUPLICATED FROM FIRST YEAR TO ALL YEARS

YEAR 1985

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.24	.05	1.71	.00	60.00	.00	102.83
FEB	2.37	.22	1.91	.00	60.00	.00	399.71
MAR	2.26	.10	4.40	.00	60.00	.00	205.32
APR	3.53	.17	6.53	.00	60.00	.00	343.59
MAY	4.63	2.11	6.70	.00	60.00	.00	3536.96
JUN	3.78	.07	8.49	.00	274.00	.00	187.03
JUL	2.96	.06	6.94	.00	238.00	.00	149.00
AUG	2.56	.02	6.47	.00	242.00	.00	72.35
SEP	3.73	.17	5.44	.00	60.00	.00	328.92
OCT	2.45	.02	3.96	.00	60.00	.00	68.28
NOV	2.54	.03	2.72	.00	60.00	.00	84.54
DEC	1.97	.04	1.77	.00	60.00	.00	92.38
YR TOTAL	34.02	3.06	57.04	.00	1294.00	.00	5570.92

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	45.43	200.80	28.98	2132.98	.00	.00
FEB	44.78	222.17	31.96	2395.94	.00	.00
MAR	50.13	223.29	81.46	2409.68	.00	.00
APR	50.40	230.63	121.51	2500.00	.00	21.36
MAY	52.24	230.63	128.77	2500.00	.00	3295.96
JUN	52.24	206.06	163.17	2197.63	.00	.00
JUL	46.10	185.57	119.17	1943.36	.00	.00
AUG	40.98	161.30	100.06	1632.67	.00	.00
SEP	34.91	173.87	73.12	1793.56	.00	.00
OCT	38.05	167.06	57.38	1706.41	.00	.00
NOV	36.35	163.18	37.87	1656.73	.00	.00
DEC	35.38	161.07	24.07	1629.66	.00	.00
YR TOTAL	526.98		967.51		.00	3317.31

SAMPLE JOB 4

RESERVOIR OPERATION PROGRAM

TITLE SAMPLE JOB NUMBER 4

TITLE CHANGE DATA FOR SEVERAL CONTROL WORDS

STO-AREA	10000.	820.	5200.	450.	2000.	190.	
STO-AREA	400.	65.	150.	35.	0.0	0.0	
LIMITS	2500.	425.	310.	31.			
GENERAL	100.	1952.					
SEEPAGE	820.	1.67					
OTHER	10.	10.	20.	30.	40.	50.	1954
OTHER	40.	30.	20.	10.	0.0	0.0	1954
RAINFALL	1.21	1.07	1.67	3.45	4.21	4.02	1952
RAINFALL	5.70	4.80	3.03	2.85	2.01	1.35	1952
RAINFALL	1.14	1.27	2.16	3.53	4.83	4.08	1953
RAINFALL	3.36	2.11	3.73	2.62	2.19	1.57	1953
RAINFALL	1.25	1.08	1.61	3.42	4.26	4.07	1954
RAINFALL	5.74	4.85	3.01	2.89	2.07	1.31	1954
RUNOFF	0.04	0.04	0.03	0.09	0.30	0.23	1952
RUNOFF	3.04	0.71	0.06	0.01	0.02	0.02	1952
EVAP.	1.46	2.00	4.45	7.27	6.37	7.69	1952
EVAP.	4.98	5.96	4.22	4.63	2.74	1.68	1952
DEMAND	60.	60.	60.	60.	184.	413.	1952
DEMAND	60.	107.	100.	60.	60.	60.	1952
RUNOFF	0.05	0.31	0.10	0.05	2.70	0.07	1953
RUNOFF	0.06	0.0	0.17	0.02	0.01	0.01	1953
EVAP.	2.04	1.86	4.40	5.51	6.12	8.16	1953
EVAP.	8.65	8.22	6.08	3.71	2.42	1.81	1953
DEMAND	60.	60.	60.	60.	60.	274.	1953
DEMAND	238.	242.	60.	60.	60.	60.	1953
RUNOFF	0.05	0.03	0.02	0.10	0.32	0.26	1954
RUNOFF	2.71	0.76	0.09	0.03	0.01	0.04	1954
EVAP.	1.56	2.01	4.35	7.67	6.27	7.29	1954
EVAP.	4.78	5.86	4.42	4.53	2.64	1.48	1954
DEMAND	60.	60.	60.	60.	184.	413.	1954
DEMAND	60.	107.	100.	60.	60.	60.	1954
END DATA							
CHANGE	DEMAND	EVAP.	RUNOFF	RAINFALL	OTHER	FACTOR	
DEMAND	20.	20.	30.	40.	50.	80.	1952
DEMAND	200.	180.	170.	150.	50.	20.	1952
FACTOR	0.986	0.857	0.821	0.821	0.871	0.937	
FACTOR	1.014	1.079	1.129	1.166	1.179	1.143	
DEMAND	30.	50.	50.	70.	120.	150.	1954
DEMAND	250.	200.	100.	60.	50.	20.	1954
RAINFALL	1.0	1.5	2.0	3.6	5.0	4.0	1953
RAINFALL	2.8	2.5	3.9	2.0	2.0	1.0	1953
RUNOFF	0.06	0.06	0.05	0.1	0.4	0.35	1952
RUNOFF	2.5	0.9	0.1	0.05	0.04	0.04	1952
OTHER	50.	40.	30.	20.	0.0	0.0	1954
OTHER	0.0	0.0	0.0	10.	20.	40.	1954
EVAP.	1.8	2.0	4.0	5.0	6.0	7.0	1953
EVAP.	9.0	8.0	6.0	3.0	3.0	1.2	1953
END DATA							
END JOB							
END RUN							

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SAMPLE JOB NUMBER 4
CHANGE DATA FOR SEVERAL CONTROL WORDS

YEAR 1952

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.21	.04	1.46	.00	60.00	.00	72.66
FEB	1.07	.04	2.00	.00	60.00	.00	71.85
MAR	1.67	.03	4.45	.00	60.00	.00	58.61
APR	3.45	.09	7.27	.00	60.00	.00	166.22
MAY	4.21	.30	6.37	.00	184.00	.00	518.11
JUN	4.02	.23	7.69	.00	413.00	.00	408.82
JUL	5.70	3.04	4.98	.00	60.00	.00	5044.88
AUG	4.80	.71	5.96	.00	107.00	.00	1252.47
SEP	3.03	.06	4.22	.00	100.00	.00	156.28
OCT	2.85	.01	4.63	.00	60.00	.00	70.02
NOV	2.01	.02	2.74	.00	60.00	.00	69.08
DEC	1.35	.02	1.68	.00	60.00	.00	56.50
YR TOTAL	35.37	4.59	53.45	.00	1284.00	.00	7945.50

