UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SIMULATION PROCEDURE FOR MODELING TRANSIENT WATER-TABLE AND ARTESIAN STRESS AND RESPONSE

Open-File Report 76-792

Prepared in cooperation with the
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SIMULATION PROCEDURE FOR MODELING TRANSIENT WATER-TABLE AND ARTESIAN STRESS AND RESPONSE

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ABSTRACT

The series of computer programs described in this report were designed specifically to model the ground-water regime in sufficient detail to determine the effects of the imposition of various types of stress upon the system, and to display the results in a convenient manner during calibration and when presenting projected data.

SUPERMOCK simulates the ground-water system and DATE and HYDROG aid in the display of computed data. During calibration, DATE is especially useful because it has the optional feature of comparing computed data with observed data. Although the programs can be run independently, experience dictates that for best results the three should be run as steps in the same job.

English units of inches, feet, and days are used in each of the programs. The units for any parameters not given in the text are clearly specified in the instructions for input to the individual programs.

INTRODUCTION

This report describes a system of digital-computer programs written in FORTRAN IV, which is used to simulate and display transient water table and artesian head in an aquifer in response to changes in ground-water withdrawal, stream stage, and climatic factors. The simulation procedure is contained in a program termed herein SUPERMOCK. DATE and HYDROG are auxilliary programs used to manipulate display data and output from SUPERMOCK.

The authors gratefully acknowledge the assistance of Edwin P. Weeks, who provided technical advice and encouragement during the preparation of the models.

SUPERMOCK is designed to simulate transient stress and response of a ground-water-flow system. The model simultaneously incorporates all components of stress on the flow field. The prototype flow system of the model is the alluvial aquifer of the Red River Valley in Louisiana. The model is designed specifically to simulate the effects on ground water of permanent changes in the stream-stage regime caused by construction of locks and dams.

SUPERMOCK is one of several finite-difference ground-water-flow models formulated in recent years, beginning with Pinder and Bredehoeft (1968). This first two-dimensional model was followed by others, including Pinder (1970), Prickett and Longuist (1971), Bedinger and others (1973), and Trescott and others (1976). Three-dimensional models have been devised by Bredehoeft and Pinder (1970) and Trescott (1975). In addition to features shared with the above-mentioned models, SUPERMOCK includes a soil-moisture accounting procedure for computing infiltration and a scheme for computing evapotranspiration from ground water that is based on theory of flow in the unsaturated zone. Another unusual feature of

SUPERMOCK is the modeling of a water table in the confining bed overlying an artesian aquifer, and the subsequent interplay between the water table and the potentiometric head in the underlying artesian aquifer. The last two features have also been modeled by Knapp (1975), who presents a finite-difference model that includes soil-moisture accounting, and by Cooley (1972), who presents an alternate scheme for incorporating the effects of a water table in a confining bed on flow in the underlying aquifer.

The prototype flow system is a confined alluvial aquifer, consisting of several tens to a few hundred feet of sand and gravel, overlain by a confining bed of from 10 to 50 feet (3.0 to 15.2 meters) of fine-grained material ranging from very fine sand to clay. The alluvial aquifer is in various degrees of hydraulic connection with perennial streams and lakes. The stresses on the system include withdrawal of water by wells, fluctuating stream stages, recharge by infiltration of rainfall, and discharge by evapotranspiration. Response of the aquifer to these transient stresses is computed as hydraulic head in the sand-and-gravel aquifer and water-table altitude in the fine-grained material above the aquifer. A vertical section through the prototype aquifer, showing the water table and potentiometric surface, is shown in figure 1.

DATE assigns calendar dates to sequentially numbered days used in SUPERMOCK and compares computed water-table levels and artesian heads at selected points in the system with observed data. Tables are printed of computed and observed water-table levels and artesian head. Comparisons between observed and computed artesian heads are in the form of minimum, maximum, and average differences and the standard deviation of the differences. HYDROG accepts output from SUPERMOCK and DATE and displays hydrographs

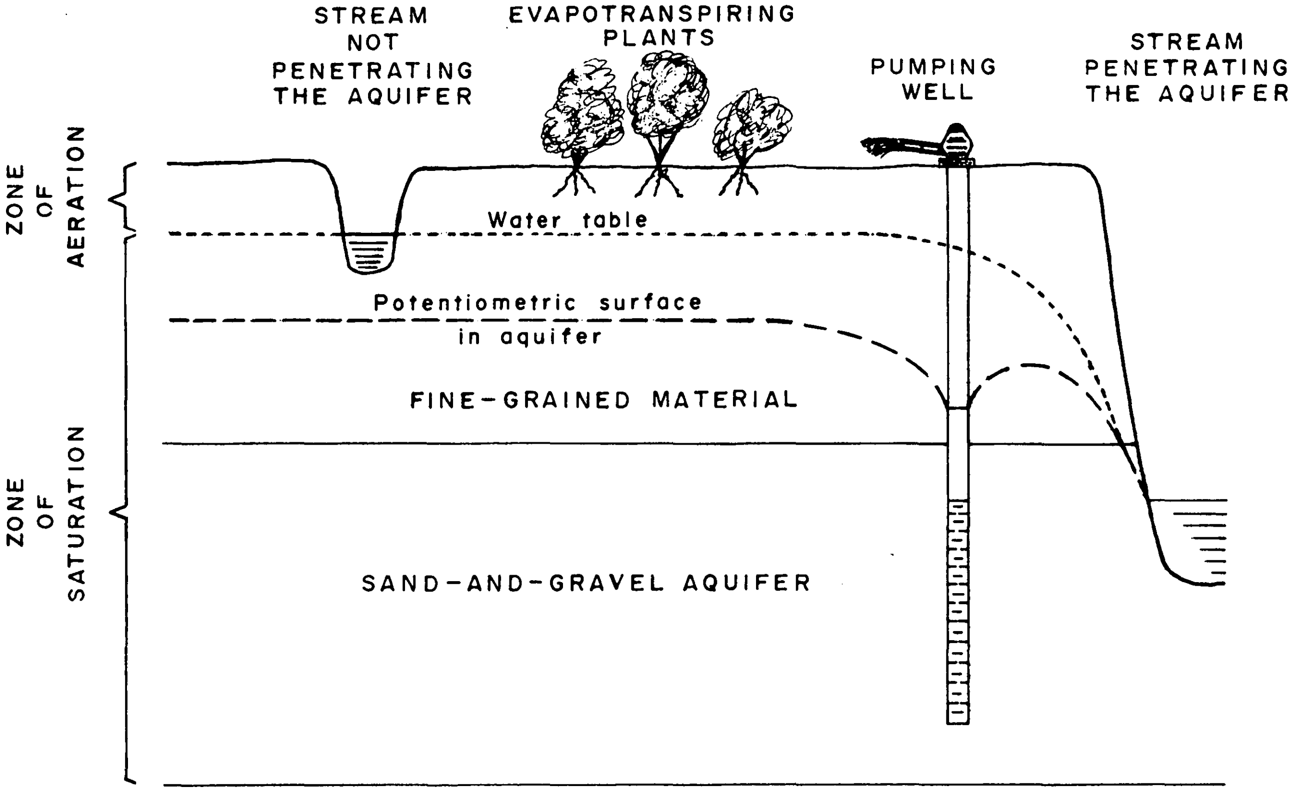

Figure 1.—Vertical section through prototype aquifer modeled by SUPERMOCK.

of water-table and artesian-head fluctuations. English units of inches, feet, and days are used in the programs. Units required are specified in the tables detailing instructions on input data.

COMPUTER PROGRAM SUPERMOCK

General Features

The model consists of three components--a soil-moisture accounting component, a vertical-flow component, and a horizontal-flow component. The relationships of these three components are shown in figure 2. A listing of the SUPERMOCK program is given in table 1. Definitions of variables used in the MAIN routine of SUPERMOCK are given in table 7 (at end of report).

The soil-moisture accounting component is a parametric rainfall-accretion model, in which the parameters have physical significance. The model is discretized into an array corresponding to the array by which the horizontal flow and vertical flow are modeled. The soil-moisture accounting component is used to compute changes in soil-moisture storage, and recharge and discharge from the zone of aeration to the water table. In the prototype flow system, the water table occurs in fine-grained material above the sand-and-gravel aquifer. The stress on the soil-moisture accounting model is the daily difference between precipitation and potential evapotranspiration. Infiltration to soil moisture is computed as a function of precipitation in excess of evapotranspiration, the amount of soil moisture already in storage, and on parameters describing the hydraulic properties of the soil.

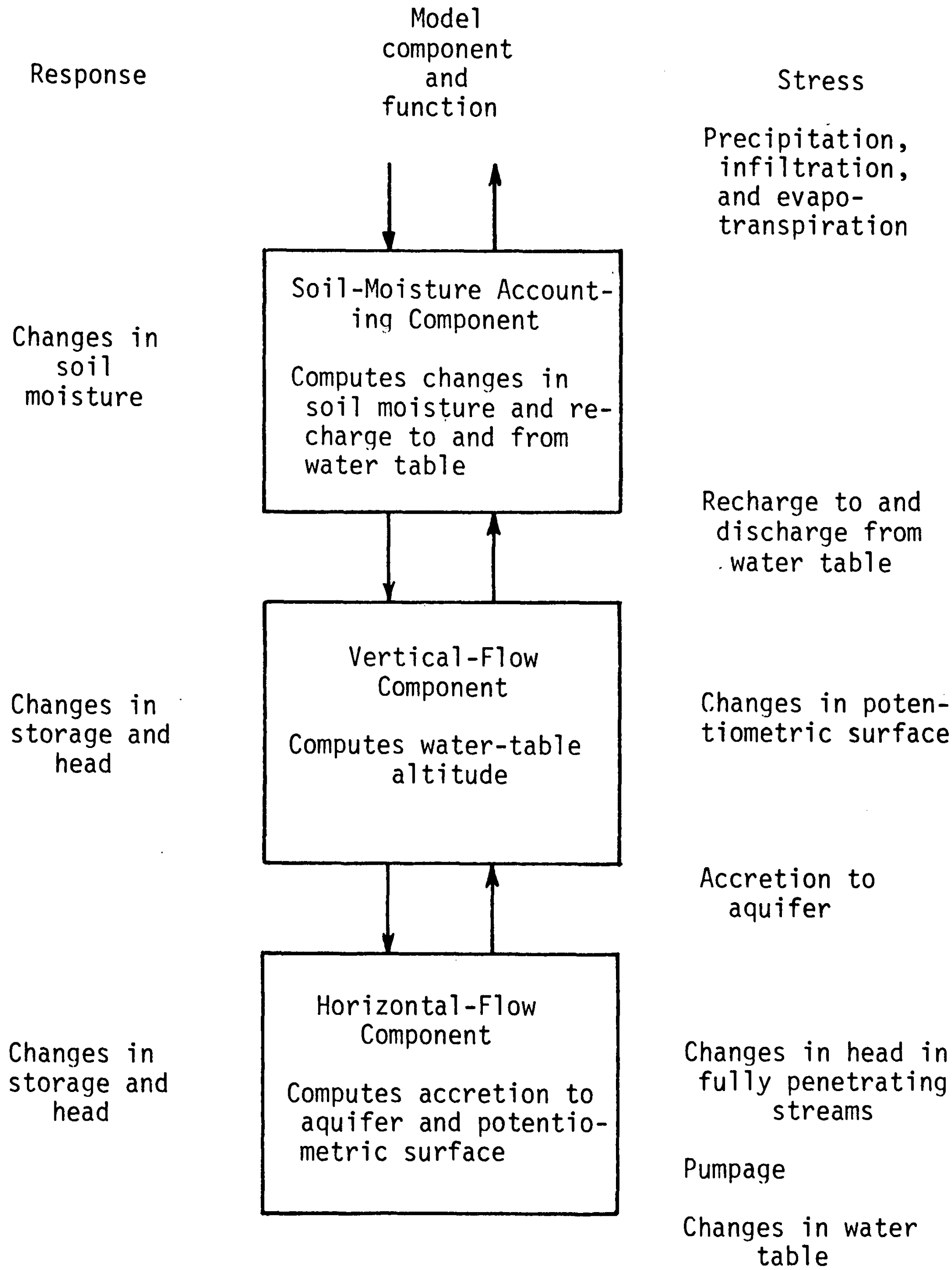

Figure 2.—Relation between soil-moisture accounting, vertical-flow, and horizontal-flow components of SUPERMOCK program.

Table 1.—*SUPERMOCK program listing*

```
C                ****************************************                    MAI
C                *                                      *                    MAI
C                *            - SUPERMOCK -             *                    MAI
C                *                                      *                    MAI
C                * A MODEL FOR GROUND-WATER FLOW ANALYSIS *                  MAI
C                *                                      *                    MAI
C                *                BY                    *                    MAI
C                *                                      *                    MAI
C                *    J. E. REED, M. S. BEDINGER,       *                    MAI
C                *                                      *                    MAI
C                *               AND                    *                    MAI
C                *                                      *                    MAI
C                *           J. E. TERRY                *                    MAI
C                *                                      *                    MAI
C                ****************************************                    MAI
C                                                                            MAI
C     -----------------------------------------------------------------------MAI
C     DIMENSIONING OF ARRAYS WHOSE SIZES SHOULD REFLECT THE SIZE OF THE MAI
C     GRID USED.                                                             MAI
C     -----------------------------------------------------------------------MAI
C                                                                            MAI
C        THE FOLLOWING ARRAYS SHOULD ALWAYS BE DIMENSIONED M BY N            MAI
C        (M ROWS AND N COLUMNS)                                              MAI
C                                                                            MAI
C          IN COMMON AREA ARY ; PZ,AM,HO,Q,RD,ACCRET,S,T,ELEV,AREA,IV        MAI
C          IN COMMON AREA WATAB ; WT                                         MAI
C          DIMENSIONED IN THE MAIN ; HSAVE,IDEPTH,ISTR                       MAI
C                                                                            MAI
C          H,WHICH IS DECLARED IN COMMOM AREA ARY, IS THE ONLY THREE         MAI
C          DIMENSIONAL ARRAY IN THE PROGRAM. IT SHOULD ALWAYS BE             MAI
C          DIMENSIONED M BY N BY 3 , (H(M,N,3)).                             MAI
C                                                                            MAI
C        ARRAYS G AND W,WHICH ARE DECLARED IN COMMON AREA ARY,SHOULD         MAI
C        BE DIMENSIONED TO THE MAXIMUM OF M AND N.                           MAI
C                                                                            MAI
C        ARRAYS CSD,CPZ, AND CAC, WHICH ARE DIMENSIONED IN THE MAIN,         MAI
C        SHOULD HAVE THEIR SIZE SET TO M (NUMBER OF ROWS).                   MAI
C                                                                            MAI
C     -----------------------------------------------------------------------MAI
C     DIMENSIONING OF ARRAYS WHOSE SIZES SHOULD REFLECT THE DURATION          MAI
C     (TIME IN DAYS) BEING USED.                                             MAI
C     -----------------------------------------------------------------------MAI
C                                                                            MAI
C          ARRAYS PE AND PRECIP SHOULD HAVE DIMENSIONS GREATER THAN          MAI
C          OR EQUAL TO THE DURATION (QPER). PRECIP IS DECLARED IN            MAI
C          COMMON ARY. PE IS DIMENSIONED IN THE MAIN.                        MAI
C                                                                            MAI
C          ARRAYS CTIME, ICODE, AND JCODE WHICH ARE DIMENSIONED IN           MAI
C          THE MAIN AND  TTIME WHICH IS DECLARED IN COMMON AREA OUT          MAI
C          SHOULD BE DIMENSIONED TO (DURATION DIVIDED BY TIME STEP           MAI
C          INCREMENT) + 1.                                                   MAI
C                                                                            MAI
```

Table 1.—*SUPERMOCK program listing*—Continued

```
C         ARRAYS KSYM, LSYM. AND KWSYM IN COMMON AREA OUT SHOULD BE
C         DIMENSIONED TO (DURATION DIVIDED BY TIME-STEP INCREMENT).
C
C     ------------------------------------------------------------------
C
C     THE FOLLOWING ARRAYS SHOULD BE DIMENSIONED TO REFLECT THE
C     NUMBER OF OBSERVATION WELLS TO BE USED; WENO,ACSUM,IR,IC
C
C     ------------------------------------------------------------------
C
C     THE  DIMENSIONING OF THE FOLLOWING ARRAYS SHOULD REFLECT THE
C     NUMBER OF DEFINED SUBAREAS IN THE AREA-DEFINITION MAP FOR
C     HYDRAULIC CONDUCTIVITY AND EVAPOTRANSPIRATION : INO,HCU,HCL,
C     WTSTO,THK
C
C     ------------------------------------------------------------------
C
C     ARRAYS IJ AND HX SHOULD BE DIMENSIONED LARGE ENOUGH TO ACCOMMODATE
C     THE NUMBER OF MAIN-STEM RIVER STAGES AND THEIR CORRESPONDING NODES
C     TO BE READ AT EACH TIME STEP.
C
C     ------------------------------------------------------------------
C
C     IPP SHOULD BE DIMENSIONED LARGE ENOUGH TO HOLD THE MAIN-STEM
C     NODES TO BE TREATED AS PARTIALLY PENETRATING.
C
C     ------------------------------------------------------------------
C
C     IJP AND HXP SHOULD BE DIMENSIONED LARGE ENOUGH TO ACCOMMODATE THE
C     NUMBER OF TRIBUTARY STREAM STAGES AND THEIR CORRESPONDING NODES
C     TO BE READ AT EACH TIME STEP.
C
C     ------------------------------------------------------------------
C     ------------------------------------------------------------------
C
      INTEGER * 2 IV,WELLS,IPCO,IR,IC
      INTEGER * 2 AREA,ELEV
      INTEGER * 2 ISTR,ISYM,KSYM,LSYM,KWSYM
      INTEGER * 2 ICODE,JCODE,JDAY
      INTEGER *4  WENO
      REAL*4 KSAT
      COMMON /ARY/ H(34,80,3),PZ(34,80),AM(34,80),HO(34,80),Q(34,80),
     1RD(34,80),ACCRET(34,80),S(34,80), T(34,80),GWETO(4,30),SAT(64,2),
     2G(80),W(80),PRECIP(1461),INO(60),HCU(60),HCL(60),THK(60),
     3 ELEV(34,80),AREA(34,80),IV(34,80)
      COMMON /OUT/WENO(60),ACSUM(60),TTIME(150),KSYM(146),LSYM(146),
     1KWSYM(146),IPCO(4),IR(60),IC(60)
      COMMON /INT/ M,N,IRD,IPT,M1,N1,IALPHA,IXMIN,IXMAX,IYMIN,IYMAX,
     1K,L,IPS,ISAM,IRX8,NDAZ,WELLS
      COMMON   /REAL/  X,XINF,Y,YINF,SWQ,CPRIME,WPRIME,DTIME,
     1PSM,SAMM,QS,C,TM,SM,XM,YM
      COMMON/DRM/SMSIN,KSAT,DRN,SWF,RGF,XNORM,SMSM
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      COMMON/WATAB/WT(34,80),WTSTO(60)                                  MAI 105
      COMMON /DATE/IMON,IDAY,IYEAR                                      MAI 106
      DIMENSION PE(1461),CSD(34),CPZ(34),CAC(34),IPP(150),IJ(150),      MAI 107
     1HX(150),IJP(300),HXP(300),AMON(12),JDAY(12)                       MAI 108
      DIMENSION  LABEL(20),CTIME(200),ICODE(200),JCODE(200),HSAVE(34,80)MAI 109
      DIMENSION IDEPTH(34,80),ISTR(34,80),ISYM(3)                       MAI 110
      EQUIVALENCE (PE(1),ACCRET(1,1)),(IDEPTH(1),HSAVE(1))              MAI 111
      DATA HSAVE,CTIME,ISCS,IFLAG/2720*0.,200*0.,11,1/                  MAI 112
      DATA SRSD,SRPZ,QSTR,SCAC/4*0.0/,IDK/9/                            MAI 113
      DATA IPP/150*0/,ISTR/2720*'*'/,ISYM/'F','P','3'/                  MAI 114
      DATA AMON/'JAN','FEB','MAR','APR','MAY','JUN','JUL','AUG','SEP',  MAI 115
     1  'OCT','NOV','DEC'/,JDAY/31,28,31,30,31,30,31,31,30,31,30,31/    MAI 116
C                                                                       MAI 117
C                    START PROCESSING HERE                              MAI 118
C                                                                       MAI 119
      TTIME(1)=0.0                                                      MAI 120
      SWQ=0.0                                                           MAI 121
      NEWYR=0                                                           MAI 122
      IRD=5                                                             MAI 123
      IPT=6                                                             MAI 124
      IDA=2                                                             MAI 125
      IDO=4                                                             MAI 126
      IDQ=10                                                            MAI 127
      K=1                                                               MAI 128
C                                                                       MAI 129
C     XM, YM CONSTANT SPACING IN X AND Y DIRECTIONS: M, N NUMBER OF ROWSMAI 130
C     AND COLUMNS; TM, SM CONSTANT VALUES FOR TRANSMISSIVITY AND STORAGEMAI 131
C     THE SWITCH ITDX INDICATES IF THE CHANGE IN X AND THE              MAI 132
C     CHANGE IN Y ARE CONSTANT (ITDX EQUALS 1) OR IF THEY ARE VARIABLE  MAI 133
C     (ITDX NOT EQUAL TO 1).                                            MAI 134
C     BALSTD IS THE MASS-BALANCE STANDARD. NDAZ IS THE TIME STEP        MAI 135
C     INCREMENT.                                                        MAI 136
C                                                                       MAI 137
      READ (IRD,1) XM,YM,M,N,TM,SM,ITDX,BALSTD,NDAZ                     MAI 138
    1 FORMAT (2F10.1,2I5,2F10.1,I2,E10.3,I3)                            MAI 139
C                                                                       MAI 140
C              THE XY PARAMETERS DEFINE THE SPACING FOR THE ITERATIONS  MAI 141
C     BY ROWS AND THE YX PARAMETERS DEFINE THE SPACING FOR THE ITERATIONMAI 142
C     BY COLUMNS. IF ITDX=1 THEN REDEFINITION OF THESE PARAMETERS AT    MAI 143
C     EACH ITERATION IS NOT NECESSARY AND SUBROUTINE SETUP IS           MAI 144
C     NEVER INVOKED.                                                    MAI 145
C                                                                       MAI 146
      XY1=XM                                                            MAI 147
      XY2=XM                                                            MAI 148
      XY3=YM                                                            MAI 149
      XY4=YM                                                            MAI 150
      YX1=YM                                                            MAI 151
      YX2=YM                                                            MAI 152
      YX3=XM                                                            MAI 153
      YX4=XM                                                            MAI 154
      DO 2 J=1,N                                                        MAI 155
      G(J)=0.0                                                          MAI 156
```

```
      W(J)=1.0
      DO 2 I=1,M
      PZ(I,J)=0.0
      HO(I,J)=0.0
      S(I,J)=0.0
      AM(I,J)=0.0
      Q(I,J)=0.0
      IV(I,J)=1
    2 CONTINUE
C
C        IRX8 IS AN OFFSET INTO ARRAY PRECIP USED BY
C        SUBROUTINE DREAM.
C
      READ (IRD,40) IRX8
C
C          IMON,IDAY,IYEAR - CALENDAR DATE CORRESPONDING TO STARTING TIME
C
      READ (IRD,3) IMON,IDAY,IYEAR
    3 FORMAT (I2,1X,I2,1X,I4)
C
C     QPER IS THE DURATION, IN DAYS.
C
      READ (IRD,4) QPER
    4 FORMAT (F6.1)
      JXA=QPER/NDAZ
      L=JXA+1
      READ (IRD,5) M01,M02,N01,N02,INDC,LABEL
    5 FORMAT (5I3/20A4)
      READ (IRD,6) (CTIME(I),ICODE(I),JCODE(I),I=1,L)
    6 FORMAT (12(F4.0,2I1))
C
C          M01,M02  -   ROW LIMITS FOR TABULAR OR MAP OUTPUT.
C          N01,N02 - COLUMN LIMITS FOR TABULAR OR MAP OUTPUT.
C          INDC - IF INDC = 1, OUTPUT WILL BE IN TABULAR FORMAT.
C                 IF INDC NOT EQUAL TO 1, OUTPUT WILL BE IN MAP FORM
C                 BOUNDED BY M01,M02,N01,AND N02.
C          LABEL - IDENTIFICATION FOR TABULAR OUTPUT.
C          CODE CTIME(I) = TTIME(I) FOR OUTPUT . OTHERWISE  LEAVE BLANK.
C          CODE ICODE(I) 0 FOR AVERAGE.
C          CODE ICODE(I) 1 FOR MAXIMUM.
C          CODE JCODE(I) = NUMBER OF CONSECUTIVE TIMES FOR WHICH
C          AVERAGE OR MAXIMUM IS CALCULATED.
C
      M1=M-1
      N1=N-1
      CALL READSO(JDAY,PE,PRECIP,IRD)
      DO 7 I=1,M
      ISTR(I,1)=ISYM(3)
      ISTR(I,N)=ISYM(3)
      IV(I,1)=3
      IV(I,N)=3
    7 CONTINUE
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      DO 8 I=2,N1
      ISTR(1,I)=ISYM(3)
      ISTR(M,I)=ISYM(3)
      IV(1,I)=3
      IV(M,I)=3
    8 CONTINUE
C
C     IPCO IS AN ARRAY OF OUTPUT CODES.
C
      READ (IRD,9) (IPCO(IX),IX=1,4)
    9 FORMAT (5I1)
      CALL START(QPER)
C
C     KSYM IS A DECODING ARRAY USED TO DETERMINE AT WHAT TIME STEP AND
C     IN WHAT FORM OUTPUT FROM THE H ARRAY IS DESIRED. KSYM IS READ ONLY
C     IF IPCO(2)=1.
C
C     LSYM IS A DECODING ARRAY USED TO DETERMINE AT WHAT TIME STEP AND
C     IN WHAT FORM OUTPUT FROM THE ACCRET ARRAY IS DESIRED. LSYM IS READ
C     ONLY IF IPCO(3)=1.
C
C     KWSYM IS A DECODING ARRAY USED TO DETERMINE AT WHAT TIME STEP AND
C     IN WHAT FORM OUTPUT FROM THE WT ARRAY IS DESIRED. KWSYM IS READ
C     ONLY IF IPCO(4)=1.
C
      IF (IPCO(2).EQ.1) READ (IRD,10) (KSYM(I),I=1,JXA)
      IF (IPCO(3).EQ.1) READ (IRD,10) (LSYM(I),I=1,JXA)
      IF (IPCO(4).EQ.1) READ (IRD,10) (KWSYM(I),I=1,JXA)
   10 FORMAT (80A1)
C
C     NSTGE AND NPSTGE ARE THE NUMBER OF DIFFERENT FULLY AND PARTIALLY
C     PENETRATING RIVER STAGES, RESPECTIVELY, TO BE READ ONLY ONCE FOR
C     THE DURATION.
C     KPNT IS A SWITCH INDICATING WHETHER  OR NOT TO PRINT (KPNT=1)
C     STAGES.
C
      READ (IRD,11) NSTGE,NPSTGE,KPNT
   11 FORMAT (3I3)
      IF (NSTGE-1) 19,12,12
   12 IF (KPNT.NE.0) WRITE (IPT,32)
      KLINES=55
      DO 18 NUD=1,NSTGE
      READ (IRD,34) XSTAGE,(IR(IQ),IC(IQ),IQ=1,18)
      DO 14 IQ=1,18
      JQ=IQ
      IQX=IR(IQ)
      IQY=IC(IQ)
      IF (IQX*IQY) 15,15,13
   13 IV(IQX,IQY)=2
      ISTR(IQX,IQY)=ISYM(1)
      H(IQX,IQY,1)=XSTAGE
   14 CONTINUE
```

```
      GO TO 16
   15 JQ=JQ-1
   16 IF (KPNT.EQ.0) GO TO 18
      WRITE (IPT,35) XSTAGE,(IR(IQX),IC(IQX),IQX=1,JQ)
      KLINES=KLINES-1
      IF (KLINES) 17,17,18
   17 WRITE (IPT,32)
   18 CONTINUE
   19 DO 20 IQX=1,M
      DO 20 IQY=1,N
      H(IQX,IQY,2)=H(IQX,IQY,1)
      H(IQX,IQY,3)=H(IQX,IQY,1)
   20 CONTINUE
      IF (NPSTGE-1) 28,21,21
   21 IF (KPNT.NE.0) WRITE (IPT,33)
      KLINES=55
      DO 27 NUD=1,NPSTGE
      READ (IRD,34) XPSTGE,(IR(IQ),IC(IQ),IQ=1,18)
      DO 23 IQ=1,18
      JQ=IQ
      IQX=IR(IQ)
      IQY=IC(IQ)
      IF (IQX*IQY) 24,24,22
   22 HO(IQX,IQY)=XPSTGE
      ISTR(IQX,IQY)=ISYM(2)
      IF (ISAM.EQ.1) AM(IQX,IQY)=SAMM
      IF (IPS.EQ.1) PZ(IQX,IQY)=PSM
   23 CONTINUE
      GO TO 25
   24 JQ=JQ-1
   25 IF (KPNT.EQ.0) GO TO 27
      WRITE (IPT,35) XPSTGE,(IR(IQX),IC(IQX),IQX=1,JQ)
      KLINES=KLINES-1
      IF (KLINES) 26,26,27
   26 WRITE (IPT,33)
      KLINES=55
   27 CONTINUE
C
C     WELLS - NUMBER OF OBSERVATION WELLS.
C
   28 READ (IRD,31) WELLS
      DO 29 IU=1,WELLS
   29 ACSUM(IU)=0.0
C
C     WENO - WELL NUMBER ; IR - ROW ; IC - COLUMN.
C
      READ (IRD,30) (WENO(JX),IR(JX),IC(JX),JX=1,WELLS)
   30 FORMAT (10(A4,2I2))
   31 FORMAT (I2)
   32 FORMAT ('1',40('*'),4X,'INVARIANT FULLY PENETRATING STREAM STAGES'
     1,4X,40('*')/8X,'STAGE',8X,18(' R# C#')/1X,129(1H-))
   33 FORMAT ('1',38('*'),4X,'INVARIANT PARTIALLY PENETRATING STREAM STA
```

```
     1GES',4X,38('*')/8X,'STAGE',8X,18(' R# C#')/1X,129(1H-))
   34 FORMAT (F5.0,36(I2))
   35 FORMAT (5X,F12.6,4X,36I3)
C
C     NOSTAG - NUMBER OF MAIN-STEM RIVER STAGES AND NODES TO BE READ
C              FROM DISK DATA SET EACH TIME STEP.
C     NOSET  - NUMBER OF AVERAGE SETS.
C     NODAYS - TIME-STEP INCREMENT.
C
      READ (IDA) NOSTAG,NOSET,NODAYS
C
C     NOPP IS THE NUMBER OF MAIN-STEM NODES TO BE TREATED AS
C     PARTIALLY PENETRATING.
C
      READ (IRD,36) NOPP
   36 FORMAT (I4)
      NOST=NOSTAG-NOPP
      IF (NOPP.EQ.0) GO TO 38
C
C     IPP - NODES ON MAIN STEM TO BE TREATED AS PARTIALLY PENETRATING.
C
      READ (IRD,39) (IPP(J),J=1,NOPP)
      DO 37 LQ=1,NOPP
      IRX=IPP(LQ)/100
      ICY=IPP(LQ)-(IRX*100)
      IF (ISAM.EQ.1) AM(IRX,ICY)=SAMM
      IF (IPS.EQ.1) PZ(IRX,ICY)=PSM
      ISTR(IRX,ICY)=ISYM(2)
   37 CONTINUE
   38 IF (NOST.EQ.0) GO TO 42
C
C     IJ - NODES ON MAIN STEM TO BE TREATED AS FULLY PENETRATING.
C
      READ (IRD,39) (IJ(I),I=1,NOST)
   39 FORMAT (20I4)
   40 FORMAT (I5)
      DO 41 I=1,NOST
      IRX=IJ(I)/100
      ICY=IJ(I)-(IRX*100)
      ISTR(IRX,ICY)=ISYM(1)
   41 IV(IRX,ICY)=2
C
C     NBEGN - SEQUENCE NUMBER FOR DESIRED BEGINNING POINT IN STAGE DATA
C             FROM DISK.
C
   42 READ (IRD,40) NBEGN
C
C     IWDR - SWITCH INDICATING IF PUMPAGE IS TO BE MODELED (IWDR=1).
C     IWDINT - SWITCH INDICATING IF ONE WITHDRAWAL RATE WILL BE CONSTANT
C              FOR A GROUP OF NODES (IWDINT=1) OR IF THEY WILL VARY
C              FROM NODE TO NODE (IWDINT= ).
C     IWDT - SWITCH INDICATING IF WITHDRAWAL RATES ARE TO BE PRINTED
```

```
C             (IWDT=1).
C       IDNT - TIME INCREMENT FOR VARIABLE WITHDRAWAL; MUST BE AN EVEN
C              MULTIPLE OF NDAZ.
C
      READ (IRD,43) IWDR,IWDINT,IWDT,IDNT
   43 FORMAT (4I4)
C
C     NPSTAG - NUMBER OF TRIBUTARY STREAM (PARTIALLY PENETRATING) NODES
C                FOR WHICH DATA ARE READ FROM DISK DATA SET EACH TIME STEP.
C
      READ (IDK) NPSTAG
C
C     IJP - TRIBUTARY STREAM NODES.
C
      READ (IDK) (IJP(I),I=1,NPSTAG)
      DO 44 I=1,NPSTAG
      IRX=IJP(I)/100
      ICY=IJP(I)-(IRX*100)
      IF (ISAM.EQ.1) AM(IRX,ICY)=SAMM
      IF (IPS.EQ.1) PZ(IRX,ICY)=PSM
      ISTR(IRX,ICY)=ISYM(2)
   44 CONTINUE
      WRITE (IPT,97)
      WRITE (IPT,45) ((ISTR(I,J),J=1,N),I=1,M)
   45 FORMAT (//45X,'LOCATION MAP OF STREAMS IN THE SYSTEM',//45X,'EXPLA
     1NATION',//45X,'* -- NON-STREAM NODE',/45X,'3 -- OUTSIDE SYSTEM',/4
     25X,'F -- FULLY PENETRATING STREAM',/,45X,'P -- PARTIALLY PENETRATI
     3NG STREAM',//(50X,80A1))
      WRITE (IPT,97)
      WRITE (IPT,46) ((IV(I,J),J=1,N),I=1,M)
   46 FORMAT (//45X,'NODE-LEVEL MAP OF FLOW SYSTEM',//45X,'EXPLANATION',
     1//45X,'1 -- INSIDE FLOW SYSTEM WITH HEAD NOT SPECIFIED',/45X,'2 --
     2 INSIDE FLOW SYSTEM WITH HEAD SPECIFIED',/45X,'3 -- OUTSIDE FLOW S
     3YSTEM',//(50X,80I1))
      CALL BETA(1,TTIME(1))
      WRITE (ISCS,47) LABEL
   47 FORMAT (20A4)
      RRM=0.0
      DO 96 K=2,L
      TTIME(K)=TTIME(K-1)+NDAZ
      IDAY=IDAY+NDAZ
      IF (IDAY.LE.JDAY(IMON)) GO TO 49
      IDAY=IDAY-JDAY(IMON)
      IMON=IMON+1
      IF (IMON.LE.12) GO TO 49
      IMON=1
      IYEAR=IYEAR+1
      NEWYR=1
      IF (MOD(IYEAR,4).EQ.0) GO TO 48
      JDAY(2)=28
      GO TO 49
   48 JDAY(2)=29
```

Table 1.—*SUPERMOCK program listing*—Continued

```
   49 CONTINUE
      IF (IWDR-1) 51,50,51
   50 IF (TTIME(K).EQ.TTIME(2).OR.RRM.EQ.TTIME(K)) CALL WDRAW(IWDINT.IWD
     1T,TTIME(K),M,N,RRM,IDNT,IRD,IPT)
   51 LQT=0
      QS=0.0
      DAZ=NDAZ
      DTIME=AMIN1(DAZ,QPER-TTIME(K-1))
C
C     DUM1,DUM2,DUM3 - DUMMY VARIABLES FOR DATE.
C
   52 READ (IDA) DUM1,DUM2,DUM3
C
C     JJ - SEQUENCE NUMBER.
C
      READ (IDA) JJ
C
C     IJ - NODES ; HX - RIVER STAGES.
C
      READ (IDA) (IJ(IT),HX(IT),IT=1,NOSTAG)
      IF (JJ.LT.NBEGN) GO TO 52
      DO 56 IT=1,NOSTAG
      KQT=0
      IRX=IJ(IT)/100
      ICY=IJ(IT)-(IRX*100)
      IF (NOPP.EQ.0.OR.LQT.EQ.NOPP) GO TO 54
      DO 53 LQ=1,NOPP
      IF (IJ(IT).EQ.IPP(LQ)) KQT=1
   53 CONTINUE
      IF (KQT.EQ.1) GO TO 55
   54 H(IRX,ICY,1)=HX(IT)
      GO TO 56
   55 HO(IRX,ICY)=HX(IT)
      LQT=LQT+1
   56 CONTINUE
C
C     JJ - SEQUENCE NUMBER.
C
   57 READ (IDK) JJ
C
C     IJP - NODES ; HXP - STREAM STAGES.
C
      READ (IDK) (IJP(IT),HXP(IT),IT=1,NPSTAG)
      IF (JJ.LT.NBEGN) GO TO 57
      DO 58 IT=1,NPSTAG
      IRX=IJP(IT)/100
      ICY=IJP(IT)-(IRX*100)
   58 HO(IRX,ICY)=HXP(IT)
      DO 59 IRX=1,M
      DO 59 ICY=1,N
      H(IRX,ICY,2)=H(IRX,ICY,1)
   59 H(IRX,ICY,3)=H(IRX,ICY,1)
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      CALL DREAM
      CALL WTABLE(ACCRET,HCL,THK,H,ELEV,M,N,IPT,INO,AREA,NDAZ)
      IRX8=IRX8+NDAZ
C
C  ********* CYCLE THROUGH BY ROWS  *******
C
C              IF THE CHANGE IN X AND/OR THE CHANGE IN Y ARE VARIABLE
C     (ITDX NOT EQUAL TO 1) THEN SUBROUTINE SETUP MUST BE INVOKED.
C
      DO 64 I=2,M1
      IF (ITDX.NE.1) CALL SETUP(I,Y,YINF,XY3,XY4,IYMIN,IYMAX)
      DO 60 J=2,N1
      IF (ITDX.NE.1) CALL SETUP(J,X,XINF,XY1,XY2,IXMIN,IXMAX)
C
C       PARAMETERS PESUM, AND DDUMM  ARE DUMMY ARGUMENTS SUPPLIED ONLY
C       TO LEND THE GENERALITY REQUIRED FOR SUBSEQUENT INVOCATIONS
C       OF SUBROUTINE PROCSS.
C
      CALL PROCSS(I,J,XY3,XY4,PESUM,PESUM,DDUMM,T(I,J-1),T(I,J+1),H(I-1,
     1J,1),H(I+1,J,1),1,J,I,N1,M1,T(I-1,J),T(I+1,J),XY1,XY2)
C
C       THE VALUE OF W IS PRECALCULATED TO FREE THE SCALER C
C       FOR THE NEXT ITERATION AND SAVE THE RESULT FOR THE
C       RECURSIVE REDEFINITION OF THE SECOND PLANE OF THE H ARRAY
C       TO FOLLOW
C
      W(J)=C/W(J)
   60 CONTINUE
C
C       RECURSIVELY REDEFINE H USING VALUES OF G AND THE PRECALCULATED
C       VALUE OF W THAT WAS FACTORED USING W AND C.
C
      DO 61 J=1,N1
      J2=N-J
      IF (ABS(H(I,J2+1,2)).LE.1.0E-20) H(I,J2+1,2)=0.0
      IF (IV(I,J2).EQ.1) H(I,J2,2)=G(J2)-H(I,J2+1,2)*W(J2)
   61 CONTINUE
      DO 63 J=2,N1
      IF (IV(I,J)-2) 63,62,63
   62 CALL QCALC(I,J,1,XY3,XY4,XY1,XY2,ITDX)
   63 CONTINUE
   64 CONTINUE
C
C    *********** CYCLE THROUGH BY COLUMNS  ***********
C
C              IF THE CHANGE IN X AND/OR THE CHANGE IN Y ARE VARIABLE
C     (ITDX NOT EQUAL TO 1) THEN SUBROUTINE SETUP MUST BE INVOKED.
C
      DO 72 J=2,N1
      IF (ITDX.NE.1) CALL SETUP(J,X,XINF,YX3,YX4,IXMIN,IXMAX)
      DO 65 I=2,M1
C
```

Table 1.—*SUPERMOCK program listing*—Continued

```
C         THE VALUES FOR VECTORS CSD,CPZ,AND CAC ARE CALCULATED IN
C         SUBROUTINE PROCSS AND RETURNED TO BE USED IN THE MASS-
C         BALANCE RESIDUAL COMPUTATION IN SUBROUTINE OUTPUT.
C
      IF (ITDX.NE.1) CALL SETUP(I,Y,YINF,YX1,YX2,IYMIN,IYMAX)
      CALL PROCSS(I,J,YX3,YX4,CSD(I),CPZ(I),CAC(I),T(I-1,J),T(I+1,J),H(I
     1,J-1,2),H(I,J+1,2),0,I,J,M1,N1,T(I,J-1),T(I,J+1),YX1,YX2)
      W(I)=C/W(I)
   65 CONTINUE
      M2=M1-1
      DO 69 IM=1,M2
      I=M-IM
      IF (ABS(H(I+1,J,3)).LT.1.0E-20) H(I+1,J,3)=0.0
      IF (IV(I,J)-1) 69,66,69
   66 H(I,J,3)=G(I)-H(I+1,J,3)*W(I)
      WTL=WT(I,J)
      IAREA=AREA(I,J)
      THICK=THK(IAREA)
      HYCND=HCL(IAREA)
      HWT=THICK-ELEV(I,J)+WTL
      IF (J.NE.2.AND.J.NE.N1) GO TO 67
      CAC(I)=CAC(I)/2.
      CSD(I)=CSD(I)/2.
      CPZ(I)=CPZ(I)/2.
   67 IF (I.NE.2.AND.I.NE.M1) GO TO 68
      CAC(I)=CAC(I)/2.
      CSD(I)=CSD(I)/2.
      CPZ(I)=CPZ(I)/2.
   68 SRSD=SRSD+(H(I,J,3)-H(I,J,1))*CSD(I)*DTIME/2.
      SHD=(H(I,J,2)+H(I,J,3))/2.
      SHEAD=SHD*DTIME
      IF (HWT.GT.0.) ACCRET(I,J)=HYCND*(WTL-SHD)/HWT
      SRPZ=SRPZ+SHEAD*CPZ(I)
      SCAC=SCAC+SHEAD*CAC(I)
   69 CONTINUE
      DO 71 I=2,M1
      IF (IV(I,J)-2) 71,70,71
C
C
C     IF NODE SPACING IS VARIABLE, SUBROUTINE SETUP NEEDS TO BE INVOKED
C     ONCE MORE HERE THAN IN THE UPPER LOOP SINCE SUBROUTINE QCALC IS
C     DEPENDENT ON HAVING XY3 AND XY4 IN TERMS OF I.
C
   70 IF (ITDX.NE.1) CALL SETUP(I,Y,YINF,XY3,XY4,IYMIN,IYMAX)
      CALL QCALC(I,J,2,XY3,XY4,XY1,XY2,ITDX)
   71 CONTINUE
   72 CONTINUE
      QS=QS/2.
      QSTR=QSTR+QS*DTIME
      IF (ABS(TTIME(K)-CTIME(K)).GT..5) GO TO 94
      CODEX=JCODE(K)
      IF (IFLAG.LT.1) GO TO 73
```

```
      IFLAG=-JCODE(K)
   73 IFLAG=IFLAG+1
      IF (ICODE(K).GT.0) GO TO 75
      DO 74 I=M01,M02
      DO 74 J=N01,N02
   74 HSAVE(I,J)=WT(I,J)/CODEX+HSAVE(I,J)
      GO TO 77
   75 DO 76 I=M01,M02
      DO 76 J=N01,N02
   76 IF (HSAVE(I,J).LT.WT(I,J)) HSAVE(I,J)=WT(I,J)
   77 IF (IFLAG.LT.0) GO TO 94
      DO 78 I=M01,M02
      DO 78 J=N01,N02
      HS=HSAVE(I,J)+.5
      IDEPX=ELEV(I,J)-HFIX(HS)
      IF (IDEPX.GT.9) IDEPX=9
   78 IDEPTH(I,J)=IDEPX
      IJC=JCODE(K)*NDAZ
      WRITE (IPT,79) LABEL
   79 FORMAT (1H1,20A4)
      IF (ICODE(K)) 80,80,82
   80 WRITE (IPT,81) IJC,AMON(IMON),IDAY,IYEAR
   81 FORMAT (1H ,4X,'AVERAGE FOR ',I3,' DAYS, ENDING ON ',A3,1X,I2,1X,I
     14)
      WRITE (ISCS,84) AMON(IMON),IDAY,IYEAR
      GO TO 85
   82 WRITE (IPT,83) IJC,AMON(IMON),IDAY,IYEAR
   83 FORMAT (1H ,4X,'HIGHEST WATER LEVEL FOR ',I3,' DAYS, ENDING ON ',A
     13,1X,I2,1X,I4)
      WRITE (ISCS,84) AMON(IMON),IDAY,IYEAR
   84 FORMAT (A3,1X,I2,1X,I4)
   85 IF (INDC.EQ.1) GO TO 89
      WRITE (IPT,86) M01,M02,N01,N02
   86 FORMAT (/,4X,'NODE MAP OF DEPTH TO WATER TABLE, IN FEET ; A "9" IND
     1ICATES A DEPTH OF 9 FT  OR GREATER'/20X,'ROWS ',I3,' THROUGH ',I3,
     2' ; COLUMNS ',I3,' THROUGH ',I3//)
      DO 87 I=M01,M02
   87 WRITE (IPT,88) (IDEPTH(I,J),J=N01,N02)
   88 FORMAT (4X,120I1)
      GO TO 91
   89 WRITE (IPT,90) ((I,J,IDEPTH(I,J),J=N01,N02),I=M01,M02)
   90 FORMAT (/,16(1X,I2,1X,I2,1X,I1))
   91 WRITE (ISCS,92) ((I,J,IDEPTH(I,J),J=N01,N02),I=M01,M02)
   92 FORMAT (16(2I2,I1))
      IFLAG=1
      DO 93 I=M01,M02
      DO 93 J=N01,N02
   93 HSAVE(I,J)=0.
   94 CONTINUE
      WRITE (IDO) (H(IR(JX),IC(JX),3),WENO(JX),JX=1,WELLS)
      WRITE (IDQ) (WT(IR(JX),IC(JX)),WENO(JX),JX=1,WELLS)
C
```

Table 1.—*SUPERMOCK program listing*—Continued

```
C       REINITIALIZING THE H ARRAY AT THIS POINT FACILITATES THE PROCESSIN
C       IN SUBROUTINE BETA WHICH OPERATES ON THE FIRST PLANE OF THE H
C       ARRAY.
C
        DO 95 I=1,M
        DO 95 J=1,N
        H(I,J,1)=H(I,J,3)
   95   CONTINUE
        CALL OUTPUT(SRSD,SWQ,QSTR,SRPZ,SCAC,BALSTD,NEWYR)
   96   CONTINUE
   97   FORMAT (1H1)
        STOP
        END
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      SUBROUTINE READSO(MDAY,PE,PRECIP,IRD)
      INTEGER * 2 MDAY
      DIMENSION PRECIP(1),MDAY(1),PE(1)
C
C     MO IS THE NUMBER OF DAILY-PRECIPITATION (PRECIP) AND POTENTIAL-
C     EVAPOTRANSPIRATION (PE) VALUES TO BE READ.
C
      READ (IRD,1) MO
    1 FORMAT (I4)
      IHOLD=0
    2 READ (IRD,6) IYRD,IMOND,(PRECIP(IHOLD+J),J=1,10)
      ISTOPM=MDAY(IMOND)
      IF (MOD(IYRD,4).EQ.0.AND.IMOND.EQ.2) ISTOPM=29
      READ (IRD,7) (PRECIP(IHOLD+J),J=11,ISTOPM)
      IHOLD=IHOLD+ISTOPM
      IF (MO-IHOLD) 3,3,2
    3 READ (IRD,4) (PE(I),I=1,MO)
    4 FORMAT (10F7.4)
C
C       CARE MUST BE TAKEN WITH THE PE VECTOR SINCE IT IS NEEDED
C        ONLY TEMPORARILY IT IS OVERLAYED ON TOP OF THE FRONT OF
C       ARRAY ACCRET (EQUIVALENCE IN THE MAIN).  ACCRET IS ALWAYS
C       CALCULATED BEFORE IT IS REFERENCED, THEREFORE IT CAN
C       CONVENIENTLY BE USED AS A TEMPORARY STORAGE AREA.  IF IT IS
C        REQUIRED THAT ACCRET MUST BE INITIALIZED, THEN ARRAY PE MUST BE
C       MOVED.
C
      DO 5 I=1,MO
    5 PRECIP(I)=PRECIP(I)-PE(I)
    6 FORMAT (9X,2I2,1X,10F6.2)
    7 FORMAT (14X,10F6.2,/14X,11F6.2)
      RETURN
      END
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      SUBROUTINE DREAM
      REAL * 4 KSAT,MSMS
      INTEGER * 2 IV,WELLS,IPCO,IR,IC
      INTEGER *4  WENO
      INTEGER * 2 AREA,ELEV
      COMMON /ARY/ H(34,80,3),PZ(34,80),AM(34,80),HO(34,80),Q(34,80),
     1RD(34,80),ACCRET(34,80),S(34,80), T(34,80),GWETO(4,30),SAT(64,2),
     2G(80),W(80),PRECIP(1461),INO(60),HCU(60),HCL(60),THK(60),
     3 ELEV(34,80),AREA(34,80),IV(34,80)
      COMMON /INT/ M,N,IRD,IPT,M1,N1,IALPHA,IXMIN,IXMAX,IYMIN,IYMAX,
     1K,L,IPS,ISAM,IRX8,NDAZ,WELLS
      COMMON/DRM/SMSIN,KSAT,DRN,SWF,RGF,XNORM,SMSM
      COMMON/WATAB/WT(34,80),WTSTO(60)
      DIMENSION SMSX(34,80)
      IF (K.GT.2) GO TO 2
      SMC=.5*SMSM
      DO 1 IL=1,M
      DO 1 JL=1,N
    1 SMSX(IL,JL)=SMSIN
    2 DO 26 IL=2,M1
      DO 26 JL=2,N1
      ACCRET(IL,JL)=0.0
      IF (IV(IL,JL)-1) 26,3,26
    3 IXX5=ELEV(IL,JL)
      WTL=WT(IL,JL)
      DEPTH=FLOAT(IXX5)-WTL
      IDEPTH=DEPTH-RD(IL,JL)+.5
      IF (IDEPTH.LT.1) IDEPTH=1
      IF (IDEPTH.GT.30) IDEPTH=30
      SMS=SMSX(IL,JL)
      IAREA=AREA(IL,JL)
      THICK=THK(IAREA)
      HYCND=HCU(IAREA)
      IF (HYCND-.004) 4,5,5
    4 IFXP=1
      GO TO 10
    5 IF (HYCND-.04) 6,7,7
    6 IEXP=2
      GO TO 10
    7 IF (HYCND-.4) 8,9,9
    8 IEXP=3
      GO TO 10
    9 IEXP=4
   10 TEST=-12.*HYCND*GWETO(IEXP,IDEPTH)
      IF (DEPTH.GT.THICK) DEPTH=THICK
      TESTR=DEPTH*HYCND*12./THICK
      SUM=0.0
      DO 25 I=1,NDAZ
      ETI=0.0
      RF=PRECIP(I+IRX8)
      IF (RF) 11,11,13
   11 ETI=-RF
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      RF=0.0
      IF (SMS-ETI) 12,12,16
   12 ACCRE=SMS-ETI
      SMS=0.0
      GO TO 22
   13 PS=SWF*(RGF-(RGF-1)*SMS/SMSM)
      FR=-SMS+KSAT/2.+SQRT((SMS+KSAT/2.)**2+2.*KSAT*PS)
      IF (RF-FR) 14,15,15
   14 SMS=SMS+RF*(1.-RF/(2.*FR))
      GO TO 16
   15 SMS=SMS+FR/2.
   16 SMS=SMS-ETI
      IF (SMS-SMC) 17,17,18
   17 DRIP=0.
      GO TO 19
   18 DRIP=DRN*(1.-EXP(-(SMS-SMC)/XNORM))
   19 CONTINUE
      IF (SMS-DRIP) 21,20,20
   20 SMS=SMS-DRIP
      ACCRE=DRIP
      GO TO 22
   21 ACCRE=SMS
      SMS=0.0
   22 CONTINUE
      IF (ACCRE.GT.TESTR) GO TO 23
      IF (ACCRE.LT.TEST) ACCRE=TEST
      GO TO 24
   23 SMS=SMS+(ACCRE-TESTR)
      ACCRE=TESTR
   24 IF (SMS.GE.SMSM) SMS=SMSM
      SUM=SUM+ACCRE
   25 CONTINUE
      ACCRET(IL,JL)=SUM/(12*NDAZ)
      SMSX(IL,JL)=SMS
   26 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE BETA(IND,TTIME)
      INTEGER * 2 IV,WELLS,IPCO,IR,IC
      INTEGER *4  WENO
      INTEGER * 2 AREA,ELEV
      INTEGER*2 PNT(80),SYMBOL(25)
      COMMON /ARY/ H(34,80,3),PZ(34,80),AM(34,80),HO(34,80),Q(34,80),
     1RD(34,80),ACCRET(34,80),S(34,80), T(34,80),GWETO(4,30),SAT(64,2),
     2G(80),W(80),PRECIP(1461),INO(60),HCU(60),HCL(60),THK(60),
     3 ELEV(34,80),AREA(34,80),IV(34,80)
      COMMON /INT/ M,N,IRD,IPT,M1,N1
      COMMON/WATAB/WT(34,80),WTSTO(60)
      COMMON /DATE/IMON,IDAY,IYEAR
      DATA  SYMBOL  /' ','+','*','=','A','B','C','D','E','F','G','H',
     1  'I','J','K','L','M','N','O','P','Q','R','S','T','U'/
      XMX=0.0
      XMN=999999.0
      IF (IND-2) 3,1,5
    1 DO 2 I=2,M1
      DO 2 J=2,N1
      IF (ACCRET(I,J).GT.XMX) XMX=ACCRET(I,J)
      IF (ACCRET(I,J).LT.XMN) XMN=ACCRET(I,J)
    2 CONTINUE
      GO TO 7
    3 DO 4 I=2,M1
      DO 4 J=2,N1
      IF (H(I,J,1).GT.XMX) XMX=H(I,J,1)
      IF (H(I,J,1).LT.XMN) XMN=H(I,J,1)
    4 CONTINUE
      GO TO 7
    5 DO 6 I=2,M1
      DO 6 J=2,N1
      IF (WT(I,J).GT.XMX) XMX=WT(I,J)
      IF (WT(I,J).LT.XMN) XMN=WT(I,J)
    6 CONTINUE
    7 DIV=ABS((XMX-XMN)/20.)
      IF (IND-2) 10,9,8
    8 WRITE (IPT,32) TTIME,IMON,IDAY,IYEAR
      WRITE (IPT,28)
      GO TO 13
    9 WRITE (IPT,33) TTIME,IMON,IDAY,IYEAR
      WRITE (IPT,30)
      GO TO 13
   10 WRITE (IPT,31) TTIME,IMON,IDAY,IYEAR
      IF (XMX-XMN) 12,11,12
   11 WRITE (IPT,26) XMN
      GO TO 25
   12 WRITE (IPT,29)
   13 DO 14 I=1,20
      XX=XMN+(I-1)*DIV
      X2=XX+DIV
      WRITE (IPT,34) SYMBOL(I+4),XX,X2
   14 CONTINUE
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      X2=20.*DIV+XMN
      WRITE (IPT,27) SYMBOL(25),X2
      DO 15 I=1,N
      PNT(I)=MOD(I,10)
   15 CONTINUE
      WRITE (IPT,37) (PNT(I),I=1,N)
      DO 23 I=2,M1
      PNT(1)=(MOD(I,10)+240)*2**8
      PNT(N)=PNT(1)
      DO 22 J=2,N1
      IF (IV(I,J)-2) 17,16,17
   16 PNT(J)=SYMBOL(2)
      GO TO 22
   17 IF (Q(I,J)) 19,19,18
   18 PNT(J)=SYMBOL(3)
      GO TO 22
   19 IF (PZ(I,J)) 21,21,20
   20 PNT(J)=SYMBOL(4)
      GO TO 22
   21 IF (IND.EQ.1) PNT(J)=SYMBOL(ABS((H(I,J,1)-XMN)/DIV)+5.0)
      IF (IND.EQ.2) PNT(J)=SYMBOL(ABS((ACCRET(I,J)-XMN)/DIV)+5.0)
      IF (IND.EQ.3) PNT(J)=SYMBOL(ABS((WT(I,J)-XMN)/DIV)+5.0)
   22 CONTINUE
      WRITE (IPT,35) (PNT(J),J=1,N)
   23 CONTINUE
      DO 24 I=1,N
      PNT(I)=MOD(I,10)
   24 CONTINUE
      WRITE (IPT,36) (PNT(I),I=1,N)
   25 RETURN
   26 FORMAT (45X,'INITIAL ELEVATION OF POTENTIOMETRIC SURFACE -- ',F5.0
     1,'FEET')
   27 FORMAT (47X,A1,12X,F10.2)
   28 FORMAT (//45X,'SYMBOL',5X,'RANGE OF WATER-TABLE ELEV. (FEET)',/)
   29 FORMAT (//45X,'SYMBOL',6X,'RANGE OF HEAD (FEET)',/)
   30 FORMAT (//45X,'SYMBOL',5X,'RANGE OF AVERAGE ACCRETION RATE (FT/DAY
     1)',/)
   31 FORMAT ('1',///45X,'MAP OF HEAD DISTRIBUTION IN AQUIFER',//45X,'TI
     1ME-- ',F10.2,5X,' DATE-- ',I2,'/',I2,'/',I4,//45X,'$ -- FULLY PENE
     2TRATING STREAM OR LAKE',//45X,'= -- PARTIALLY PENETRATING STREAM O
     3R LAKE',//45X,'* -- PUMPING WELL'/)
   32 FORMAT ('1',///45X,'DISTRIBUTION MAP OF WATER-TABLE ELEVATION',//4
     15X,'TIME-- ',F10.2,5X,' DATE-- ',I2,'/',I2,'/',I4,//45X,'$ -- FULL
     2Y PENETRATING STREAM OR LAKE',//45X,'= -- PARTIALLY PENETRATING ST
     3REAM OR LAKE',//45X,'* -- PUMPING WELL'/)
   33 FORMAT ('1',///45X,'MAP OF ACCRETION DISTRIBUTION',//45X,'TIME-- '
     1,F10.2,5X,' DATE-- ',I2,'/',I2,'/',I4,//45X,'$ -- FULLY PENETRATIN
     2G STREAM OR LAKE',//45X,'= -- PARTIALLY PENETRATING STREAM OR LAKE
     3',//45X,'* -- PUMPING WELL'/)
   34 FORMAT (47X,A1,6X,F10.4,' TO',F10.4)
   35 FORMAT (45X,80A1)
   36 FORMAT (45X,80I1)
   37 FORMAT (1H1,///,45X,80I1)
      END
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      SUBROUTINE ALPHA(PAR)
      DIMENSION  CARD(80),PAR(M,N)
      INTEGER * 2 AREA,ELEV
      INTEGER * 2 IV,WELLS,IPCO,IR,IC
      INTEGER *4  WENO
      COMMON /ARY/ H(34,80,3),PZ(34,80),AM(34,80),HO(34,80),Q(34,80),
     1RD(34,80),ACCRET(34,80),S(34,80), T(34,80),GWETO(4,30),SAT(64,2),
     2G(80),W(80),PRECIP(1461),INO(60),HCU(60),HCL(60),THK(60),
     3 ELEV(34,80),AREA(34,80),IV(34,80)
      COMMON   /INT/ M,N,IRD,IPT,M1,N1,NS
      READ (IRD,8) NS
      READ (IRD,5) (SAT(IXX,1),SAT(IXX,2),IXX=1,NS)
      WRITE (IPT,9)
      DO 4 I=1,M
      READ (IRD,7) (CARD(J),J=1,N)
      WRITE (IPT,6) (CARD(J),J=1,N)
      DO 3 J=1,N
      DO 1 JJ=1,NS
      IF (CARD(J)-SAT(JJ,1)) 1,2,1
    1 CONTINUE
    2 PAR(I,J)=SAT(JJ,2)
    3 CONTINUE
    4 CONTINUE
      RETURN
    5 FORMAT (8(A1,E8.1))
    6 FORMAT (44X,80A1)
    7 FORMAT (80A1)
    8 FORMAT (I2)
    9 FORMAT (1H1)
      END
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      SUBROUTINE INIT(ARRAY,CONST)


        SUBROUTINE INIT PERFORMS THE FUNCTION OF SETTING ALL INTERIOR
        ELEMENTS OF THE ARRAY PASSED AS THE FIRST ARGUMENT TO THE
        VALUE OF THE SCALER PASSED AS THE SECOND ARGUMENT. THE
        EDGE ELEMENTS ARE SET TO 0.


      DIMENSION ARRAY (M,N)
      COMMON /INT/ M,N,IRD,IPT,M1,N1
      DO 1 I=2,M1
      DO 1 J=2,N1
      ARRAY(I,J)=CONST
    1 CONTINUE
      DO 2 I=1,M
      ARRAY(I,1)=0.0
      ARRAY(I,N)=0.0
    2 CONTINUE
      DO 3 J=2,N1
      ARRAY(1,J)=0.0
      ARRAY(M,J)=0.0
    3 CONTINUE
      RETURN
      END
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      SUBROUTINE SETUP(J,A,AINF,A1,A2,MIN,MAX)
C
C
C       SUBROUTINE SETUP  ASCERTAINS IF THE VALUE PASSED AS
C       THE FIRST ARGUMENT  IS WITHIN THE BOUNDS OF MIN AND MAX AND
C       RETURNS THE PROPER VALUES FOR THE THIRD AND FOURTH
C       ARGUMENTS.
C
C
      IF (MIN-J) 1,3,5
    1 IF (J-MAX) 2,4,5
    2 A1=A
      A2=A
      GO TO 7
    3 A2=A
      GO TO 6
    4 A1=A
      A2=AINF
      GO TO 7
    5 A2=AINF
    6 A1=AINF
    7 RETURN
      END
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      SUBROUTINE QCALC(I,J,KZ,XY3,XY4,XY1,XY2,ITDX)
C
C
C        SUBROUTINE QCALC PERFORMS THE INTERMEDIATE CALCULATIONS FOR
C        THE MASS-BALANCE RESIDUAL COMPUTATION.  THE CHECKING DONE
C        BY THIS ROUTINE IS TO ASCERTAIN IF THE CURRENT ELEMENT IS
C        ON AN EDGE OF THE MATRIX, OR IF IT IS ADJACENT TO BOTH EDGES
C       IN THE CASE OF AN ARRAY OF DIMENSION 3.
C
C
      INTEGER * 2 IV,WELLS,IPCO,IR,IC
      INTEGER * 2 AREA,ELEV
      INTEGER *4  WENO
      COMMON /ARY/ H(34,80,3),PZ(34,80),AM(34,80),HO(34,80),Q(34,80),
     1RD(34,80),ACCRET(34,80),S(34,80), T(34,80),GWETO(4,30),SAT(64,2),
     2G(80),W(80),PRECIP(1461),INO(60),HCU(60),HCL(60),THK(60),
     3 ELEV(34,80),AREA(34,80),IV(34,80)
      COMMON /INT/ M,N,IRD,IPT,M1,N1,IALPHA,IXMIN,IXMAX,IYMIN,IYMAX,
     1K,L,IPS,ISAM,IRX6,NDAZ,WELLS
      COMMON   /REAL/  X,XINF,Y,YINF,SWQ,CPRIME,WPRIME,DTIME,
     1PSM,SAMM,QS,C,TM,SM,XM,YM
      FXX(Z1,Z2,Z3,Z4,Z5)=(TT+Z1)/2.*((Z2-HH)/Z3)*((Z4+Z5)/2.)
      IKX=KZ+1
      IF (ITDX.NE.1) CALL SETUP(J,X,XINF,XY1,XY2,IXMIN,IXMAX)
      DO 13 KX=KZ,IKX
      Q1=0.0
      HH=H(I,J,KX)
      TT=T(I,J)
      IF (I-2) 1,3,1
    1 Q1=FXX(T(I-1,J),H(I-1,J,KX),XY3,XY1,XY2)
      IF (N1-2) 2,3,2
    2 IF ((J-2)*(N1-J).EQ.0) Q1=Q1/2.
    3 Q2=0.0
      IF (M1-I) 4,6,4
    4 Q2=FXX(T(I+1,J),H(I+1,J,KX),XY4,XY1,XY2)
      IF (N1-2) 5,6,5
    5 IF ((J-2)*(N1-J).EQ.0) Q2=Q2/2.
    6 Q3=0.0
      IF (J-2) 7,9,7
    7 Q3=FXX(T(I,J-1),H(I,J-1,KX),XY1,XY3,XY4)
      IF (M1-2) 8,9,8
    8 IF ((I-2)*(M1-I).EQ.0) Q3=Q3/2.
    9 Q4=0.0
      IF (N1-J) 10,12,10
   10 Q4=FXX(T(I,J+1),H(I,J+1,KX),XY2,XY3,XY4)
      IF (M1-2) 11,12,11
   11 IF ((I-2)*(M1-I).EQ.0) Q4=Q4/2.
   12 QS=QS+(Q1+Q2+Q3+Q4)/2.
   13 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE PROCSS (I,J,XY3,XY4,D1,D3,D4,TMINUS,TPLUS,HMINUS,
     1HPLUS,ISW,ISW1,ISW2,IM1,IM2,TP1,TP2,XY1,XY2)
C
C        SUBROUTINE PROCSS PERFORMS THE CALCULATION OF THE W AND G
C        FACTORS NECESSARY FOR THE REDEFINITION OF THE H ARRAY.  THE
C        EXTENSIVE USE OF PARAMETER PASSING IS NECESSITATED BY THE
C        FACT THAT THIS ROUTINE IS COMMON FOR BOTH THE ROW AND
C        COLUMN ITERATIONS, AND THE ADJACENT ELEMENTS ARE, BY DEFINITION,
C        PERPENDICULAR WITH RESPECT TO  THE ARRAY SURFACE.  THUS
C        EACH SEPARATE CALL TO THIS ROUTINE REPRESENTS A DIFFERENT
C        ORIENTATION OF CRITICAL POINTS WITHIN THE T AND H ARRAYS.
C        PARAMETER ISW IS A SWITCH THAT INDICATES THIS ORIENTATION.
C        ARGUMENTS  D1, D3, AND D4 ARE CALCULATED IN THE ROUTINE AND
C        PASSED BACK FOR FURTHER EVALUATION.
C
      INTEGER * 2 IV,WELLS,IPCO,IR,IC
      INTEGER * 2 AREA,ELEV
      INTEGER *4  WENO
      COMMON /ARY/ H(34,80,3),PZ(34,80),AM(34,80),HO(34,80),Q(34,80),
     1RD(34,80),ACCRET(34,80),S(34,80), T(34,80),GWETO(4,30),SAT(64,2),
     2G(80),W(80),PRECIP(1461),INO(60),HCU(60),HCL(60),THK(60),
     3 ELEV(34,80),AREA(34,80),IV(34,80)
      COMMON   /REAL/  X,XINF,Y,YINF,SWQ,CPRIME,WPRIME,DTIME,
     1PSM,SAMM,QS,C,TM,SM,XM,YM
      COMMON/WATAB/WT(34,80),WTSTO(60)
      FX(Z1,Z2,Z3,Z4)=(TX+Z1)*(Z3+Z4)/(4.*Z2)
      FX2(Z1,Z2)=(TX+Z1)/Z2*(XY1+XY2)/2.
      H1=H(I,J,2-ISW)
      H2=H(I,J,3-ISW)
      TX=T(I,J)
      WTL=WT(I,J)
      IAREA=AREA(I,J)
      THICK=THK(IAREA)
      HYCND=HCL(IAREA)
      HWT=THICK-ELEV(I,J)+WTL
      HPS=THICK-ELEV(I,J)+H(I,J,1)
      XYTOT=(XY1+XY2)*(XY3+XY4)
      IF (HPS) 1,2,2
    1 STORAG=WTSTO(IAREA)
      GO TO 3
    2 STORAG=S(I,J)
    3 D1=STORAG*XYTOT/(2.*DTIME)
      D3=0.0
      IF (AM(I,J).NE.0.) D3=PZ(I,J)*XYTOT/(4.*AM(I,J))
      D4=0.
      IF (HWT.GT.0.) D4=HYCND*XYTOT/(4.*HWT)
      IF (IV(I,J)-2) 4,21,22
    4 A=0.0
      B=0.0
      C=0.0
      ARR4=-(D1+D3+D4)
      IF (ISW1-2) 8,5,8
```

Table 1.—*SUPERMOCK program listing*—Continued

```
 5 IF (IM1-ISW1) 7,6,7
 6 B=XRR4
   GO TO 11
 7 C=2.*FX(TPLUS,XY2,XY3,XY4)
   B=XRR4-C
   GO TO 11
 8 IF (IM1-ISW1) 10,9,10
 9 A=2.*FX(TMINUS,XY1,XY3,XY4)
   B=XRR4-A
   GO TO 11
10 C=FX(TPLUS,XY2,XY3,XY4)
   A=FX(TMINUS,XY1,XY3,XY4)
   B=XRR4-(A+C)
11 QPZ=HO(I,J)*D3
   QAC=WTL*D4
   IF (D4.EQ.0.) QAC=ACCRET(I,J)*XYTOT/4.
   WQ=Q(I,J)-QPZ-QAC
   XRR5=-D1
   IF (ISW2-2) 12,15,12
12 IF (IM2-ISW2) 13,14,13
13 XRR4=FX(TP1,XY3,XY1,XY2)
   XRR6=FX(TP2,XY4,XY1,XY2)
   D=-XRR4*HMINUS+(XRR4+XRR6+XRR5)*H1-XRR6*HPLUS+WQ
   GO TO 18
14 XRR4=FX2(TP1,XY3)
   D=-XRR4*HMINUS+(XRR4+XRR5)*H1+WQ
   GO TO 18
15 IF (IM2-ISW2) 17,16,17
16 D=XRR5*H1+WQ
   GO TO 18
17 XRR4=FX2(TP2,XY4)
   D=(XRR4+XRR5)*H1-XRR4*HPLUS+WQ
18 IF ((ISW2-2)*(IM2-ISW2).EQ.0.0) WQ=WQ/2.
   IF ((ISW1-2)*(IM1-ISW1)) 20,19,20
19 WQ=WQ/2.
20 SWQ=SWQ+WQ*DTIME/2.
   W(ISW1)=B-A*W(ISW1-1)
   G(ISW1)=(D-A*G(ISW1-1))/W(ISW1)
   IF (ABS(G(ISW1)).LT.1.0E-20) G(ISW1)=0.0
   GO TO 22
21 G(ISW1)=H2
   W(ISW1)=1.0
   C=0.0
22 RETURN
   END
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      SUBROUTINE WDRAW(IWDNT,IWDT,TIME,M,N,RRM,IDNT,IRD,IPT)
      INTEGER * 2 IF,JF,AREA,ELEV,IV
      COMMON /ARY/ H(34,80,3),PZ(34,80),AM(34,80),HO(34,80),Q(34,80)
      COMMON /DATE/IMON,IDAY,IYEAR
      DIMENSION IF(200),JF(200)
      DO 1 I=1,M
      DO 1 J=1,N
    1 Q(I,J)=0.0
C
C     NR - NUMBER OF WITHDRAWAL RATES.
C
      READ (IRD,2) NR
    2 FORMAT (I4)
      IF (IWDNT-1) 3,5,3
C
C     IF - ROW ; JF - COLUMN.
C     Q - HOLDS WITHDRAWAL RATES.
C
    3 READ (IRD,4) (IF(I),JF(I),Q(IF(I),JF(I)),I=1,NR)
    4 FORMAT (5(2I3,E10.3))
      GO TO 10
    5 JR=1
      DO 9 I=1,NR
C
C     MR - CUMULATIVE SUM OF NODES.
C
      READ (IRD,6) MR,(IF(J),JF(J),J=JR,MR)
C
C     QU - RATE TO BE APPLIED TO NODES FROM JR TO MR.
C
      READ (IRD,7) QU
    6 FORMAT (I4,25I3)
    7 FORMAT (E10.3)
      DO 8 K=JR,MR
    8 Q(IF(K),JF(K))=QU
    9 JR=MR+1
      NR=MR
   10 IF (IWDT-1) 14,11,14
   11 WRITE (IPT,12) TIME,IMON,IDAY,IYEAR
   12 FORMAT (1H1,55X,'** WITHDRAWAL RATES **'//45X,'TIME, IN DAYS--',F1
     12.5,5X,'DATE-- ',1X,I2,'/',I2,'/',I4//7(1X,'ROW COL',5X,'RATE',1X)
     2)
      WRITE (IPT,13) (IF(I),JF(I),Q(IF(I),JF(I)),I=1,NR)
   13 FORMAT (7(1X,I3,1X,I3,1X,F9.1))
   14 RRM=TIME+IDNT
      RETURN
      END
```

```
      SUBROUTINE START(QPER)
      INTEGER * 2 IV,WELLS,IPCO,IR,IC
      INTEGER * 2 AREA,ELEV
      INTEGER *4  WENO
      REAL*4 KSAT
      COMMON /ARY/ H(34,80,3),PZ(34,80),AM(34,80),HO(34,80),Q(34,80),
     1RD(34,80),ACCRET(34,80),S(34,80), T(34,80),GWETO(4,30),SAT(64,2),
     2G(80),W(80),PRECIP(1461),INO(60),HCU(60),HCL(60),THK(60),
     3 ELEV(34,80),AREA(34,80),IV(34,80)
      COMMON /INT/ M,N,IRD,IPT,MI,NI,IALPHA,IXMIN,IXMAX,IYMIN,IYMAX,
     1K,L,IPS,ISAM,IRX8,NDAZ,WELLS
      COMMON  /REAL/  X,XINF,Y,YINF,SWQ,CPRIME,WPRIME,DTIME,
     1PSM,SAMM,QS,C,TM,SM,XM,YM
      COMMON/DRM/SMSIN,KSAT,DRN,SWF,RGF,XNORM,SMSM
      COMMON/WATAB/WT(34,80),WTSTO(60)
      COMMON /DATE/IMON,IDAY,IYEAR
C
C     INO IS USED AS A TEMPORARY LOCATION FOR PROJECT TITLE.
C
      READ (IRD,1) (INO(I),I=1,20)
    1 FORMAT (20A4)
C
C     KMON, KDAY, KYR IS THE DATE OF ANALYSIS.
C
      READ (IRD,2) KMON,KDAY,KYR
    2 FORMAT (2I2,I4)
      WRITE (IPT,3)
    3 FORMAT (5X,10('S'),4X,2('U'),6X,2('U'),4X,10('P'),4X,10('E'),4X,10
     1('R'),4X,2('M'),6X,2('M'),4X,10('O'),4X,10('C'),4X,2('K'),5X,2('K'
     2)/5X,10('S'),4X,2('U'),6X,2('U'),4X,10('P'),4X,10('E'),4X,10('R'),
     34X,3('M'),4X,3('M'),4X,10('O'),4X,10('C'),4X,2('K'),4X,2('K')/5X,2
     4('S'),6X,2('S'),4X,2('U'),6X,2('U'),4X,2('P'),6X,2('P'),4X,2('E'),
     512X,2('R'),6X,2('R'),4X,4('M'),2X,4('M'),4X,2('O'),6X,2('O'),4X,2(
     6'C'),6X,2('C'),4X,2('K'),3X,2('K'),/5X,2('S'),12X,2('U'),6X,2('U')
     7,4X,2('P'),6X,2('P'),4X,2('E'),12X,2('R'),6X,2('R'),4X,'MM',1X,4('
     8M'),1X,2('M'),4X,2('O'),6X,2('O'),4X,2('C'),12X,2('K'),2X,2('K'),/
     95X,2('S'),12X,2('U'),6X,2('U'),4X,2('P'),6X,2('P'),4X,2('E'),12X,2
     $('R'),6X,2('R'),4X,2('M'),2X,2('M'),2X,2('M'),4X,2('O'),6X,2('O'),
     $4X,2('C'),12X,2('K'),1X,2('K')/5X,10('S'),4X,2('U'),6X,2('U'),4X,1
     $0('P'),4X,7('E'),7X,10('R'),4X,'MM',6X,2('M'),4X,2('O'),6X,2('O'),
     $4X,2('C'),12X,4('K'))
      WRITE (IPT,4)
    4 FORMAT (5X,10('S'),4X,'UU',6X,'UU',4X,10('P'),4X,7('E'),7X,10('R')
     1,4X,'MM',6X,'MM',4X,'OO',6X,'OO',4X,'CC',12X,4('K')/13X,'SS',4X,'U
     2U',6X,'UU',4X,'PP',12X,'EE',12X,'RR',2X,'RR',8X,'MM',6X,'MM',4X,'O
     3O',6X,'OO',4X,'CC',12X,'KK',1X,'KK',/13X,'SS',4X,'UU',6X,'UU',4X,'
     4PP',12X,'EE',12X,'RR',3X,'RR',7X,'MM',6X,'MM',4X,'OO',6X,'OO',4X,'
     5CC',12X,'KK',2X,2('K'),/5X,2('S'),6X,2('S'),4X,2('U'),6X,2('U'),4X
     6,2('P'),12X,2('E'),12X,2('R'),4X,2('R'),6X,2('M'),6X,2('M'),4X,2('
     7O'),6X,2('O'),4X,2('C'),6X,2('C'),4X,2('K'),3X,2('K'),/5X,10('S'),
     84X,10('U'),4X,2('P'),12X,10('E'),4X,2('R'),5X,2('R'),5X,2('M'),6X,
     92('M'),4X,10('O'),4X,10('C'),4X,2('K'),4X,2('K')/5X,10('S'),4X,10(
```

```
     $'U'),4X,2('P'),12X,10('E'),4X,2('R'),6X,2('R'),4X,2('M'),6X,2('M')
     $,4X,10('O'),4X,10('C'),4X,2('K'),5X,2('K'))
      WRITE (IPT,5)
    5 FORMAT (/////,47X,'A MODEL FOR GROUND-WATER FLOW ANALYSIS'///15X,1
     102('*'))
      WRITE (IPT,6) (INO(I),I=1,20),KMON,KDAY,KYR
    6 FORMAT (//19X,'PROJECT TITLE: ',20A4//19X,'DATE OF ANALYSIS: ',I2,
     1'/',I2,'/',I4)
      WRITE (IPT,7) QPER,IMON,IDAY,IYEAR,NDAZ
    7 FORMAT (/19X,'DURATION IN DAYS:',F10.0//19X,'BEGINNING ON: ',I2,'/
     1',I2,'/',I4//19X,'TIME-STEP INCREMENT, IN DAYS: ',I3)
      WRITE (IPT,8) M,N
    8 FORMAT (/19X,'NO. OF ROWS IN GRID: ',I3//19X,'NO. OF COLUMNS IN GR
     1ID: ',I3)
      IF (XM*YM) 9,11,9
    9 X=XM
      Y=YM
      IXMIN=0
      IXMAX=100
      XINF=0.0
      IYMAX=100
      IYMIN=0
      YINF=0.0
      WRITE (IPT,10) XM,YM
   10 FORMAT (/19X,'NODE SPACING IN X DIRECTION IS CONSTANT: ',F10.1,' F
     1T.'//19X,'NODE SPACING IN Y DIRECTION IS CONSTANT: ',F10.1,' FT.')
      GO TO 15
C
C     ******************************************************************
C     PARAMETERS NEEDED TO DEFINE GRID WITH VARIABLE SPACING.
C     ******************************************************************
C
C     XINF IS THE SPACING FROM COL. 1 TO IXMIN AND FROM IXMAX TO N. X IS
C     IS THE SPACING FROM IXMIN TO IXMAX.
C     YINF IS THE SPACING FROM ROW 1 TO IYMIN AND FROM IYMAX TO M. Y IS
C     THE SPACING FROM IYMIN TO IYMAX.
C
   11 READ (IRD,12) IXMIN,IXMAX,XINF,X,IYMIN,IYMAX,YINF,Y
   12 FORMAT (2(2I3,2F10.1))
      WRITE (IPT,13) IXMIN,XINF,IXMIN,IXMAX,X,IXMAX,N,XINF
   13 FORMAT (/19X,'NODE SPACING IS VARIABLE:'//22X,'FROM COLUMN 1 TO ',
     1I3,' THE SPACING IS: ',F10.1,' FT.'//22X,'FROM COLUMN ',I3,' TO ',
     2I3,' IT IS: ',F10.1,' FT.'//22X,'FROM COLUMN ',I3,' TO ',I3,' IT I
     3S: ',F10.1,' FT.')
      WRITE (IPT,14) IYMIN,YINF,IYMIN,IYMAX,Y,IYMAX,M,YINF
   14 FORMAT (/22X,'FROM ROW 1 TO ',I3,' THE SPACING IS: ',F10.1,' FT.'/
     1/22X,'FROM ROW ',I3,' TO ',I3,' IT IS: ',F10.1,' FT.'//22X,'FROM R
     2OW ',I3,' TO ',I3,' IT IS: ',F10.1,' FT.')
C
C         ARRAY ACCRET IS USED AS A TEMPORARY STORAGE LOCATION FOR AREA
C
   15 CALL ALPHA(ACCRET)
```

```
C
C     AREA IS THE DECODED ARRAY FOR THE AREA DEFINITION MAP FOR
C     HYDRAULIC CONDUCTIVITY AND EVAPOTRANSPIRATION.
C
      DO 16 I=1,M
      DO 16 J=1,N
      AREA(I,J)=ACCRET(I,J)
   16 ACCRET(I,J)=0.0
C
C     GWETO HOLDS VALUES OF EVAPOTRANSPIRATION DIVIDED BY SATURATED
C     HYDRAULIC CONDUCTIVITY FOR FOUR DIFFERENT RANGES OF HYDRAULIC
C     CONDUCTIVITY; ROW 1 HC<.004, ROW 2 .004<HC<.040, ROW 3
C     .040<HC<.400, ROW 4 .400<HC .
C
      READ (IRD,17) ((GWETO(I,J),J=1,30),I=1,4)
   17 FORMAT (10F7.5)
C
C     NLOGS IS THE NUMBER OF DEFINED AREAS IN HYD. COND. AND ET MAP.
C
      READ (IRD,18) NLOGS
   18 FORMAT (I2)
C
C     INO IS A REPRESENTATIVE WELL NUMBER, HCU IS HYD. COND. FROM
C     SURFACE TO WATER TABLE, HCL IS HYD. COND. FROM WATER TABLE TO TOP
C     OF AQUIFER, THK IS THICKNESS FROM SURFACE TO TOP OF AQUIFER,
C     WTSTO IS THE WATER-TABLE STORAGE COEFFICIENT.
C
      READ (IRD,19) (INO(I),HCU(I),HCL(I),THK(I),WTSTO(I),I=1,NLOGS)
   19 FORMAT (A4,6X,4F10.5)
      WRITE (IPT,20) (SAT(I,2),SAT(I,1),INO(I),HCU(I),HCL(I),THK(I),I=1,
     1NLOGS)
   20 FORMAT (//44X,'AREA-DEFINITION MAP FOR HYDRAULIC CONDUCTIVITY AND
     1EVAPOTRANSPIRATION'/1H1,70X,'HC EXPLANATION',//43X,'+',67('-'),'+'
     2/43X,'|',1X,'SEQUENCE',1X,'|',1X,'SYMBOL',1X,'|',1X,'REPRESENTATIV
     3E',1X,'|',4X,'HCU',3X,'|',4X,'HCL',3X,'|',3X,'THK',2X,'|'/43X,'|',
     42X,'NUMBER',2X,'|',8X,'|',2X,'WELL NUMBER',3X,'|',10X,'|',10X,'|',
     58X,'|'/43X,'|',67('-'),'|',/(43X,'|',4X,F3.0,3X,'|',3X,A1,4X,'|',6
     6X,A4,6X,'|',1X,F8.5,1X,'|',1X,F8.5,1X,'|',1X,F6.2,1X,'|'))
      WRITE (IPT,21)
   21 FORMAT (43X,'+',67('-'),'+')
      WRITE (IPT,22) (J,(GWETO(I,J),I=1,4),J=1,30)
   22 FORMAT (1H1,73X,'ET EXPLANATION',//43X,'+',73('-'),'+'/43X,'|',2X,
     1'DEPTH TO',3X,'|',6X,'HC<.004',1X,'|',1X,'.004<HC<.040',1X,'|',1X,
     2'.040<HC<.400',1X,'|',1X,'.400<HC',6X,'|',/43X,'|',1X,'WATER TABLE
     3',1X,'|',4(14X,'|')/43X,'|',5X,'(FT)',4X,'|',4(14X,'|')/43X,'|',73
     4('-'),'|',/((43X,'|',6X,I2,5X,'|',4X,F7.4,3X,'|',4X,F7.4,3X,'|',4X
     5,F7.4,3X,'|',4X,F7.4,3X,'|')))
      WRITE (IPT,23)
   23 FORMAT (43X,'+',73('-'),'+')
C
C     INITIAL ELEVATION FOR POTENTIOMETRIC SURFACE IS READ INTO H.
C
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      READ (IRD,61) ((H(I,J,1),J=1,N),I=1,M)
      DO 24 I=1,M
      DO 24 J=1,N
   24 WT(I,J)=H(I,J,1)
C
C     ARRAY ELEV HOLDS LAND SURFACE ELEVATIONS FOR GRID.
C
      READ (IRD,25) ((ELEV(I,J),J=1,N),I=1,M)
   25 FORMAT (20I3)
C
C     RD IS THE DECODED ARRAY FOR ROOT DEPTH.
C
      CALL ALPHA(RD)
      WRITE (IPT,26) (SAT(IXX,1),SAT(IXX,2),IXX=1,IALPHA)
   26 FORMAT (//45X,'ROOT DEPTH',/45X,'EXPLANATION',/45X,'SYMBOL',11X,'R
     1OOT DEPTH',/(47X,A1,1X,12(1H-),1X,F10.1))
C
C
C     SMSIN - INITIAL VALUE FOR SMS (SURFACE MOISTURE STORAGE) IN
C             INCHES.
C     KSAT  - SATURATED HYD. COND. FOR SOIL, IN INCHES/DAY.
C     DRN   - MAX. DRAINAGE RATE FOR SOIL, IN INCHES/DAY.
C     SWF   - SUCTION (TENSION) AT FIELD CAPACITY, IN INCHES.
C     RGF   - RATIO OF SUCTION AT FIELD CAPACITY TO SUCTION AT
C             WILTING POINT, DIMENSIONLESS.
C     XNORM - PARAMETER  THAT LIMITS RECHARGE RATE, CODE=1 FOR NO LIMIT.
C     SMSM  - MAX. WATER HELD IN SURFACE MOISTURE STORAGE, IN INCHES.
C
C
      READ (IRD,59) SMSIN,KSAT,DRN,SWF,RGF,XNORM,SMSM
      WRITE (IPT,27) SMSIN,KSAT,DRN,SWF,RGF,XNORM,SMSM
   27 FORMAT (12X,'SMSIN=',F5.2,',KSAT=',F5.2,',DRN=',F5.2,',SWF=',F5.1,
     1',RGF=',F5.2,',XNORM=',F5.2,',SMSM=',F5.2)
C
C
C     THE FOLLOWING SWITCHES CAN INDICATE CONSTANT (1), VARIES (2),
C     NOT MODELED (3) ; IPS (CONDUCTIVITY OF STREAMBED & LAKEBED),
C     ISAM (THICKNESS OF STREAMBED & LAKEBED), IPZ (COND. OF AQUITARD),
C     IAM (THICKNESS OF AQUITARD).
C     IF IPS=1, PSM IS COND. : IF ISAM=1 , SAMM IS THICKNESS :
C     IF IPZ=1 , PZM IS COND. : IF IAM=1 ,AMM IS THICKNESS.
C
      READ (IRD,46) IPS,ISAM,IPZ,IAM,PSM,SAMM,PZM,AMM
      IF (TM-1) 29,28,28
   28 WRITE (IPT,47) TM
      CALL INIT(T,TM)
      GO TO 30
C
C     T IS THE DECODED ARRAY FOR TRANSMISSIVITY.
C
   29 CALL ALPHA(T)
      WRITE (IPT,53) (SAT(IXX,1),SAT(IXX,2),IXX=1,IALPHA)
```

```
   30 IF (SM) 31,32,31
   31 WRITE (IPT,48) SM
      CALL INIT(S,SM)
      GO TO 33
C
C     S IS THE DECODED ARRAY FOR AQUIFER STORAGE.
C
   32 CALL ALPHA(S)
      WRITE (IPT,54) (SAT(IXX,1),SAT(IXX,2),WTSTO(IXX),IXX=1,IALPHA)
   33 IF (IPS-2) 34,35,36
   34 WRITE (IPT,49) PSM
      GO TO 36
C
C     PZ IS THE DECODED ARRAY FOR HYD. COND. FOR STREAMBED AND LAKEBED
C     OR AQUITARD.
C
   35 CALL ALPHA(PZ)
      WRITE (IPT,55) (SAT(IXX,1),SAT(IXX,2),IXX=1,IALPHA)
   36 IF (ISAM-2) 37,38,39
   37 WRITE (IPT,50) SAMM
      GO TO 39
C
C     AM IS THE DECODED ARRAY FOR THICKNESS OF STREAMBED & LAKEBED OR
C     AQUITARD.
C
   38 CALL ALPHA(AM)
      WRITE (IPT,56) (SAT(IXX,1),SAT(IXX,2),IXX=1,IALPHA)
   39 IF (IPZ-2) 40,41,42
   40 WRITE (IPT,51) PZM
      CALL INIT(PZ,PZM)
      GO TO 42
   41 CALL ALPHA(PZ)
      WRITE (IPT,57) (SAT(IXX,1),SAT(IXX,2),IXX=1,IALPHA)
   42 IF (IAM-2) 43,44,45
   43 WRITE (IPT,52) AMM
      CALL INIT(AM,AMM)
      GO TO 45
   44 CALL ALPHA(AM)
      WRITE (IPT,58) (SAT(IXX,1),SAT(IXX,2),IXX=1,IALPHA)
      WRITE (IPT,60)
   45 RETURN
   46 FORMAT (4I1,4E8.1)
   47 FORMAT (//45X,'TRANSMISSIVITY -- ',F10.1)
   48 FORMAT (//45X,'COEFFICIENT OF STORAGE -- ',F12.6)
   49 FORMAT (//45X,'CONDUCTIVITY OF STREAM AND LAKE BED MATERIAL -- ',F
     112.6)
   50 FORMAT (//45X,'THICKNESS OF STREAM AND LAKE BED MATERIAL -- ',F5.0
     1)
   51 FORMAT (//45X,'CONDUCTIVITY OF AQUITARD -- ',F12.6)
   52 FORMAT (//45X,'THICKNESS OF AQUITARD -- ',F5.0)
   53 FORMAT (//45X,'TRANSMISSIVITY MAP OF AQUIFER',/45X,'EXPLANATION',/
     1/45X,'SYMBOL',7X,'TRANSMISSIVITY',/(47X,A1,1X,12(1H-),1X,F12.6))
```