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	9.32	66.58	8.15	420.20	.00	.00
FEB	9.27	65.91	11.10	411.68	.00	.00
MAR	9.17	62.20	24.44	376.68	.00	.00
APR	8.66	67.86	37.68	436.55	.00	.00
MAY	9.44	90.41	36.02	725.20	.00	.00
JUN	12.58	84.57	57.94	650.50	.00	.00
JUL	11.77	230.63	35.10	2500.00	.00	3088.52
AUG	32.10	230.63	114.54	2500.00	.00	998.83
SEP	32.10	226.00	81.10	2443.08	.00	.00
OCT	31.45	217.17	87.20	2334.45	.00	.00
NOV	30.22	211.43	49.59	2263.72	.00	.00
DEC	29.42	206.35	29.60	2201.20	.00	.00
YR TOTAL	225.50		572.45		.00	4087.35

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REV 11/30/87

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SAMPLE JOB NUMBER 4
CHANGE DATA FOR SEVERAL CONTROL WORDS

YEAR 1953

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.14	.05	2.04	.00	60.00	.00	101.41
FEB	1.27	.31	1.86	.00	60.00	.00	528.90
MAR	2.16	.10	4.40	.00	60.00	.00	204.92
APR	3.53	.05	5.51	.00	60.00	.00	149.55
MAY	4.83	2.70	6.12	.00	60.00	.00	4504.24
JUN	4.08	.07	8.16	.00	274.00	.00	192.80
JUL	3.36	.06	8.65	.00	238.00	.00	156.59
AUG	2.11	.00	8.22	.00	242.00	.00	32.98
SEP	3.73	.17	6.08	.00	60.00	.00	328.29
OCT	2.62	.02	3.71	.00	60.00	.00	70.35
NOV	2.19	.01	2.42	.00	60.00	.00	46.85
DEC	1.57	.01	1.81	.00	60.00	.00	37.52
YR TOTAL	32.59	3.55	58.98	.00	1294.00	.00	6354.39

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	28.72	204.53	35.08	2178.81	.00	.00
FEB	28.46	230.63	31.70	2500.00	.00	87.54
MAR	32.10	230.63	84.56	2500.00	.00	28.27
APR	32.10	226.69	105.90	2451.56	.00	.00
MAY	31.55	230.63	115.61	2500.00	.00	4248.64
JUN	32.10	208.68	156.82	2229.88	.00	.00
JUL	29.04	187.58	150.42	1969.00	.00	.00
AUG	26.10	159.17	128.49	1605.39	.00	.00
SEP	22.15	172.10	80.65	1770.88	.00	.00
OCT	23.95	166.88	53.21	1704.08	.00	.00
NOV	23.22	161.41	33.65	1634.05	.00	.00
DEC	22.46	156.00	24.35	1564.76	.00	.00
YR TOTAL	331.95		1000.44		.00	4364.44

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SAMPLE JOB NUMBER 4
CHANGE DATA FOR SEVERAL CONTROL WORDS

YEAR 1954

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.25	.05	1.56	10.00	60.00	.00	108.27
FEB	1.08	.03	2.01	10.00	60.00	.00	73.29
MAR	1.61	.02	4.35	20.00	60.00	.00	73.44
APR	3.42	.10	7.67	30.00	60.00	.00	236.50
MAY	4.26	.32	6.27	40.00	184.00	.00	619.48
JUN	4.07	.26	7.29	50.00	413.00	.00	536.90
JUL	5.74	2.71	4.78	40.00	60.00	.00	4565.69
AUG	4.85	.76	5.86	30.00	107.00	.00	1365.14
SEP	3.01	.09	4.42	20.00	100.00	.00	224.92
OCT	2.89	.03	4.53	10.00	60.00	.00	114.57
NOV	2.07	.01	2.64	.00	60.00	.00	55.22
DEC	1.31	.04	1.48	.00	60.00	.00	89.25
YR TOTAL	35.56	4.42	52.86	260.00	1284.00	.00	8062.66

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	21.71	156.49	20.28	1571.03	.00	.00
FEB	21.78	153.78	26.21	1536.34	.00	.00
MAR	21.40	148.80	55.74	1472.63	.00	.00
APR	20.71	153.54	95.11	1533.32	.00	.00
MAY	21.37	179.63	80.22	1867.21	.00	.00
JUN	25.00	178.83	109.12	1856.98	.00	.00
JUL	24.89	230.63	71.23	2500.00	.00	3766.55
AUG	32.10	230.63	112.62	2500.00	.00	1113.42
SEP	32.10	230.63	84.95	2500.00	.00	7.88
OCT	32.10	225.38	87.06	2435.41	.00	.00
NOV	31.36	218.41	49.58	2349.68	.00	.00
DEC	30.40	216.13	26.94	2321.60	.00	.00
YR TOTAL	314.89		819.07		.00	4887.85

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SAMPLE JOB NUMBER 4
 CHANGE DATA FOR SEVERAL CONTROL WORDS

YEAR 1952

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.21	.06	1.46	.00	20.00	.00	105.62
FEB	1.07	.06	2.00	.00	20.00	.00	105.28
MAR	1.67	.05	4.45	.00	30.00	.00	93.11
APR	3.45	.10	7.27	.00	40.00	.00	187.56
MAY	4.21	.40	6.37	.00	50.00	.00	689.01
JUN	4.02	.35	7.69	.00	80.00	.00	619.34
JUL	5.70	2.50	4.98	.00	200.00	.00	4177.99
AUG	4.80	.90	5.96	.00	180.00	.00	1562.95
SEP	3.03	.10	4.22	.00	170.00	.00	221.64
OCT	2.85	.05	4.63	.00	150.00	.00	135.11
NOV	2.01	.04	2.74	.00	50.00	.00	101.07
DEC	1.35	.04	1.68	.00	20.00	.00	89.05
YR TOTAL	35.37	4.65	53.45	.00	1010.00	.00	8087.73