Table 1.—*SUPERMOCK program listing*—Continued

```
54 FORMAT (//45X,'COEFFICIENT OF STORAGE MAP',//45X,'SYMBOL',6X,'AQUISTA 261
  2X,F10.8,5X,F10.8))                                              STA 263
55 FORMAT (//45X,'MAP OF CONDUCTIVITY OF STREAM AND LAKE BED MATERIALSTA 264
  1'//45X,'SYMBOL',5X,'HYDRAULIC CONDUCTIVITY',/(47X,A1,1X,12(1H-),1XSTA 265
  2,F12.6))                                                        STA 266
56 FORMAT (//45X,'MAP OF THICKNESS OF STREAM AND LAKE BED MATERIAL',/STA 267
  1/45X,'SYMBOL',13X,'THICKNESS',/47X,'3',1X,'----------------',3X,'(STA 268
  2OUTSIDE SYSTEM)',/(47X,A1,1X,16(1H-),1X,F5.0))                  STA 269
57 FORMAT (//45X,'MAP OF VERTICAL CONDUCTIVITY OF AQUITARD',//45X,'SYSTA 270
  1MBOL',8X,'HYDRAULIC CONDUCTIVITY',/(47X,A1,1X,12(1H-),1X,F12.6))  STA 271
58 FORMAT (//45X,'MAP OF THICKNESS OF AQUITARD',//45X,'SYMBOL',14X,'TSTA 272
  1HICKNESS',/(47X,A1,1X,17(1H-),1X,F5.0))                         STA 273
59 FORMAT (12F6.1)                                                 STA 274
60 FORMAT (1H1)                                                    STA 275
61 FORMAT (20F3.0)                                                 STA 276
   END                                                             STA 277-
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      SUBROUTINE WTABLE(ACCRET,HCL,THK,H,ELEV,M,N,IPT,WELLNO,AREA,NDAYS)
      INTEGER*4 WELLNO
      INTEGER*2 AREA,ELEV
      COMMON/WATAB/WT(34,80),WTSTO(60)
      DIMENSION ACCRET(34,80),HCL (60),THK(60),H(34,80,3),ELEV(34,80),
     1   WELLNO(60),AREA(34,80)
      DO 37 IL=1,M
      DO 37 JL=1,N
      ELE=ELEV(IL,JL)
      IAREA=AREA(IL,JL)
      THICK=THK(IAREA)
      HC=HCL(IAREA)
      F=WTSTO(IAREA)
      DEPTH=ELE-H(IL,JL,3)
      HP=THICK-DEPTH
      AA=HC*HP
      ACRT=ACCRET(IL,JL)
      WW=WT(IL,JL)
      BB=ACRT-HC
      CC=THICK+WW-ELE
      ARG=CC**2+2*NDAYS*AA/F
      IF (ARG) 1,1,2
    1 G=0.
      GO TO 3
    2 G=SQRT(ARG)
    3 IF (HP) 4,4,7
    4 IF (CC) 5,6,6
    5 WTL=CC
      WT(IL,JL)=H(IL,JL,3)
      GO TO 34
    6 WTL=CC+NDAYS*BB/F
      GO TO 29
    7 IF (CC.GT.0.) GO TO 8
      CC=HP
      ARG=CC**2+2*NDAYS*AA/F
      G=SQRT(ARG)
    8 IF (BB) 9,28,9
    9 IF (ABS(CC-HP)-1.E-3) 10,12,12
   10 IF (ABS(ACRT)-1.E-4) 11,12,12
   11 WTL=CC+ACRT*NDAYS/F
      GO TO 34
   12 AB=AA/BB
      IF (ABS(BB)-1.E-6) 13,14,14
   13 XXI=G
      GO TO 15
   14 XXI=CC
   15 CONTINUE
      DNM=AA+BB*CC
      IF (DNM) 16,27,16
   16 CONTINUE
      DO 26 I=1,9
      XNM=AA+BB*XXI
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      RTO=XNM/DNM
      IF (RTO) 17,17,18
   17 RTO=10.**(-I)
      XXI=(RTO*DNM-AA)/BB
      XNM=RTO*DNM
   18 CONTINUE
      IF (ABS(RTO-1.)-.001) 20,19,19
   19 FX=XXI-AB*ALOG(RTO)-(CC+NDAYS*BB/F)
      GO TO 21
   20 FX=XXI-AA*(XXI-CC)/DNM-(CC+NDAYS*BB/F)
   21 CONTINUE
      IF (ABS(FX)-.01) 27,27,22
   22 F1X=1.-AA/XNM
      IF (F1X) 24,23,24
   23 XXII=ABS(AB)/2.
      GO TO 25
   24 XXII=XXI-FX/F1X
   25 XXI=XXII
   26 CONTINUE
   27 WTL=XXI
      GO TO 29
   28 WTL=G
   29 IF (WTL) 30,33,33
   30 IF (THICK-DEPTH) 31,32,32
   31 WTL=0.
      WT(IL,JL)=ELE-DEPTH
      GO TO 34
   32 WTL=0.
      WT(IL,JL)=ELE-THICK
      GO TO 34
   33 WT(IL,JL)=ELE-THICK+WTL
   34 IF (WTL-THICK) 37,37,35
   35 WTL=THICK
      WT(IL,JL)=ELEV(IL,JL)
   37 CONTINUE
      RETURN
      END
```

Table 1.—*SUPERMOCK program listing*—Continued

```
      SUBROUTINE OUTPUT(SRSD,SWQ,QSTR,SRPZ,SCAC,BALSTD,NEWYR)
      INTEGER *4  WENO
      INTEGER * 2 IV,WELLS,IPCO,IR,IC
      INTEGER * 2 AREA,ELEV
      INTEGER * 2 KSYM,LSYM,KWSYM,JSYM
      COMMON /ARY/ H(34,80,3),PZ(34,80),AM(34,80),HO(34,80),Q(34,80),
     1RD(34,80),ACCRET(34,80),S(34,80), T(34,80),GWETO(4,30),SAT(64,2),
     2G(80),W(80),PRECIP(1461),INO(60),HCU(60),HCL(60),THK(60),
     3 ELEV(34,80),AREA(34,80),IV(34,80)
      COMMON /OUT/WENO(60),ACSUM(60),TTIME(150),KSYM(146),LSYM(146),
     1KWSYM(146),IPCO(4),IR(60),IC(60)
      COMMON /INT/ M,N,IRD,IPT,M1,N1,IALPHA,IXMIN,IXMAX,IYMIN,IYMAX,
     1K,L,IPS,ISAM,IRX8,NDAZ,WELLS
      COMMON/WATAB/WT(34,80),WTSTO(60)
      COMMON /DATE/IMON,IDAY,IYEAR
      DIMENSION JSYM(4)
      DATA JSYM/'A','B','C',' '/
      BAL=0.0
      IF (IPCO(1)-1) 5,1,5
    1 IF (K.EQ.2) WRITE (IPT,40)
      WRITE (IPT,39) TTIME(K),IMON,IDAY,IYEAR
      WRITE (IPT,2)
    2 FORMAT (/51X,'*** POTENTIOMETRIC SURFACE ***')
      WRITE (IPT,3) (H(IR(JX),IC(JX),3),WENO(JX),JX=1,WELLS)
    3 FORMAT (12(1X,F6.2,A4))
      WRITE (IPT,4)
    4 FORMAT (/57X,'*** WATER TABLE ***')
      WRITE (IPT,3) (WT(IR(JX),IC(JX)),WENO(JX),JX=1,WELLS)
    5 CBAL=-(SRSD+SWQ+QSTR+SRPZ+SCAC)
      BAL=ABS(CBAL)*100/((ABS(SRSD)+ABS(SRPZ)+ABS(SCAC)+ABS(QSTR)+ABS(SW
     1Q))/2.)
      IF (BAL.LE.BALSTD) GO TO 7
      WRITE (IPT,6) BALSTD,BAL
    6 FORMAT ('0CUMULATIVE MASS BALANCE EXCEEDS STANDARD'//'   MASS BALA
     1NCE STANDARD -----',E10.3//' CUMULATIVE MASS BALANCE RESIDUAL,PERC
     2ENT'/'   OF TOTAL FLUX -----',E10.3)
    7 IF (WELLS) 19,19,8
    8 IF (NEWYR) 15,15,9
    9 NEWYR=0
      DO 10 JX=1,WELLS
   10 ACSUM(JX)=(NDAZ-IDAY)*ACCRET(IR(JX),IC(JX))+ACSUM(JX)
      IOYR=IYEAR-1
      WRITE (IPT,11) IOYR
   11 FORMAT ('1',57X,'ACCRETION SUMMATION (FT.)'//60X,'CALENDAR YEAR ',
     1I4)
      WRITE (IPT,12)
   12 FORMAT ('0',4('WELL NO.  ROW  COL  ACSUM',8X))
      WRITE (IPT,13) (WENO(JX),IR(JX),IC(JX),ACSUM(JX),JX=1,WELLS)
   13 FORMAT (4(3X,A4,4X,I3,2X,I3,1X,F6.2,7X))
      DO 14 JX=1,WELLS
   14 ACSUM(JX)=IDAY*ACCRET(IR(JX),IC(JX))
      GO TO 19
```

Table 1.—*SUPERMOCK program listing*—Continued

```
15 DO 16 JX=1,WELLS
16 ACSUM(JX)=ACSUM(JX)+(ACCRET(IR(JX),IC(JX))*NDAZ)
   IF (K-L) 19,17,19
17 WRITE (IPT,18) IMON,IDAY,IYEAR
18 FORMAT ('1',56X,'ACCRETION SUMMATION (FT.)'//57X,'THROUGH',3X,I2,'
  1/',I2,'/',I4)
   WRITE (IPT,12)
   WRITE (IPT,13) (WENO(JX),IR(JX),IC(JX),ACSUM(JX),JX=1,WELLS)
19 IF (IPCO(2)-1) 26,20,26
20 IF (KSYM(K-1).EQ.JSYM(4)) GO TO 26
   IF (KSYM(K-1)-JSYM(2)) 21,22,25
21 CALL BETA(1,TTIME(K))
   GO TO 26
22 WRITE (IPT,23)
23 FORMAT (1H1,51X,'*** POTENTIOMETRIC SURFACE ***')
   WRITE (IPT,39) TTIME(K),IMON,IDAY,IYEAR
   WRITE (IPT,24) ((I,J,H(I,J,3),I=1,M),J=1,N)
24 FORMAT (/,8(1X,'ROW',1X,'COL',4X,'ELEV')//(8(2I4,1X,F7.2)))
   GO TO 26
25 CALL BETA(1,TTIME(K))
   GO TO 22
26 IF (IPCO(3)-1) 33,27,33
27 IF (LSYM(K-1).EQ.JSYM(4)) GO TO 33
   IF (LSYM(K-1)-JSYM(2)) 28,29,32
28 CALL BETA(2,TTIME(K))
   GO TO 33
29 WRITE (IPT,30)
30 FORMAT (1H1,51X,'*** AVERAGE ACCRETION RATE ***')
   WRITE (IPT,39) TTIME(K),IMON,IDAY,IYEAR
   WRITE (IPT,31) ((I,J,ACCRET(I,J),I=1,M),J=1,N)
31 FORMAT (/,8(1X,'ROW',1X,'COL',4X,'RATE')//(8(2I4,1X,F7.4)))
   GO TO 33
32 CALL BETA(2,TTIME(K))
   GO TO 29
33 IF (IPCO(4)-1) 41,34,41
34 IF (KWSYM(K-1).EQ.JSYM(4)) GO TO 41
   IF (KWSYM(K-1)-JSYM(2)) 35,36,38
35 CALL BETA(3,TTIME(K))
   GO TO 41
36 WRITE (IPT,37)
37 FORMAT (1H1,57X,'*** WATER TABLE ***')
   WRITE (IPT,39) TTIME(K),IMON,IDAY,IYEAR
   WRITE (IPT,24) ((I,J,WT(I,J),I=1,M),J=1,N)
   GO TO 41
38 CALL BETA(3,TTIME(K))
   GO TO 36
39 FORMAT (/45X,'TIME, IN DAYS -- ',F9.2,8X,'DATE --   ',I2,'/',I2,'/'
  1,I4)
40 FORMAT (1H1)
41 RETURN
   END
```

The vertical-flow component is used to compute the altitude of the water table in the fine-grained material above the aquifer. Water-table altitude is computed as a function of transient flow through the fine-grained material above the aquifer and transient altitude of head in the aquifer.

The horizontal-flow component computes accretion to the aquifer and the transient altitude of the potentiometric surface in the aquifer. Stresses simulated on the aquifer include changes in stream stage, withdrawal by wells, and accretion (infiltration and evapotranspiration through the fine-grained material above the aquifer).

The level of discretization is different in the three components of SUPERMOCK. Generally, parameters are constant over the modeled area in the soil-moisture accounting component. The exceptions to this are root depth (RD), which varies from node to node, and the hydraulic conductivity (HCU) from the base of the root zone down to the water table, which is constant over user-defined areas. In the vertical-flow component, parameters are discretized as constant over user-specified areas. These areas should be set up as an aid to calibration with data points at the center of each area. This procedure will minimize the effect of changing parameter values in adjacent areas on the model-observed match at the data point. The maximum number of these specified areas is 60. In the horizontal-flow component, parameters can be discretized node by node. However, the results of the interaction of model parameters and model stress in the three components--soil-moisture storage, water-table head, and potentiometric head--all vary from node to node.

A flow diagram of the SUPERMOCK program is shown in figure 3. This program calls as many as 10 subroutines directly, and 2 more subroutines indirectly, during its execution. The first called is subroutine READSO, which is used to input daily precipitation and potential evapotranspiration. Subroutine START is next called, and this subroutine calls ALPHA and (or) INIT as is necessary. A flow diagram of subroutine START is shown in figure 4. Subroutine BETA is called to print a map of the initial altitude of the potentiometric surface. The preceding calls are made only once during the program's execution. The following calls are respected at specific steps during program execution. Subroutine WDRAW is called only if pumping is modeled and the pumping rate or location is changed as indicated by the input value of IDNT, the time increment of input of pumping data. Subroutine DREAM, the soil-moisture accounting component, and subroutine WTABLE, the vertical-flow component, are called once each time step. If ITDX is coded not equal to one, indicating that node spacing in the grid is not constant, subroutine SETUP is called once for each row and column and two or three times for each node within the model boundaries during each time step. Subroutine PROCSS is called twice each time step for each nonboundary node. A flow diagram for subroutine PROCSS is shown in figure 5. Subroutine QCALC is called twice each time step for each node for which head in the aquifer is specified (IV(I,J)=2). Subroutine OUTPUT is called once each time step. A flow diagram of subroutine OUTPUT is shown in figure 6.

Figure 3.—Flow diagram of SUPERMOCK program.

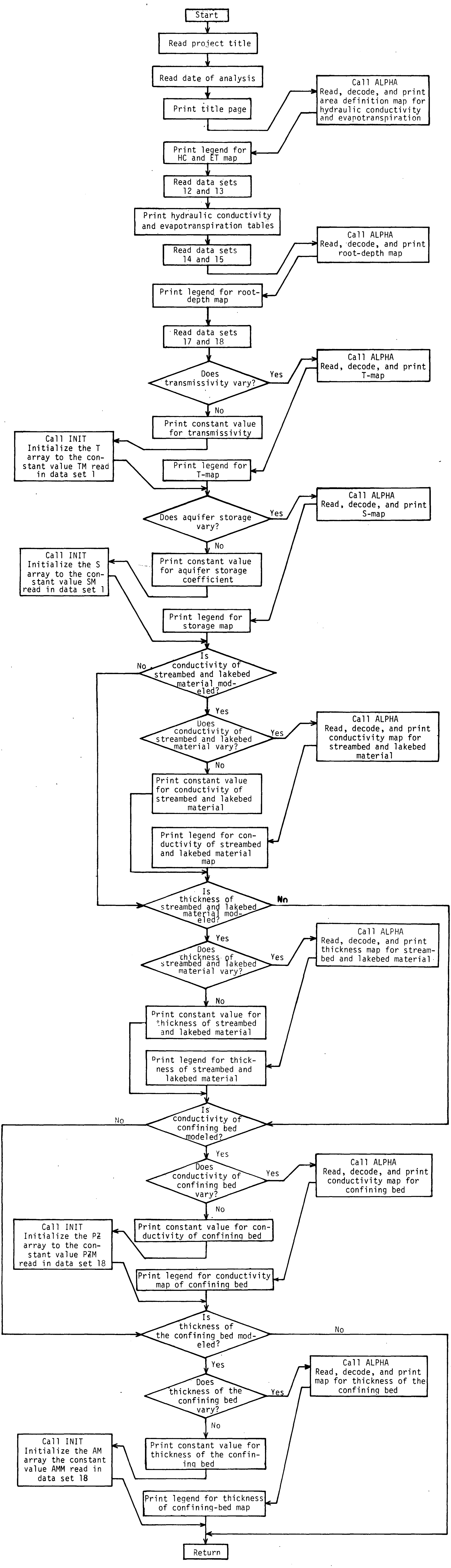

Figure 4.—Flow diagram of START subroutine.

Figure 5.—Flow diagram of PROCSS subroutine.

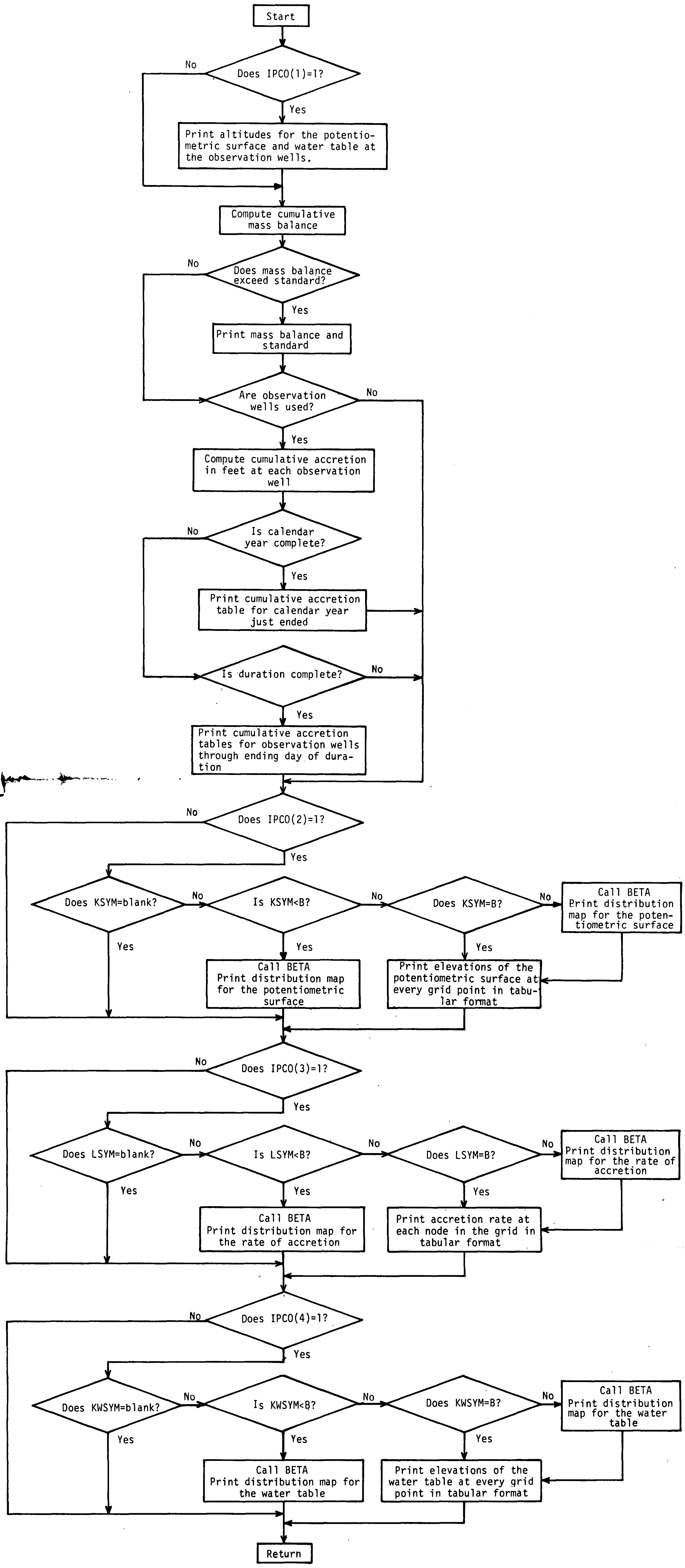

Figure 6.—Flow diagram of OUTPUT subroutine.

Soil-moisture accounting component

Subroutine DREAM (daily-rainfall-excess accounting model), is an accounting model for soil moisture, with functional relations governing response (change in soil moisture) to stresses of precipitation, evapotranspiration, and drainage to the water table. Subroutine DREAM, although modified considerably for the purposes of this model, was derived from the U.S. Geological Survey small-streams model (Dawdy and others, 1972). A flow diagram of DREAM is shown in figure 7. Available soil-moisture storage is constrained by this procedure to vary within a range from a lower limit of zero to an upper limit equal to SMSM (input data for the upper limit, in inches of water). Daily precipitation and potential evapotranspiration data are combined in subroutine READSO and the daily net flux to the atmosphere (precipitation minus evapotranspiration) is used in DREAM as the atmospheric stress on soil moisture. There are two responses to atmospheric stress. The response depends on whether the stress is positive (rainfall) or negative (evapotranspiration).

Response to evapotranspiration is controlled by the amount of evapotranspiration. If evapotranspiration is less than the remaining available soil-moisture storage, then soil mositure is reduced by the amount of evapotranspiration. If evapotranspiration is greater than soil moisture, soil moisture is reduced to zero, and evapotranspiration is assumed to be derived from ground-water storage in the water-table confining bed until soil moisture is replenished by infiltration from rainfall.

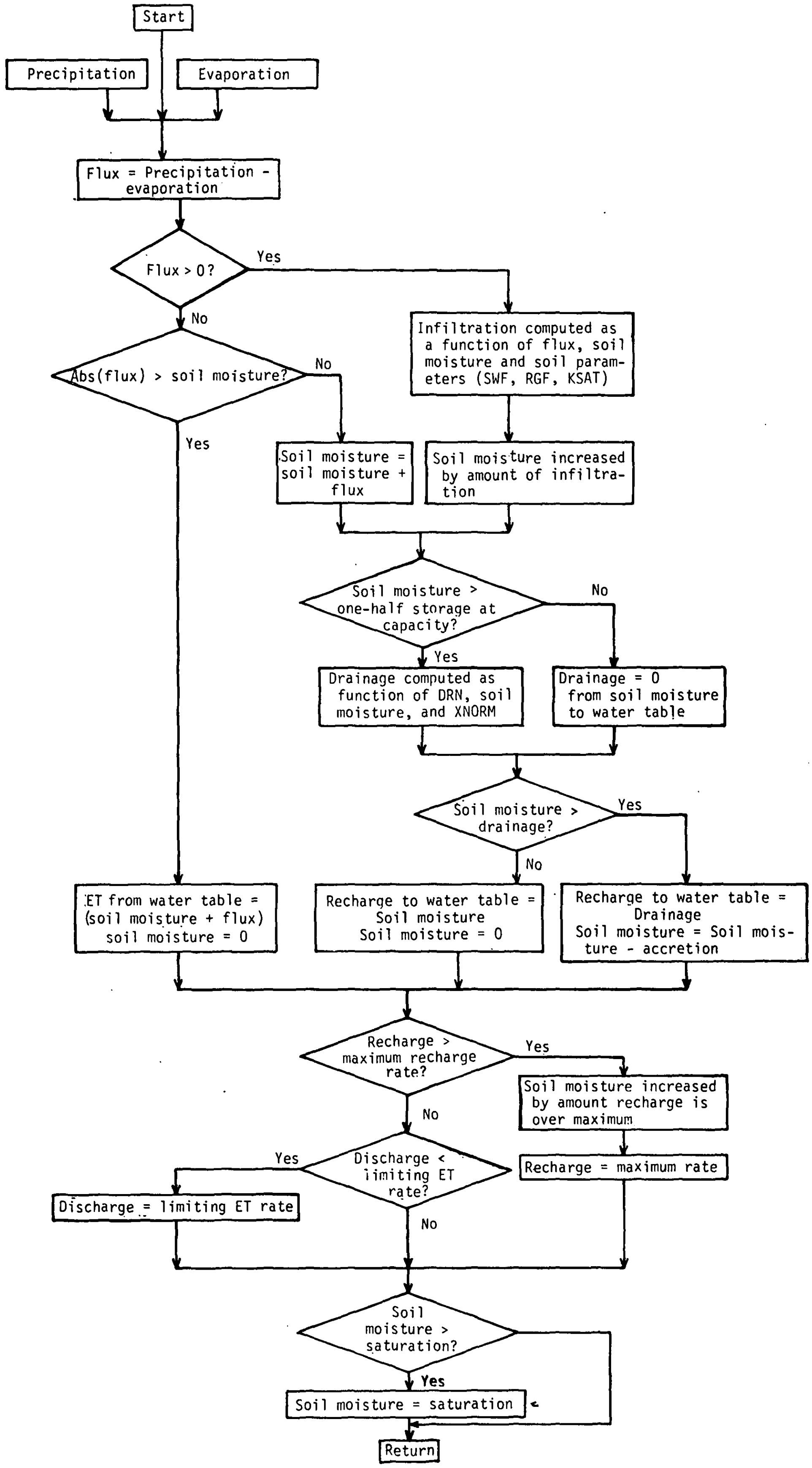

Figure 7.— Flow diagram of DREAM subroutine.

A limit is set on upward movement of water from the water table in response to evapotranspiration. This limit is the variable TEST; its units are in inches per day. TEST is a limitation imposed by the ability of the unsaturated zone between the base of the root zone and the water table to transmit water; TEST is the product of the harmonic-mean hydraulic conductivity of the material from the base of the root zone down to the water table (HCU) and a function expressing a relation between dimensionless evapotranspiration and depth to the water table below the root zone (GWETO). Both HCU and GWETO are input data. GWETO includes four different functional relations. The appropriate one is selected during program execution based on the value of HCU. The separation points are HCU = 0.004, 0.04, and 0.4, as shown in figure 16, sheet 4. The GWETO values shown on this figure were calculated using equation 23 of Ripple and others (1972), which is

$$(e_\infty + 1)(e_\infty/(e_\infty + 1))^{1/n} L/S_{1/2} = \pi/n \sin(\pi/n),$$

where e_∞ is the dimensionless variable which is called GWETO here, L is the total distance between the water table and the soil surface, $S_{1/2}$ and n are parameters of a conductivity-suction relation which is equation 10 of Ripple and others (1972) and is

$$K = K(S) = K_{sat}/((S/(S_{1/2}))^n + 1.$$

Substituting $X = e_\infty + 1$ into the previous equation, raising both sides to the n-th power and multiplying by $S_{1/2}/L$ gives

$$X^n - X^{n-1} = \pi/n \sin(\pi/n) . S_{1/2}/L .$$

A program for computing solutions of this equation is listed below. This program uses the Newton-Raphson iterative procedure, discussed on pages 62-63. Input data for this program are values of n and $S_{1/2}$.

Output is a tabulation of 30 values of e_∞ (GWETO) for depths from 1 to 30. Depth units are the same as for input values of $S_{1/2}$. Estimates of n and $S_{1/2}$ were made from saturated hydraulic conductivity (K_{sat}), as shown here.

```
      REAL*4 L
      DIMENSION EINF(30)
    1 READ(5,5,END=4) N,S12
C     N IS GARDNER'S EXPONENT, S12 IS THE SUCTION AT WHICH K IS
C     KSAT/2, S12 AND DEPTH(L) HAVE THE SAME LENGTH UNITS.
      N1=N-1
      F=3.14159/(N*SIN(3.14159/N))
      X=S12*F
      IF(X.LT.1.) X=1.
C     BEGINNING ESTIMATE OF X
      DO 3 I=1,30
      L=I
C     L IS DEPTH IN SAME UNITS AS S12
      A=(S12*F/L)**N
      DO 2 J=1,100
      XN=X**N
      XN1=XN/X
      XN2=XN1/X
      U=(XN-XN1-A)/(N*XN1-N1*XN2)
      X=X-U
      IF(U.LT.0.) U=-U
      IF(U.LT.3.E-6) GO TO 3
    2 CONTINUE
    3 EINF(I)=X-1.
      WRITE(6,6) N,S12,(I,EINF(I),I=1,30)
      GO TO 1
    4 STOP
    5 FORMAT(I2,3X,F5.0)
    6 FORMAT('1','GARDNER''S EXPONENT= ',I2,', S12=',F8.0/
     1   '0','DEPTH',3X,'ET/HC'/(' ',I5,F8.5))
      END
```

K_{sat}	n	$S_{1/2}$ (ft)
<0.004	2	2
.004-0.04	3	2
.04-0.4	4	2
>.4	5	1

No data on unsaturated conductivity or on decrease in moisture content with soil tension were available for the project area. Relations in the preceding table were selected somewhat arbitrarily from widely varying figures published in the soils literature. Values of $S_{1/2}$ listed above were influenced by moisture-suction and conductivity-suction relations shown in Weir and Larson (1973, figs. 3,4).

This relation between depth and limiting rate assumes bare soil, so that flux is continuous all the way to the land surface, and that the transmitting material is uniform between the water table and the land surface. In the area where this model has been applied, the material generally consists of different layers, and the place of removal of water is not at land surface but is at depth within the layer where plant roots are extracting water from the soil. The soil-moisture accounting model uses the harmonic-mean hydraulic conductivity (HCU) of the material between the water table and the base of the root zone, as estimated from test-hole logs. The depth, for the GWETO function, is from the base of the root zone down to the water table. Root depth (RD) is read in to the program as coded maps showing the predominant land cover or crop at a given node, such as woodland, cotton, or soybeans. Each land cover or crop is assigned a root depth. These maps of land cover and associated root depths were provided by the Soil Conservation Service.

For a more detailed discussion, derivation of equations used in this section, and the reason for existence of a critical–flow rate, the interested reader should refer to Ripple and others (1972).

Response to rainfall (infiltration) is a function of the amount of rainfall, soil moisture, and soil parameters. The soil parameters and corresponding program identifiers are: suction at field capacity, SWF; ratio of suction at wilting point to SWF and RGF; soil moisture, SMS; soil-moisture capacity, SMSM; suction at wetting front, PS; and hydraulic conductivity of saturated soil in the root zone, KSAT. There are three steps in the computation of infiltration. The first step is the computation of soil suction by

PS=SWF*(RGF-(RGF-1)*SMS/SMSM).

The above-mentioned relation allows PS (soil suction) to change linearly with soil moisture, from a lower limit equal to SWF (for SMS=SMSM) to an upper limit equal to SWF*RGF (for SMS=0). Step two is computation of the infiltration rate (FR),

FR=-SMS+KSAT/2.+SQRT((SMS+KSAT/2)**2+2*KSAT*PS).