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	9.32	72.29	8.03	493.27	.00	.00
FEB	10.06	77.36	10.32	558.17	.00	.00
MAR	10.77	79.61	23.55	586.96	.00	.00
APR	11.08	87.18	39.60	683.84	.00	.00
MAY	12.13	133.00	40.31	1270.42	.00	.00
JUN	18.51	167.45	79.86	1711.39	.00	.00
JUL	23.30	230.63	70.47	2500.00	.00	3095.60
AUG	32.10	230.63	123.59	2500.00	.00	1227.26
SEP	32.10	224.77	91.57	2427.98	.00	.00
OCT	31.28	212.81	101.12	2280.69	.00	.00
NOV	29.62	209.89	57.29	2244.86	.00	.00
DEC	29.21	210.40	33.59	2251.11	.00	.00
YR TOTAL	249.46		679.29		.00	4322.87

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SAMPLE JOB NUMBER 4
 CHANGE DATA FOR SEVERAL CONTROL WORDS

YEAR 1953

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.00	.05	1.80	.00	60.00	.00	99.32
FEB	1.50	.31	2.00	.00	60.00	.00	533.23
MAR	2.00	.10	4.00	.00	60.00	.00	201.85
APR	3.60	.05	5.00	.00	60.00	.00	150.89
MAY	5.00	2.70	6.00	.00	60.00	.00	4507.89
JUN	4.00	.07	7.00	.00	274.00	.00	191.26
JUL	2.80	.06	9.00	.00	238.00	.00	147.39
AUG	2.50	.00	8.00	.00	242.00	.00	39.24
SEP	3.90	.17	6.00	.00	60.00	.00	330.76
OCT	2.00	.02	3.00	.00	60.00	.00	61.48
NOV	2.00	.01	3.00	.00	60.00	.00	44.15
DEC	1.00	.01	1.20	.00	60.00	.00	29.71
YR TOTAL	31.30	3.55	56.00	.00	1294.00	.00	6337.17

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	29.28	208.69	31.12	2230.03	.00	.00
FEB	29.04	230.63	29.81	2500.00	.00	144.41
MAR	32.10	230.63	63.11	2500.00	.00	46.64
APR	32.10	228.99	78.89	2479.91	.00	.00
MAY	31.87	230.63	99.73	2500.00	.00	4296.20
JUN	32.10	211.05	126.06	2259.11	.00	.00
JUL	29.37	188.33	160.51	1978.63	.00	.00
AUG	26.21	159.86	135.47	1614.18	.00	.00
SEP	22.25	172.22	90.24	1772.45	.00	.00
OCT	23.97	166.54	50.20	1699.76	.00	.00
NOV	23.18	159.66	49.09	1611.65	.00	.00
DEC	22.22	154.13	18.25	1540.88	.00	.00
YR TOTAL	333.67		932.47		.00	4487.25

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SAMPLE JOB NUMBER 4
 CHANGE DATA FOR SEVERAL CONTROL WORDS

YEAR 1954

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.25	.05	1.56	50.00	30.00	.00	148.08
FEB	1.08	.03	2.01	40.00	50.00	.00	103.61
MAR	1.61	.02	4.35	30.00	50.00	.00	84.37
APR	3.42	.10	7.67	20.00	70.00	.00	229.04
MAY	4.26	.32	6.27	.00	120.00	.00	582.33
JUN	4.07	.26	7.29	.00	150.00	.00	490.46
JUL	5.74	2.71	4.78	.00	250.00	.00	4532.93
AUG	4.85	.76	5.86	.00	200.00	.00	1335.14
SEP	3.01	.09	4.42	.00	100.00	.00	204.92
OCT	2.89	.03	4.53	10.00	60.00	.00	114.12
NOV	2.07	.01	2.64	20.00	50.00	.00	74.71
DEC	1.31	.04	1.48	40.00	20.00	.00	129.12
YR TOTAL	35.56	4.42	52.86	210.00	1150.00	.00	8028.83

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	21.45	160.14	19.76	1617.76	.00	.00
FEB	22.29	160.79	22.99	1626.10	.00	.00
MAR	22.38	157.99	47.85	1590.24	.00	.00
APR	21.99	162.22	82.90	1644.39	.00	.00
MAY	22.58	190.84	73.82	2010.32	.00	.00
JUN	26.56	207.52	108.63	2215.59	.00	.00
JUL	28.88	230.63	83.82	2500.00	.00	3885.82
AUG	32.10	230.63	121.52	2500.00	.00	981.52
SEP	32.10	228.75	95.91	2476.92	.00	.00
OCT	31.83	222.38	100.69	2398.52	.00	.00
NOV	30.95	217.19	57.68	2334.59	.00	.00
DEC	30.23	221.11	30.62	2382.87	.00	.00
YR TOTAL	323.31		846.18		.00	4867.34

SAMPLE JOB 5

RESERVOIR OPERATION PROGRAM							
TITLE SAMPLE JOB NUMBER 5							
TITLE	RESERVOIR	OPERATION	---	START	IN	OCTOBER	
STO-AREA	10000.	820.	5200.	450.	2000.	190.	
STO-AREA	400.	65.	150.	35.	0.0	0.0	
LIMITS	2500.	425.	310.	31.			
GENERAL	72.	1983.					
SEEPAGE	800.	3.2	400.	2.9	200.	2.2	
SEEPAGE	150.	1.8	100.	1.0	0.0	0.0	
RAINFALL	0.0	0.0	0.0	0.0	0.0	0.0	1983
RAINFALL	0.0	0.0	0.0	2.62	2.19	1.57	1983
RUNOFF	0.0	0.0	0.0	0.0	0.0	0.0	1983
RUNOFF	0.00	0.0	0.00	0.02	0.01	0.01	1983
EVAP.	0.0	0.0	0.0	0.0	0.0	0.0	1983
EVAP.	0.0	0.0	0.0	3.31	2.42	1.81	1983
DEMAND	0.0	0.0	0.0	0.0	0.0	0.0	1983
DEMAND	0.0	0.0	00.	60.	60.	60.	1983
OTHER	5.58	5.58	5.58	5.58	5.58	5.58	1983
OTHER	5.58	5.58	5.58	0.0	0.0	0.0	1983
RAINFALL	1.21	1.07	1.67	3.45	4.21	4.02	1984
RAINFALL	5.70	4.80	3.03	2.85	2.01	1.35	1984
RUNOFF	0.04	0.04	0.03	0.09	0.30	0.23	1984
RUNOFF	3.04	0.71	0.06	0.01	0.02	0.02	1984
EVAP.	1.46	2.00	4.45	6.87	6.37	6.59	1984
EVAP.	4.98	5.96	4.22	4.63	2.74	1.68	1984
DEMAND	60.	60.	60.	60.	184.	413.	1984
DEMAND	60.	107.	100.	60.	60.	60.	1984
RAINFALL	1.24	2.37	2.26	3.53	4.63	3.78	1985
RAINFALL	2.96	2.56	3.73	2.45	2.54	1.97	1985
RUNOFF	0.05	0.22	0.10	0.17	2.11	0.07	1985
RUNOFF	0.06	0.02	0.17	0.02	0.03	0.04	1985
EVAP.	1.71	1.91	4.40	6.53	6.70	7.11	1985
EVAP.	6.34	6.47	5.44	3.96	2.72	1.77	1985
DEMAND	60.	60.	60.	60.	80.	360.	1985
DEMAND	253.	231.	60.	60.	60.	60.	1985
END DATA							
END JOB							
END RUN							

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SAMPLE JOB NUMBER 5
 RESERVOIR OPERATION --- START IN OCTOBER

YEAR 1983

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	.00	.00	.00	5.58	.00	.00	5.58
FEB	.00	.00	.00	5.58	.00	.00	5.58
MAR	.00	.00	.00	5.58	.00	.00	5.58
APR	.00	.00	.00	5.58	.00	.00	5.58
MAY	.00	.00	.00	5.58	.00	.00	5.58
JUN	.00	.00	.00	5.58	.00	.00	5.58
JUL	.00	.00	.00	5.58	.00	.00	5.58
AUG	.00	.00	.00	5.58	.00	.00	5.58
SEP	.00	.00	.00	5.58	.00	.00	5.58
OCT	2.62	.02	3.31	.00	60.00	.00	47.57
NOV	2.19	.01	2.42	.00	60.00	.00	28.20
DEC	1.57	.01	1.81	.00	60.00	.00	24.16
YR TOTAL	6.38	.04	7.54	50.22	180.00	.00	150.16

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	5.58	66.95	.00	425.00	.00	.00
FEB	5.58	66.95	.00	425.00	.00	.00
MAR	5.58	66.95	.00	425.00	.00	.00
APR	5.58	66.95	.00	425.00	.00	.00
MAY	5.58	66.95	.00	425.00	.00	.00
JUN	5.58	66.95	.00	425.00	.00	.00
JUL	5.58	66.95	.00	425.00	.00	.00
AUG	5.58	66.95	.00	425.00	.00	.00
SEP	5.58	66.95	.00	425.01	.00	.00
OCT	5.58	64.24	13.30	393.70	.00	.00
NOV	5.35	58.67	9.33	347.22	.00	.00
DEC	4.89	53.01	6.37	300.12	-9.88	.00
YR TOTAL	66.04		29.00		-9.88	.00

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SAMPLE JOB NUMBER 5
 RESERVOIR OPERATION --- START IN OCTOBER

YEAR 1984

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.21	.04	1.46	.00	60.00	.00	71.30
FEB	1.07	.04	2.00	.00	60.00	.00	70.71
MAR	1.67	.03	4.45	.00	60.00	.00	56.88
APR	3.45	.09	6.87	.00	60.00	.00	162.98
MAY	4.21	.30	6.37	.00	184.00	.00	515.55
JUN	4.02	.23	6.59	.00	413.00	.00	407.26
JUL	5.70	3.04	4.98	.00	60.00	.00	5044.27
AUG	4.80	.71	5.96	.00	107.00	.00	1252.47
SEP	3.03	.06	4.22	.00	100.00	.00	156.28
OCT	2.85	.01	4.63	.00	60.00	.00	70.45
NOV	2.01	.02	2.74	.00	60.00	.00	69.71
DEC	1.35	.02	1.68	.00	60.00	.00	57.04
YR TOTAL	35.37	4.59	51.95	.00	1284.00	.00	7934.91

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	4.42	53.28	4.64	302.36	-7.64	.00
FEB	4.44	53.27	6.39	302.24	-7.76	.00
MAR	4.44	50.65	14.22	280.46	-29.54	.00
APR	4.22	60.00	20.88	358.34	.00	.00
MAY	5.00	85.47	22.93	661.96	.00	.00
JUN	7.12	81.82	33.79	615.30	.00	.00
JUL	6.82	230.63	24.45	2500.00	.00	3068.30
AUG	32.40	230.63	82.47	2500.00	.00	1030.60
SEP	32.40	227.82	58.39	2465.48	.00	.00
OCT	31.72	220.95	63.29	2380.92	.00	.00
NOV	30.06	216.34	36.32	2324.24	.00	.00
DEC	28.95	211.98	21.81	2270.53	.00	.00
YR TOTAL	192.00		389.60		-44.94	4098.90

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SAMPLE JOB NUMBER 5
RESERVOIR OPERATION --- START IN OCTOBER

YEAR 1985

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.24	.05	1.71	.00	60.00	.00	103.69
FEB	2.37	.22	1.91	.00	60.00	.00	401.63
MAR	2.26	.10	4.40	.00	60.00	.00	206.85
APR	3.53	.17	6.53	.00	60.00	.00	345.64
MAY	4.63	2.11	6.70	.00	80.00	.00	3536.96
JUN	3.78	.07	7.11	.00	360.00	.00	187.03
JUL	2.96	.06	6.34	.00	253.00	.00	148.97
AUG	2.56	.02	6.47	.00	231.00	.00	73.08
SEP	3.73	.17	5.44	.00	60.00	.00	331.25
OCT	2.45	.02	3.96	.00	60.00	.00	70.43
NOV	2.54	.03	2.72	.00	60.00	.00	87.29
DEC	1.97	.04	1.77	.00	60.00	.00	94.82
YR TOTAL	34.02	3.06	55.06	.00	1404.00	.00	5587.63