The preceding equation is derived from equation 4 in Dawdy and others (1972, p. B6). Their equation 4 is

$$di/dt=K_h[1+P(m-m_0)/i],$$

where i is the accumulated infiltration, K_h is the capillary conductivity, P is capillary potential at the wetting front, m is field capacity, and m_0 is the initial moisture content. Approximating di/dt, and i by $\Delta i/\Delta t$ and $i_0+\Delta i/2$, respectively, yields the equation

$$\Delta i/\Delta t=K_h[1+P(m-m_0)/(i_0+\Delta i/2)] .$$

Solving this equation for Δi,

$$\Delta i= -i_0+K_h \Delta t/2+\sqrt{(i_0+K_h\Delta t/2)^2+2K_h\Delta t P(m-m_0)} ,$$

substituting corresponding program identifiers

$$FR=\Delta i, SMS=i_0, KSAT=K_h, PS=P(m-m_0),$$

and using a value of 1 day for Δt, gives the preceding equation. A graph illustrating the general shape of this function for RGF=40, SWF=120, KSAT=10, and SMSM=1 is shown in figure 8.

KSAT represents the saturated hydraulic conductivity of the root zone. It is a constant value for the entire model and is different from HCU, which can be varied from one area to another, and represents the hydraulic conductivity of the material between the root zone and the water table. The limit (SMSM) on soil-moisture storage is also a constant for the entire model, although in the prototype it might be a function of the type of material, root depth, etc.

The last step is to make an empirical correction to the infiltration rate. This correction has the effect of allowing some precipitation excess for rainfalls that are smaller than the infiltration rate. Any infiltration rate computed from single values of antecedent moisture conditions and soil parameters will be a point value. In nature, however, infiltration will vary over the nodal area, and the following procedure provides for allowing infiltration to vary linearly from zero to a maximum rate equal to one-half of the infiltration rate. If rainfall (RF) is less than infiltration (FR) rate,

SMS=SMS+RF*(1-RF/(2*FR)),

and, conversely, if rainfall is greater than infiltration rate,

SMS=SMS+FR/2.

This correction is discussed in Dawdy and others (1972, p. B7), where it is stated that it "* * * is an empirical tool which eliminates the absolute threshold value for infiltration. Thus, there is some runoff from any volume of rainfall, although for low-intensity rains where soil conditions are dry, the runoff is very small."

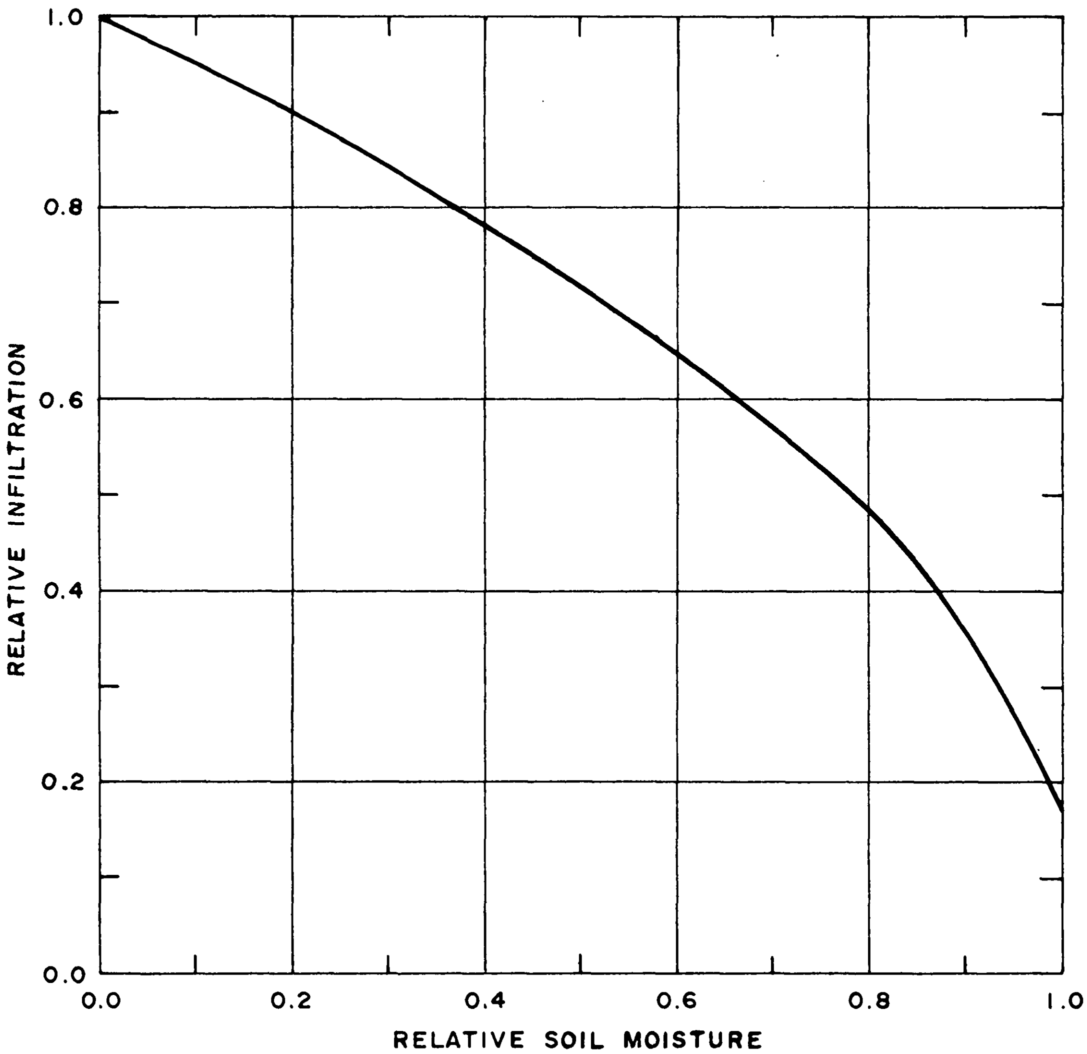

Figure 8.—Generalized curve of infiltration versus soil moisture.

Overland runoff is the residual between precipitation (RF) and the increase in SMS. Data for overland runoff are not stored or used in this program.

The response to drainage is a function of soil moisture and empirical drainage parameters DRN, XNORM, and SMC. SMC is calculated in the program and set equal to one-half the moisture content at field capacity. If soil moisture is less than SMC, then drainage rate (DRIP) is set equal to zero. Otherwise,

DRIP=DRN*(1-EXP (-(SMS-SMC)/XNORM)).

A graph illustrating the general shape of the drainage curve for DRN=10, SMC=0.5, and XNORM=3 is shown in figure 9. The drainage rate (DRIP) computed by this equation is compared with a limiting recharge rate (TESTR). TESTR is computed as the hydraulic conductivity (HCU), of the confining bed between the root zone and the water table, multiplied by the gradient in head, which is computed as the depth to water table divided by the thickness of the confining bed. A unit gradient is used if a water table does not exist in the confining bed. This relation is only a qualitative approximation to the true flow relation.

DRIP, GWETO, TEST, AND TESTR are all factors linking the soil zone to the water table, although they are computed and used in the soil-moisture accounting component of the model. DRIP is computed from parameters representing the soil zone, DRN, SMC, and XNORM, which are constant over the entire model. GWETO, TEST, and TESTR are computed from parameters representing the material between the soil zone and the water table and can be varied over as many as 60 different areas which the user selects.

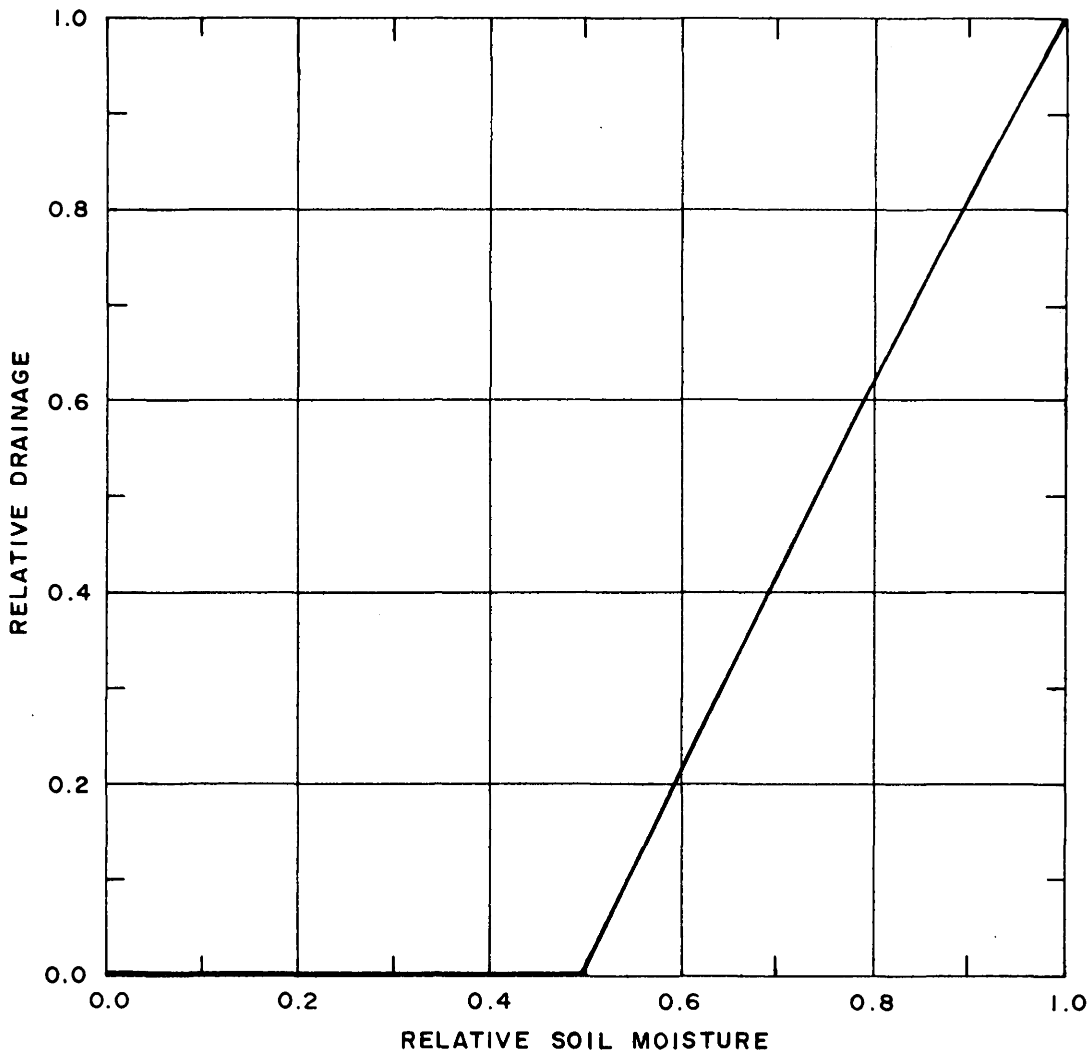

Figure 9.—Generalized curve of drainage to water table versus soil moisture.

Vertical-flow component

Subroutine WTABLE models the flow through the fine-grained material between the water table and the aquifer. The model is based on a differential equation describing vertical flow in a bed containing a water table in response to accretion from above and drainage to a confined aquifer below. This equation is

$$dh/dt=[K(h_p-h)/h+A]/f,$$

where K is the harmonic-mean hydraulic conductivity of the materials between the water table and the top of the aquifer, f is the specific yield, A is the constant rate of accretion to the water table during the period from t_1 to t_2, and h_p and h are potentiometric and water-table levels, respectively, both measured with reference to the base of the unit containing the water table (negative values indicating levels below the base of the unit). In the preceding equation, A can be either positive (recharge) or negative (evapotranspiration). A particular solution to this equation for the condition $A \neq K$ was given by Bouwer (Soil Conservation Service, 1970, p. 37). Bouwer's solution is

$$(h_2-h_1)/(A-K)-(Kh_p/(A-K)^2)\ \log_e[(Kh_p+(A-K)h_2)/(Kh_p+(A-K)h_1)]$$
$$=(t_2-t_1)/f\ , \qquad (1)$$

where h_2 is the water-table height at time t_2, h_1 is the water-table height at time t_1, and other terms are as defined previously.

The preceding equation is not linear in h_2, so its solution is not a trivial problem. Commonly, iterative methods are used to solve this type of equation. One such method, the Newton-Raphson iteration, was used in subroutine WTABLE to solve the preceding equation. The Newton-Raphson method (Ralston, 1965, p. 322) is

$$x_{i+1}=x_i-f(x_i)/f'(x_i),$$

where the subscripts represent the step in the interation, x_i is the value computed in the i-th step, $f(x_i)$ is the function evaluated at $x=x_i$ and $f'(x_i)$ is the first derivative of the function, with respect to x, evaluated at $x=x_i$. The choice of starting value of x, x_0 is h_1, except when $|A-K|<1X10^{-6}$. Particular values of the parameters to which equation 1 cannot be applied are: A-K=0 and $Kh_p+(A-K)h_1=0$. For A-K=0, the differential equation becomes $dh/dt=Kh_p/hf$, and the corresponding solution is

$$h_2=\sqrt{h_1^2+2Kh_p(t_2-t_1)/f}.$$

For $0<A-K<10^{-6}$, the preceding expression is used for x_0 in the iteration procedure. For $Kh_p+(A-K)h_1=0$, the differential equation becomes $dh/dt=0$ and $h_2=h_1$. Another special case is when the potentiometric surface is below the base of the fine-grained top stratum, $h_p<0$. If $h_1<0$, then $h_2=h_p$. If $h_1>0$, then $h_2=h_1+(A-K)(t_2-t_1)/f$.

A flow diagram for subroutine WTABLE is shown in figure 10.

This model of the vertical-flow component assumes that the direction of flow is vertical and ignores any horizontal component of flow that may exist. Field water-level measurements in wells and piezometers indicate that the vertical gradient between the water table in the confining bed and the potentiometric surface in the aquifer is commonly 100 times or more the horizontal gradient. This indicates that, in general, vertical flow predominates in the confining bed although horizontal flow might be important locally, especially where lenses of more permeable material with large lateral extent occur in the confining bed.

The parameters that control the response of the water table are the hydraulic conductivity between the base of the root zone and the water table (HCU), the hydraulic conductivity between the water table and the top of the confined aquifer (HCL), and the water-table storage coefficient (WTSTO).

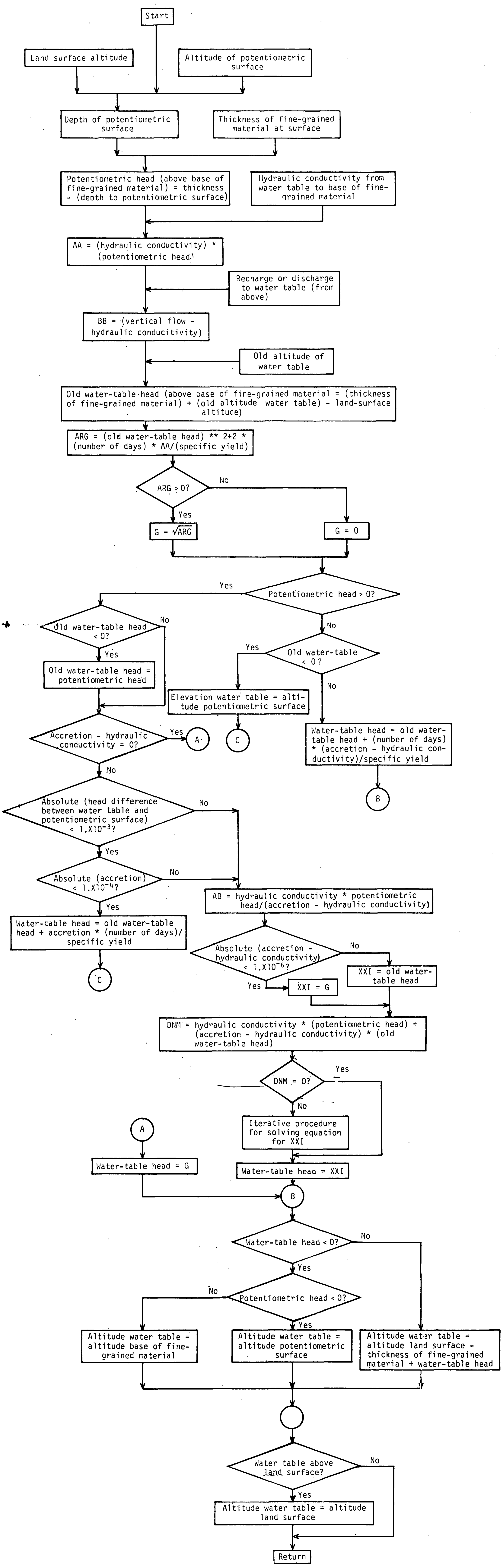

Figure 10.—Flow diagram of WTABLE subroutine.

The initial values of HCU, HCL are determined from estimates of hydraulic conductivity for the entire confining bed from test-hole logs. As calibration of the model proceeds, these parameters are changed to improve the match between model results and field data on water-table position. Generally, HCU is increased to increase recharge to the water table and cause a higher altitude for the water table or vice versa if the opposite effect is desired. WTSTO is increased (or decreased) to increase (or decrease) the amount of water-level fluctuation. HCL is increased to increase recharge to the aquifer (and a concomitant release of water from water-table storage) or decreased if less recharge to the aquifer is desired. Both HCU and HCL should change with a changing position of the water table for nonuniform material. However, for simplicity of the model, this correction is not made.

h_p is assumed constant in WTABLE and is set equal to the potentiometric head at the beginning of period for which the vertical flow between the soil zone and the water table is computed in DREAM. Then a new water-table altitude is computed, based on the initial h_p and the vertical-flow rate, down to the water table. Later, a new h_p value for the end of the period is computed in the horizontal-flow component based on the new water-table altitude. This explicit sequence, instead of an iterative sequence, was chosen to minimize execution time for the program, although it may cause a water imbalance in the water-table component. That is, the inflow of water to the water table may not be equal to the outflow.

Horizontal-flow component

The differential equations for flow in the confined aquifer are solved by finite-difference approximations at nodal points in a rectangular grid superposed on the aquifer. The program accommodates modeling (1) irregular aquifer configurations; (2) nonhomogeneous transmissivity and storage coefficient of the aquifer; (3) areal variations in thickness and conductivity of streambeds and lakebeds; and (4) various boundary conditions, including discharging or recharging wells and changes in stream and lake stage, accretion, and evapotranspiration.

Accretion and evapotranspiration from the aquifer are computed within the program and are discussed under "Soil-moisture accounting component" and "Vertical-flow component."

The finite-difference matrix is a rectangular array of nodes, superposed on a plan view of the aquifer. Data on properties of the aquifer and boundaries are specified for each node. The location of each node is designated by the intersection of a row and a column in the network. According to the convention adopted for this report, rows are numbered from the top to the bottom; columns are numbered from left to right. The matrix size for SUPERMOCK is specified by the user. The matrix is limited to 80 columns by format statements of the program; the number of rows is not limited.

The spacing of nodes is designated separately in the x and y directions. Node spacing can be increased (or decreased) parallel to each axis to enlarge (or reduce) the model, depending on the detail desired along each side. Experience has shown that the grid spacing cannot be increased more than 1.5 times between adjacent nodes without incurring noticeable truncation error.

A numerical method, the ADIP (alternating-direction implicit procedure) method, is used in SUPERMOCK for solving the finite-difference approximations of the differential equation for ground-water flow. This method is described in detail by Peaceman and Rachford (1955). Application of the method of solution was used by Pinder and Bredehoeft (1968), Pinder (1970), and Bedinger and others (1973) to solve equations of ground-water flow.

As the name inplies, ADIP uses an alternating-direction procedure in solving the finite-difference equations of ground-water flow. The program computes the head change at all nodes in the aquifer at successive increments of time. At each time step, the equations are solved in the matrix by alternately cycling through the matrix by rows, and then cycling through the matrix by columns. When cycling through the matrix by rows, an equation is set up for each node, incorporating three unknown heads in the direction of the rows and three known heads in the direction of the columns. When cycling through the matrix by columns, the known and unknown heads are interchanged from the previous cycle. For a more complete presentation of ADIP, the reader is referred to Pinder and Bredehoeft (1968).

Preparation of Input Data

An outline for the preparation of the input-data deck for the SUPERMOCK program is given in the following. Some of the input data are read from disk or tape files instead of cards. A discussion of the creation of such disk or tape files for an actual study will be included in a report available through the National Technical Information Service to be published in 1977 (A. H. Ludwig, oral commun., 1976). The outline is keyed to table 2, which contains formats for coding input data. The components of the input deck are illustrated in figure 11.

Table 2.—*Input data for SUPERMOCK program*

Outline reference	Number of cards	Columns	Format	Program variable	Input item	Remarks
1. Parameters	1	1-10	F10.1	XM	Node spacing (ft) in x direction.	Code only those parameters that are uniform.
		11-20	F10.1	YM	Node spacing (ft) in y direction.	
		21-25	I5	M	Number of rows.	
		26-30	I5	N	Number of columns.	
		31-40	F10.1	TM	Transmissivity (ft^2/d).	
		41-50	F10.1	SM	Aquifer storage coefficient (dimensionless).	
		51-52	I2	ITDX	Switch indicating if node spacing is constant (ITDX=1).	If XM and YM are coded, set ITDX=1.
		53-62	E10.3	BALSTD	Mass balance standard.	An appropriate value is 5 (percent).
		63-65	I3	NDAZ	Time step increment, in days.	
2. Precipitation parameter	1	1-5	I5	IRX8	Offset pointer into daily precipitation data (days).	Number of days from beginning of precipitation data to beginning date.
3. Beginning date	1	1-2	I2	IMON	Month of starting time.	
		4-5	I2	IDAY	Day of starting time.	
		7-10	I4	IYEAR	Year of starting time.	
4. Duration	1	1-6	F6.1	QPER	Duration of simulation, in days.	
5. Variable water-table output parameters	1	1-3	I3	MO1	Beginning row for output.	This output gives nodes and corresponding depths to water table below land surface. Depths from 1 to 9 ft are given. A depth greater than 9 ft is printed as 9 ft. If neither tabular, map, nor card output is desired, leave all CTIMES blank. If L=(QPER/NDAZ)+1, then J=1 if L≤12 or J=2 if 12<L≤24, etc.
		4-6	I3	MO2	Ending row for output.	
		7-9	I3	NO1	Beginning column for output.	
		10-12	I3	NO2	Ending column for output.	
		13-15	I3	INDC	Switch indicating if printed output should be in tabular (INDC=1) or map (INDC=0) form.	
	1	1-80	20A4	LABEL	Identification heading for tabular and card output.	
	1 to J	1-72	12(F4.0,2I1)	CTIME(I), ICODE(I), JCODE(I), I=1,L	A CTIME should be coded to correspond to each TTIME for which the water-table values computed are to be included in an average computation or a maximum comparison. ICODE=0 for average. ICODE=1 for maximum. JCODE is the number of time steps to be considered for each output data set.	
6. Precipitation and potential evapotranspiration	1	1-4	I4	MO	Number of daily-precipitation and potential-evapotranspiration values.	Daily precipitation and potential evapotranspiration may begin before the beginning date IMON/IDAY/IYEAR.
	3 per month for the duration — Card 1	10-11	I2	IYRD	Calendar year.	
		12-13	I2	IMOND	Calendar month.	
		15-74	10F6.2	PRECIP(J)	Daily-precipitation values (inches). Day 1 through day 10.	
	Card 2	15-74	10F6.2	PRECIP(J)	Daily-precipitation values (inches). Day 11 through day 20.	
	Card 3	15-80	11F6.2	PRECIP(J)	Daily-precipitation values (inches). Day 21 through end of month.	
	Number of cards depends on MO	1-70	10F7.4	PE(J)	Daily potential-evapotranspiration values (inches).	
7. Output codes	1	1	I1	IPCO(1)	Code for potentiometric surface and water-table altitudes to be printed for each observation well at each time step.	Code as 1 to obtain the indicated output.
		2	I1	IPCO(2)	Code if tabular and (or) map output for the potentiometric surface is desired at time steps to be specified later (KSYM).	
		3	I1	IPCO(3)	Code if tabular and (or) map output for accretion to the aquifer is desired at time steps to be specified later (LSYM).	
		4	I1	IPCO(4)	Code if tabular and (or) map output for the water table is desired at time steps to be specified later (KWSYM).	

Table 2.—*Input data for SUPERMOCK program*—Continued

Outline reference	Number of cards	Columns	Format	Program variable	Input item	Remarks
8. Project title	1	1-80	20A4	INO(I)	Code title of project for which analysis is being made.	
9. Date of analysis	1	1-2	I2	KMON	Month of calendar date of analysis.	
		3-4	I2	KDAY	Day of calendar date of analysis.	
		5-8	I4	KYR	Year of calandar date of analysis.	
10. Nonuniform node spacing	1	1-3	I3	IXMIN	Column number.	Omit if ITDX=1. This option allows for one user-defined area within the grid in which spacing may be increased or decreased by rows and (or) columns.
		4-6	I3	IXMAX	Column number.	
		7-16	F10.1	XINF	Node spacing from column 1 to IXMIN and IXMAX to N.	
		17-26	F10.1	X	Node spacing from column IXMIN to IXMAX.	
		27-29	I3	IYMIN	Row number.	
		30-32	I3	IYMAX	Row number.	
		33-42	F10.1	YINF	Node spacing (ft) from row 1 to IYMIN and row IYMAX to M.	
		43-52	F10.1	Y	Node spacing (ft) from IYMIN to IYMAX.	
11. Alphameric map used to define hydraulic conductivity and evapotranspiration	1	1-2	I2	NS	Number of symbols used.	
	1 to 8	1-72	8(A1,E8.1)	SAT(IXX,1), SAT(IXX,2), IXX=1,NS	Alphameric symbol, SAT(IXX,1), and corresponding sequence number SAT(IXX,2). The decoded map of sequence numbers is transferred to array AREA in the program.	
	M	1-N	NI1	CARD(J), J=1,N	CARD is the symbol representing the sequence number corresponding to the order in which hydraulic conductivity and evapotranspiration data for each area defined on the map will be read.	
12. Evapotranspiration divided by saturated hydraulic conductivity	12	1-70	10F7.5	GWETO(I,J), J=1,30, I=1,4	GWETO holds values of ET/SAT.HYD.COND. for 4 ranges of hydraulic conductivity from the water table to 30 ft above. Each row holds a set of values for a different range of hydraulic conductivity (dimensionless).	
13. Data computed from representative well lithology and used in defining hydrologic properties of the subareas defined in AREA	1	1-2	I2	NLOGS	Number of representative wells used in defining hydrologic properties of subareas in AREA map. Should be equal to the number of symbols used in AREA.	
	1 to NLOGS	1-4	A4	INO(I)	Representative well number.	Each card defines the properties of a subarea in the AREA map.
		11-20	F10.5	HCU(I)	Hydraulic conductivity from root zone to water table (ft/d).	
		21-30	F10.5	HCL(I)	Hydraulic conductivity from water table to top of aquifer (ft/d).	
		31-40	F10.5	THK(I)	Thickness (ft) from surface to top of aquifer.	
		41-50	F10.5	WTSTO(I)	Storage coefficient for water table (dimensionless).	
14. Initial altitude of the potentiometric surface	1 to K	1-60	20F3.0	H(I,J,1)	These are average altitudes (ft) of the initial potentiometric surface based on available data.	K depends on size of grid. If there are 80 columns, K=4(M); M=Number of rows.
15. Land-surface altitudes	1 to K	1-60	20I3	ELEV(I,J)	Land-surface altitude (ft) at each grid node.	See Remark 14.
16. Alphameric map used to define root depth over the grid area	1	1-2	I2	NS	Number of symbols used.	
	1 to 8	1-72	8(A1,E8.1)	SAT(IXX,1), SAT(IXX,2), IXX=1,NS	Alphameric symbol, SAT(IXX,1), and corresponding value for root depth (ft), SAT(IXX,2). The decoded map of root-depth values is transferred to array RD.	
	M	1-N	NI1	CARD(J), J=1,N	CARD is a symbol representing a root-depth value.	

Table 2.—*Input data for SUPERMOCK program*—Continued

Outline reference	Number of cards	Columns	Format	Program variable	Input item	Remarks
17. Soil parameters	1	1-6	F6.1	SMSIN	Initial value for SMS (surface moisture storage), in inches.	
		7-12	F6.1	KSAT	Saturated hydraulic conductivity for soil, in inches per day.	
		13-18	F6.1	DRN	Maximum drainage rate for soil, in inches per day.	
		19-24	F6.1	SWF	Suction (tension) at field capacity, in inches.	
		25-30	F6.1	RGF	Ratio of wilting point tension to tension at field capacity, dimensionless.	
		31-36	F6.1	XNORM	Parameter of drainage function for soil. Drainage rate is an inverse function of XNORM.	
		37-42	F6.1	SMSM	Maximum water held in surface moisture storage, in inches.	
18. Optional parameters	1	1	I1	IPS	Data-level indicators for hydraulic conductivity and thickness of streambed material, respectively: 1=Parameter uniform. 2=Parameter varies. 3=Parameter not modeled.	Either streambed material or a confining bed can be modeled but not both. If a confining bed is modeled, the head in the source bed is read in as though it were a stage for a partially penetrating stream.
		2	I1	ISAM		
		3	I1	IPZ	Data-level indicators for hydraulic conductivity and thickness of the confining bed, respectively. 1=Parameter uniform. 2=Parameter varies. 3=Parameter not modeled.	
		4	I1	IAM		
		5-12	E8.1	PSM	Hydraulic conductivity (ft/d) of streambed material.	Code values of parameters that are uniform (coded 1 in columns 1 through 4).
		13-20	E8.1	SAMM	Thickness (ft) of streambed material.	
		21-28	E8.1	PZM	Hydraulic conductivity (ft/d) of confining bed normal to plane of aquifer.	
		29-36	E8.1	AMM	Thickness (ft) of confining bed.	
19. Nonhomogeneous parameters — 19.1 through 19.6	1	1-2	I2	NS	Number of symbols used.	This sequence of cards is repeated for each parameter modeled as nonhomogeneous. The first card in each sequence specifies the number of symbols used, next are 1-8 cards as needed, indicating the alphameric representation of the mapped parameter values, next are the M cards (1 card for each row), each containing N alphameric symbols (1 for each column). Sets used are stacked in the following order: 1. Transmissivity (ft^2/d). 2. Aquifer storage (dimensionless). 3. Conductivity (ft/d) of streambed. 4. Thickness (ft) of streambed. 5. Conductivity (ft/d) of confining bed beneath underlying aquifer. 6. Thickness (ft) of confining bed beneath underlying aquifer.
	1 to 8	1-72	8(A1,E8.1)	SAT(IXX,1), SAT(IXX,2), IXX=1,NS	Alphameric symbol SAT(IXX,1) and corresponding parameter value SAT(IXX,2).	
	M	1-N	NI1	CARD(J), J=1,N	CARD is the symbol representing the value of a nonhomogeneous parameter.	

Outline reference	Number of cards	Columns	Format	Program variable	Input item	Remarks
20. Optional output decoding arrays	1-L	1-80	80A1	KSYM(I), I=1,K	Decoding arrays to determine at what time step and what type of output will be printed for the potentiometric surface, accretion, and water table, respectively. KSYM is entered only if IPCO(2)=1; LSYM is entered only if IPCO(3)=1; and KWSYM is entered only if IPCO(4)=1.	Each member of each array corresponds to a time step beginning with TTIME(2)=NDAZ. Therefore, if K=number of time steps, then L=1 if K≤80, or L=2 if 80<K≤160, etc. Code each entry as either blank, A, B, or C. Blank: No output. A: Distribution map. B: Tabular printout by columns. C: Distribution map and tabular printout.
	1-L	1-80	80A1	LSYM(I), I=1,K		
	1-L	1-80	80A1	KWSYM(I), I=1,K		
21. Invariant stream stages	1	1-3	I3	NSTGE	Number of XSTAGE.	Enter a blank card if there are no invariant stream stages.
		4-6	I3	NPSTGE	Number of XPSTGE.	
		7-9	I3	KPNT	Switch indicating if invariant stages should be printed (KPNT=1), or not (KPNT=blank).	
	1 to NSTGE	1-5	F5.0	XSTAGE	Fully penetrating stream stage (ft).	Omit if NSTGE is blank. Note.-- Datum for all stage values is mean sea level.
		6-77	18(2I2)	IR(I),IC(I), I=1,18	Row, IR(I), and column, IC(I), for which stream stage applies. Each stage value can be associated with as many as 18 nodes.	
	1 to NPSTGE	1-5	F5.0	XPSTGE	Partially penetrating stream stage.	Omit if NPSTGE is blank
		6-77	18(2I2)	IR(I),IC(I), I=1,18	Row, IR(I), and column, IC(I), for which stream stage applies. Each stage value can be associated with as many as 18 nodes.	
22. Observation wells	1	1-2	I2	WELLS	Number of observation wells.	
	Number of cards depends on wells	1-80	10(A4,2I2)	WENO(I), IR(I), IC(I), I=1, WELLS	WENO(I) is an alphameric well-identification number; IR(I) and IC(I) are the corresponding row and column locations.	
23. Variant main-stem river-stage parameters	None	------	None	NOSTAG	The number of main-stem river stages and corresponding nodes to be read from a magnetic disk or tape data set each time step.	These parameters are read as one variable-length spanned record from a data set loaded on a magnetic disk or tape.
		------	None	NOSET	Number of average sets.	
		------	None	NODAYS	Time-step increment, in days.	
	1	1-4	I4	NOPP	The number of nodes on the main stem that are to be treated as partially penetrating.	NOPP must be less than or equal to NOSTAG.
	Number of cards depends on NOPP	1-80	20I4	IPP(J), J=1,NOPP	Nodes on main stem to be treated as partially penetrating.	Omit if NOPP=0.
	Number of cards depends on NOST	1-80	20I4	IJ(I), I=1,NOST	Nodes on main stem to be treated as fully penetrating.	NOST=NOSTAG-NOPP. Omit if NOPP=NOSTAG.
	1	1-5	I5	NBEGN	Sequence number corresponding to beginning day for which stage data will be read from disk or tape each time step.	NBEGN will control starting point in both main-stem and tributary-stream data sets.
24. Withdrawal (pumpage) parameters	1	1-4	I4	IWDR	Switch indicating if pumpage is to be modeled.	Code IWDR=1 if pumpage will be modeled.
		5-8	I4	IWDINT	Switch indicating if pumpage will be read in with one rate associated with several nodes, or with the withdrawal rate variable for each node indicated.	Code IWDINT=1 if constant method is used, or IWDINT=blank if variable method is used.
		9-12	I4	IWDT	Switch indicating if withdrawal rates are to be printed.	IWDT=1 if yes; IWDT=blank if no.
		13-16	I4	IDNT	This is the variable time-step increment, in days, for read-in of withdrawal rates.	Must be an even multiple of NDAZ. If pumpage is modeled, the first read-in will be at TTIME=NDAZ and every IDNT days thereafter.

Table 2.—*Input data for SUPERMOCK program*—Continued

Outline reference	Number of cards	Columns	Format	Program variable	Input item	Remarks
25. Variant tributary stream-stage parameters	None	-------	None	NPSTAG	The number of tributary stream stages and corresponding nodes to be read from a magnetic disk or tape data set each time step.	This parameter is read as one variable-length spanned record from a data set loaded on a magnetic disk or tape.
		-------	None	IJP(I), I=1, NPSTAG	Nodes to which tributary stream stages will be associated.	Each of these nodes will be treated as partially penetrating. These nodes comprise another single, variable-length record in the tributary-stream data set.
All of the following input data will be read repetitively for the duration						
26. Withdrawal rates to be read at TTIME=NDAZ and every IDNT days thereafter	1	1-4	I4	NR	Number of withdrawal rates to be read.	Entered only if IWDR=1.
	Number of cards depends on NR	1-6	2I3	IF(I),JF(I)	IF(I) is a row number, JF(I) is a column number, and Q(IF(I),JF(I)) is the withdrawal rate (ft^3/d) associated with this specific node.	This format is used only if IWDINT=blank.
		7-16	E10.3	Q(IF(I), JF(I))		
		17-22	2I3	IF(I), JF(I)		
		23-32	E10.3	Q(IF(I), JF(I))		
		33-38	2I3	IF(I), JF(I)		
		39-48	E10.3	Q(IF(I), JF(I))		
		49-54	2I3	IF(I), JF(I)		
		55-64	E10.3	Q(IF(I), JF(I))		
		65-70	2I3	IF(I), JF(I)		
		71-80	E10.3	Q(IF(I), JF(I))		
	1	1-4	I4	MR	Cumulative sum of withdrawal nodes.	This format is used only if IWDINT=1. These 2 cards are repeated NR times.
		5-76	24I3	IF(I),JF(I), I=JR,MR	IF(I), row number, JF(I), column number. For the first card read JR=1 in the program and MR is the number of nodes on the card. Thereafter, JR=MR+1 and MR is a cumulative total of the nodes on the card being read and each card that has been read.	As many as 12 nodes can be associated with the same withdrawal rate.
	1	1-10	E10.3	QU	This is the withdrawal rate (ft^3/d) to be associated with the above nodes.	
27. Variant main-stem river stages	None	-------	None	DUM 1, DUM 2, DUM 3	Dummy variables for calendar date of the average set to be read.	This is 1 variable-length spanned record. These data are read each time step. The first data used is when JJ=NBEGN. Note.--Datum for all stage values is mean sea level.
	None	-------	None	JJ	Sequence number for this set of average stage data.	This also is 1 record.
	None	-------	None	IJ(IT), HX(IT), IT=1,NOSTAG	IJ(IT): node, and HX(IT): corresponding river stage (ft).	This also is 1 record
28. Variant tributary stream stages	None	-------	None	JJ	Sequence number for this set of average tributary stream data.	This is 1 variable-length spanned record. These data are read each time step. The first data used is when JJ=NBEGN.
	None	-------	None	IJP(IT), HXP(IT), IT=1,NPSTAG	IJP(IT): node, and HXP(IT): corresponding stream stage (ft).	This also is 1 record.

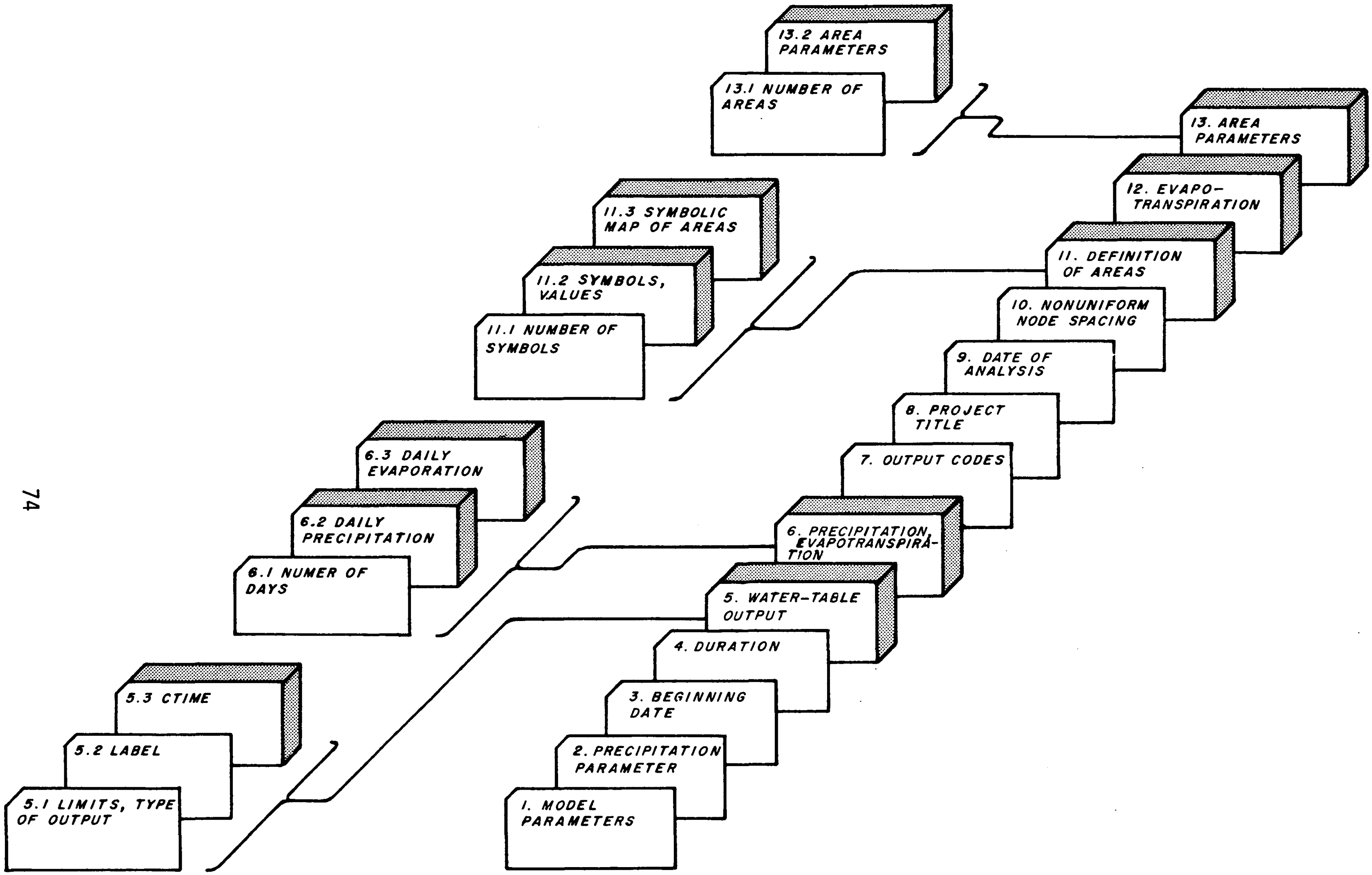

Figure 11, sheet 1 of 3.—Input-data deck for SUPERMOCK program.