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	27.90	211.50	21.75	2264.57	.00	.00
FEB	27.78	230.63	24.24	2500.00	.00	54.19
MAR	32.40	230.63	60.89	2500.00	.00	53.56
APR	32.40	230.63	90.36	2500.00	.00	162.88
MAY	32.40	230.63	92.71	2500.00	.00	3331.85
JUN	32.40	205.95	98.38	2196.25	.00	.00
JUL	26.44	189.02	78.34	1987.44	.00	.00
AUG	22.99	169.15	73.38	1733.15	.00	.00
SEP	19.34	184.52	55.21	1929.85	.00	.00
OCT	22.16	180.18	43.84	1874.27	.00	.00
NOV	21.37	178.34	29.40	1850.79	.00	.00
DEC	21.03	177.94	18.94	1845.64	.00	.00
YR TOTAL	318.60		687.44		.00	3602.48

SAMPLE JOB 6

RESERVOIR OPERATION PROGRAM

TITLE	SAMPLE JOB NUMBER 6			TWO SITES IN SERIES			
TITLE	UPPER SITE	-- DEMAND MULTIPLIED BY FACTOR					
STO-AREA	10000.	820.	5200.	450.	2000.	190.	
STO-AREA	400.	65.	150.	35.	0.0	0.0	
LIMITS	2500.	425.	310.	31.			
GENERAL	100.	1983.	1		2.0		
SEEPAGE	820.	2.3	200.	1.4			
RAINFALL	1.14	1.27	2.16	3.53	4.83	4.08	1983
RAINFALL	3.36	2.11	3.73	2.62	2.19	1.57	1983
RUNOFF	0.05	0.31	0.10	0.05	2.70	0.07	1983
RUNOFF	0.06	0.0	0.17	0.02	0.01	0.01	1983
EVAP.	2.04	1.86	4.40	5.51	6.12	8.16	1983
EVAP.	8.65	8.22	6.08	3.71	2.42	1.81	1983
DEMAND	60.	60.	60.	60.	60.	274.	1983
DEMAND	238.	242.	60.	60.	60.	60.	1983
RAINFALL	1.21	1.07	1.67	3.45	4.21	4.02	1984
RAINFALL	5.70	4.80	3.03	2.85	2.01	1.35	1984
RUNOFF	0.04	0.04	0.03	0.09	0.30	0.23	1984
RUNOFF	3.04	0.71	0.06	0.01	0.02	0.02	1984
EVAP.	1.46	2.00	4.45	7.27	6.37	7.69	1984
EVAP.	4.98	5.96	4.22	4.63	2.74	1.68	1984
DEMAND	60.	60.	60.	60.	184.	413.	1984
DEMAND	60.	107.	100.	60.	60.	60.	1984
RAINFALL	1.24	2.37	2.26	3.53	4.63	3.78	1985
RAINFALL	2.96	2.56	3.73	2.45	2.54	1.97	1985
RUNOFF	0.05	0.22	0.10	0.17	2.11	0.07	1985
RUNOFF	0.06	0.02	0.17	0.02	0.03	0.04	1985
EVAP.	1.71	1.91	4.40	6.53	6.70	8.49	1985
EVAP.	6.94	6.47	5.44	3.96	2.72	1.77	1985
DEMAND	60.	60.	60.	60.	80.	360.	1985
DEMAND	253.	231.	60.	60.	60.	60.	1985
END DATA							
TITLE	SAMPLE JOB NUMBER 6			TWO SITES IN SERIES			
TITLE	LOWER SITE	-- DEMAND OPTIMIZED					
STO-AREA	11000.	900.	5722.	495.	2000.	209.	
STO-AREA	440.	71.	165.	38.	0.0	0.0	
LIMITS	2750.	510.	360.	22.			
GENERAL	100.	1983.	2	2			
SEEPAGE	900.	3.0	495.	2.6	209.	2.1	
SEEPAGE	71.	1.4	38.	0.9	0.0	0.0	
RAINFALL	1.14	1.27	2.16	3.53	4.83	4.08	1983
RAINFALL	3.36	2.11	3.73	2.62	2.19	1.57	1983
RUNOFF	0.05	0.31	0.10	0.05	2.70	0.07	1983
RUNOFF	0.06	0.0	0.17	0.02	0.01	0.01	1983
EVAP.	2.04	1.86	4.40	5.51	6.12	8.16	1983
EVAP.	8.65	8.22	6.08	3.71	2.42	1.81	1983
DEMAND	80.	80.	80.	80.	80.	304.	1983
DEMAND	268.	262.	80.	80.	80.	80.	1983

RAINFALL	1.21	1.07	1.67	3.45	4.21	4.02	1984
RAINFALL	5.70	4.80	3.03	2.85	2.01	1.35	1984
RUNOFF	0.04	0.04	0.03	0.09	0.30	0.23	1984
RUNOFF	3.04	0.71	0.06	0.01	0.02	0.02	1984
EVAP.	1.46	2.00	4.45	7.27	6.37	7.69	1984
EVAP.	4.98	5.96	4.22	4.63	2.74	1.68	1984
DEMAND	80.	80.	80.	80.	204.	433.	1984
DEMAND	80.	137.	120.	80.	80.	80.	1984
RAINFALL	1.24	2.37	2.26	3.53	4.63	3.78	1985
RAINFALL	2.96	2.56	3.73	2.45	2.54	1.97	1985
RUNOFF	0.05	0.22	0.10	0.17	2.11	0.07	1985
RUNOFF	0.06	0.02	0.17	0.02	0.03	0.04	1985
EVAP.	1.71	1.91	4.40	6.53	6.70	8.49	1985
EVAP.	6.94	6.47	5.44	3.96	2.72	1.77	1985
DEMAND	80.	80.	80.	80.	80.	390.	1985
DEMAND	273.	251.	80.	80.	80.	80.	1985
END DATA							
END JOB							
ENDRUN							

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SAMPLE JOB NUMBER 6 TWO SITES IN SERIES
 UPPER SITE -- DEMAND MULTIPLIED BY FACTOR