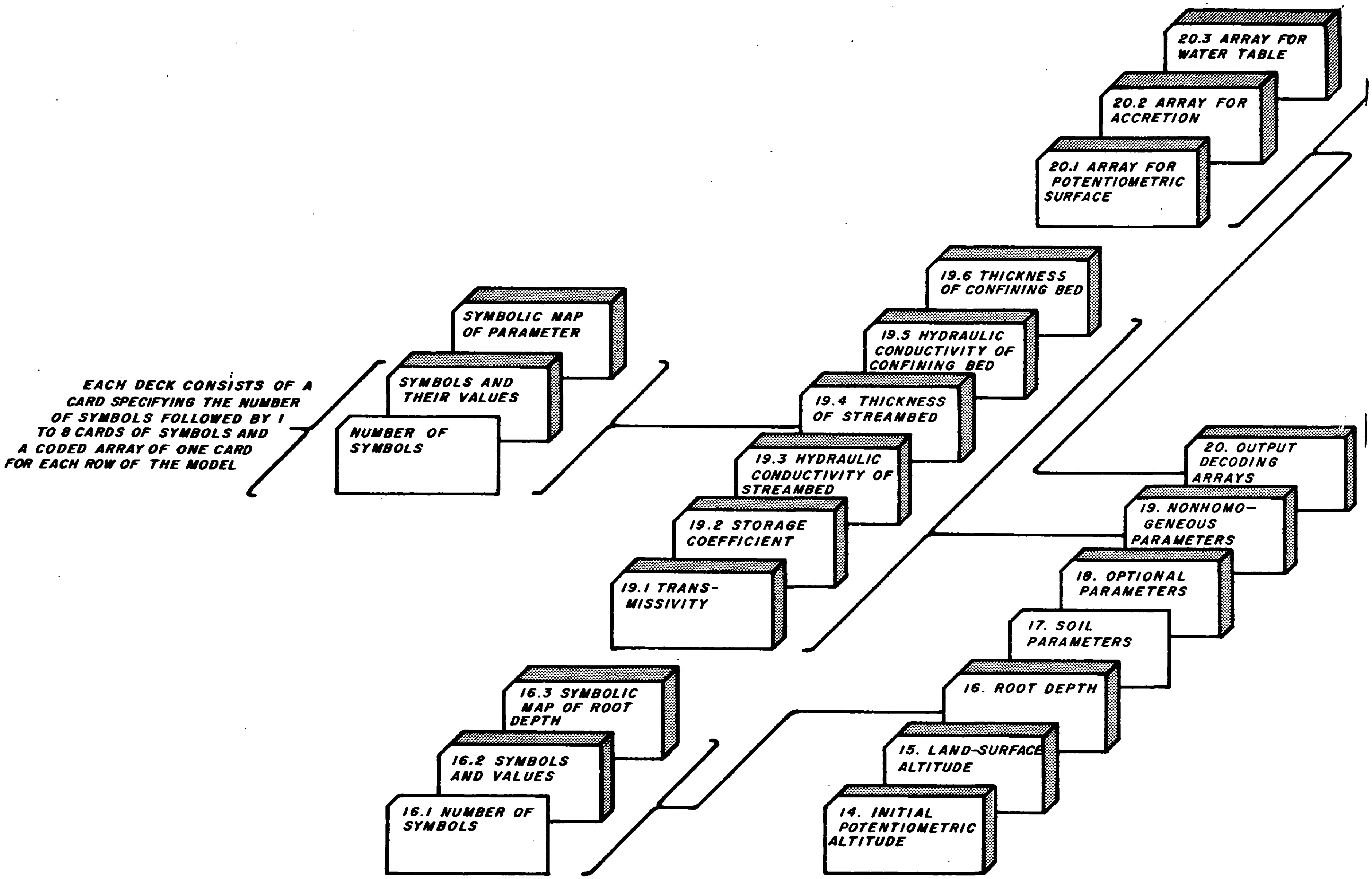

Figure 11, sheet 2 of 3.—Input-data deck for SUPERMOCK program.

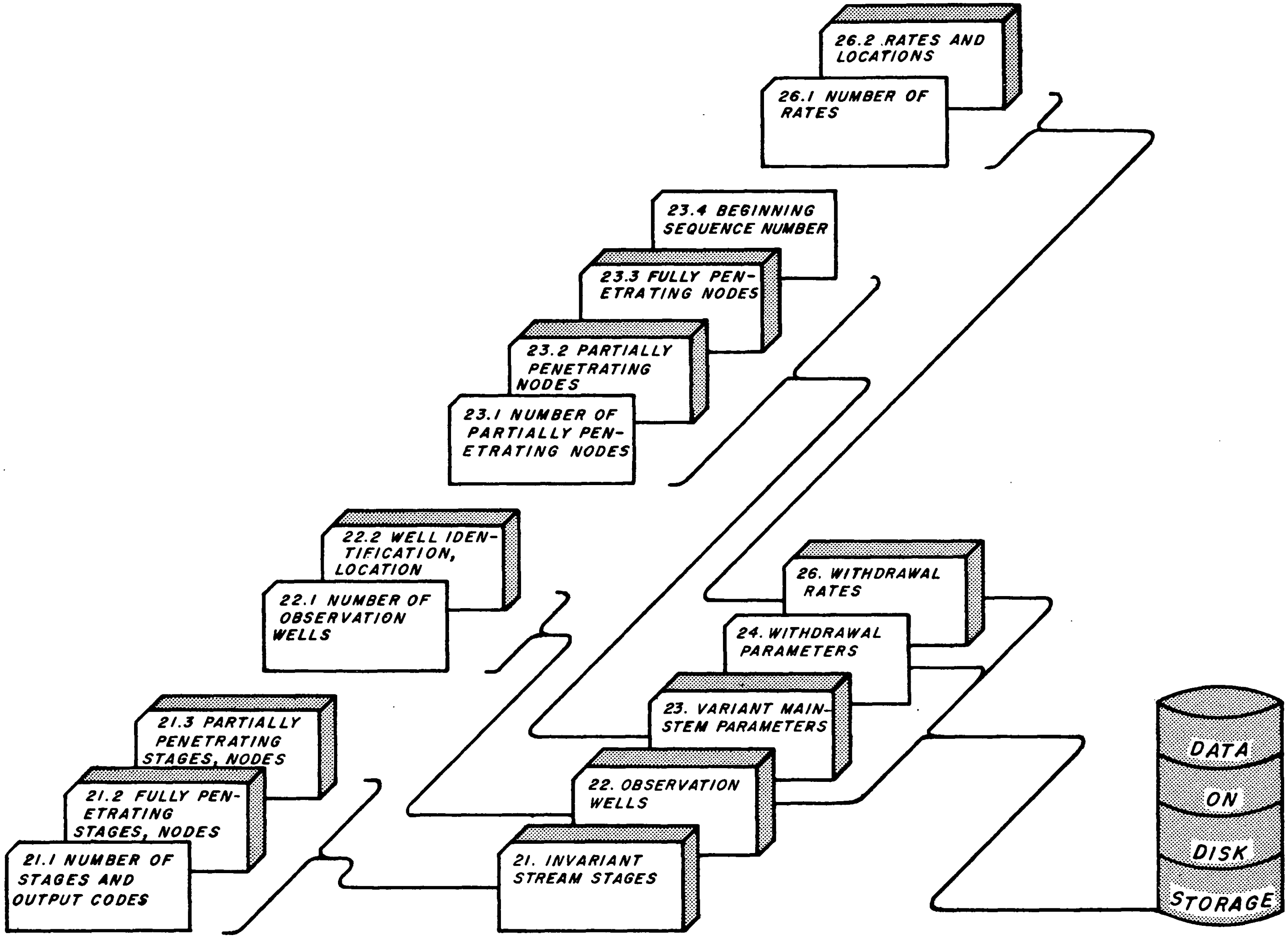

Figure 11, sheet 3 of 3.—Input-data deck for SUPERMOCK program.

1. Model parameters

One card--four of the parameters are coded only if they are to be uniform. They are: node spacing in the x direction (XM) and in the y direction (YM), transmissivity (TM), and aquifer storage coefficient (SM). Each of these that is to be nonuniform should be left blank. Also, on this card are the number of rows (M) and columns (N), a switch (ITDX) indicating if node spacing will be uniform, a mass-balance standard (BALSTD), and the time-step increment (NDAZ). The mass balance (BAL) is printed for any time step if it exceeds BALSTD. The purpose of this comparison is to check the performance of the model. A large mass balance indicates errors in the computational process; a small mass balance indicates that the computations are proceeding satisfactorily. A sum (CBAL) is computed for net flow in and out of the model and the change in storage of the model. Ideally, CBAL would be zero but it is not, due to roundoff and other errors in computation. BAL is computed as the percentage of the absolute value of CBAL to the total flux. The total flux is one-half the sum of the absolute values of the flow components. The one-half multiplication is based on the supposition that each flow component is counted twice, one as inflow or gain in storage and again as outflow or decrease in storage. A suitable value for BALSTD is 5 (percent) or less.

2. Precipitation parameter

One card--the only parameter on this card is IRX8, an offset pointer into the daily-precipitation array allowing subroutine DREAM to orient itself properly in computing accretion. IRX8 should be initialized to point to the desired beginning day in the daily precipitation array.

3. Beginning date

One card--contains the calendar date of the first day of the period to be analyzed.

4. Duration

One card--contains one parameter, QPER, giving the duration, in days, to be covered in the analysis.

5. Variable water-table output parameters

A group of cards--card one contains the beginning (M01) and ending (M02) rows, and the beginning (N01) and ending (N02) columns for output from the water-table array, and a switch (INDC) indicating if the printed output should be in a tabular or map form. Card two contains an identification heading, which will be printed at the beginning of the tabular print and punched on the first card of the card output if cards are punched. Next are a group of cards that contain CTIMES. CTIMES correspond to computation times (TTIMES) and define a period of interest for which output is desired. Accompanying each CTIME are two codes: ICODE, indicating if an average depth to water is to be computed for the period or if a comparison to determine the maximum depth to water is to be made; and JCODE, indicating the number of time steps that will be included in a period of interest.

If either tabular or map output is chosen, the program automatically punches cards containing corresponding nodes and depths to water, computed according to the dictates of CTIME, ICODE, and JCODE.

If none of this output is desired, leave all cards blank. If map or tabular output is desired but not cards, set unit 11 to DUMMY instead of SYSOUT=B on the appropriate data-definition (DD) card in the job control.

6. Daily precipitation and potential evapotranspiration

A group of cards--card one contains the number of precipitation and potential evapotranspiration values (MO) to be read. Next are two groups of cards; the first group contains daily precipitation values for the duration, and the second group contains daily-potential-evapotranspiration values for the duration. It is the responsibility of the user to furnish potential-evapotranspiration values for the program. Many methods of estimating potential evapotranspiration exist in the literature, one of which is by Thornthwaite (1948).

7. Output codes

One card--containing switches controlling some types of program output.

8. Project title

One card--contains title of project for which analysis is being made. This title will be reproduced on the heading sheet of the printed output.

9. Date of analysis

One card--contains calendar date of the day on which the analysis is being made.

10. Nonuniform node spacing

One card--if node spacing is variable, this card contains the information for defining that spacing; if node spacing is uniform, this card is omitted.

11. Alphameric map used to define hydraulic conductivity and evapotranspiration

A group of cards--the first card specifies the number of symbols to be used, next are one to eight cards, containing a set of sequence numbers and a corresponding set of single alphameric symbols by which the sequence numbers are mapped. As many as 64 alphameric symbols are possible. The symbols in each row in the array are coded on a card, using one card for each row.

12. Evapotranspiration divided by saturated hydraulic conductivity

Twelve cards--containing values of ET/SAT.H.C. for four ranges in hydraulic conductivity. Depths covered are from the water table to 30 feet above. Cards 1-3 contain values for $HC<0.004$; cards 4-6, for $0.004<HC<0.040$; cards 7-9, for $0.040<HC<0.400$; and cards 10-12, for $0.400<HC$.

13. Representative well data

A group of cards--card one contains the number of representative wells used (NLOGS) and, consequently, the number of cards to be read. This number must be equal to the number of symbols used in the HC and ET map. Each of the next NLOGS cards contains five parameters; the well number of the representative well, the upper and lower hydraulic conductivities, the thickness from the surface to the top of the aquifer, and a storage coefficient for the water table. The parameters on each card will be associated sequentially with the appropriate subarea in the alphameric map described in number 11 of the outline.

14. Initial altitude of the potentiometric surface

A group of cards--each card contains 20 values. The initial values in the H array are read from the values in this deck by rows.

15. Land-surface altitude

A group of cards--each card contains 20 values. The ELEV array is read from the values in this deck by rows.

16. Alphameric map used to define root depth

A group of cards--the first card specifies the number of symbols to be used, next are 1 to 8 cards containing the set of mapped values of root depth and a corresponding set of single alphameric symbols by which the of confining beds (if the appropriate optional parameter indices indicate nonuniformity). The first card in each sequence specifies the number of symbols used, next are one to eight cards containing the set of mapped values of the parameter and a corresponding set of single alphameric symbols by which the values are mapped. As many as 64 alphameric symbols are possible. The symbols in each row in the array are coded on a card, using one card for each row in arrays containing as many as 80 nodes. A map of each nonhomogeneous optional parameter is included in the printed output.

The number of symbols used and, therefore, the number of subareas defined in the aquifer-storage-coefficient map must be equal in number to those used in the map defining hydraulic conductivity and evapotranspiration.

20. Optional output decoding arrays

Zero to X number of cards, depending on the type of output desired and the duration. Three groups of cards are possible. Each of the groups comprises an output decoding array. The number of members in each array equals the number of time steps beginning with TTIME(2)=NDAZ. The first array, KSYM, controls output of potentiometric-surface altitudes (ft). It is included in the data deck only if IPCO(2)=1. The second array, LSYM, controls output of accretion rates (ft/day). It is included in the data deck only if IPCO(3)=1. The third array, KWSYM, controls output of water-table altitudes (ft). It is included in the data deck only if IPCO(4)=1. Each array member may be A, which indicates distribution map output; B, which indicates tabular printout; C, indicating both; or blank, indicating no output is desired at this time step. Each position in the arrays corresponds with a time step in the duration of the model. For example, if NDAZ=10 and $800<QPER\leq 1,600$, and a distribution map of the accretion rates is

values are mapped. As many as 64 symbols are possible. The symbols are coded on a card, using one card for each row.

17. Soil parameters

One card--contains a group of values defining various soil parameters used by subroutine DREAM in computing accretion. (See discussion of DREAM, p. 52.)

18. Optional parameters

One card--contains indices for hydraulic conductivities and thicknesses of the streambed and lakebed materials and of confining beds. The modeling of these parameters is optional. The indices indicate whether or not each parameter is modeled and, if so, whether it is uniform or nonuniform throughout its occurrence. The values of these parameters, if modeled and if uniform, are coded on the same card with the indices. Either streambed material or a confining bed (underlying the aquifer) can be modeled but not both, because the two differing values would have to be stored in the same array. If a confining bed is modeled, the data for head in the source bed would be input as though it were stage data for a partially penetrating stream (HO). The head in the source bed would be coded, according to outline reference 21, if it is invariant, and according to outline reference 25, if it varies with time.

19. Nonhomogeneous optional parameters

This part of the deck consists of from zero to six sequences of cards--one sequence of cards for each parameter modeled as nonhomogeneous. The parameters that may be coded here are transmissivity (if TM≠0) aquifer storage coefficient (if SM≠0), hydraulic conductivity and thicknesses of streambed and lakebed material (if the appropriate optional parameter indices indicate nonuniformity), and hydraulic conductivity and thickness desired at time steps 500 and 810, then IPCO(3)=1, and two cards would be entered for LSYM. The first card would have an "A" punched in column 50 and the second, an "A" in column 1.

21. Invariant stream and lake stages

One card--containing the number of fully penetrating (NSTGE) and the number of partially penetrating (NPSTGE) stages to be read, and a switch (KPNT) indicating if these stages should be printed.

If NSTGE>0, one or more cards containing partially penetrating stages and associated nodes are read.

If no invariant stream or lake stages are to be read, enter only the first card blank.

22. Observation wells

One card--containing the number of observation wells to be used.

One or more cards--containing well numbers and associated nodes.

23. Variant main-stem river-stage parameters

No cards--these data are read from a disk file. The parameters read are: NOSTAG, the number of main-stem river stages and corresponding nodes to be read each time step; NOSET, the number of average sets (equal to the number of time steps beginning with TTIME(2)=NDAZ); NODAYS, the time-step increment (equal to NDAZ).

One card--contains the number of nodes on the main stem to be treated as partially penetrating (NOPP).

One or more cards--containing the nodes on the main stem to be treated as partially penetrating (only if NOPP>0).

One or more cards--containing the nodes on the main stem to be treated as fully penetrating (only if NOPP<NOSTAG).

One card--contains sequence number (NBEGN), which should correspond to the sequence number of the desired beginning day for which stage data from the disk files will be used.

24. Withdrawal parameters

One card--contains switches controlling the input of withdrawal rates. The switches are IWDR, IWDINT, IWDT, and IDNT. Code IWDR=1 if pumpage is to be modeled. Code IWDINT=1 if a rate is to be associated with several nodes, or IWDINT=blank if the rates will vary from node to node. Code IWDT=1 if withdrawal rates and associated nodes are to be printed. Code IDNT equal to the time increment to read withdrawal rates.

25. Variant tributary-stream parameters

No cards--these data are read from a disk file. The first parameter (NPSTAG) read is the number of tributary-stream stages and associated nodes to be read each time step. Next is an array (IJP) of nodes to which tributary-stream stages will be associated and which will be treated as partially penetrating.

From this point, data are read repetitively for the duration.

26. Withdrawal rates

These cards are included in the data deck only if IWDR=1.

One card--contains the number of withdrawal rates to be read (NR).

If IWDINT=blank, a card or group of cards is read containing NR nodes and associated withdrawal rates.

If IWDINT=1, two cards are read for each indicated withdrawal rate from one to NR. The first card in each set contains the cumulative number of withdrawal nodes (MR) and a list of nodes (IF and JF). The second card contains the withdrawal rate to be associated with these nodes.

27. Variant main-stem river stages

No cards--these data are read from a disk file. The first record read contains dummy variables for the calendar date of the data to be read. The second record is a sequence number JJ, which increases by one with each set of stages read. JJ is used to locate the first set of stages to be used--for the first set of stages to be used, JJ must equal NBEGN. The third record is a group of associated nodes and river stages.

28. Variant tributary-stream stages

No cards--these data are read from a disk file. The first record read is a sequence number JJ. Again, the model will not use stage data associated with a JJ less than NBEGN. The second record is a group of nodes and associated river stages.

COMPUTER PROGRAM DATE

General Features

DATE, program C323, is a manipulative program developed to process computed altitudes of the potentiometric surface and water table passed to it in the job stream by SUPERMOCK. The altitudes are converted to depth below land surface and reordered by observation well or node level. The data for each well are associated with appropriate dates and written in a sequential disk data set in card-image format. This data set is passed to HYDROG, which will produce hydrographs of the computed data.

Also, DATE compares the computed water levels with measured water levels at the same locations for the high in the spring and the low in the fall of a specified year (or years). A set of differences between the observed and simulated potentiometric surface is computed. The maximum and minimum absolute difference, average, and standard deviation for this set of differences are determined for use as aids in calibrating. Because in many places observed data for the water table can be defined only within a range, no statistics are computed. However, both the computed depths to water and the observed ranges in depths to water are included in the tabular printout. A flow diagram of the DATE program is shown in figure 12. A listing of the DATE program is given in table 3.

Preparation of Input Data

An outline of the input-data deck for the DATE program is given in the following. The outline is keyed to table 4, which contains formats for coding input data. The components of the input deck are illustrated in figure 13.

1. Parameters

One card--the first parameter (LD) is the time increment for computing dates for the water levels for each well. The second parameter (NORDS) is the number of water levels for each well. The third parameter (ISTAT) is a switch indicating if comparisons with observed data are to be made (ISTAT=1).

2. Observation wells

A group of cards--card one contains the variable WELLS, the number of observation wells. Next is one or more cards containing well-identification numbers and corresponding nodes from the grid used in SUPERMOCK. The water levels for each of these wells will be passed to HYDROG on a disk file as card images in the format of a standard U.S. Geological Survey water-level card.

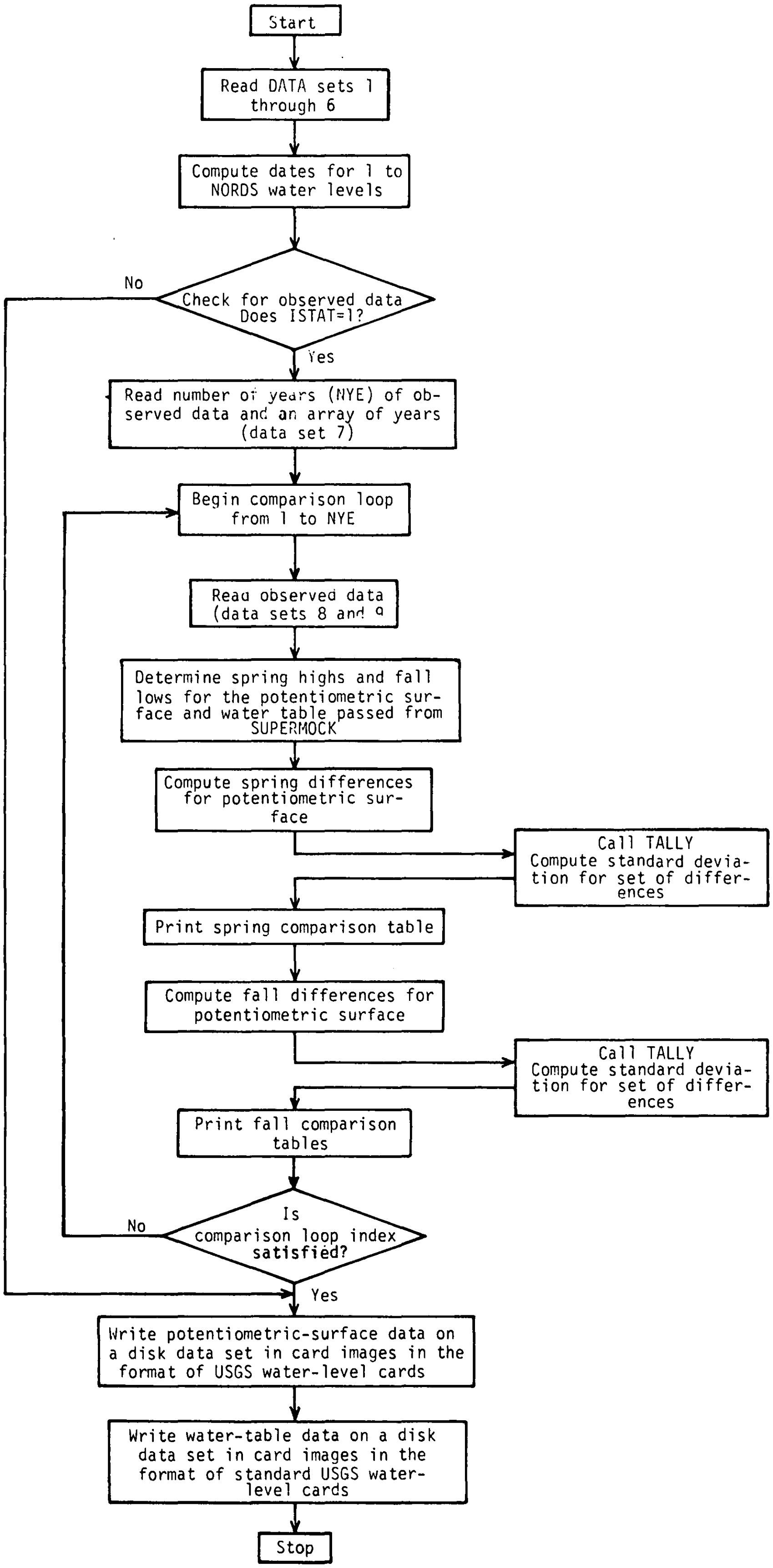

Figure 12.—Flow diagram of DATE program.

Table 3.—*DATE program listing*

```
C     ******************************************************************
C
C
C                             PROGRAM DATE
C
C                             VERSION II
C
C                               06/26/74
C
C                             BY JOHN TERRY
C
C
C     ******************************************************************
C     ******************************************************************
C
C        THIS PROGRAM IS CONSTRUCTED TO PROCESS COMPUTED WATER-LEVEL
C     ELEVATIONS FOR THE POTENTIOMETRIC SURFACE AND WATER TABLE. THESE
C     DATA ARE PASSED TO 'DATE' BY THE GROUND-WATER-FLOW SIMULATION
C     MODEL,'SUPERMOCK'.
C        THE DATA ARE CONVERTED TO DEPTH BELOW LAND SURFACE AND ASSIGNED
C     AN APPROPRIATE DATE.
C        THE PROGRAM IS CAPABLE OF PERFORMING TWO FUNCTIONS. THE FIRST
C     IS ALWAYS PERFORMED, THE SECOND IS OPTIONAL; (1) THE WATER LEVELS
C     ARE REARRANGED  BY WELL (OR NODE LEVEL) AND PASSED ON TO A THIRD
C     PROGRAM (HYDROG) IN THE FORM OF A WATER-LEVEL CARD IMAGE. (2) THE
C     COMPUTED WATER LEVELS ARE COMPARED TO MEASURED WATER LEVELS AT THE
C     SAME LOCATIONS FOR THE HIGH IN THE SPRING AND THE LOW IN THE
C     FALL OF A SPECIFIED YEAR. DIFFERENCES ARE TAKEN AND STANDARD
C     DEVIATIONS COMPUTED FOR THE POTENTIOMETRIC SURFACE. BECAUSE MANY
C     OF THE MEASURED DATA FOR THE WATER TABLE CAN BE DEFINED ONLY
C     WITHIN A RANGE,NO STATISTICS ARE COMPUTED FOR THESE DATA.
C
C     ******************************************************************
C
C     LD - TIME INTERVAL IN DAYS.
C
C     NORDS - NUMBER OF WATER LEVEL ELEVATIONS TO BE READ AT EACH POINT.
C
C     ISTAT - IF ISTAT EQUALS 1 , MEASURED DATA WILL BE READ FROM CARDS
C             AND COMPARED WITH COMPUTED DATA. IF ISTAT IS NOT EQUAL TO
C             1 , NO MEASURED DATA WILL BE READ AND NO COMPARISON MADE.
C
C     WELLS - NUMBER OF WELLS (OR NODE LEVELS) FOR WHICH DATA HAVE BEEN
C             PASSED FROM SUPERMOCK.
C
C     WENO - WELL NUMBER : IR - ROW : IC - COLUMN
C
C     WTABL - HOLDS COMPUTED WATER-TABLE VALUES.
C
C     XWAL - HOLDS COMPUTED POTENTIOMETRIC-SURFACE VALUES.
C
C     INITM,INITD,INITY - BEGINNING MONTH,DAY,YEAR
```

```
C
C     ELEV - LAND-SURFACE ELEVATIONS AT SPECIFIED WELLS (OR NODE LEVELS)
C
C     POT - HOLDS MEASURED WATER LEVELS (IN DEPTH BELOW LAND SURFACE)
C           FOR POTENTIOMETRIC SURFACE. IF NO MEASURED WATER LEVEL IS
C           AVAILABLE AT A SITE,ENTER .9999.
C
C     ISWT - INDICATES HOW MEASURED WATER TABLE IS DEFINED.
C            RR = CLOSED RANGE.
C            RL = MINIMUM DEPTH TO WATER GIVEN.
C            RH = MAXIMUM DEPTH TO WATER GIVEN.
C               = DEPTH TO WATER DEFINED BY SINGLE VALUE OR NO DEFINITIO
C            OF WATER TABLE POSSIBLE AT THIS SITE.
C
C     WLR - IF ISWT=RR,THIS IS LOWER VALUE FOR CLOSED RANGE. IF ISWT=RL,
C           THIS IS THE MINIMUM DEPTH TO WATER.
C
C     WHR - IF ISWT=RR,THIS IS UPPER VALUE FOR CLOSED RANGE. IF ISWT=RH,
C           THIS IS THE MAXIMUM DEPTH TO WATER. IF ISWT= , THIS IS 'THE'
C           DEPTH TO WATER OR .9999 IS INSERTED TO INDICATE THAT NO
C           DEFINITION OF THE WATER TABLE IS POSSIBLE AT THIS SITE.
C
C     NYE - NUMBER OF YEARS OF OBSERVED DATA TO BE COMPARED WITH
C           COMPUTED DATA.
C
C     ITPYR - YEARS SPECIFIED FOR WHICH COMPARISONS BETWEEN MEASURED
C             AND COMPUTED VALUES ARE TO BE MADE.
C
C     ******************************************************************
C
      INTEGER WELLS
      DIMENSION XWAL(60,150),IR(60),IC(60),WENO(60),WTABL(60,150)
      DIMENSION IYEAR(150),IDAY(150),IMON(150),ELEV(60)
      DIMENSION POT(2,60),WLR(2,60),COPO(2,60),COWA(2,60),PSDF(60),
     1WHR(2,60),ISWT(2,60),IQB(4),ITPYR(4)
      DATA IQB/'RR','RL','RH','  '/
      IDQ=10
      IDO=4
      IDIS=3
      IRD=5
      IPT=6
      IPCH=7
      READ (IRD,1) LD,NORDS,ISTAT
    1 FORMAT (I2,I3,I2)
      READ (IRD,2) WELLS
    2 FORMAT (I2)
      READ (IRD,3) (WENO(JX),IR(JX),IC(JX),JX=1,WELLS)
    3 FORMAT (10(A4,2I2))
      DO 4 IT=1,NORDS
      READ (IDQ) (WTABL(JX,IT),WENO(JX),JX=1,WELLS)
    4 READ (IDO) (XWAL(JX,IT),WENO(JX),JX=1,WELLS)
      READ (IRD,5) INITM,INITD,INITY
```

Table 3.—*DATE program listing*—Continued

```
 5 FORMAT (3I2)
   READ (IRD,6) (ELEV(IF),IF=1,WELLS)
 6 FORMAT (13(F6.2))
   DO 7 IF=1,WELLS
   DO 7 IT=1,NORDS
   WTABL(IF,IT)=ELEV(IF)-WTABL(IF,IT)
 7 XWAL(IF,IT)=ELEV(IF)-XWAL(IF,IT)
   IYEAR(1)=INITY
   IDAY(1)=INITD
   IMON(1)=INITM
   DO 20 J=2,NORDS
   IDAY(J)=IDAY(J-1)
   IMON(J)=IMON(J-1)
   IYEAR(J)=IYEAR(J-1)
   IDAY(J)=IDAY(J)+LD
   IF (IDAY(J).GT.28) GO TO 8
   GO TO 20
 8 INDX=IMON(J)
   GO TO (9,15,9,13,9,13,9,9,13,9,13,11), INDX
 9 IF (IDAY(J).GT.31) GO TO 10
   GO TO 20
10 IDAY(J)=IDAY(J)-31
   IMON(J)=IMON(J)+1
   GO TO 8
11 IF (IDAY(J).GT.31) GO TO 12
   GO TO 20
12 IDAY(J)=IDAY(J)-31
   IMON(J)=1
   IYEAR(J)=IYEAR(J)+1
   GO TO 8
13 IF (IDAY(J).GT.30) GO TO 14
   GO TO 20
14 IDAY(J)=IDAY(J)-30
   IMON(J)=IMON(J)+1
   GO TO 8
15 AYEAR=IYEAR(J)
   ATEST=AYEAR/4.
   ITEST=IYEAR(J)/4
   BTEST=ITEST
   IF (ATEST-BTEST) 16,18,16
16 IF (IDAY(J).GT.28) GO TO 17
   GO TO 20
17 IDAY(J)=IDAY(J)-28
   IMON(J)=IMON(J)+1
   GO TO 8
18 IF (IDAY(J).GT.29) GO TO 19
   GO TO 20
19 IDAY(J)=IDAY(J)-29
   IMON(J)=IMON(J)+1
   GO TO 8
20 CONTINUE
   IF (ISTAT.NE.1) GO TO 72
```

Table 3.—*DATE program listing*—Continued

```
      READ (IRD,21) NYE,(ITPYR(I),I=1,NYE)
   21 FORMAT (5I2)
      DO 71 N=1,NYE
      COWA(1,1)=1000
      COPO(1,1)=1000
      COPO(2,1)=.001
      COWA(2,1)=.001
      IF (ITPYR(N).EQ.0) GO TO 71
      READ (IRD,22) ((POT(I,J),J=1,WELLS),I=1,2)
   22 FORMAT (16F5.1)
      READ (IRD,23) ((ISWT(I,J),WLR(I,J),WHR(I,J),J=1,WELLS),I=1,2)
   23 FORMAT (6(A2,2F5.1))
      DO 30 I=1,NORDS
      IF (IYEAR(I).NE.ITPYR(N)) GO TO 30
      IF (IMON(I).GE.2.AND.IMON(I).LE.11) GO TO 24
      GO TO 30
   24 IU=1
      IF (IMON(I).GE.7) GO TO 27
      DO 26 K=1,WELLS
      IF (IMON(I).EQ.2.AND.IDAY(I).LE.LD) GO TO 25
      COPO(IU,K)=AMIN1(COPO(IU,K),XWAL(K,I))
      COWA(IU,K)=AMIN1(COWA(IU,K),WTABL(K,I))
      GO TO 26
   25 COPO(IU,K)=XWAL(K,I)
      COWA(IU,K)=WTABL(K,I)
   26 CONTINUE
      GO TO 30
   27 IU=2
      IF (IMON(I).GT.11) GO TO 30
      DO 29 K=1,WELLS
      IF (IMON(I).EQ.7.AND.IDAY(I).LE.LD) GO TO 28
      COPO(IU,K)=AMAX1(COPO(IU,K),XWAL(K,I))
      COWA(IU,K)=AMAX1(COWA(IU,K),WTABL(K,I))
      GO TO 29
   28 COPO(IU,K)=XWAL(K,I)
      COWA(IU,K)=WTABL(K,I)
   29 CONTINUE
   30 CONTINUE
      M=0
   31 M=M+1
      DO 32 L=1,WELLS
      PSDF(L)=POT(M,L)-COPO(M,L)
      IF (POT(M,L).EQ..9999) PSDF(L)=.9999
   32 CONTINUE
      CALL TALLY(PSDF,PSTOT,PSAV,PSSD,PSMN,PSMX,WELLS)
      WRITE (IPT,33)
   33 FORMAT (1H1)
      IF (M-1) 34,34,36
   34 WRITE (IPT,35) ITPYR(N)
   35 FORMAT (60X,'SPRING 19',I2/60X,'(FEB.-JUNE)')
      GO TO 38
   36 WRITE (IPT,37) ITPYR(N)
```

Table 3.—*DATE program listing*—Continued

```
37 FORMAT (61X,'FALL 19',I2/60X,'(JULY-NOV.)')
38 WRITE (IPT,39)
39 FORMAT (1H0,18X,'POTENTIOMETRIC SURFACE',51X,'WATER TABLE')
   WRITE (IPT,40)
40 FORMAT (1H0,2X,'WELL',5X,'MEASURED',6X,'COMPUTED',4X,'DIFFERENCE',
  133X,'WELL',5X,'MEASURED',6X,'COMPUTED')
   WRITE (IPT,41)
41 FORMAT (1X,'NUMBER',2X,'DEPTH BELOW',3X,'DEPTH BELOW',8X,'*',36X,'
  1NUMBER',2X,'DEPTH BELOW',3X,'DEPTH BELOW')
   WRITE (IPT,42)
42 FORMAT (9X,'LAND SURFACE',2X,'LAND SURFACE',52X,'LAND SURFACE',2X,
  1'LAND SURFACE')
   WRITE (IPT,43)
43 FORMAT (1H )
   DO 65 I=1,WELLS
   IF (ISWT(M,I).NE.IQB(4)) GO TO 47
   IF (WHR(M,I).EQ..9999) GO TO 60
   IF (PSDF(I).NE..9999) GO TO 45
   WRITE (IPT,44) WENO(I),COPO(M,I),WENO(I),WHR(M,I),COWA(M,I)
44 FORMAT (2X,A4,9X,'**',10X,F5.1,9X,'**',37X,A4,7X,F5.1,9X,F5.1)
   GO TO 65
45 WRITE (IPT,46) WENO(I),POT(M,I),COPO(M,I),PSDF(I),WENO(I),WHR(M,I)
  1,COWA(M,I)
46 FORMAT (2X,A4,7X,F5.1,9X,F5.1,7X,F5.1,36X,A4,7X,F5.1,9X,F5.1)
   GO TO 65
47 ASSIGN 48 TO IZQ
   IF (PSDF(I).EQ..9999) ASSIGN 50 TO IZQ
   IF (ISWT(M,I).EQ.IQB(1)) GO TO IZQ, (48,50)
   ASSIGN 52 TO IZQ
   IF (PSDF(I).EQ..9999) ASSIGN 54 TO IZQ
   IF (ISWT(M,I).EQ.IQB(2)) GO TO IZQ, (52,54)
   ASSIGN 56 TO IZQ
   IF (PSDF(I).EQ..9999) ASSIGN 58 TO IZQ
   IF (ISWT(M,I).EQ.IQB(3)) GO TO IZQ, (56,58)
48 WRITE (IPT,49) WENO(I),POT(M,I),COPO(M,I),PSDF(I),WENO(I),WLR(M,I)
  1,WHR(M,I),COWA(M,I)
49 FORMAT (2X,A4,7X,F5.1,9X,F5.1,7X,F5.1,36X,A4,2X,F5.1,'<WL<',F5.1,5
  1X,F5.1)
   GO TO 65
50 WRITE (IPT,51) WENO(I),COPO(M,I),WENO(I),WLR(M,I),WHR(M,I),COWA(M,
  1I)
51 FORMAT (2X,A4,9X,'**',10X,F5.1,9X,'**',37X,A4,2X,F5.1,'<WL<',F5.1,
  15X,F5.1)
   GO TO 65
52 WRITE (IPT,53) WENO(I),POT(M,I),COPO(M,I),PSDF(I),WENO(I),WLR(M,I)
  1,COWA(M,I)
53 FORMAT (2X,A4,7X,F5.1,9X,F5.1,7X,F5.1,36X,A4,2X,F5.1,'<WL',11X,F5.
  11)
   GO TO 65
54 WRITE (IPT,55) WENO(I),COPO(M,I),WENO(I),WLR(M,I),COWA(M,I)
55 FORMAT (2X,A4,9X,'**',10X,F5.1,9X,'**',37X,A4,2X,F5.1,'<WL',11X,F5
  1.1)
```

Table 3.—*DATE program listing*—Continued

```
      GO TO 65
   56 WRITE (IPT,57) WENO(I),POT(M,I),COPO(M,I),PSDF(I),WENO(I),WHR(M,I)
     1,COWA(M,I)
   57 FORMAT (2X,A4,7X,F5.1,9X,F5.1,7X,F5.1,36X,A4,8X,'WL<',F5.1,5X,F5.1
     1)
      GO TO 65
   58 WRITE (IPT,59) WENO(I),COPO(M,I),WENO(I),WHR(M,I),COWA(M,I)
   59 FORMAT (2X,A4,9X,'**',10X,F5.1,9X,'**',37X,A4,8X,'WL<',F5.1,5X,F5.
     11)
      GO TO 65
   60 IF (PSDF(I)-.9999) 63,61,63
   61 WRITE (IPT,62) WENO(I),COPO(M,I),WENO(I),COWA(M,I)
   62 FORMAT (2X,A4,9X,'**',10X,F5.1,9X,'**',37X,A4,9X,'**',10X,F5.1)
      GO TO 65
   63 WRITE (IPT,64) WENO(I),POT(M,I),COPO(M,I),PSDF(I),WENO(I),COWA(M,I
     1)
   64 FORMAT (2X,A4,7X,F5.1,9X,F5.1,7X,F5.1,36X,A4,9X,'**',10X,F5.1)
   65 CONTINUE
      WRITE (IPT,66)
   66 FORMAT (39X,'______')
      WRITE (IPT,67) PSTOT,PSAV
   67 FORMAT (30X,'TOTAL =',F7.1//27X,'AVERAGE =',F7.1)
      WRITE (IPT,68) PSMX,PSMN,PSSD
   68 FORMAT (1H0,10X,'MAX ABSOLUTE DIFFERENCE =',F7.1,3X,'STANDARD'/11X
     1,'MIN ABSOLUTE DIFFERENCE =',F7.1,3X,'DEVIATION =',F5.1)
      WRITE (IPT,69)
   69 FORMAT (131('_')/1X,'* NEGATIVE IF COMPUTED WATER LEVEL IS LOWER T
     1HAN MEASURED WATER LEVEL.')
      WRITE (IPT,70)
   70 FORMAT (1X,'** NO MEASURED WATER LEVELS AVAILABLE AT THIS SITE.')
      IF (M.EQ.1) GO TO 31
   71 CONTINUE
   72 DO 83 IXD=1,2
      IF (IXD-2) 75,73,75
   73 DO 74 I=1,WELLS
      DO 74 J=1,NORDS
   74 XWAL(I,J)=WTABL(I,J)
   75 DO 82 IF=1,WELLS
      IXPH=100
      DO 81 LAZY=1,NORDS,4
      IXPH=IXPH+1
      LDIPH=NORDS-LAZY
      IF (LDIPH-4) 76,77,77
   76 LOP=NORDS
      GO TO 79
   77 LOP=LAZY+3
      IF (LOP.EQ.NORDS) GO TO 79
      WRITE (IDIS,78) WENO(IF),IR(IF),IC(IF),(IMON(J),IDAY(J),IYEAR(J),X
     1WAL(IF,J),J=LAZY,LOP),IXPH
      GO TO 81
   78 FORMAT (3X,A4,3X,2I3,3X,3I2,1X,F6.2,1X,3I2,1X,F6.2,1X,3I2,1X,F6.2,
     11X,3I2,1X,F6.2,3X,I3)
```