YEAR 1983

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.14	.05	2.04	.00	120.00	.00	88.75
FEB	1.27	.31	1.86	.00	120.00	.00	517.49
MAR	2.16	.10	4.40	.00	120.00	.00	181.26
APR	3.53	.05	5.51	.00	120.00	.00	109.94
MAY	4.83	2.70	6.12	.00	120.00	.00	4479.80
JUN	4.08	.07	8.16	.00	548.00	.00	192.80
JUL	3.36	.06	8.65	.00	476.00	.00	150.56
AUG	2.11	.00	8.22	.00	484.00	.00	26.22
SEP	3.73	.17	6.08	.00	120.00	.00	311.93
OCT	2.62	.02	3.71	.00	120.00	.00	57.76
NOV	2.19	.01	2.42	.00	120.00	.00	35.66
DEC	1.57	.01	1.81	.00	120.00	.00	29.03
YR TOTAL	32.59	3.55	58.98	.00	2588.00	.00	6181.19

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	7.81	61.95	11.38	374.55	.00	.00
FEB	7.23	92.75	9.60	755.22	.00	.00
MAR	10.82	94.03	34.01	771.64	.00	.00
APR	10.97	89.02	43.18	707.43	.00	.00
MAY	10.39	230.63	45.40	2500.00	.00	2511.45
JUN	29.20	186.78	156.82	1958.77	.00	.00
JUL	21.79	149.13	134.64	1476.91	.00	.00
AUG	17.40	104.03	102.16	899.58	.00	.00
SEP	12.14	113.96	52.71	1026.66	.00	.00
OCT	13.30	105.30	35.23	915.89	.00	.00
NOV	12.29	96.10	21.24	798.03	.00	.00
DEC	11.21	86.98	14.49	681.35	.00	.00
YR TOTAL	164.54		660.86		.00	2511.45

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SAMPLE JOB NUMBER 6 TWO SITES IN SERIES
 UPPER SITE -- DEMAND MULTIPLIED BY FACTOR

YEAR 1984

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.21	.04	1.46	.00	120.00	.00	74.61
FEB	1.07	.04	2.00	.00	120.00	.00	73.16
MAR	1.67	.03	4.45	.00	120.00	.00	60.03
APR	3.45	.09	7.27	.00	120.00	.00	168.05
MAY	4.21	.30	6.37	.00	368.00	.00	518.36
JUN	4.02	.23	7.69	.00	826.00	.00	404.55
JUL	5.70	3.04	4.98	.00	120.00	.00	5029.89
AUG	4.80	.71	5.96	.00	214.00	.00	1252.47
SEP	3.03	.06	4.22	.00	200.00	.00	156.28
OCT	2.85	.01	4.63	.00	120.00	.00	68.15
NOV	2.01	.02	2.74	.00	120.00	.00	67.04
DEC	1.35	.02	1.68	.00	120.00	.00	54.66
YR TOTAL	35.37	4.59	53.45	.00	2568.00	.00	7927.26

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	10.15	81.82	10.58	615.24	.00	.00
FEB	9.55	76.34	13.64	545.21	.00	.00
MAR	8.91	68.75	28.31	448.03	.00	.00
APR	8.02	68.63	41.65	446.40	.00	.00
MAY	8.01	76.90	36.43	552.33	.00	.00
JUN	8.97	16.95	49.28	72.63	-237.37	.00
JUL	1.98	230.63	7.03	2500.00	.00	2473.51
AUG	29.20	230.63	114.54	2500.00	.00	894.72
SEP	29.20	218.11	81.10	2345.97	.00	.00
OCT	26.80	204.88	84.15	2183.17	.00	.00
NOV	24.27	194.81	46.78	2059.16	.00	.00
DEC	22.73	185.61	27.27	1943.82	.00	.00
YR TOTAL	187.78		540.78		-237.37	3368.24

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SAMPLE JOB NUMBER 6 TWO SITES IN SERIES
 UPPER SITE -- DEMAND MULTIPLIED BY FACTOR

YEAR 1985

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.24	.05	1.71	.00	120.00	.00	101.07
FEB	2.37	.22	1.91	.00	120.00	.00	396.05
MAR	2.26	.10	4.40	.00	120.00	.00	201.04
APR	3.53	.17	6.53	.00	120.00	.00	336.27
MAY	4.63	2.11	6.70	.00	160.00	.00	3531.41
JUN	3.78	.07	8.49	.00	720.00	.00	187.03
JUL	2.96	.06	6.94	.00	506.00	.00	140.86
AUG	2.56	.02	6.47	.00	462.00	.00	61.54
SEP	3.73	.17	5.44	.00	120.00	.00	309.64
OCT	2.45	.02	3.96	.00	120.00	.00	54.71
NOV	2.54	.03	2.72	.00	120.00	.00	70.10
DEC	1.97	.04	1.77	.00	120.00	.00	80.85
YR TOTAL	34.02	3.06	57.04	.00	2808.00	.00	5470.58

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	21.65	180.37	26.45	1876.79	.00	.00
FEB	21.04	198.38	28.71	2103.08	.00	.00
MAR	23.14	197.17	72.74	2088.24	.00	.00
APR	23.00	204.16	107.29	2174.22	.00	.00
MAY	24.13	230.63	113.99	2500.00	.00	2907.51
JUN	29.20	172.40	163.17	1774.66	.00	.00
JUL	20.11	134.51	99.70	1289.71	.00	.00
AUG	15.69	96.33	72.52	801.03	.00	.00
SEP	11.24	106.86	43.67	935.77	.00	.00
OCT	12.47	98.03	35.26	822.75	.00	.00
NOV	11.44	91.50	22.22	739.19	.00	.00
DEC	10.67	86.55	13.50	675.87	.00	.00
YR TOTAL	223.80		799.22		.00	2907.51

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SAMPLE JOB NUMBER 6 TWO SITES IN SERIES
 LOWER SITE -- DEMAND OPTIMIZED

YEAR 1983

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.14	.05	2.04	.00	110.40	.00	65.68
FEB	1.27	.31	1.86	.00	110.40	.00	369.44
MAR	2.16	.10	4.40	.00	110.40	.00	133.25
APR	3.53	.05	5.51	.00	110.40	.00	85.00
MAY	4.83	2.70	6.12	.00	110.40	2511.45	5694.35
JUN	4.08	.07	8.16	.00	419.52	.00	171.23
JUL	3.36	.06	8.65	.00	369.84	.00	133.73
AUG	2.11	.00	8.22	.00	361.56	.00	34.25
SEP	3.73	.17	6.08	.00	110.40	.00	244.42
OCT	2.62	.02	3.71	.00	110.40	.00	57.00
NOV	2.19	.01	2.42	.00	110.40	.00	37.88
DEC	1.57	.01	1.81	.00	110.40	.00	29.05
YR TOTAL	32.59	3.55	58.98	.00	2144.52	2511.45	7055.29

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	7.78	71.39	13.12	444.37	.00	.00
FEB	6.77	92.72	11.06	685.58	.00	.00
MAR	10.50	90.81	34.00	663.93	.00	.00
APR	10.17	83.97	41.70	586.67	.00	.00
MAY	8.97	266.63	42.83	2750.00	.00	3368.82
JUN	43.34	230.29	181.31	2277.07	.00	.00
JUL	35.46	194.80	166.00	1839.49	.00	.00
AUG	28.37	151.53	133.44	1350.38	.00	.00
SEP	20.79	154.76	76.78	1386.83	.00	.00
OCT	21.36	143.91	47.85	1264.23	.00	.00
NOV	19.46	133.21	29.02	1143.22	.00	.00
DEC	17.59	122.68	20.09	1024.19	.00	.00
YR TOTAL	230.55		797.20		.00	3368.82

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SAMPLE JOB NUMBER 6 TWO SITES IN SERIES
 LOWER SITE -- DEMAND OPTIMIZED

YEAR 1984

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.21	.04	1.46	.00	110.40	.00	58.89
FEB	1.07	.04	2.00	.00	110.40	.00	56.84
MAR	1.67	.03	4.45	.00	110.40	.00	49.92
APR	3.45	.09	7.27	.00	110.40	.00	132.94
MAY	4.21	.30	6.37	.00	281.52	.00	382.43
JUN	4.02	.23	7.69	.00	597.54	.00	300.50
JUL	5.70	3.04	4.98	.00	110.40	2473.51	6054.15
AUG	4.80	.71	5.96	.00	189.06	894.72	1818.67
SEP	3.03	.06	4.22	.00	165.60	.00	136.39
OCT	2.85	.01	4.63	.00	110.40	.00	71.81
NOV	2.01	.02	2.74	.00	110.40	.00	63.31
DEC	1.35	.02	1.68	.00	110.40	.00	48.90
YR TOTAL	35.37	4.59	53.45	.00	2116.92	3368.24	9174.76

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	15.74	115.41	14.93	942.02	.00	.00
FEB	14.47	107.69	19.23	854.75	.00	.00
MAR	13.12	97.65	39.93	741.21	.00	.00
APR	11.36	93.40	59.16	693.23	.00	.00
MAY	10.62	97.00	49.58	733.95	.00	.00
JUN	11.25	61.82	62.16	363.50	.00	.00
JUL	5.63	266.63	25.66	2750.00	.00	3525.96
AUG	43.34	266.63	132.43	2750.00	.00	1453.84
SEP	43.34	253.85	93.76	2583.69	.00	.00
OCT	40.57	240.24	97.94	2406.59	.00	.00
NOV	37.62	229.52	54.86	2267.02	.00	.00
DEC	35.30	219.61	32.13	2138.10	.00	.00
YR TOTAL	282.35		681.77		.00	4979.80

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SAMPLE JOB NUMBER 6 TWO SITES IN SERIES
 LOWER SITE -- DEMAND OPTIMIZED

YEAR 1985

MONTH	RAINFALL IN.	RUNOFF IN.	EVAP IN.	OTHER AF	DEMAND AF	UP. SITE AF	TOTAL INFLOW AF
JAN	1.24	.05	1.71	.00	110.40	.00	80.44
FEB	2.37	.22	1.91	.00	110.40	.00	296.18
MAR	2.26	.10	4.40	.00	110.40	.00	157.22
APR	3.53	.17	6.53	.00	110.40	.00	260.05
MAY	4.63	2.11	6.70	.00	110.40	2907.51	5428.67
JUN	3.78	.07	8.49	.00	538.20	.00	164.57
JUL	2.96	.06	6.94	.00	376.74	.00	123.59
AUG	2.56	.02	6.47	.00	346.38	.00	62.66
SEP	3.73	.17	5.44	.00	110.40	.00	243.64
OCT	2.45	.02	3.96	.00	110.40	.00	54.43
NOV	2.54	.03	2.72	.00	110.40	.00	64.82
DEC	1.97	.04	1.77	.00	110.40	.00	68.34
YR TOTAL	34.02	3.06	57.04	.00	2254.92	2907.51	7004.62

MONTH	SEEPAGE AF	SURF AREA ACRES	EVAP AF	STORAGE AF	DEFICIT AF	SPILL AF
JAN	33.15	212.36	31.29	2043.70	.00	.00
FEB	31.58	221.61	33.80	2164.10	.00	.00
MAR	33.58	216.38	81.26	2096.09	.00	.00
APR	32.45	216.34	117.75	2095.54	.00	.00
MAY	32.44	266.63	120.79	2750.00	.00	4510.58
JUN	43.34	220.09	188.64	2144.39	.00	.00
JUL	33.25	185.18	127.29	1730.70	.00	.00
AUG	26.68	148.89	99.84	1320.46	.00	.00
SEP	20.33	152.90	67.50	1365.87	.00	.00
OCT	21.03	141.63	50.46	1238.41	.00	.00
NOV	19.06	133.07	32.10	1141.67	.00	.00
DEC	17.56	126.06	19.63	1062.41	.00	.00
YR TOTAL	344.46		970.35		.00	4510.58

RESERVOIR OPERATION PROGRAM (RESOP)

INPUT DATA FORM 1 11-87

PROJECT _____ BY _____ CHECKED _____ DATE _____

1-10										11-20										21-30										31-40										41-50										51-60										61-70										71-80									
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0										
CONTROL WORD										1										2										3										DATA FIELDS										4										5										6									
RESERVOIR										OPERATION										PROGRAM																																																											
TITLE																																																																															
TITLE																																																																															
										ACRE + FEET										ACRES										ACRE - FEET										ACRES										ACRE - FEET										ACRES																			
STO-AREA <u>1/</u>																																																																															
STO-AREA																																																																															
										UPPER LIMIT AF										START STO AF										LOWER LIMIT AF										DRAINAGE A, SM																																							
LIMITS																																																																															
										EVAP COEF <u>2/</u>										1ST YR RECORD										CODE <u>3/</u>										OPT DEMAND <u>4/</u>										DEMAND FACTOR <u>5/</u>										DUPLICATE DEM <u>6/</u>																			
GENERAL																																																																															
										SURFACE A AC										RATE IN/MONTH										SURFACE A AC										RATE IN/MONTH										SURFACE A AC										RATE IN/MONTH																			
SEEPAGE <u>1/</u>																																																																															
										COEF FACTOR										COEF FACTOR										COEF FACTOR										COEF FACTOR										COEF FACTOR										COEF FACTOR																			
										JAN/JULY										FEB/AUG										MAR/SEPT										APR/OCT										MAY/NOV										JUNE/DEC																			
FACTOR <u>1/</u>																																																																															
FACTOR																																																																															
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CHANGE <u>8/</u>																																																																															

✓ Refer to footnotes on reverse side of form.