Table 3.—*DATE program listing*—Continued

```
79 WRITE (IDIS,80) WENO(IF),IR(IF),IC(IF),(IMON(J),IDAY(J),IYEAR(J),X
  1WAL(IF,J),J=LAZY,LOP)
80 FORMAT (3X,A4,3X,2I3,3X,3I2,1X,F6.2,1X,3I2,1X,F6.2,1X,3I2,1X,F6.2,
  11X,3I2,1X,F6.2,6X)
   IF (LOP.EQ.NORDS) GO TO 82
81 CONTINUE
82 CONTINUE
83 CONTINUE
   STOP
   END
   SUBROUTINE TALLY(A,TOTAL,AVER,DS,VMIN,VMAX,NO)
   DIMENSION A(1)
   DS=0.0
   AVER=0.0
   TOTAL=0.0
   VMIN=1.0E75
   VMAX=-1.0E75
   SCNT=0.0
   DO 4 J=1,NO
   IF (A(J).EQ..9999) GO TO 4
   SCNT=SCNT+1.0
C
C       CALCULATE TOTAL,MINIMA,MAXIMA
C
   TOTAL=TOTAL+A(J)
   AA=ABS(A(J))
   IF (AA-VMIN) 1,2,2
 1 VMIN=AA
 2 IF (AA-VMAX) 4,4,3
 3 VMAX=AA
 4 CONTINUE
C
C       CALCULATE MEANS AND STANDARD DEVIATIONS
C
   XB=0.0
   XX=0.0
   AVER=TOTAL/SCNT
   DO 5 I=1,NO
   XB=(A(I)-AVER)**2
 5 XX=XX+XB
   DS=SQRT(XX/(SCNT-1))
   RETURN
   END
```

Table 4.—*Input data for DATE program*

Outline reference	Number of cards	Columns	Format	Program variable	Input item	Remarks
1. Parameters	1	1-2	I2	LD	Time increment, in days.	LD=NDAZ (from SUPERMOCK). NORDS=QPER/NDAZ (from SUPERMOCK).
		3-5	I3	NORDS	Number of water-level altitudes.	
		6-7	I2	ISTAT	Switch indicating if measured data are to be read and compared with computed data.	ISTAT=1: Yes. ISTAT= Blank: No.
2. Observation wells	1	1-2	I2	WELLS	Number of observation wells.	This set of cards should be exactly the same as the one described in outline reference 22 for SUPERMOCK.
	Depends on WELLS	1-80	10(A4,2I2)	WENO(JX), IR(JX), IC(JX), JX=1,WELLS	WENO(JX) is an alphameric well-identification number, IR(JX) and IC(JX) are the corresponding row and column locations.	
3. Water-table altitudes	None	-------	None	WTABL(I,J), WENO(I), I=1,WELLS, J=1,NORDS	WTABL(I,J)--altitude (ft) of the water table; WENO(I)--corresponding well number.	Each set of data from 1 to WELLS comprises 1 unformated, variable-length record passed from SUPERMOCK on disk file at each time step.
4. Potentiometric surface altitudes	None	-------	None	XWAL(I,J), WEND(I), I=1,WELLS, J=1,NORDS	XWAL(I,J)--altitude (ft) of the potentiometric surface; WENO(I)--corresponding well number.	Each set of data from 1 to WELLS comprises 1 unformated, variable-length record passed from SUPERMOCK.
5. Beginning date	1	1-2	I2	INITM	Beginning month.	This date will be associated with the first water levels passed from SUPERMOCK at the end of the first time step.
		3-4	I2	INITD	Beginning day.	
		5-6	I2	INITY	Beginning year.	
6. Land-surface altitudes	Depends on WELLS	1-78	13(F6.2)	ELEV(IF), IF=1,WELLS	Land-surface altitudes for the observation wells.	Should be coded in the same order as the observation wells.
7. Years of observed data	1	1-2	I2	NYE	Number of years of observed data to be read and compared with computed data.	If ISTAT=1, NYE must be >0.
		3-10	4I2	ITPYR(I), I=1,NYE	Years for which observed data will be entered.	Code in order.
The following data must be coded NYE times. There should be a set of observed potentiometric and water-table data for each year indicated.						
8. Observed potentiometric-surface data	Depends on WELLS	1-80	16F5.1	POT(I,J), J=1,WELLS, I=1,2	Row 1 of POT holds the spring highs for the potentiometric surface and row 2 holds the fall lows (in feet below land surface).	Both the highs and the lows should be coded in the same order as the observation wells.
9. Observed water-table data	Depends on WELLS	1-72	6(A2,2F5.1)	ISWT(I,J), WLR(I,J), WHR(I,J), J=1,WELLS, I=1,2	SWT(I,J) is a switch indicating how the water table is defined. WLR(I,J) may be either the lower value for a closed range or a minimum depth (ft) to water. WHR(I,J) may be the upper value of a closed range, a maximum depth (ft) to water, a specific depth (ft) to water, or 0.9999, indicating no definition. Note.--These data are coded in the same order as the observed potentiometric-surface data. However, for each entry, 3 fields must be coded instead of 1.	Possible entries for ISWT(I,J): RR: Closed range. RL: Minimum depth to water. RH: Maximum depth to water. Blank: A specific depth to water or no definition possible. If ISWT(I,J)=RR, WLR(I,J)=lower value of closed range. WHR(I,J)=upper value of closed range. If ISWT(I,J)=RL, WLR(I,J)=minimum depth to water. WHR(I,J)=blank. If ISWT(I,J)=RH, WLR(I,J)=blank, WHR(I,J)=maximum depth to water. If ISWT(I,J)=blank, WLR(I,J)=blank. WHR(I,J)=specific depth to water or 0.9999 indicating no definition.

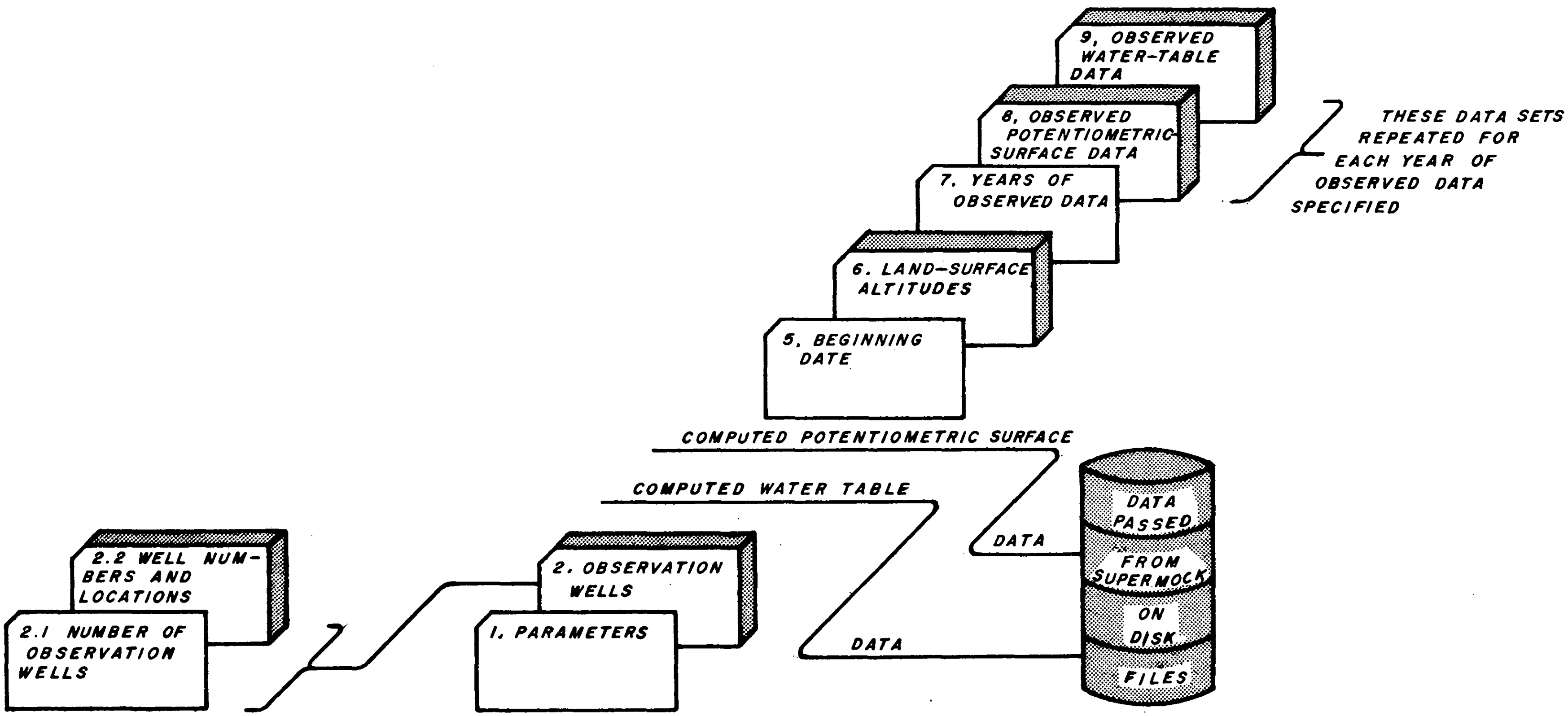

Figure 13.—Input data deck for DATE program.

This set of cards must be exactly the same as the set described in outline reference number 22 for SUPERMOCK.

3. Water-table altitudes

No cards--these data consist of observation-well numbers and associated water-table altitudes every LD days for (NORDS*LD) days, beginning on the date indicated in outline reference number 5, which follows. These data are read from a disk file passed from SUPERMOCK.

4. Potentiometric-surface altitudes

No cards--these data consist of observation-well numbers and associated potentiometric-surface altitudes every LD day for (NORDS*LD) days, beginning on the date indicated in outline reference number 5, which follows. These data are read from a disk file passed from SUPERMOCK.

5. Beginning date

One card--containing the calendar date of the first water-level altitude passed from SUPERMOCK.

6. Land-surface altitudes

One or more cards--containing land-surface altitudes for the observation wells. These altitudes should be coded in the same order as were the observation wells in the preceding outline reference number 2.

The following data sets are included only if ISTAT=1:

7. Years of observed data

One card--the first parameter (NYE) on the card is the number of years of observed data to be read and compared. Next is an array (ITPYR) of years for which observed data for both the potentiometric surface and the water table are provided.

<u>The following data sets are read for each year specified</u>:

8. Observed potentiometric-surface data

One or more cards--containing the measured depth below land surface of the potentiometric surface for the high in the spring and the low in the fall of the indicated year for each observation well. These observed highs and lows will be compared with corresponding highs and lows computed by SUPERMOCK. The highs are coded first, in the same order as that used in coding the observation wells in the preceding outline reference number 2. The lows follow immediately (beginning in the next field after the last high coded) and are coded in the same order as the highs. Code 0.9999 for those observation wells where no data are available.

To aid in getting the best fit in calibrating the model, the differences between measured and simulated values are computed and the standard deviation of this set of differences is determined for the spring and for the fall (0.9999's are excluded).

9. Observed water-table data

One or more cards--in many places the position of the observed water table can be determined only to within a certain range. To allow for this possibility, there are five options available in coding these data. The order of the data is the same as that specified for the potentiometric surface in the preceding outline reference number 8. However, for each water-table value entered, three fields must be coded. The first field contains a switch indicating how the water table will be defined. An RR in this field indicates a closed range, and the minimum is coded in field two and the maximum in field three. An RL in field one indicates that the water table can be defined only as being below some minimum depth below the land surface. This minimum depth is coded in field two, and field three is coded blank. An RH in field one indicates that the water table can be defined only as being above some maximum depth below the land surface. Field two is then coded blank and the maximum depth is coded in field three. A blank in field one indicates that the water table can be defined as being at a specific depth below the land surface or that it cannot be defined at all at this site. Field two should be coded blank and field three should contain the depth below land surface of the water table, or 0.9999 if the water table is not defined at this site.

COMPUTER PROGRAM HYDROG

General Features

HYDROG, program C324, is a slightly modified version of program W4309 by the same name. HYDROG is used to plot hydrographs at control points of potentiometric surface and water-table data computed by SUPERMOCK. These hydrographs can be very useful during calibration of the model for comparing model response with the observed fluctuations of the potentiometric surface and water table in observation wells. Also, in making projections, the hydrographs can be used to illustrate expected fluctuations and changes in fluctuations that will occur due to the imposition or deletion of certain stresses. Optionally, the hydrographs may cover any period of time within the duration of SUPERMOCK. A flow diagram of the HYDROG program is shown in figure 14 and a listing of the program is given in table 5.

Preparation of Input Data

An outline of the input-data deck for the HYDROG program is given in the following. This outline is keyed to table 6, which contains formats for coding input data. The components of the input deck are illustrated in figure 15.

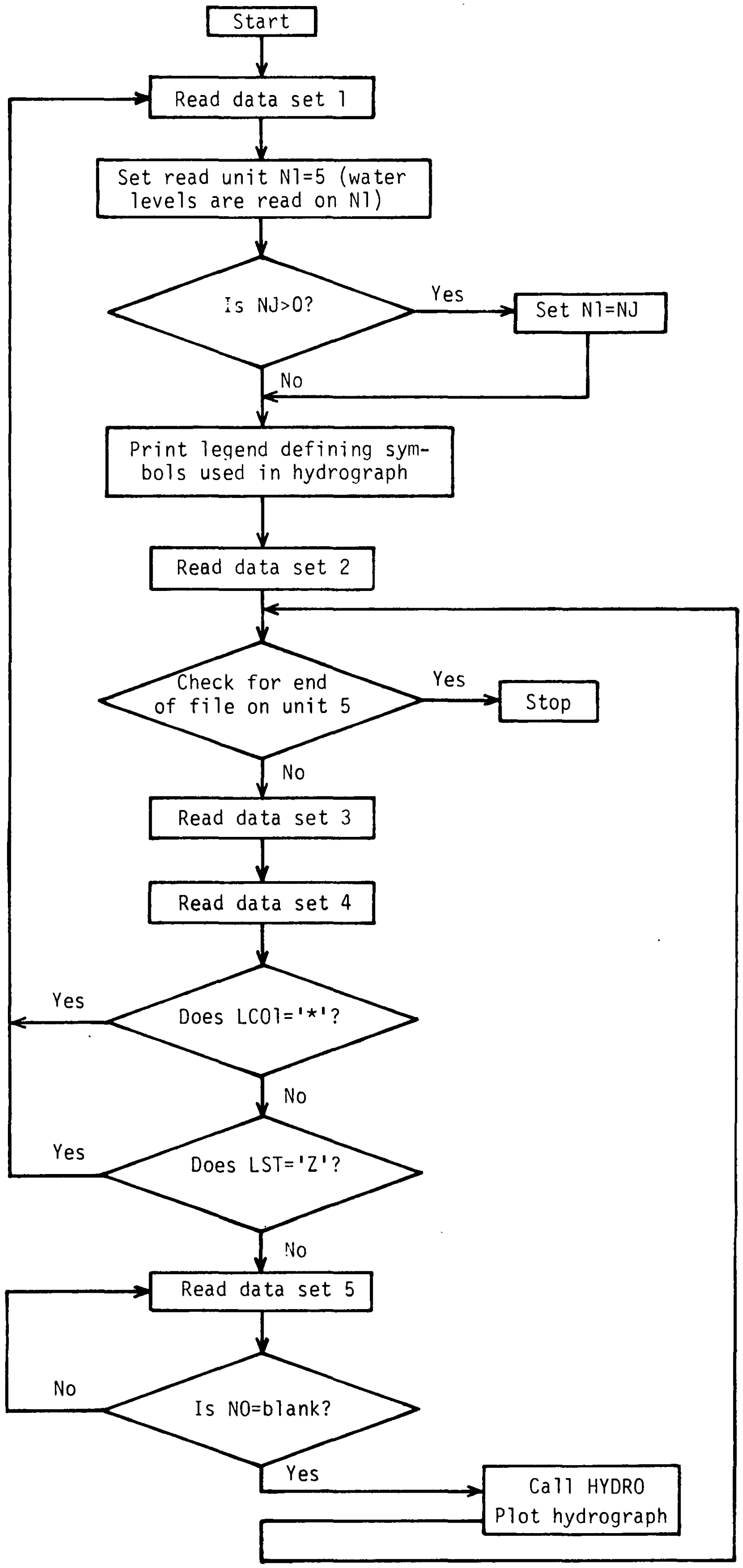

Figure 14.—Flow diagram of HYDROG program.

Table 5.—*HYDROG program listing*

```
***************************************************
*                                                 *
*                     HYDROG                      *
*                                                 *
*                       BY                        *
*                                                 *
*                 C. O. MORGAN                    *
*                                                 *
*              THIS VERSION MODIFIED              *
*                                                 *
*                       BY                        *
*                                                 *
*                  JOHN TERRY                     *
***************************************************

      DIMENSION LYR(4)
      DIMENSION IRC(48), IAQU(3)
      DIMENSION MA(46), MM(13), NDAY(12)
      DOUBLE PRECISION IHD
      COMMON IHD(180),ICODE(2600),IYR(2600),MON(2600),IDAY(2600),ISAGN(2
     1600),MST(2600),HSCAL(5),VSCAL(5),NA(46),MN(13),MDAY(12),W1(2600),I
     2MON(2),NYR(2),IC(20)
      DATA MA/1H0,1H1,1H2,1H3,1H4,1H5,1H6,1H7,1H8,1H9,1HA,1HB,1HC,1HD,1H
     1E,1HF,1HG,1HH,1HI,1HJ,1HK,1HL,1HM,1HN,1HO,1HP,1HQ,1HR,1HS,1HT,1HU,
     21HV,1HW,1HX,1HY,1HZ,1H ,1H.,1H+,1H-,1H/,1H*,1H,,4H, 19,4H     ,2H
     3/
      DATA MM/4HJAN.,4HFEB.,4HMAR.,4HAPR.,4HMAY ,4HJUNE,4HJULY,4HAUG.,4H
     1SEP.,4HOCT.,4HNOV.,4HDEC.,4H    /
      DATA NDAY/31,28,31,30,31,30,31,31,30,31,30,31/
      NRRD=99
      IRD=5
      DO 1 I=1,46
      NA(I)=MA(I)
    1 CONTINUE
      DO 2 I=1,13
      MN(I)=MM(I)
    2 CONTINUE
      DO 3 I=1,12
      MDAY(I)=NDAY(I)
    3 CONTINUE
      IRC ARRAY--STORAGE OF LENGTH-OF-RECORD DATA (CARD 2).
      W1 ARRAY--WATER-LEVEL DATA.
      ICODE ARRAY--CODE FOR STATUS AT WELL AT TIME OF MEASUREMENT.
      IYR ARRAY--YEAR OF WATER-LEVEL MEASUREMENT.
      MON ARRAY--MONTH OF WATER-LEVEL MEASUREMENT.
      IDAY ARRAY--DAY OF WATER-LEVEL MEASUREMENT.
      ISAGN ARRAY--SIGN, IF + OF WATER LEVEL.
      MST ARRAY--MEASUREMENT TYPE.
      HSCAL ARRAY--HORIZONTAL SCALE (READ IN), IN FEET.
      VSCAL ARRAY--VERTICAL SCALE (READ IN), IN DAYS PER LINE.
      NA ARRAY--DECODING ARRAY OF NUMBERS, LETTERS, A BLANK, AND
                SYMBOLS.
```

```
C      MN ARRAY--MONTHS IN FORM TO BE PRINTED ON HYDROGRAPH.             MAI
C      MDAY ARRAY--MONTHS IN DAYS PER MONTH, FOR CALCULATING TIME SCALE  MAI
C                  ON HYDROGRAPH.                                        MAI
C      IHD ARRAY--HEADING DATA (CARDS 3-20), PRINTED AT TOP OF EACH      MAI
C                 HYDROGRAPH.                                            MAI
C      IMON ARRAY--CONTROL CARD SPECIFYING BEGINNING AND ENDING MONTH    MAI
C                  OF HYDROGRAPH.                                        MAI
C      NYR ARRAY--CONTROL CARD SPECIFYING BEGINNING AND ENDING YEAR OF   MAI
C                 HYDROGRAPH.                                            MAI
       WRITE (6,4)                                                       MAI
     4 FORMAT (1H1)                                                      MAI
C      READ HORIZONTAL SCALE(HSCAL) AND VERTICAL SCALE(VSCAL).           MAI
C      HORIZONTAL SCALE (HSCAL)                                          MAI
C          SCALE GIVEN WILL BE FOR FEET ACROSS A 10 INCH HYDROGRAPH (10. MAI
C          FOR EXAMPLE IS 1 FOOT PER INCH)                               MAI
C      VERTICAL SCALE (VSCAL)                                            MAI
C          1. = DAILY                                                    MAI
C          2.5 = 2.5 DAYS PER UNIT                                       MAI
C          5. = 5 DAYS PER UNIT                                          MAI
C          10. = 10 DAYS PER UNIT                                        MAI
C          30. = MONTH PER UNIT                                          MAI
C          366 = YEARLY (2 LINES PER YEAR)                               MAI
C      READ TIME INTERVAL FOR OUTPUT.                                    MAI
     5 READ (IRD,6) (IMON(I),NYR(I),I=1,2),(HSCAL(I),I=1,5),(VSCAL(I),I=1MAI
      1,5),NJ                                                            MAI
     6 FORMAT (4I5,10F5.0,I5)                                            MAI
       N1=5                                                              MAI
       N5=5                                                              MAI
       IF (NJ.GT.0) N1=NJ                                                MAI
       IF (IMON(1).LT.1) IMON(1)=1                                       MAI
       IF (NYR(1).LT.1) NYR(1)=81                                        MAI
C      CHANGE VERTICAL-SCALE VALUES(VSCAL) TO VALUES USED IN PROGRAM     MAI
       DO 7 I=1,5                                                        MAI
       IF (VSCAL(I).EQ.1.) VSCAL(I)=5.1                                  MAI
       IF (VSCAL(I).EQ.2.5) VSCAL(I)=2.                                  MAI
       IF (VSCAL(I).EQ.5.) VSCAL(I)=1.                                   MAI
       IF (VSCAL(I).EQ.10.) VSCAL(I)=.5                                  MAI
       IF (VSCAL(I).EQ.30.) VSCAL(I)=.1666667                            MAI
       IF (VSCAL(I).EQ.366.) VSCAL(I)=0.027322404                        MAI
       IF (VSCAL(I).EQ.5.1) VSCAL(I)=5.                                  MAI
     7 CONTINUE                                                          MAI
C      WRITE HEADING DEFINING SYMBOLS USED ON HYDROGRAPH.                MAI
       WRITE (6,8)                                                       MAI
     8 FORMAT (10X,31HPLOTTED SYMBOLS ON HYDROGRAPHS //15X,42HA = WELL BEMAI
      1ING PUMPED (N = OFF-SCALE PLOT)//15X,46HB = WELL PUMPED RECENTLY (MAI
      2O = OFF-SCALE PLOT) //15X,50HC = NEARBY WELL BEING PUMPED (P = OFFMAI
      3-SCALE PLOT) //15X,53HD = NEARBY WELL PUMPED RECENTLY (Q = OFF-SCAMAI
      4LE PLOT) //15X,35HE = ESTIMATED (R = OFF-SCALE PLOT) //15X,57HF = MAI
      5DRY, PLOTTED VALUE IS WELL DEPTH (S = OFF-SCALE PLOT)//15X,55HG = MAI
      6MEASUREMENT BY ANOTHER AGENCY (T = OFF-SCALE PLOT) //15X,52HH = TAMAI
      7PE MEASUREMENT(RECORDER) (U = OFF-SCALE PLOT) //15X,58HI = AFFECTEMAI
      8D BY ATMOSPHERIC PRESSURE (V = OFF-SCALE PLOT) //15X,31HJ = OTHER MAI
```

```
     9(W = OFF-SCALE PLOT) //15X,57HK = MEASUREMENT FROM RECORDER CHART
     $(Z = OFF-SCALE PLOT) //15X,89HNOTE***WHEN MONTH IS MISSING, JULY I
     $S SUBSTITUTED, WHEN DAY IS MISSING, 1 IS SUBSTITUTED //)
      WRITE (6,9)
    9 FORMAT (15X,51HX = UNDISTURBED WATER LEVEL (- = OFF-SCALE PLOT)
     1//15X,80H2,3,4,ETC. = NUMBER OF NEARLY EQUAL WATER LEVELS AT APPRO
     2XIMATELY THE SAME TIME /)
      WRITE (6,10)
   10 FORMAT (15X,'***Q MAYBE USED FOR FLOWING (LAND SURFACE) WHERE ACTU
     1AL WATER LEVELS ARE UNKNOWN'//)
      WRITE (6,4)
C     IC--IDENTIFICATION OF DATA
      READ (IRD,11) IC
   11 FORMAT (20A4)
      IF (N5.LT.1) N5=5
C     READ DATA.
C     READ TWO HEADER CARDS.
C         LST--STATE CODE
C         LCO1, LCO2--COUNTY CODE
C         LTDG, LTMN, LTSC, LTDIR--LATITUDE IN DEGREES, MINUTES,
C                SECONDS
C         NOSEQ--SEQUENTIAL NUMBER
C         LTP, LNS, LRG, LWE, LSC, L11, L12, L13, L14--LOCAL WELL
C                NUMBER OR LOCATION
C         OW1, OW2, OW3, OW4--OWNER
C         OWNO--OWNER'S NUMBER
C         ELEV--ALTITUDE OF LAND SURFACE
C         ARTWL--WATER LEVEL OR ARTESIAN
C         WMUS--USE OF WATER
C         WLUS--USE OF WELL
C         IAQ--AQUIFER CODE(S)--MAXIMUM OF 3
C         NO1CD--CARD NUMBER
C         DEPTH--DEPTH OF WELL
C         AXMP--HEIGHT OR DEPTH (-) OF MEASURING POINT IN RELATION
C               TO LAND SURFACE
C         IRC--RECORD LENGTH (18 MAXIMUM)
C         NO2CD--CARD NUMBER
   12 READ (IRD,13,END=31) LST,LCO1,LCO2,LTDG,LTMN,LTSC,LTDIR,LGDG,LGMN,
     1LGSC,NOSEQ,LTP,LNS,LRG,LWE,LSC,L1,L2,L3,L4,OW1,OW2,OW3,OW4,OWNO,EL
     2EV,ARTWL,WMUS,WLUS,(IAQU(I),I=1,3),NO1CD
   13 FORMAT (A2,2A1,3I2,A1,I3,2I2,I1,2(A2,A1),A2,4A1,2X,3A6,A4,A5,F7.0,
     13A1,3A3,I1)
      IF (LCO1.EQ.NA(42)) GO TO 5
      IF (N5.EQ.5) GO TO 14
      GO TO 15
   14 IF (LST.EQ.NA(36)) GO TO 5
   15 READ (IRD,16) DEPTH,AXMP,(IRC(I),I=1,48),NO2CD
   16 FORMAT (19X,2F5.0,48A1,2X,I1)
C     SET DECIMAL INTO DATA--ELEV, DEPTH, AXMP.
      ELEV=ELEV*0.01
      DEPTH=DEPTH*0.1
      AXMP=AXMP*0.01
```

Table 5.—*HYDROG program listing*—Continued

```
C     READ CARDS CONTAINING DESCRIPTION FOR TABLE HEADING.
C         IHD--HEADING DATA (MAXIMUM 18 CARDS)
C         NOKD--CARD NUMBER FOR EACH HEADING CARD (EXCEPT LAST)
      MX=1
      NX=10
   17 READ (IRD,18) (IHD(J),J=MX,NX),NOKD
   18 FORMAT (20X,10A5,9X,A1)
      IF (NOKD.EQ.NA(37)) GO TO 19
      MX=MX+10
      NX=NX+10
      GO TO 17
C         MON--MONTH
C         IDAY--DAY
C         IYR--YEAR
C         ISAGN--SIGN, IF ABOVE LAND SURFACE (+)
C         W1--WATER LEVEL
C         ICODE--STATUS AT WELL AT TIME OF MEASUREMENT
C         MSTYP--TYPE MEASUREMENT
C         MSFREQ--FREQUENCY OF MEASUREMENT
C         NO--CARD NUMBER (LAST CARD OF DATA SET NOT NUMBERED)
   19 MY=1
      NY=4
      MEASTY=0
   20 READ (N1,21) (MON(I),IDAY(I),IYR(I),ISAGN(I),W1(I),ICODE(I),I=MY,N
     1Y),MSTYP,MSFREQ,NO
   21 FORMAT (19X,4(3I2,A1,F6.2,A1),2A1,2X,A1)
      IF (NY.GT.4.AND.MSTYP.EQ.NA(37)) MSTYP=MST(NY-4)
      IF (NY.EQ.4.AND.MSTYP.EQ.NA(37)) MSTYP=NA(11)
C     PLACE MEASUREMENT TYPE WITH EACH VALUE.
      DO 22 J=MY,NY
      MST(J)=MSTYP
   22 CONTINUE
C     CHECK FOR LAST CARD.
      IF (NO.EQ.NA(37)) GO TO 25
   23 IF (IYR(NY).GE.1) GO TO 24
      NY=NY-1
      MY=MY-1
      GO TO 23
   24 MY=MY+4
      NY=NY+4
      MEASTY=MSTYP
      GO TO 20
C     IF A CHANGE OCCURS IN MEASUREMENT TYPE--BACK SPACE, IF NEEDED,
C     COUNTERS TO AN OCCUPIED SPACE.
C     IF LAST CARD NOT FILLED, BACKSPACE COUNTER.
   25 IF (IYR(NY).LT.1) GO TO 26
      GO TO 27
   26 NY=NY-1
      GO TO 25
   27 CONTINUE
      IF (NY.LE.1) GO TO 28
C     CALL HYDRO TO PLOT HYDROGRAPH.
```

```
C          NY--TOTAL NUMBER OF MEASUREMENTS
C          NX--NUMBER OF A6 SPACES HEADING REQUIRES
      KYDO=0
      CALL HYDRO(NY,ELEV,DEPTH,NX,KYDO)
      IF (KYDO.GT.0) GO TO 28
      WRITE (6,4)
      GO TO 12
   28 WRITE (6,29) (IHD(I),I=1,NX)
   29 FORMAT (10X,20A5)
      WRITE (6,30) MON(1),IDAY(1),IYR(1),ISAGN(1),W1(1),ICODE(1)
   30 FORMAT (' ONLY ONE WATER LEVEL, NO HYDROGRAPH POSSIBLE',', DATE =
     1',I2,'-',I2,'-',I2,', WATER LEVEL = ',A1,F6.2,A1)
      WRITE (6,4)
      GO TO 12
   31 IF (N5.NE.5) REWIND N5
      STOP
      END
```

Table 5.— *HYDROG program listing*—Continued

```
      SUBROUTINE HYDRO(NY,ELEV,DEPTH,NX,KYDO)
C     SUBROUTINE HYDRO TO PLOT HYDROGRAPH.
      DIMENSION LYEAR(10)
      DIMENSION SCTOP(11), IDAP(2600), PLOTH(2600), IOFF(2600), IPLT(260
     10), IPT(100)
      DOUBLE PRECISION IHD
      COMMON IHD(180),ICODE(2600),IYR(2600),MON(2600),IDAY(2600),ISAGN(2
     1600),MST(2600),HSCAL(5),VSCAL(5),NA(46),MN(13),MDAY(12),W1(2600),I
     2MON(2),NYR(2),IC(20)
      DATA LYEAR /1880,1890,1900,1910,1920,1930,1940,1950,1960,1970/
C     SCTOP ARRAY--STORAGE FOR HORIZONTAL SCALE PRINTED BEFORE AND
C                AFTER EACH HYDROGRAPH
C     IDAP ARRAY--LINES ON WHICH DATA ARE PLOTTED (VERTICAL).
C     PLOTH ARRAY--PLOT POSITION OF DATA ON THE HORIZONTAL.
C     IOFF ARRAY--NUMBER OF TIMES PLOT IS OFF SCALE.
C     IPLT ARRAY--CHARACTER OF PLOTTED POINT.
C     IPT ARRAY--100 CHARACTER ARRAY FOR ARRANGING AND PRINTING
C               A LINE OF THE HYDROGRAPH.
C     DECODE MEASUREMENT TYPE AND PUMPING STATUS.
    1 DO 3 I=1,NY
      DO 2 J=1,37
      IF (MST(I).EQ.NA(J)) MST(I)=J
      IF (ICODE(I).EQ.NA(J)) ICODE(I)=J
    2 CONTINUE
      IF (MST(I).EQ.28) MST(I)=1
      IF (MST(I).EQ.30) MST(I)=2
C     IF MONTH MISSING, SUBSTITUTE JULY
C     IF DAY MISSING, SUBSTITUTE 1
      IF (MON(I).LT.1) MON(I)=7
      IF (IDAY(I).LT.1) IDAY(I)=1
    3 CONTINUE
C     IF HIGH AND LOW WATER LEVELS ARE AT FRONT OF RECORDS AND THEY ARE
C     NOT IN TIME SEQUENCE, MOVE STARTING POSITION UNTIL ORDERED DATA AR
C     ARE ENCOUNTERED.
C     JYXX - POSITION OF FIRST PROPERLY TIME-SEQUENCED WATER LEVEL IN
C        DATA ARRAYS.
      JYXX=1
C     AYRR - USED FOR CHECK OF DATA BEING IN TIME SEQUENCE.
      IF (IYR(1).GT.80) IYRX1=IYR(1)-80
      IF (IYR(1).LE.80) IYRX1=IYR(1)+20
      AYRR=(FLOAT(IYRX1)*12.)+FLOAT(MON(1))+(FLOAT(IDAY(1))/100.)
      DO 4 I=2,NY
C     BYRR - USED FOR CHECK OF DATA BEING IN TIME SEQUENCE.
      IF (IYR(I).GT.80) IYRX1=IYR(I)-80
      IF (IYR(I).LE.80) IYRX1=IYR(I)+20
      BYRR=(FLOAT(IYRX1)*12.)+FLOAT(MON(I))+(FLOAT(IDAY(I))/100.)
      IF (AYRR.GT.BYRR) JYXX=I
      AYRR=BYRR
    4 CONTINUE
C     DETERMINE MAXIMUM AND MINIMUM WATER LEVELS.
C     SET PLOT RANGE (TIME)
C        LOWER TIME LIMIT.
```

```
C     KY - POSITION OF FIRST WATER LEVEL IN DATA ARRAY (DATE SORTED).
      KY=0
C     JYR - USED FOR SORTING FIRST WATER LEVEL (DATE FROM CONTROL CARD).
      IF (NYR(1).GT.80) JYR=((NYR(1)-80)*12)+IMON(1)
      IF (NYR(1).LE.80) JYR=((NYR(1)+20)*12)+IMON(1)
      DO 6 I=JYXX,NY
C     KYR - USED FOR SORTING FIRST WATER LEVEL (DATE FROM DATA ARRAY).
      IF (IYR(I).GT.80) KYR=((IYR(I)-80)*12)+MON(I)
      IF (IYR(I).LE.80) KYR=((IYR(I)+20)*12)+MON(I)
      IF (KYR.GE.JYR) GO TO 5
      GO TO 6
    5 KY=I
      GO TO 7
    6 CONTINUE
C         UPPER TIME LIMIT.
      KY=NY
C     JY - POSITION OF LAST WATER LEVEL IN DATA ARRAY (DATE SORTED).
    7 JY=0
      IF (NYR(2).LT.1) GO TO 10
C     JJYR - USED FOR SORTING LAST WATER LEVEL(DATE FROM CONTROL CARD).
      IF (NYR(2).GT.80) JJYR=((NYR(2)-80)*12)+IMON(2)
      IF (NYR(2).LE.80) JJYR=((NYR(2)+20)*12)+IMON(2)
      DO 9 I=KY,NY
C     KKYR - USED FOR SORTING LAST WATER LEVEL(DATE FROM DATA ARRAY).
      IF (IYR(I).GT.80) KKYR=((IYR(I)-80)*12)+MON(I)
      IF (IYR(I).LE.80) KKYR=((IYR(I)+20)*12)+MON(I)
      IF (KKYR.GT.JJYR) GO TO 8
      GO TO 9
    8 JY=I-1
      GO TO 11
    9 CONTINUE
   10 JY=NY
   11 CONTINUE
   12 IF (W1(JY).EQ.0..AND.(ICODE(JY).EQ.11.OR.ICODE(JY).EQ.26.OR.ICODE(
     1JY).EQ.25.OR.ICODE(JY).EQ.23.OR.ICODE(JY).EQ.24)) GO TO 13
      GO TO 14
   13 JY=JY-1
      GO TO 12
   14 IF (JY.GT.1) GO TO 15
      KYDO=1
      RETURN
C     DETERMINE MAXIMUM AND MINIMUM WATER LEVELS FOR HYDROGRAPHS
C     BMX - MAXIMUM WATER LEVEL.
   15 BMX=(-100000.)
C     BMI - MINIMUM WATER LEVEL.
      BMI=100000.
      DO 17 I=KY,JY
      IF (ISAGN(I).EQ.NA(37).OR.ISAGN(I).EQ.NA(39)) GO TO 16
      CALL CRDCON(ISAGN(I))
   16 IF (ISAGN(I).NE.NA(39)) W1(I)=W1(I)*(-1.)
      IF (ICODE(I).EQ.23.OR.ICODE(I).EQ.24.OR.ICODE(I).EQ.25.OR.ICODE(I)
     1.EQ.26) GO TO 17
```

Table 5.—*HYDROG program listing*—Continued

```
      BMX=AMAX1(BMX,W1(I))
      BMI=AMIN1(BMI,W1(I))
   17 CONTINUE
      DO 18 I=KY,JY
      IF (W1(I).EQ.0..AND.ICODE(I).EQ.11) W1(I)=BMI
      IF (ICODE(I).EQ.16) W1(I)=-1.*DEPTH
   18 CONTINUE
C     DIFF - DIFFERENCE BETWEEN MAXIMUM AND MINIMUM WATER LEVEL.
      DIFF=BMX-BMI
      DO 20 I=1,5
      IF (HSCAL(I).GT.DIFF) GO TO 19
      GO TO 20
   19 SCALH=HSCAL(I)
      SCALV=VSCAL(I)
      GO TO 23
   20 CONTINUE
      I=5
   21 IF (HSCAL(I).GE.0.5) GO TO 22
      I=I-1
      GO TO 21
C     SCALH - HORIZONTAL SCALE FOR HYDROGRAPH(SELECTED FROM HSCAL
C             ARRAY).
   22 SCALH=HSCAL(I)
C     SCALV - VERTICAL SCALE FOR HYDROGRAPH(SELECTED FROM VSCAL
C             ARRAY).
      SCALV=VSCAL(I)
C     DETERMINE RANGE OF SCALE
   23 IF (SCALH.LE.10.) GO TO 24
C     KMM, DMI, IMI, CMI - USED TO DETERMINE LOWEST EVEN SCALE VALUE.
      KMM=BMI/10.
      DMI=KMM*10
      IF ((DMI+(-10.)+SCALH).LT.BMX.AND.(DMI+(-1.)+SCALH).GE.BMX) GO TO
     124
      BMI=DMI+(-10.)
      BMX=BMI+SCALH
      GO TO 25
   24 BMI=BMI+(-1.5)
      IMI=BMI
C     IMX - MAXIMUM SCALE VALUE, EQUAL TO LOWEST SCALE VALUE
      CMI=IMI
C           PLUS SCALH.
      IMX=CMI+SCALH
      GO TO 26
   25 IMX=BMX
      IMI=BMI
   26 SCTOP(11)=IMX
      SCTOP(1)=IMI
      DO 27 I=2,10
      SCTOP(I)=SCTOP(I-1)-((SCTOP(1)-SCTOP(11))/10.)
   27 CONTINUE
C     DETERMINE PLOT POSITION - PLOTH--POSITION ON LINE, IDAP--LINE OF
C         PLOT, IOFF--TIMES PLOT IS OFF SCALE.
```

```
      DO 28 I=1,2600
      IDAP(I)=0
      PLOTH(I)=0.
   28 CONTINUE
      J=0
      DO 43 I=KY,JY
      J=J+1
C     SLOTH, LOTH, KOTH - USED TO DETERMINE PLOT POSITION OF WATER LEVEL
C                         ON HORIZONTAL LINE(PLOTH VALUE).
      SLOTH=(W1(I)-SCTOP(11))/(SCALH/100.)
      LOTH=SLOTH
      KOTH=SLOTH*100.
      KOTH=KOTH-(LOTH*100)
      IF (KOTH.GE.50) PLOTH(J)=PLOTH(J)+1.
      IF (KOTH.LE.(-50)) PLOTH(J)=PLOTH(J)-1.
C     IL - SWITCH FOR CHANGING PLOT SYMBOL ON OFF-SCALE PLOT.
      IL=0
      PLOTH(J)=LOTH+100+IFIX(PLOTH(J))
      IF (PLOTH(J).GE.101.) IL=1
      IOFF(J)=0
   29 IF (PLOTH(J).LE.100.) GO TO 30
      PLOTH(J)=PLOTH(J)-100.
      IOFF(J)=IOFF(J)+1
      GO TO 29
   30 IF (PLOTH(J).LT.0.) PLOTH(J)=PLOTH(J)+100.
      IF (PLOTH(J).LT.1.) PLOTH(J)=1.
      IF (SCALV.GE.5.) GO TO 33
C     IVT - DATE(YEAR AND MONTH) CONVERTED TO SINGLE NUMBER FOR
C           DETERMINING LINE FOR PLOT.
      IF (IYR(I).GT.80) JY1=IYR(I)-80
      IF (IYR(I).LE.80) JY1=IYR(I)+20
      IF (IYR(KY).GT.80) KY1=IYR(KY)-80
      IF (IYR(KY).LE.80) KY1=IYR(KY)+20
      IF (SCALV.LT..1) GO TO 32
      IVT=((JY1-KY1)*12)+(MON(I)-MON(KY))
C     AVT - IVT IN REAL NUMBER FORM.
      AVT=IVT
C     AINES - LINE OF PLOT MINUS DAY INCREMENT.
      AINES=AVT*(SCALV*6.)
      IF (SCALV.LT..17) GO TO 31
C     DAYV - DAY INCREMENT FOR DETERMINING LINE OF PLOT(IDAP =
C            AINES + DAYV).
      DAYV=IDAY(I)
      DAYV=DAYV*(SCALV/5.)
C     IDV, JDV, ADV, IDA - VARIABLES USED IN DETERMINING LINE INCREMENT
C                          FOR IDAP.
      IDV=DAYV
      JDV=DAYV*100.
      ADV=JDV-(IDV*100)
      IF (ADV.GE.1.) DAYV=DAYV+1.
      IDA=DAYV
      DAYV=IDA
```

Table 5.—*HYDROG program listing*—Continued

```
      IF (DAYV.GT.(SCALV*6.)) DAYV=DAYV-1.
C     LINE ON WHICH DATA ARE TO BE PLOTTED--IDAP(J)
      IDAP(J)=AINES+DAYV
      GO TO 41
C     SET UP IDAP(LINE OF PLOT VALUE) FOR DAILY HYDROGRAPH.
   31 IDAP(J)=AINES+1.
      GO TO 41
   32 IDAP(J)=((JY1-KY1)+1)*2
      IF (MON(I).LT.7) IDAP(J)=IDAP(J)-1
      GO TO 41
   33 IVT=0
C     MDA - MONTH OF WATER LEVEL BEING EXAMINED.
      MDA=MON(I)
C     NDA - MONTH OF FIRST WATER LEVEL TO BE OUTPUT.
      NDA=MON(KY)
      IF (MDA.LT.NDA) GO TO 35
      IF ((MDA-NDA).EQ.0) GO TO 37
      MDA=MDA-1
      DO 34 IR=NDA,MDA
      IVT=IVT+MDAY(IR)
   34 CONTINUE
      GO TO 37
   35 NDA=NDA-1
      DO 36 IS=MDA,NDA
      IVT=IVT-MDAY(IS)
   36 CONTINUE
   37 IF (IYR(I).GT.80) JY1=IYR(I)-80
      IF (IYR(I).LE.80) JY1=IYR(I)+20
      IF (IYR(KY).GT.80) KY1=IYR(KY)-80
      IF (IYR(KY).LE.80) KY1=IYR(KY)+20
      AVT=IVT+((JY1-KY1)*365)
      AINES=AVT*(SCALV/5.)
      DAYV=IDAY(I)
      IDAP(J)=AINES+DAYV
      JMM=4
C     KZZ - EQUAL TO KY-FIRST DATA-VALUE ARRAY POSITION.
      KZZ=KY
C     JZZ - EQUAL TO ARRAY POSITION OF DATA VALUE BEING EXAMINED.
      JZZ=I
C     CHECK FOR LEAP YEAR.
   38 DO 39 IG=JMM,96,4
      DO 39 NZZ=KZZ,JZZ
      IF (IYR(NZZ).EQ.IG) GO TO 40
   39 CONTINUE
      GO TO 41
   40 JMM=IG+4
      IF (IYR(KY).EQ.IG.AND.MON(KY).GT.2) GO TO 41
      IF (MON(I).GT.2) IDAP(J)=IDAP(J)+1
      GO TO 38
   41 IPLT(J)=NA(34)
      IF (IL.EQ.1) IPLT(J)=NA(40)
C     ICDE - EQUAL TO ICODE OF DATA VALUE BEING EXAMINED.
```

Table 5.—*HYDROG program listing*—Continued

```
      ICDE=ICODE(I)
      IF (ICDE.NE.37) IPLT(J)=NA(ICDE)
      IF (IL.EQ.1.AND.ICDE.NE.37) IPLT(J)=NA(ICDE+13)
      IF (IL.EQ.1.AND.IPLT(J).EQ.NA(34)) IPLT(J)=NA(36)
      IF (ICDE.EQ.23.OR.ICDE.EQ.24.OR.ICDE.EQ.25.OR.ICDE.EQ.26) GO TO 42
      GO TO 43
   42 IPLT(J)=NA(37)
   43 CONTINUE
C     IDAP(J)--VERTICAL LINE OF PLOT, PLOTH(J)--VALUE OF PLOTTED POINT
C     IPLT--CHARACTER OF PLOTTED POINT
C     ITV--TOTAL NUMBER OF LINES
C     MYEAR, KYEAR - YEAR OF FIRST MEASUREMENT TO BE PLOTTED.
      IF (IYR(KY).GT.80) MYEAR=IYR(KY)+1800
      IF (IYR(KY).LE.80) MYEAR=IYR(KY)+1900
      IF (SCALV.LT..1) GO TO 44
C     IBG - MONTH OF FIRST MEASUREMENT TO BE PLOTTED.
      IBG=MON(KY)
      GO TO 45
C     KOUT - COUNTER FOR SPACING LINES, PRINTING MONTHS ON PROPER LINES.
   44 IBG=1
      IF (IMON(KY).GT.6) IBG=2
   45 KOUT=0
      IF (SCALV.GE.5.) GO TO 47
      IF (IYR(JY).GT.80) JY1=IYR(JY)-80
      IF (IYR(JY).LE.80) JY1=IYR(JY)+20
      IF (IYR(KY).GT.80) KY1=IYR(KY)-80
      IF (IYR(KY).LE.80) KY1=IYR(KY)+20
      IF (SCALV.LT..1) GO TO 46
      IK=SCALV*6.
C     ITV - TOTAL NUMBER OF LINES OF HYDROGRAPH.
      ITV=(((JY1-KY1)*12)+(MON(JY)-MON(KY))+1)*IK
      GO TO 55
   46 ITV=((JY1-KY1)+1)*2
      GO TO 55
   47 ITV=0
C     MDX, NDX, IK - VARIABLES USED IN CALCULATING LINES ON A DAILY
C                    HYDROGRAPH.
      MDX=MON(JY)
      NDX=MON(KY)
      IK=MDAY(NDX)
      IF (MDX.LT.NDX) GO TO 49
      DO 48 I=NDX,MDX
      ITV=ITV+MDAY(I)
   48 CONTINUE
      GO TO 51
   49 NDX=NDX-1
      MDX=MDX+1
      IF (NDX.LT.MDX) GO TO 51
      DO 50 I=MDX,NDX
      ITV=ITV-MDAY(I)
   50 CONTINUE
   51 IF (IYR(JY).GT.80) JY1=IYR(JY)-80
```

Table 5.—*HYDROG program listing*—Continued

```
      IF (IYR(JY).LE.80) JY1=IYR(JY)+20
      IF (IYR(KY).GT.80) KY1=IYR(KY)-80
      IF (IYR(KY).LE.80) KY1=IYR(KY)+20
      ITV=((JY1-KY1)*365)+ITV
      DO 54 IJ=4,96,4
      DO 52 JI=KY,JY
      IF (IYR(JI).EQ.IJ) GO TO 53
   52 CONTINUE
      GO TO 54
   53 ITV=ITV+1
   54 CONTINUE
C     WRITE IDENTIFICATION--IC1 TO IC5 AND IHD.
   55 WRITE (6,56) IC
   56 FORMAT (10X,20A4///)
      WRITE (6,57) (IHD(I),I=1,NX)
   57 FORMAT (10X,20A5)
      WRITE (6,58)
   58 FORMAT (//////)
C     SET ALL MINUS SCALE VALUES TO PLUS VALUES.
C     KEG - VARIABLE USED TO DETERMINE WHICH SCALE IDENTIFICATION
C           TO WRITE.
      KEG=0
      DO 59 I=1,11
C     DETERMINE PROPER SCALE TITLE TO PRINT.
      IF (SCTOP(I).GE.0.) GO TO 59
      KEG=KEG+1
      SCTOP(I)=SCTOP(I)*(-1.)
   59 CONTINUE
      IF (KEG.EQ.11) GO TO 63
      IF (KEG.EQ.0) GO TO 61
      WRITE (6,60)
   60 FORMAT (/,39X,49HWATER LEVEL, IN FEET BELOW OR ABOVE LAND SURFACE
     1/)
      GO TO 65
   61 WRITE (6,62)
   62 FORMAT (/,45X,40HWATER LEVEL, IN FEET ABOVE LAND SURFACE /)
      GO TO 65
   63 WRITE (6,64)
   64 FORMAT (/,43X,44HDEPTH TO WATER BELOW LAND SURFACE, IN FEET  /)
C     PRINT SCALE VALUES.
   65 WRITE (6,66) (SCTOP(I),I=1,11)
   66 FORMAT (8X,11(F7.1,3X))
      J=1
C     PRINT PLOT BOUNDRY.
      WRITE (6,67)
C     IAS - COUNTER TO PRINT OUT LEFT HAND EDGE OF HYDROGRAPH, EITHER
   67 FORMAT (13X,101(1H*))
C           AN * OR NUMBER FOR OFF-SCALE INDICATOR.
      IAS=42
C     JAS - COUNTER TO SET-UP LINE.
      JAS=7
      NKX=1
```

Table 5.—*HYDROG program listing*—Continued

```
      KYEAR=MYEAR
C     STATEMENTS THROUGH 1000 ARRANGE  AND PLOT  HYDROGRAPH.
      DO 119 I=1,ITV
C     BLANK PLOT ARRAY (IPT).
      DO 68 K=1,100
      IPT(K)=NA(37)
   68 CONTINUE
C     SET INTO IPT ARRAY INTERMEDIATE LINES OF DOTS.
      IF (KOUT.EQ.IK.AND.SCALV.GE.1.) GO TO 69
      GO TO 71
   69 DO 70 IOJ=1,100
      IPT(IOJ)=NA(38)
   70 CONTINUE
      GO TO 80
   71 IF (SCALV.LT..17) GO TO 72
      IF (SCALV.EQ.0.5.AND.JAS.EQ.I) GO TO 73
      GO TO 76
   72 IF (SCALV.LT.0.1) GO TO 76
      IF (I.GT.3.AND.(IBG.EQ.5.OR.IBG.EQ.11).AND.I.LT.(ITV-2)) GO TO 74
      GO TO 76
   73 IF (JAS.EQ.ITV) GO TO 76
      JAS=JAS+6
   74 DO 75 JOI=1,100
      IPT(JOI)=NA(38)
   75 CONTINUE
      GO TO 80
   76 DO 77 ITY=10,90,10
      IPT(ITY)=NA(38)
   77 CONTINUE
      IF (I.LE.3.OR.I.GE.(ITV-3)) GO TO 80
      IF (NKX.EQ.1) GO TO 80
      NKX=1
      DO 79 IDM=1,10
      IF (MYEAR.NE.LYEAR(IDM)) GO TO 79
      DO 78 IDXX=1,100
      IPT(IDXX)=NA(38)
   78 CONTINUE
      GO TO 80
   79 CONTINUE
   80 IPT(100)=NA(42)
      KOUT=KOUT+1
C     PDAY - LENGTH OF MONTH IN DAYS(FROM MDAY ARRAY).
      PDAY=MDAY(IBG)
C     IF DAILY SCALE, DETERMINE NUMBER OF PLOT LINES FOR MONTH.
      IF (SCALV.GE.5.) IK=PDAY*(SCALV/5.)
      IF (SCALV.LT..17) GO TO 82
C     CHECK FOR LEAP YEAR.
      DO 81 NIT=1880,2000,4
      IF (IBG.EQ.2.AND.KYEAR.EQ.NIT) IK=(PDAY*(SCALV/5.))+1.
   81 CONTINUE
      IF (KOUT.LE.IK) GO TO 84
      KOUT=1
```

Table 5.—*HYDROG program listing*—Continued

```
   82 IF (SCALV.LT.0.1) GO TO 83
      IF (SCALV.LT..17.AND.I.EQ.1) GO TO 84
      IBG=IBG+1
      IF (IBG.EQ.13) IBG=1
      GO TO 84
   83 IF (I.EQ.1) GO TO 84
      IBG=IBG+1
      IF (IBG.EQ.3) IBG=1
C     CHECK FOR PLOTTING OF VALUE ON LINE.
   84 IF (IDAP(J).EQ.I) GO TO 85
      GO TO 94
C     SET PLOT SYMBOL ON LINE.
C     IP - PLOT POSITION ON HORIZONTAL LINE FROM PLOTH ARRAY TO PUT
C          INTO IPT ARRAY.
   85 IP=PLOTH(J)
      IF (IPLT(J).NE.NA(37)) IPT(IP)=IPLT(J)
C     NR - COUNTER FOR MORE THAN ONE NUMBER AT A POSITION.
      NR=2
C     CHECK FOR MORE THAN ONE VALUE ON LINE.
   86 IF (J.EQ.(JY-KY+1)) GO TO 89
      IF (IDAP(J).NE.IDAP(J+1)) GO TO 88
C     CHECK FOR MORE THAN ONE PLOT AT SAME POSITION ON LINE.
      IF (PLOTH(J).EQ.PLOTH(J+1)) GO TO 87
      J=J+1
C     SET ADDITIONAL VALUES ON LINE.
      IP=PLOTH(J)
      IF (IPLT(J).NE.NA(37)) IPT(IP)=IPLT(J)
      GO TO 86
C     SET IN NUMBER IF MORE THAN ONE VALUE IS AT SAME POSITION.
   87 NR=NR+1
      IPT(IP)=NA(NR)
      J=J+1
      GO TO 86
C     NDP - VARIABLE TO MOVE OR NOT TO MOVE TO NEXT LINE OF HYDROGRAPH
C           CONTROL IS IDAP ARRAY.
   88 NDP=1
      GO TO 90
   89 NDP=0
C     SET NUMBER FOR OFF-SCALE INDICATOR IN LEFT-HAND COLUMN OF PLOT
C          OR * IF NOT OFF SCALE.
   90 IF (IOFF(J).LT.1) GO TO 92
      IAS=1
C     ISA - COUNTER FROM IOFF ARRAY, FOR OBTAINING CORRECT IAS VALUE--
C           OFF-SCALE INDICATOR IN LEFT COLUMN.
      ISA=IOFF(J)
      DO 91 IE=1,ISA
      IAS=IAS+1
   91 CONTINUE
      GO TO 93
   92 IF (IPT(IP).EQ.NA(37)) GO TO 93
      IAS=42
C     J - LINE COUNTER.
```

Table 5.—*HYDROG program listing*—Continued

```
   93 J=NDP+J
C     NK - INDEX FOR PRINTING MONTH(MN ARRAY).
   94 NK=IBG
C     JOUT, AOUT, MOUT, LOUT--VARIABLES USED TO DETERMINE WHETHER OR
C                                NOT TO PRINT DAYS AT SIDE OF HYDROGRAPH.
      JOUT=0
      IF (SCALV.LT..1) GO TO 114
      IF (SCALV.LT..17) GO TO 110
      IF (KOUT.NE.1) NK=13
      IF (SCALV.GE.5.) GO TO 97
      AOUT=KOUT
      AOUT=(AOUT/SCALV)*5.
      MOUT=AOUT
      LOUT=AOUT*100.
      JOUT=LOUT-(MOUT*100)
      IF (JOUT.GE.1) GO TO 98
C     NOUT - DAY COUNTER, PRINTED ON SIDE OF HYDROGRAPH.
      NOUT=AOUT
      IF (IBG.EQ.2.AND.NOUT.GT.28) NOUT=28
      DO 95 IKT=1880,2000,4
      IF (KYEAR.EQ.IKT.AND.IBG.EQ.2.AND.NOUT.EQ.28) NOUT=29
   95 CONTINUE
      IF (IBG.EQ.1.OR.IBG.EQ.3.OR.IBG.EQ.5.OR.IBG.EQ.7.OR.IBG.EQ.8.OR.IB
     1G.EQ.10.OR.IBG.EQ.12) GO TO 96
      GO TO 98
   96 IF (NOUT.NE.30) GO TO 98
      NOUT=31
      GO TO 98
   97 AOUT=KOUT
      NOUT=AOUT*(5./SCALV)
   98 IF (KOUT.NE.1) GO TO 102
      IF (JOUT.GE.1) GO TO 100
C     A LINE WITH MONTH AND DAY PRINTED - MN, NOUT.
      WRITE (6,99) MN(NK),NOUT,NA(IAS),(IPT(KJK),KJK=1,100),NOUT,MN(NK)
   99 FORMAT (4X,A4,1X,I2,2X,A1,100A1,2X,I2,1X,A4)
      GO TO 119
C     A LINE WITH MONTH PRINTED - MN.
  100 WRITE (6,101) MN(NK),NA(IAS),(IPT(KJK),KJK=1,100),MN(NK)
  101 FORMAT (4X,A4,5X,A1,100A1,5X,A4)
      GO TO 119
  102 IF (I.EQ.2) GO TO 106
      IF (KOUT.EQ.2.AND.IBG.EQ.1) GO TO 106
      IF (JOUT.GE.1) GO TO 104
C     A LINE WITH DAY PRINTED - NOUT.
      WRITE (6,103) NOUT,NA(IAS),(IPT(KJK),KJK=1,100),NOUT
  103 FORMAT (9X,I2,2X,A1,100A1,2X,I2)
      GO TO 119
C     A LINE WITH NO SIDE TIME SCALE.
  104 WRITE (6,105) NA(IAS),(IPT(KJK),KJK=1,100)
  105 FORMAT (13X,A1,100A1)
      GO TO 119
  106 IF (JOUT.GE.1) GO TO 108
```

Table 5.—*HYDROG program listing*—Continued

```
C       A LINE WITH YEAR AND DAY PRINTED - MYEAR, NOUT.                      HYD 521
        WRITE (6,107) MYEAR,NOUT,NA(IAS),(IPT(KJK),KJK=1,100),NOUT,MYEAR     HYD 522
  107   FORMAT (4X,I4,1X,I2,2X,A1,100A1,2X,I2,1X,I4)                         HYD 523
        GO TO 118                                                            HYD 524
C       A LINE WITH YEAR PRINTED - MYEAR.                                    HYD 525
  108   WRITE (6,109) MYEAR,NA(IAS),(IPT(KJK),KJK=1,100),MYEAR               HYD 526
  109   FORMAT (4X,I4,5X,A1,100A1,5X,I4)                                     HYD 527
        GO TO 118                                                            HYD 528
C       MONTHLY HYDROGRAPH.                                                  HYD 529
  110   IF (NK.EQ.1) GO TO 112                                               HYD 530
        IF (I.EQ.1) GO TO 112                                                HYD 531
C       A LINE WITH MONTH PRINTED - MN.                                      HYD 532
        WRITE (6,111) MN(NK),NA(IAS),(IPT(KJK),KJK=1,100),MN(NK)             HYD 533
  111   FORMAT (7X,A4,2X,A1,100A1,2X,A4)                                     HYD 534
        GO TO 119                                                            HYD 535
C       A LINE WITH YEAR AND MONTH PRINTED - MYEAR, MN.                      HYD 536
  112   WRITE (6,113) MYEAR,MN(NK),NA(IAS),(IPT(KJK),KJK=1,100),MN(NK),MYEHYD 537
       1AR                                                                   HYD 538
  113   FORMAT (1X,I4,2X,A4,2X,A1,100A1,2X,A4,2X,I4)                         HYD 539
        GO TO 118                                                            HYD 540
C       YEARLY HYDROGRAPH (2 LINES PER YEAR)                                 HYD 541
  114   IF (NK.EQ.1) GO TO 116                                               HYD 542
        IF (I.EQ.1) GO TO 116                                                HYD 543
        WRITE (6,115) NA(IAS),(IPT(KJK),KJK=1,100)                           HYD 544
  115   FORMAT (13X,101A1)                                                   HYD 545
        NKX=2                                                                HYD 546
        GO TO 119                                                            HYD 547
  116   WRITE (6,117) MYEAR,NA(IAS),(IPT(KJK),KJK=1,100),MYEAR               HYD 548
  117   FORMAT (7X,I4,2X,101A1,2X,I4)                                        HYD 549
  118   KYEAR=MYEAR                                                          HYD 550
        MYEAR=MYEAR+1                                                        HYD 551
  119   CONTINUE                                                             HYD 552
        WRITE (6,67)                                                         HYD 553
C       WRITE SCALE AT END OF HYDROGRAPH--IF ALTITUDE GIVEN, CONVERT SCALE   HYD 554
C           TO ALTITUDE OF WATER LEVEL.                                      HYD 555
        IF (ELEV.LT.1.) GO TO 126                                            HYD 556
        IF (KEG.GE.1) GO TO 121                                              HYD 557
        DO 120 ISX=1,11                                                      HYD 558
        SCTOP(ISX)=SCTOP(ISX)*(-1.)                                          HYD 559
  120   CONTINUE                                                             HYD 560
        GO TO 123                                                            HYD 561
  121   IF (KEG.EQ.11) GO TO 123                                             HYD 562
        DO 122 ITX=1,10                                                      HYD 563
        IF (SCTOP(ITX).LT.SCTOP(ITX+1)) SCTOP(ITX)=SCTOP(ITX)*(-1.)          HYD 564
  122   CONTINUE                                                             HYD 565
        SCTOP(11)=SCTOP(11)*(-1.)                                            HYD 566
  123   DO 124 I=1,11                                                        HYD 567
        SCTOP(I)=ELEV-SCTOP(I)                                               HYD 568
  124   CONTINUE                                                             HYD 569
        WRITE (6,125) (SCTOP(I),I=1,11)                                      HYD 570
  125   FORMAT (7X,11(F8.1,2X),//55X,18H ALTITUDE, IN FEET )                 HYD 571
        GO TO 127                                                            HYD 572
```

Table 5.—*HYDROG program listing*—Continued

```
126 WRITE (6,66) (SCTOP(I),I=1,11)
    IF (KEG.LT.1) WRITE (6,62)
    IF (KEG.EQ.11) WRITE (6,64)
    IF (KEG.GE.1.AND.KEG.LT.11) WRITE (6,60)
127 RETURN
    END
    SUBROUTINE CRDCON(NSG)
    DATA NPS,NP1/1H&,1H+/
    IF (NSG.EQ.NPS) NSG=NP1
    RETURN
    END
```

Table 6.—*Input data for HYDROG program*

Outline reference	Number of cards	Columns	Format	Program variable	Input item	Remarks
1. Dates, hydrograph scales, and water-level read unit	1	1-20	4I5	IMON(I), NYR(I), I=1,2	Beginning and ending month and year for hydrograph plots.	If beginning date is omitted, hydrograph will begin with first water level read and continue to ending date. If ending date is omitted, hydrograph will begin on beginning date and end with last water level read. If both beginning and ending dates are omitted, every water level read will be plotted.
		21-45	5F5.0	HSCAL(I), I=1,5	Possible horizontal scales, in feet.	Any scale may be used as long as it fits the field.
		46-70	5F5.0	VSCAL(I), I=1,5	Possible vertical scales, in days.	The possibilities for vertical scales are restricted to the following: 1.--daily (1 day per line). 2.5--2.5 days per line. 5.0--5.0 days per line. 10.0--10.0 days per line. 30.0--30.0 days per line.
		71-75	I5	NJ	Read unit for water-level data.	When using HYDROG in conjunction with SUPERMOCK and DATE, code NJ equal to the unit used in the data-definition statement describing the data set passed from DATE which contains computed water levels in card-image format. This version of HYDROG can be used to plot hydrographs from cards by setting NJ=blank.
2. Identification of data	1	1-80	20A4	IC	Data identification to be printed with each hydrograph.	

The following data sets must be read for each hydrograph plotted.

Outline reference	Number of cards	Columns	Format	Program variable	Input item	Remarks
3. Header cards	1	1-2	A2	LST	State code.	For use with SUPERMOCK, the essential entries on card 1 are LST, LC01, ELEV, and N01CD, and on card 2, are DEPTH and N02CD. On card 1, if an "*" is coded in column 3 or a "Z" in column 2, new scale and data ID cards may be entered. This option may be used to separate and identify hydrographs for the potentiometric surface and the water table.
		3-4	2A1	LC01,LC02	County code.	
		5-10	3I2	LTDG,LTMN, LTSC	Latitude, in degrees, minutes, and seconds.	
		11	A1	LTDIR	Latitude direction.	
		12-18	I3,2I2	LGDG,LGMN, LGSC	Longitude, in degrees, minutes, and seconds.	
		19	A1	NOSEQ	Sequence number.	
		20-25	2(A2,A1)	LTP,LNS, LRG,LWE	Local well number or location.	
		26-31	A2,4A1	LSC,L1,L2, L3,L4		
		34-55	3A6,A4	OW1,OW2, OW3,OW4	Owner.	
		56-60	A5	OWNO	Owner's number.	
		61-67	F7.0	ELEV	Altitude of land surface (ft) at well. Code to hundreths. Decimal is set in program.	
		68	A1	ARTWL	Type of well.	
		69	A1	WMUS	Use of water.	
		70	A1	WLUS	Use of well.	
		71-79	3A3	IAQU(I), I=1,3	Aquifer codes, maximum of 3.	
		80	I1	N01CD	Card number.	
	1	20-24	F5.0	DEPTH	Depth of well (ft).	
		25-29	F5.0	AXMP	Measuring point in relation to land surface (ft).	
		30-77	48A1	IRC(I)	Record length.	
		80	I1	N02CD	Card number.	

Table 6.—*Input data for HYDROG program*--Continued

Outline reference	Number of cards	Columns	Format	Program variable	Input item	Remarks
4. Heading cards for hydrograph identification	1 to 18	21-70	10A5	IHD(J)	Description for hydrograph identification.	On the last heading card, NOKD should be blank.
		80	A1	NOKD	Card number.	
5. Water levels	None	-------	19X,3I2	MON(I), IDAY(I), IYR(I)	MON(I)--month, IDAY(I)--day, IYR(I)--year, W1(I)--water level (depth below land surface in feet).	These are computed water levels passed from DATE on unit 3. Water levels for the potentiometric surface for each observation well are read first, then water levels for the water table. The period of record and frequency are equal to the duration and time-step increment used in SUPERMOCK. Each record is a card image. Card images for an observation well are read until NO (which is set by DATE) becomes equal to blank, then a hydrograph is plotted and data for a new observation well is read.
		-------	1X,F6.2	W1(I)		
			1X,3I2	MON(I), IDAY(I), IYR(I)		
		-------	1X,F6.2	W1(I)		
		-------	1X,3I2	MON(I), IDAY(I), IYR(I)		
		-------	1X,F6.2	W1(I)		
		-------	1X,3I2	MON(I), IDAY(I), IYR(I)		
		-------	1X,F6.2	W1(I)		
		-------	3X,I3	NO	Sequence number.	

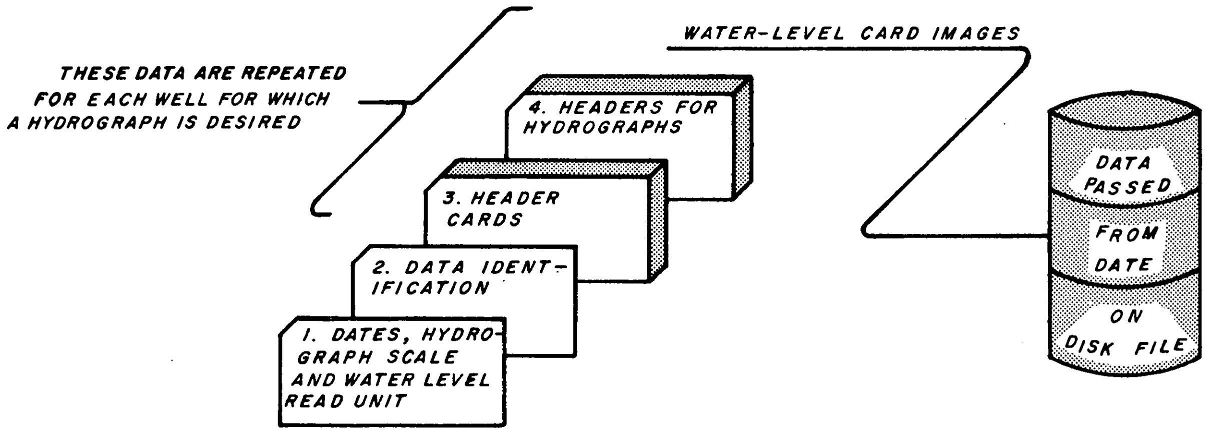

Figure 15.— Input data deck for HYDROG program.

1. Dates, hydrograph scales, and read unit for water levels

One card--the first two parameters, IMON(1) and NYR(1), are the beginning month and year for the hydrographs. Plots will begin with data on or following this date. The next two parameters are IMON(2) and NYR(2). These parameters are the ending month and year for the hydrographs. If IMON(2) and NYR(2) are omitted, all data from the beginning date to the last water level read will be plotted.

Next are the possible horizontal, HSCAL(I), and vertical, VSCAL(I), scales. Water levels, in feet, are plotted horizontally and time, in days, is plotted vertically. As many as five horizontal and vertical scales may be entered and the program will choose from among them appropriate scales for each well. Any horizontal scale may be used so long as it fits the field and is in feet. Vertically, the scales are restricted to those indicated in the instructions for input data.

The last parameter on this card is NJ, the read unit for water-level data. For use with SUPERMOCK, NJ should be set equal to the unit number used in the data-definition statement in the job control that describes the data set containing water-level data passed from DATE.

2. Data identification

One card--containing a description of the data to be printed with each hydrograph.

3. Header cards

Two cards--these are standard water-well heading cards. Only certain entries on these cards are essential to HYDROG. Therefore, for use with SUPERMOCK in plotting computed water levels, all entries, except those indicated as essential in the instructions for coding input data, may be omitted in order to reduce coding and keypunching.

4. Well-identification heading

One to 18 cards--containing heading information to identify each hydrograph.

5. Water levels

No cards--these data are read from a sequential-disk data set passed to HYDROG by DATE. The water levels are in card-image format, with four water levels and corresponding dates to a card image.

PROGRAM OUTPUT

Output from SUPERMOCK includes various illustrations describing input data and displays of computed data for the potentiometric surface and water table. Figure 16 is a sample of printed output from SUPERMOCK.

Sheet 1 of figure 16 is simply a title page giving a project title and various constraints under which the area is being modeled.

Sheet 2 of figure 16 is an alphameric map used to define hydraulic conductivity and evapotranspiration throughout the area. It is keyed to the table on sheet 3. The upper and lower hydraulic conductivities and thickness of fine-grained material assigned to each symbol are determined from data collected at the indicated well.

Sheet 4 contains a table from which the rate of evapotranspiration in each subarea is determined. By knowing the depth to the water table and the range into which the upper hydraulic conductivity for a subarea falls, the ET rate can be determined by multiplying HCU times the value indicated in the table.

Sheet 5 contains an alphameric map that defines root depth throughout the area. Also listed on sheet 5 are the soil parameters described in outline reference number 17.

```
SSSSSSSSSS   UU        UU   PPPPPPPPPP   EEEEEEEEEE   RRRRRRRRRR   MM        MM   OOOOOOOOOO   CCCCCCCCCC   KK        KK
SSSSSSSSSS   UU        UU   PPPPPPPPPP   EEEEEEEEEE   RRRRRRRRRR   MMM      MMM   OOOOOOOOOO   CCCCCCCCCC   KK       KK
SS      SS   UU        UU   PP      PP   EE           RR      RR   MMMM    MMMM   OO      OO   CC      CC   KK     KK
SS           UU        UU   PP      PP   EE           RR      RR   MM MMMM MM     OO      OO   CC           KK   KK
SS           UU        UU   PP      PP   EE           RR      RR   MM   MM   MM   OO      OO   CC           KK KK
SSSSSSSSSS   UU        UU   PPPPPPPPPP   EEEEEEE      RRRRRRRRRR   MM        MM   OO      OO   CC           KKKK
SSSSSSSSSS   UU        UU   PPPPPPPPPP   EEEEEEE      RRRRRRRRRR   MM        MM   OO      OO   CC           KKKK
        SS   UU        UU   PP           EE           RR  RR       MM        MM   OO      OO   CC           KK KK
        SS   UU        UU   PP           EE           RR   RR      MM        MM   OO      OO   CC           KK   KK
SS      SS   UU        UU   PP           EE           RR    RR     MM        MM   OO      OO   CC      CC   KK     KK
SSSSSSSSSS   UUUUUUUUUU     PP           EEEEEEEEEE   RR     RR    MM        MM   OOOOOOOOOO   CCCCCCCCCC   KK       KK
SSSSSSSSSS   UUUUUUUUUU     PP           EEEEEEEEEE   RR      RR   MM        MM   OOOOOOOOOO   CCCCCCCCCC   KK        KK
```

A MODEL FOR GROUND-WATER FLOW ANALYSIS

****

PROJECT TITLE: RED RIVER LOCK & DAM AREA 3 PRECONSTRUCTION ANALYSIS.

DATE OF ANALYSIS: 5/29/1975

DURATION IN DAYS: 365.

BEGINNING ON: 1/ 4/1969

TIME STEP INCREMENT IN DAYS: 10

NO. OF ROWS IN GRID: 34

NO. OF COLUMNS IN GRID: 80

NODE SPACING IN X DIRECTION IS CONSTANT: 2640.0 FT.

NODE SPACING IN Y DIRECTION IS CONSTANT: 2640.0 FT.

Figure 16, sheet 1 of 21.—Examples of output from SUPERMOCK program.

```
BBBBBBBCCCCCCAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDDDDDDDAAAAAAAAAAAAAAAA
BBBBBBBCCCCCCAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDDDDDDDAAAAAAAAAAAAAAAA
BBBBBBBCCCCCCAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDDDDDDDAAAAAAAAAAAAAAAA
BBBBBBBCCCCCCCCAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDDDDAAAAAAAAAAAAAAAA
BBBBBBBCCCCCCCCCAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDDAAAAAAAAAAAAAAAA
BBBBBBBCCCCCCCCCAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDDAAAAAAAAAAAAAAAA
BBBBBBBCCCCCCFAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDDAAAAAAAAAAAAAAAA
BBBBBBBCCCCCFFFAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDAAAAAAAAAAAAAAAAA
BBBBBBBCCFFFFFFAAAAAAAAAAAAAAAAAAAAAAAAAAAAHHHHHHHAAAAADDDDDAAAAAAAAAAAAAAAAA
BBBBBBBFFFFFFFFAAAAAAAAAAAAAAAAAAAAAAAAAAAHHHHHHHHAAAADDDDDDAAAAAMMMMMMMAAAAA
BBBBBBBFFFFFFFFGGGGGAAAAAAAAAAAAAAAAAAAAAAHHHHHHHHAAAALDDDDDAAAAAMMMMMMAAAAAA
AAEEEEEEFFFFFFFGGGGGAAAAAAAAAAAAAAAAAAAAAAIIHHHHHHAAAALDDDDDDAAAAMMMMMMNAAAAA
AAEEEEEEOFFFFFGGGGGGAAAAAAAAAAAAAAAAAAAAAAAIIJJJJKKLLLLLDDDDDDDDDMMMMMNNAAAAA
AAAEEEEEOOFFFFGGGGGGAAAAAAAAAAAAAAAAAAAAAAAIIIIJJJKKLLLLLLDDDDDMMMMMMNNNAAAAN
AAAAEEEOOOOOOOPPPPPPPQQRRRSSSAAAAAAAAAAAAIIIIIJJKKKKLLLLLLDDMMMMMMMMMNNNANNNN
AAAAEEEOOOOOOOPPPPPPPQQQRRRSSSAAAAAAAAVVVVVIIXXXKKKKKLLLLLLMMMMMMMMMNNNNNNNNN
AAAAEEOOOOOOO$$PPPPPPQQQRRRSSTTAAAAVVVVVVVWXXXXXXXKKYYLLLLLLMMMMMMMMMNNNNNNNN
AAAAAEOOOOOO$$$$$PPPQQQQQRRRRTTTUUUUVVVWWWWXXXXXXXYYYYYYAAMMMMMMMM//NNNNNNNNN
AAAAAEOOOOO$$$$$$PPQQQQQ@@@@TTTUUUUUWWWWWWXXXXXXXYYYYYYAAAMMMMM//////NNNNNNNN
AAAAAEOOO$$$$$$$$$$PQQQ@@@@++++)UUUUUWWWW222XXZZZZYYYAAAAAMMM////////NNNNNNNN
AAAA********$$$$$$88888@@@++++)))))))11122222ZZZZZZYAAAAAAMM//////////NNNNNNN
AAAA**********$$$88888888@+++++)))))??111122222ZZZZZZZAAAAAA////////33333NNNNNN
AAAA***********688888888 8++++))))????1111122222ZZ>>>AAAAAAA///////333333NNNNN4
AAA************7777888888888+++)????????=111122&&>>>>>>AAAAAAAA3333333333333NNNN4
AAA*******AAA77777777888888::::???????====11&&&&&>>>>AAAAAAAAA333333333333N444
AAAAAA*AAAAAA667777777778::::::?????=====&&&&&&>>>AAAAAAAAAAAAAAAAA333334444
AAAAAA*AAAAAAA66677777779:::::::::(((((((=&&&&&&&&>>AAAAAAAAAAAAAAAAAA333344444
AAAAAAAAAAAAAA66677779999:::::::::((((((####&&&&&&AAAAAAAAAAAAAAAAAAAA334444444
AAAAAAAAAAAAA666666999999:::::::::#########&&&AAAAAAAAAAAAAAAAAAAA3344445555
AAAAAAAAAAAAAA66669999999:::::::::##########&&AAAAAAAAAAAAAAAAAAAA3444555555
AAAAAAAAAAAAAA66699999999:::::::::##########&&&AAAAAAAAAAAAAAAAAAA444444555555
AAAAAAAAAAAAA666999999999:::::::::##########A&&AAAAAAAAAAAAAAAAAAA444A55555555
AAAAAAAAAAAAA6669999999999::::::::#########AAAAAAAAAAAAAAAAAAAA44444AA5555555
AAAAAAAAAAAAA6666999999999::::::::#########AAAAAAAAAAAAAAAAAAAAAAA44AAA5555555
```

AREA DEFINITION MAP FOR HYDRAULIC CONDUCTIVITY AND EVAPOTRANSPIRATION

Figure 16, sheet 2 of 21.—Examples of output from SUPERMOCK program.