(210-VI-TR-19, Appendix A, November 1987)

A-44

Footnotes for Input Form #1

- 1/ STO-AREA and SEEPAGE -- Enter paired values in order from highest to lowest. A maximum of four records may be entered.
- 2/ Evaporation Coefficient (Percent) -- Enter a number up to 100. If Texas Bulletin 6006 is used, enter the annual coefficient as 6XX.X where XX.X is the correct annual class A pan evaporation coefficient.
- 3/ Code -- Enter a "0" (or blank) when no other sites above or below this site are being considered. Enter a "1" when spill from this site is to be saved as inflow to a lower site. Enter a "2" when spill from an above site is to be added as inflow to this site. Enter a "3" when both "1" and "2" apply.
- 4/ Optimize Demand -- Enter a "0" (or blank) for a normal run (demand not altered); "1" for demand changed such that the storage does not go below the lower storage limit; "2" performs the same function as a "1" except all printing is suppressed until the maximum demand is found. This option is mutually exclusive with the "Demand Factor" option.
- 5/ Demand Factor (decimal) -- Enter factor which will be multiplied by the input demand values. For example, to reduce demand by one-half, enter 0.5.
- 6/ Duplicate Demand -- Entering a "1" will result in demand for first year of record to be duplicated for all years.
- 7/ Factor -- If preloaded monthly evaporation factors are to be revised, enter all 12 monthly values.
- 8/ Change -- Control words for which data may be changed include TITLE, STO-AREA, LIMITS, GENERAL, SEEPAGE, FACTOR, RAINFALL, RUNOFF, EVAP., DEMAND, OTHER, and OTHERIN. Enter the control words to be changed. More than one CHANGE record may be entered. After the CHANGE record, enter the changed data. Enter an END DATA after changed data.

RESERVOIR OPERATION STUDY PROGRAM (RESOP)

INPUT DATA FORM 2

11-87

PROJECT _____ BY _____ CHECKED _____ DATE _____

1-10										11-20										21-30										31-40										41-50										51-60										61-70										71-80									
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0
CONTROL WORD										JAN/JULY										FEB/AUG										MAR/SEPT										APR/NOV										MAY/NOV										JUNE/DEC										YEAR ^{1/}									
RAINFALL ^{2/}																																																																															
RAINFALL																																																																															
RUNOFF ^{2/}																																																																															
RUNOFF																																																																															
EVAP ^{2/}																																																																															
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OTHERIN																																																																															
END DATA																																																																															
END JOB																																																																															
END RUN																																																																															

^{1/} Refer to footnotes on reverse side of form.

(210-VI-TR-19, Appendix A, November 1987)

A-46

Footnotes for Input Form #2

- 1/ Year must be entered on all RAINFALL, RUNOFF, EVAP., DEMAND, OTHER, and OTHERIN data records in columns 71-80.
- 2/ Enter values in inches.
- 3/ Enter values in acre-feet.
- 4/ Use either OTHER or OTHERIN to enter data for a year of record.

DIRECTIVE CLEARANCE, REPRODUCTION, & DISTRIBUTION
Final Copy Approval

Use other side for draft clearances. Originator fills out Sections I, II, III, IV, and routing order in V. This form will be filed with the record copy of the directive.

Directive type, number, and name TECHNICAL RELEASE NO. 19, APPENDIX A	Originated by: <i>(Name & organizational unit)</i> William H. Merkel, Engineering Division	
	Room number Cotton Annex - 1st Mezz.	Telephone 475-5334

I. REPRODUCTION

<input checked="" type="checkbox"/> Assemble and staple <i>(attach dummy)</i> <input type="checkbox"/> Punch <input type="checkbox"/> Rush printing <i>(attach Form GPA-PLB-1)</i>	Special instructions: <i>(8 1/2 x 11 white paper unless otherwise specified)</i>
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II. DISTRIBUTION

Check	Code	No. of Copies	Check	Code	No. of Copies
	O all offices	4,800		F field offices	3365
	E all employees	20,000		I employees on foreign assignment	60
	N NHQ staffs	200		GM General Manual	4800
X	L NHQ limited	100		Manual or handbook	
	H all NHQ employees	700		Distribution list attached	
X	T National Technical Centers	63		Other distribution list:	
X	S state offices	310	X	Extra copies: Send to:	Engineering Div. Cotton Annex
	A area offices	462		TOTAL <i>(both columns)</i>	473

III. COST ESTIMATE

No. of pages <i>(includes transmittal and all enclosures)</i> 53	No. of copies <i>(from Section II)</i> 473	No. of impressions = 25,069	Estimated printing cost X \$.05 (if < 1000 impressions) X \$.03 (if > 1000 impressions) = \$752.07
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IV. REPORTING REQUIREMENTS

Check one: Contains no recurring reporting requirements. Establishes recurring report. AD-368 has been submitted.
Cleared by _____, IRM

V. CLEARANCES

Routing order	Signature	Date
	Information Resources Management Division <i>(Required for all permanent directives)</i>	
1	Division Director DONALD L. BASINGER, Engineering Division Assistant Chief <i>(Required for bulletins with "Action" line)</i>	
	Office of General Counsel <i>(Required for Federal Register rules)</i> Natural Resources Division Rm 2425-S Other clearances if applicable	
2	Deputy chief or Associate Deputy Chief for <u>Technology</u> <i>(Required for permanent directives and for bulletins that require response.)</i>	
	Chief <i>(Required for delegations of authority and major policy documents, as appropriate.)</i>	
3	Administrative Services Division <i>(for printing and distribution)</i> Claudette Hayes	

Remarks

Order No.	Date	To	Tentative Completion Date	Distribution Made
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