HC EXPLANATION

SEQUENCE NUMBER	SYMBOL	REPRESENTATIVE WELL NUMBER	HCU	HCL	THK
1.	A	N999	0.00020	0.00020	45.00
2.	$	N257	0.02209	0.02209	45.00
3.	Y	N270	0.01000	0.01000	85.00
4.	#	N273	0.15000	0.05000	90.00
5.	W	N276	0.00010	0.01000	67.00
6.	9	N281	0.02000	0.20000	67.00
7.	6	N283	0.02000	0.20000	35.00
8.	7	N284	0.02000	0.20000	42.00
9.	8	N285	0.40000	0.20000	48.00
10.	R	N287	0.00400	0.04000	31.00
11.	S	N289	0.00100	0.00010	23.00
12.	E	N290	0.02000	0.00500	50.00
13.	C	N293	0.02000	0.00600	63.00
14.	B	N308	0.00200	0.00250	60.00
15.	O	N381	0.08000	0.00200	50.00
16.	P	N382	0.50000	0.02000	30.00
17.	Q	N383	0.00300	0.02000	35.00
18.	*	N384	0.20000	0.00400	100.00
19.	@	N385	0.03000	0.03500	35.00
20.	+	N386	0.00300	0.00868	45.00
21.	T	N387	0.00050	0.00700	25.00
22.	U	N388	0.00100	0.00050	47.00
23.	V	N389	0.00400	0.00100	30.00
24.	1	N390	0.00300	0.01000	85.00
25.	=	N391	0.00200	0.00200	25.00
26.	(	N392	0.00020	0.00500	35.00
27.	?	N393	0.00200	0.01000	36.00
28.	2	N394	0.00100	0.01000	45.00
29.	I	N395	0.00200	0.00001	40.00
30.	)	N398	0.00100	0.00800	13.00
31.	:	N399	0.00009	0.01000	65.00
32.	&	N400	0.00100	0.00020	55.00
33.	>	N401	0.00060	0.01000	80.00
34.	F	N402	0.04000	0.00800	85.00
35.	K	N429	0.06000	0.08000	70.00
36.	Z	N432	0.41000	0.02000	66.00
37.	X	N433	0.22000	0.04000	37.00
38.	G	W128	0.00005	0.00005	40.00
39.	M	G268	0.20000	0.01000	32.00
40.	N	G270	0.20000	0.02000	75.00
41.	/	G338	0.08000	0.15000	75.00
42.	L	G343	0.00300	0.03000	75.00
43.	J	G347	0.03000	0.05000	47.00
44.	H	G348	0.10000	0.00500	60.00
45.	D	G349	0.10000	0.07000	53.00
46.	3	R654	0.00500	0.00500	20.00
47.	5	R964	0.10000	0.01000	36.00
48.	4	R970	0.20000	0.02000	50.00

Figure 16, sheet 3 of 21.—Examples of output from SUPERMOCK program.

ET EXPLANATION

DEPTH TO WATER TABLE (FT)	HC<.004	.004<HC<.040	.040<HC<.400	.400<HC
1	2.6815	1.8021	1.5209	0.3824
2	1.1486	0.6498	0.4747	0.0376
3	0.6605	0.3068	0.1821	0.0056
4	0.4311	0.1633	0.0763	0.0014
5	0.3030	0.0945	0.0351	0.0004
6	0.2240	0.0585	0.0178	0.0002
7	0.1719	0.0383	0.0098	0.0001
8	0.1358	0.0262	0.0058	0.0000
9	0.1098	0.0187	0.0037	0.0000
10	0.0905	0.0138	0.0024	0.0000
11	0.0758	0.0104	0.0016	0.0000
12	0.0644	0.0081	0.0012	0.0
13	0.0553	0.0064	0.0008	0.0
14	0.0481	0.0051	0.0006	0.0
15	0.0421	0.0042	0.0005	0.0
16	0.0372	0.0034	0.0004	0.0
17	0.0331	0.0029	0.0003	0.0
18	0.0296	0.0024	0.0002	0.0
19	0.0266	0.0020	0.0002	0.0
20	0.0241	0.0018	0.0001	0.0
21	0.0219	0.0015	0.0001	0.0
22	0.0200	0.0013	0.0001	0.0
23	0.0183	0.0012	0.0001	0.0
24	0.0168	0.0010	0.0001	0.0
25	0.0155	0.0009	0.0001	0.0
26	0.0144	0.0008	0.0000	0.0
27	0.0134	0.0007	0.0000	0.0
28	0.0124	0.0006	0.0000	0.0
29	0.0116	0.0006	0.0000	0.0
30	0.0108	0.0005	0.0000	0.0

Figure 16, sheet 4 of 21.—Examples of output from SUPERMOCK program.

```
UUUUUUUSSPPPPPUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU
UUUUUUUWSCPPPPUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU
UUUUPPWWPPCPPPUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU
PPUUUPWWPPCCPPUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU
PPPPPPPWPPCPPPUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU
PPPPCPPPPPCPPPPUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU
PPPPCCPCCPPPPPPUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU
PSSPCCCCCPPPPPUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUWUUUUUUUUUUUUUUUUUU
PSSPPPCCCPPPCPPUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUPPPPUUUUUUUUUWWWUUUUUUUUUUUUUUUUUU
SSPPPPCCCPPPCCPPPPWWUUUUUUUUUUUUUUUUUUUUUUUUUPPPPUUUUUUUUUUWWWUUUUUUUUUUUUUUUUUU
SPPPPPPPPPPCOCPPPPWWUUUUUUUUUUUUUUUUUUUUUUUUUPPPPPPPPUUUUUUWPPUUUUUUUUUWWPUUUUUU
UPPWPPPCPPPCCPPPPPWPPUUUUUUUUUUUUUUUUUUUUUUUUUPPPPPPWWPUPPCCPPPPPPPPPPPPPCPUUUUU
UUCCOCCCPOPCCPPPPPWPPUUUUUUUUUUUUUUUUUUUUUUPPUPPPPPPPWCWPPCPPWPPPSCCPPPPPPPUUUUU
UUPOOCPCOOOCPPPPPPWPPWWPPPUPPPUUUUUUUUUUUUUUUPPPPPPPPPCWPPPPWWWPPCOPPPPPPPPUUUPP
UUUWWCPPCCOPPPPPPPPPOPPPPPPPPPPUUUUUUUUUPPPSSSWWPPPSPPPPPPPWWWPCPCCPCPCCCCCWWPCP
UUUWCPCCCCCCPPPSSPPPPPPPPPPWPPUUUUUUPPPPPPSSSWWWWSSPPPPPPPPPPCCCPSSCCOCCCPPCCCPP
UUUUWWCCCCCCPPSPPOWPPPPPPWCPWPPPUUUUPPPSWPPPSSWWSSSSPPPPWWPPPUUSSSCCCCCSSPPSWWWW
UUUUUWCCCCPPPWCCCOWPWWWSPWPOPPWPPPPPCCCSSPWWWWWWSSSWPWCCWPPWWWWWWCCCCCSSSPPPWWWW
UUUUUWCCCPCCCCCCCPWPPPSWPWOCWCSSWPSWCSSPSSPWWWOOSSSPCCCWCUUUUUUUUUCPCCPPSWWPWWWW
UUUUPPPCPCCCPPCPPPCCCCSPOOOSCCSSWPPWWPPPPPPWWOOOOSSSCCPCWUUUUUUUUCCCCPPCCPPPWWWW
UUUPPPPPPPPPPPPPPCCCCCCCSPSSSSSCCSWSSWSWWPPWPWPOOOSSSCCPPWWWWWWWPPCCWPPCCPPPPWWW
UUUUPPPPPPWPPWPCCCCPCCCCPSSSSSOOWCCWWWWWPPPPWPOOOSSSCCCUUUUUUUUUPSPUPPCCCPCPPPWW
UUUUUPPWPPPWCCSCCCCPCCCCCCWPOOOOOCWWWPPPPWWCWPOOOSSCPPCWUUUUUUUUPCPUPPPPPPOCCPPP
UUUUUUPPPPPWPPSPOWWPCCCCCCPPOOOOOPPPPPPPPCCCPPOOSSSCPPUUUUUUUUUUPPUUCCSWWCPPCCPP
UUUUUUUPUUUPUPPPCWPCCCCCCCCCOOOOPWPPPPPPCCCCPOOOOOSPPPUUUUUUUUUUPPUUUWSWCCCPCCCP
UUUUUUUUUUUUUUPCCCCWWCCCCCCCOOOCCCPPPPWWCCPCWOOOOCPPPUUUUUUUUUUUUUUUUUUUUCOPPPCW
UUUUUUUUUUUUUUUCCCCSPPPPPCCCCOOCCCPPPPCCCCPCCPOPCCCPUUUUUUUUUUUUUUUUUUUUUCCPPCCW
UUUUUUUUUUUUUUUUCCOOPPPPPPPPPCCCCCPPPPOCCPPPPPOOCCCUUUUUUUUUUUUUUUUUUUUUUPCPPPWW
UUUUUUUUUUUUUUUUUCCPPOPPPPPPPCCCCCCCCOSPPPPPPOOUUUUUUUUUUUUUUUUUUUUUUUUUUSPPPWPW
UUUUUUUUUUUUUUUUUUPPPPPPPPPPPPPWPOCCCCSSSPPPPOOOOUUUUUUUUUUUUUUUUUUUUUUUUCCSWWPP
UUUUUUUUUUUUUUUUUUPPPPPPUUPPPPPPPPPCPCPPPPPPOUUUUUUUUUUUUUUUUUUUUUUUUUUUUUCSWPPC
UUUUUUUUUUUUUUUUUUUPPUUUUUUUUPPPPPPPPCPPPPPUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUPCPPPC
UUUUUUUUUUUUUUUUUUUUUUUUUUUUUPPPPPPPPPPPPUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUPCPCPW
UUUUUUUUUUUUUUUUUUUUUUUUUUUUUPPPPPPPPPPPPUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUPCPCPW
```

```
ROOT-DEPTH
EXPLANATION
SYMBOL              ROOT DEPTH
  C -------------        2.3
  P -------------        2.5
  S -------------        ?.3
  W -------------        5.0
  U -------------        5.0
  O -------------        5.0
    -------------        2.5
```

SMSIN= 1.00,KSAT=10.00,DRN=10.00,SWF=120.0,RGF=40.00,XNORM= 3.00,SMSM= 1.00

Figure 16, sheet 5 of 21.—Examples of output from SUPERMOCK program.

```
11111111111111111111111111111111111111111111111111111111111111111111111111111111
1AAABCCCEEEEEEDDBBAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABBBAAAAAAAAAAAAAAAAAA1
1AAABCCEEEEEEEEDCBAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABBBBAAAAAAAAAAAAAAAAAAA1
1DAAACEEEHHHEEDCBAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABBBBAAAAAAAAAAAAAAAAAA1
1EEEEEEEHHHHHEDCBAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABBBAAAAAAAAAAAAAAAAAAA1
1EHHHHHHHHHHHEDCBAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABBAAAAAAAAAAAAAAAAAAA1
1DDDDDEHHHHHHEDBBAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABBAAAAAAAAAAAAAAAAAAAAA1
1EEEEEEHIIIHHEDBBAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABBBAAAAAAAAAAAAAAAAAAA1
1HHHHHHIIIIHEDCBBBBBBAAAAAAAAAAAAAAAAAAAAAAAAABBAAAAAAAAAAABCBAAAAAAAAACCAAAAAA1
1HHIIIIIIIIIIHEECCCCCBBAAAAAAAAAAAAAAAAAAAAAAAABBBAAAAAAAABBCBBAAAAAAAACCCAAAAA1
1HHHHIIIIIIIHHEEDDDCCBAAAAAAAAAAAAAAAAAAAAAAAABDDBBBAAAAAAABBCCCBACCCCCCCCCAAAA1
1EEEHHHIIIIIIHHEEEEDCBAAAAAAAAAAAAAAAAAAAAAAABBDDDBBBBBBBBBBBBBBBDDDDDDDDCCAAAA1
1CEEEEEHHHIIIIHHHHEDCBAAAAABBBBBAAAAAAAAAAAABBBBDDDDDCCDDDDDHHHHHHHHHHHHDDCAAAC1
1CDEDCEEEEIIIIIIHHEECBBBBBBBCCCBAAAAAAAAAABBCCCEEEEEEDCCCCDHHIIIIIIIIIIIHHCAAAC1
1BCEECCCDEHIIIIIIHEEDCCCCCCCCDEBAAAAAAAABBCEEEEEEEEECCCCCDHHHHHHIIIIIIIIIHCCCCC1
1BBDEDCCDEHIIIIIIHEEDDDEEHEEEHEBAAAAAAABBDEEEEEEEEEEDCCDDEHHEDEDHIHHHHHHHHHHHI1
1ABCEEDCCEHIIHHIIHEEEEEEEHHHHHEDBAAABBBBDDDDDDDDDDDCCDEHHHDBBBBBIIHDDDDDDDHIIII1
1ABBCEEDCEHIIHEHIHEEEDDDEHHHHHHDBBBBBBDDCCCCCCCCCCCCCDEHHDBBAAABEIIDDDDDDDHIIII1
1AABBCEDCEEHIHEEHIHHHEEEHHHEEHHEDCCCCDEEEDCCCCCCCCCCDEHHDBBAAAABEHIHHHHHIIIIIII1
1AAABCDEDDEHIIHEHIIIHHHHHHHHHHHHHDDEEEEEEEEEEDDDDDDEEEHEBBAAAAABCHIIIIIIIIIIIIII1
1AABBBCDEDDEHHIIEHIIIIIIIIIIIIIIHHHHHHHHHHHHHHEEEEEHHHEBBAAAAAABCEHHHHIIIIIIIII1
1AAABBBCEEEEEEEHIIHIIHHHHIIIIIIIIIIIIIIIIIIIIHHHHHHHHEDBAAAAAABBCDDDDDHIIHHHHI1
1AAAABBCDDDDDEEHIIIIHEEEEHHHHIIIIIIHHHHIIIIIIIIIIIIHEDCBAAAAAABBBBBBCDDHIHCCCDD1
1AAAABBBBBBBCDEEHIIIHEEDDDEEEHHHHHHEEEEEHIIIIIIIIIHEDCBAAAAAAAABBAAABCDDEECBCCC1
1AAAAABBAAAABCDEEHHHHEEEDCCCDEEEEEEEEEEEEHIIIIIIIHHEDBAAAAAAAAAAAAAAABDDDDECBBBB1
1AAAAAAAAAAABBBDEEEHHHEEEDCCDDDDEEEEEEEEEHHHHHHHHHHEECBAAAAAAAAAAAAAAABBBBDECCCCC1
1AAAAAAAAAAAABCDEEEEHHEEEEEEEEEEEEEEEEHHHEEEEEEEEEEDCBAAAAAAAAAAAAAAAAABDEHHHEE1
1AAAAAAAAAAAAABCDDEEEEEEEEEDDDDDDEHHHHHHEEEDDDDDDCBAAAAAAAAAAAAAAAAAAAABDEHHHHH1
1AAAAAAAAAAAAAAABCCDDDDDDDDCCCCCCDEEHHHHEEDDDCCCBBBAAAAAAAAAAAAAAAAAAAABDEHHHHH1
1AAAAAAAAAAAAAAAABCCCCCCCCCCCCCCCDEEHHEEEECCBBBBAAAAAAAAAAAAAAAAAAAAAAABDEHHHHH1
1AAAAAAAAAAAAAAAAABBBBBBBBBBBBBBBCCDEEEEDCCBBBAAAAAAAAAAAAAAAAAAAAAAAABBDEHHHHH1
1AAAAAAAAAAAAAAAAAABBBBBBBBBBBBBBBBCCCDDCCBBBBAAAAAAAAAAAAAAAAAAAAAAAAABDEHHHHH1
1AAAAAAAAAAAAAAAAAAABBBBBBBBBBBBBBBBBCCBBBAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABDDDDDD1
11111111111111111111111111111111111111111111111111111111111111111111111111111111
```

TRANSMISSIVITY MAP OF AQUIFER
EXPLANATION

SYMBOL	TRANSMISSIVITY
A ------------	500.000000
B ------------	3000.000000
C ------------	5000.000000
D ------------	7000.000000
E ------------	9000.000000
H ------------	11000.000000
I ------------	12000.000000
1 ------------	0.0

Figure 16, sheet 6 of 21.—Examples of output from SUPERMOCK program.

```
BBRBBBHCCCCCCCAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDDDDDDAAAAAAAAAAAAAAAA
BBBBBBRCCCCCCCAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDDDDDDDAAAAAAAAAAAAAAAA
BBBBBBBCCCCCCCAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDDDDDDDAAAAAAAAAAAAAAAA
BBBBBBBCCCCCCCCCAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDDDAAAAAAAAAAAAAAAA
BBBBBBBCCCCCCCCCCAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDDAAAAAAAAAAAAAAAA
BBBBBBBCCCCCCCCCCCAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDDAAAAAAAAAAAAAAAA
BBBBBBBCCCCCCCFAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDDAAAAAAAAAAAAAAAA
BBBBBBBCCCCCFFFAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAADDDDAAAAAAAAAAAAAAAA
BBBBBBBCCFFFFFFAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAHHHHHHAAAAADDDDAAAAAAAAAAAAAAAA
BBBBBBBFFFFFFFFAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAHHHHHHHAAAADDDDDDAAAAAMMMMMMAAAAA
BBBBBBBFFFFFFFFGGGGGAAAAAAAAAAAAAAAAAAAAAAAAAAHHHHHHHHAAAALDDDDDAAAAAMMMMMMAAAAA
AAEEEEEEEFFFFFFFGGGGGAAAAAAAAAAAAAAAAAAAAAAAIIHHHHHHAAAALDDDDDDAAAAMMMMMMMNAAAAA
AAEEEEEEEOFFFFFGGGGGGGAAAAAAAAAAAAAAAAAAAAAAAIIJJJJKKLLLLLDDDDDDDDDMMMMMNNAAAAA
AAAEEEEEEOOFFFFGGGGGGGAAAAAAAAAAAAAAAAAAAAAAAIIIIJJJKKKLLLLLLDDDDDMMMMMMMNNNAAAAN
AAAAEEEOOOOOOOPPPPPPPPQQRRRSSSAAAAAAAAAAAAIIIIIIJJKKKKKLLLLLLDDMMMMMMMMMNNNANNNN
AAAAEEEOOOOOOOPPPPPPPQQQQRPRSSSAAAAAAAAAVVVVVIIXXXKKKKKKLLLLLLMMMMMMMMMMNNNNNNNNN
AAAAEEOOOOOOO$$PPPPPPQQQQRRRSSTTAAAAVVVVVVVWXXXXXXXKKYYLLLLLLMMMMMMMMMMNNNNNNNNN
AAAAAEOOOOOO$$$$$PPPQQQQQRRRRTTTTUUUUVVVWWWWXXXXXXXYYYYYYYAAMMMMMMMM//NNNNNNNNN
AAAAAEOOOOO$$$$$$$PPQQQQQ@@@@TTTTUUUUUWWWWWXXXXXXXYYYYYYAAAMMMMM//////NNNNNNNNN
AAAAAEOOO$$$$$$$$$$$PQQQQ@@@@++++)UUUUUWWWWW222XXZZZZYYYAAAAAMMM////////NNNNNNNN
AAAA*********$$$$$$$88888@@@++++))))))))111222222ZZZZZZYAAAAAAMM//////////NNNNNNN
AAAA***********$$$88888888@+++++)))))??1111222222ZZZZZZZAAAAAA////////33333NNNNNNN
AAAA*************888888888++++))))????11111222222ZZ>>>AAAAAAA///////3333333NNNNN4
AAA************777788888888+++)????????=111122&&>>>>>AAAAAAAA3333333333333NNNN4
AAA*******AAA7777777778888888::::???????====11&&&&&>>>>AAAAAAAAAA3333333333333N444
AAAAAA*AAAAAA667777777778:::::::?????=====&&&&&&&>>>AAAAAAAAAAAAAAAAAAA333334444
AAAAAA*AAAAAAA66677777779:::::::::((((((=&&&&&&&&>>AAAAAAAAAAAAAAAAAAA33334444
AAAAAAAAAAAAAA66677779999:::::::::(((((###&&&&&&AAAAAAAAAAAAAAAAAAAAAAA334444444
AAAAAAAAAAAAA6666669999999:::::::::#########&&&AAAAAAAAAAAAAAAAAAAAAA3344445555
AAAAAAAAAAAAAA66669999999:::::::::##########&&AAAAAAAAAAAAAAAAAAAAAAA3444555555
AAAAAAAAAAAAAA666999999999:::::::::##########&&&AAAAAAAAAAAAAAAAAAAAAA444444555555
AAAAAAAAAAAAA666999999999:::::::::##########A&&AAAAAAAAAAAAAAAAAAAAA444A55555555
AAAAAAAAAAAAA6666999999999999::::::::##########AAAAAAAAAAAAAAAAAAAAAAA4444AA5555555
AAAAAAAAAAAAA6666999999999999:::::::##########AAAAAAAAAAAAAAAAAAAAAAA44AAA5555555
```

COEFFICIENT-OF-STORAGE MAP

SYMBOL	AQUIFER COEFFICIENT	WATER-TABLE COEFFICIENT
A	0.00010000	0.09999996
$	0.00100000	0.09999996
Y	0.00100000	0.14999998
#	0.00050000	0.14999998
W	0.00100000	0.01000000
9	0.00100000	0.01000000
6	0.00010000	0.01000000
7	0.00001000	0.01000000
8	0.00100000	0.19999999
R	0.00100000	0.19999999
S	0.00100000	0.09999996
E	0.00100000	0.09999996
C	0.00080000	0.09999996
B	0.00100000	0.01000000
O	0.00100000	0.06999999
P	0.00001000	0.01000000
Q	0.00001000	0.01000000
*	0.00010000	0.07999998
@	0.00100000	0.09999996
+	0.00100000	0.09999996

Figure 16, sheet 7 of 21.—Examples of output from SUPERMOCK program.

T	0.00100000	0.09999996
U	0.00010000	0.01000000
V	0.00001000	0.01000000
1	0.00100000	0.01000000
=	0.00100000	0.09999996
(	0.00100000	0.09999996
?	0.00100000	0.09999996
2	0.00100000	0.09999996
I	0.00100000	0.09999996
)	0.00100000	0.02000000
:	0.00080000	0.01000000
&	0.00100000	0.09999996
>	0.00100000	0.19999999
F	0.00100000	0.05000000
K	0.00001000	0.02000000
Z	0.00100000	0.14999998
X	0.00100000	0.14999998
G	0.00100000	0.01000000
M	0.00100000	0.11999995
N	0.00100000	0.09999996
/	0.00100000	0.05000000
L	0.00100000	0.01000000
J	0.00100000	0.09999996
H	0.00001000	0.09999996
D	0.00100000	0.09999996
3	0.00010000	0.01000000
5	0.00100000	0.19999999
4	0.00001000	0.05000000

CONDUCTIVITY OF STREAMBED AND LAKEBED MATERIAL-- 0.005000

Figure 16, sheet 8 of 21.—Examples of output from SUPERMOCK program.

```
33333333333333333333333333333333333333333333333333333333333333333333333333333333
3           B                                                                  3
3            B                                                                 3
3            B                                                                 3
3             B                                                                3
3             B                                                                3
3            B                                                                 3
3             B                                               C                3
3  FF         B                                               C                3
3 F F          H                                              CC        C      3
3F  FFFFFF    H H                                              C      CC C     3
3         F    H H                                             CCCCCCC    C    3
3    A     F  H H H                                                      C     3
3    A     F F H FFFF                       HHHHHHHGAA                    C    3
3  AA       F   F    F   JJH HH           HH         A FFFII              C  CC3
3  A                 F   J  H  H       HHH            G     FF             CC  3
3  A    AA            JKK      H    HHH                       FFF              3
3   A  A  A    A                HHHH                            FFF            3
3    A A  AAA  AA                                                BL            3
3     A      AA AAA AA                               HHHJDDD     B   L         3
3              A AAA A                                G     D     B  BB        3
3               AA A A                                G      DD DDDBB B      F 3
3               A    II                            GGGG        D      GGG    F3
3            DD      GG                             J                   G GG  F3
3             D      FFFFFF              GGG       H                    G G FF 3
3              D         G  AAAA         G G   DD   J                   GGG    3
3              D          IA AAAA       JD GDDD D   D                          3
3              G                J      J   G DD  DDD                           3
3               G                J     GG                                      3
3                DGGGI        KKJDDDD D                                        3
3                     GGDD   K  J  D D                                         3
3                         DDDD                                                 3
3                                                                              3
33333333333333333333333333333333333333333333333333333333333333333333333333333333
```

MAP OF THICKNESS OF STREAMBED AND LAKEBED MATERIAL

SYMBOL		THICKNESS
3	----------------	(OUTSIDE SYSTEM)
A	----------------	20.
B	----------------	20.
C	----------------	0.
D	----------------	5.
	----------------	0.
F	----------------	5.
G	----------------	10.
H	----------------	0.
I	----------------	15.
J	----------------	2.
K	----------------	1.
L	----------------	40.

Figure 16, sheet 9 of 21.—Examples of output from SUPERMOCK program.

INVARIANT PARTIALLY PENETRATING STREAM STAGES

STAGE	R#	C#	R#	C#	R#	C#	R#	C#	R#	C#	R#	C#	R#	C#	R#	C#	R#	C#	R#	C#	R#	C#	R#	C#	R#	C#	R#	C#	R#	C#	R#	C#	R#	C#	R#	C#
96.000000	30	33	29	34	28	33	27	33	27	32	26	32	26	31	27	31	27	30	26	30	26	29	27	28	27	27	26	26	25	26	25	25	25	24		
96.000000	25	23	25	22	24	22	23	22	24	23	23	23	22	22	21	22	20	22	20	21	21	20	22	20	21	19	20	19	20	18	21	18	22	18		
96.000000	23	17	22	17	21	16	20	17	19	17	18	16	19	16	20	15	20	14	19	13	19	12	19	11	18	11	17	10	17	9	18	8	19	8		
96.000000	20	7	19	6	18	5	17	4	16	4	15	4	15	5	14	6	13	6																		

Figure 16, sheet 10 of 21.—Examples of output from SUPERMOCK program.

```
LOCATION MAP OF STREAMS IN THE SYSTEM

EXPLANATION

* -- NON-STREAM NODE
3 -- OUTSIDE SYSTEM
F -- FULLY PENETRATING STREAM
P -- PARTIALLY PENETRATING STREAM

     33333333333333333333333333333333333333333333333333333333333333333333333333333333
     3***********P******************************************************************3
     3************P*****************************************************************3
     3************P*****************************************************************3
     3*************P****************************************************************3
     3*************P****************************************************************3
     3************P*****************************************************************3
     3*************P***********************************************P****************3
     3**PP*********P***********************************************P****************3
     3*P*P**********P**********************************************PP********P******3
     3P**PPPPPP****P*P**********************************************P******PP*P*****3
     3*********P****P*P**********************************************PPPPPP****P****3
     3****P*****P**P*P*P******************************************************P*****3
     3****P*****P*P*P*PPPP***********************PPPPPPPPPP********************P****3
     3**PP*******P***P****P***PPP*PP***********PP*********P*PPPPP**************P**PP3
     3**P*****************P***P**P**P*******PPP************P*****PP*************PP**3
     3**P****PP************PPP******P****PPP***********************PPP**************3
     3***P**P**P****P****************PPPP****************************PPP************3
     3****P*P**PPP**PP************************************************PP************3
     3*****P******PP*PPP*PP*******************************PPPPPPP*****P***P*********3
     3**************P*PPP*P********************************P*****P*****P**PP********3
     3***************PP*P*P********************************P******PP*PPPPP*P******P*3
     3***************P****PP****************************PPPP********P******PPP*****P3
     3************PP******PP*****************************P*******************P*PP**P3
     3*************P******PPPPP***************PPP*******P********************P*P*PP*3
     3**************P*********P**PPPP*********P*P***PP***P*******************PPP****3
     3**************P**********PP*PPPP*******PP*PPPP*P***P**************************3
     3**************P****************P******P***P*PP**PPP***************************3
     3***************P****************P*****PP**************************************3
     3****************PPPPP********PPPPPPP*P****************************************3
     3*********************PPPP***P**P**P*P*****************************************3
     3*************************PPPP*************************************************3
     3******************************************************************************3
     33333333333333333333333333333333333333333333333333333333333333333333333333333333
```

Figure 16, sheet 11 of 21.—Examples of output from SUPERMOCK program.

NODE LEVEL MAP OF FLOW SYSTEM

EXPLANATION

1 -- INSIDE FLOW SYSTEM WITH HEAD NOT SPECIFIED
2 -- INSIDE FLOW SYSTEM WITH HEAD SPECIFIED
3 -- OUTSIDE FLOW SYSTEM

```
33333333333333333333333333333333333333333333333333333333333333333333333333333333
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
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31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
31111111111111111111111111111111111111111111111111111111111111111111111111111113
33333333333333333333333333333333333333333333333333333333333333333333333333333333
```

Figure 16, sheet 12 of 21.—Examples of output from SUPERMOCK program.

MAP OF HEAD DISTRIBUTION IN AQUIFER

TIME-- 0.0 DATE-- 1/ 4/1969

$ -- FULLY PENETRATING STREAM OR LAKE

= -- PARTIALLY PENETRATING STREAM OR LAKE

* -- PUMPING WELL

SYMBOL	RANGE OF HEAD (FEET)		
A	60.0000	TO	66.0000
B	66.0000	TO	72.0000
C	72.0000	TO	78.0000
D	78.0000	TO	84.0000
E	84.0000	TO	90.0000
F	90.0000	TO	96.0000
G	96.0000	TO	102.0000
H	102.0000	TO	108.0000
I	108.0000	TO	114.0000
J	114.0000	TO	120.0000
K	120.0000	TO	126.0000
L	126.0000	TO	132.0000
M	132.0000	TO	138.0000
N	138.0000	TO	144.0000
O	144.0000	TO	150.0000
P	150.0000	TO	156.0000
Q	156.0000	TO	162.0000
R	162.0000	TO	168.0000
S	168.0000	TO	174.0000
T	174.0000	TO	180.0000
U		180.00	

Figure 16, sheet 13 of 21.—Examples of output from SUPERMOCK program.

```
12345678901234567890123456789012345678901234567890123456789012345678901234567890
2PPGGGGGGFFE=EFGGGKKPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPDDDDDPPPPPPPPPPPPPPPPPPP2
3PPKGGGGGGFFE=EFFFGKPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPDDDDDDPPPPPPPPPPPPPPPPP3
4PLKGGGGGGFFE=EEEEFGKPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPDDDDPPPPPPPPPPPPPPPPPP4
5PKGGGGGGGGFFE=EEFGKPPPPPPPPPPPPPPPPPPPPPPPPPPPPKPPPPPPPPPPPDDKPPPPPPPPPPPPPPPP5
6GGGGGGGGGFFFE=EFGKPPPPPPPPPPPPPPPPPPPPPPPPPPPPKGKPPPPPPPPPKDDDGKPPPPPPPPPPPPPP6
7GGGGGGGGFFFF=DEFGKPPPPPPPPPPPPPPPPPPPPPPPPPKKGFGKKKKPPPPKGFDDFGPPPPPPPKPPPPPP7
8GGFFGGGFFFFFE=EFGGKPPPPPPPPPPPPPPPPPPPPPPPKGGFEFGGGGKKPKGFFD=FGKPPPPPKGKPPPPP8
9FF==FFFFFFFFE=EFFFGKPPPPPPPPPPPPPPPPPPPPPPKGFFEEEFFFFGKKGFEED=FFGKKKKKGFGKPPPP9
0F=F=FFFEEFFFEE=EEEFGKPPPPPPPPPPPPPPPPPPPPKGFEEEEEEEEFGGGGFEDD==FGGGGGGF=FGKPPP0
1=FF======EFFE=D=DEEFGKPKKKPKKKPPPPPPPPPPKKKKGFEEEDDEEFFFFFEEDDD=FFFFFF==D=FGKKK1
2GGFFEFFEE=EFEE=E=DEEFGKGGGKGGGKPPPPPPPKGGGGGFEDDDDDDDEEEEDDDDDD======DDDD=FGKG2
3GGGG=FFFFE=EE=E=E=EEFGGFFGGFFFGKPPPKKKGFFFFFFDCCCCCCDDDDDDDDDDDDDDDDDDDD=DFGGF3
4GGGG=FFFFE=E=E=D====FGFDDFFDDDFGKKKGGGFDDDD==========CDDDCCCCDDDDDDDDDDDD=FFFD4
5PG==GFFFFFE=EEE=EDDD=FDD===C==DFGGGFFFDCC==CCCCCCCCC=B=====CCCDDDDDDDCCCD=DD==5
6PG=GGGFGGFFEEFFEEEEE=DDD=DD=DD=DFFFDDD===CCCCCCCCCCCC=CCCBB==BCCDDDCCCCCCD==CC6
7PG=GGGG==GFFFFFFFFFFEE===DDDDDD=CDDD===CCCCDDDDDDDDDCCCCCCCBBB===CCCCCCCCCCCCCC7
8UPG=GG=GG=GFFF=FFFFFFEEEEEEEEED====CCCCDDDDDDDDDDDDDDDCCCCCCBBCC===CCCCCCCCCCC8
9UUPG=G=GG===GG==GGGGGFFFFFEEEEDDDDDDDDDDDDDDDDDDDDDDDDCCCCCFFFFFFB==BCCCCCCCCCC9
0UUPGG=GGGGGG==G===G==GFFFFFFEEEEDDDDDDDDDDDDDDDDDDDDDD=======FFFFB=BBB=BCCCCCCCC0
1UUPGGGGGGGGGGG=G===G=GGFFFFFFEEEEEEDDDDDDDDDDDDDDDDCC=CFGFF=BBFBB=BB==BCCCCCCB1
2UUPGGGGGGGGGGGG==G=G=GGGFFFFFFEEEEEEDDDDDDDDDDDDDDCCC=FFGFBB==B=====B=BBBBBB=B2
3UUPGGGGGFFFFFFG=GGGG==GGGFFFFFFEEEEEEDDDDDDDDDDDDD====FGPGGGGG=BBBFBB===BBBBB=3
4UUPGFFFFFFFFF==FGGGGG==GGGGFFFFFFEEEEEDDDDDDDDDDDDCC=CFGPPPPPPGBBFFFBBAA=B==BA=4
5UUPGFFFGFFPPG=FFGGGG=====GGFFFFFEEEEEDDD===DDDDDDC=CFGGPPPPPPPGBFFFFBBB=B=A==A5
6UUPGFGGPPUUUPG=FFFFGGGGG=GG====FEEEEEDDD=D=DDD==DCC=FGPPPPPPPPGFFGGFFFB===BBBB6
7UUUPGPPUUUUUPG=FFFFFFFFGG==F====EEEEEDD==D====D=DCC=FGPPPPPPPPPGGPPGFFFBCCCCCC7
8UUUUUUUUUUUUPG=FFFFFFFFFFFFFFFF=EEEEDD=DDD=D==DD===CFGPPPPPPPPPPPPPPGFFDDDDDDD8
9UUUUUUUUUUUUUUG=FFFFFFFFFFEEEEEE=EEDDD==DDDDDDDDDFFFGPPPPPPPPPPPPPGGFFDDDDDDDD9
0UUUUUUUUUUUUUUPG=====FFEEEEEE=======D=DDDDDDDDDDDFGGGPPPPPPPPPPPPPGFFFDDDDDDDDD0
1UUUUUUUUUUUUUUUGFFFFF====EEE=EE=EE=E=EEEEEEEEEEEFGPPPPPPPPPPPPPPGFFDDDDDDDDDDD1
2UUUUUUUUUUUUUUUPGFFFFFFEE====EEEEEEEEEEEEEEEEEEEFGPPPPPPPPPPPPPPPGGFFDDFFDDDDDD2
3UUUUUUUUUUUUUUPGFFFFFFFFFEEEEEEEEEEEEEEEEEEEEEFFFFGGPPPPPPPPPPPPPPPPGFFDFGGGDDDDD3
12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

Figure 16, sheet 14 of 21.—Examples of output from SUPERMOCK program.

** WITHDRAWAL RATES **

TIME, IN DAYS-- 10.00000 DATE-- 1/14/1969

ROW	COL	RATE	ROW	COL	RATE	ROW	COL	RATE	ROW	COL	RATE	ROW	COL	RATE	ROW	COL	RATE	ROW	COL	RATE
21	40	10000.0	23	5	15000.0	30	65	19000.0	5	40	5000.0	10	35	7500.0	27	70	13000.0	9	10	11500.0

Figure 16, sheet 15 of 21.—Examples of output from SUPERMOCK program.

TIME, IN DAYS -- 10.00 DATE -- 1/14/1969

*** POTENTIOMETRIC SURFACE ***

96.63N257	74.16N270	81.61N273	79.42N276	92.24N281	92.61N283	95.57N284	98.06N285	82.53N287	82.60N289	94.83N290	94.28N293
100.23N308	94.69N381	93.74N382	88.96N383	93.81N384	88.59N385	88.32N386	82.37N387	81.12N388	78.05N389	80.11N390	80.93N391
81.61N392	84.63N393	80.49N394	77.65N395	86.51N398	87.05N399	75.76N400	75.76N401	90.46N402	76.72N429	79.36N432	80.93N433
89.25W128	76.11G268	74.73G270	73.28G338	77.16G343	77.51G347	81.66G348	80.01G349	72.68R654	78.87R964	77.28R970	

*** WATER TABLE ***

98.42N257	77.16N270	83.60N273	78.00N276	92.76N281	92.62N283	95.66N284	98.37N285	82.11N287	81.09N289	97.58N290	96.51N293
98.55N308	97.24N381	95.20N382	89.95N383	97.08N384	89.71N385	89.09N386	81.03N387	79.43N388	78.56N389	81.53N390	82.14N391
83.00N392	85.09N393	82.03N394	75.11N395	86.00N398	88.00N399	78.04N400	76.01N401	93.19N402	76.92N429	80.56N432	81.67N433
85.00W128	79.70G268	75.87G270	74.42G338	79.35G343	77.79G347	83.87G348	80.90G349	64.00R654	80.39R964	79.99R970	

TIME, IN DAYS -- 20.00 DATE -- 1/24/1969

*** POTENTIOMETRIC SURFACE ***

96.52N257	72.64N270	81.11N273	77.64N276	91.83N281	92.59N283	95.57N284	97.97N285	82.27N287	78.22N289	94.34N290	93.14N293
95.05N308	93.23N381	93.03N382	87.60N383	96.00N384	88.60N385	87.83N386	79.75N387	78.95N388	75.24N389	79.70N390	80.60N391
80.83N392	84.57N393	80.10N394	74.23N395	86.31N398	85.93N399	74.36N400	73.53N401	89.59N402	76.17N429	78.25N432	80.82N433
85.05W128	75.71G268	73.47G270	72.77G338	76.50G343	76.26G347	80.66G348	79.65G349	69.66R654	78.91R964	77.24R970	

*** WATER TABLE ***

98.32N257	77.16N270	83.52N273	78.28N276	92.39N281	92.62N283	95.57N284	98.31N285	82.20N287	81.18N289	97.53N290	96.48N293
99.18N308	97.22N381	94.27N382	89.64N383	97.06N384	89.54N385	89.15N386	81.19N387	79.87N388	78.97N389	81.85N390	82.18N391
82.98N392	85.15N393	82.01N394	75.20N395	86.57N398	87.86N399	78.09N400	76.01N401	93.12N402	76.81N429	80.53N432	81.56N433
85.04W128	79.54G268	75.83G270	73.97G338	78.87G343	77.73G347	83.84G348	80.76G349	64.00R654	80.37R964	79.61R970	

TIME, IN DAYS -- 30.00 DATE -- 2/ 3/1969

*** POTENTIOMETRIC SURFACE ***

96.31N257	72.73N270	81.04N273	78.71N276	91.36N281	92.51N283	95.60N284	97.88N285	82.56N287	80.99N289	94.23N290	93.26N293
95.11N308	93.45N381	92.55N382	87.87N383	96.36N384	88.41N385	88.15N386	81.56N387	81.16N388	77.37N389	79.72N390	80.61N391
80.80N392	84.55N393	79.79N394	76.54N395	86.24N398	85.72N399	74.64N400	73.67N401	89.75N402	75.98N429	78.02N432	80.68N433
87.23W128	75.91G268	73.46G270	72.48G338	77.00G343	76.90G347	80.94G348	79.44G349	70.90R654	78.86R964	77.39R970	

*** WATER TABLE ***

98.21N257	77.13N270	83.40N273	78.18N276	91.92N281	92.59N283	95.63N284	98.23N285	82.22N287	81.18N289	97.48N290	96.43N293
99.21N308	97.19N381	93.45N382	88.26N383	96.99N384	89.39N385	89.13N386	81.08N387	80.10N388	78.91N389	81.81N390	82.15N391
82.93N392	85.14N393	81.97N394	75.20N395	86.32N398	87.55N399	78.09N400	75.99N401	93.04N402	76.47N429	80.47N432	81.45N433
85.06W128	79.35G268	75.73G270	73.48G338	78.19G343	77.39G347	83.81G348	80.57G349	64.00R654	80.33R964	79.10R970	

TIME, IN DAYS -- 40.00 DATE -- 2/13/1969

*** POTENTIOMETRIC SURFACE ***

97.02N257	80.04N270	83.59N273	82.73N276	91.71N281	92.99N283	96.11N284	98.02N285	83.61N287	88.39N289	95.71N290	94.42N293
96.49N308	94.92N381	95.27N382	90.23N383	97.43N384	88.74N385	88.85N386	86.19N387	86.57N388	84.03N389	81.73N390	83.11N391
83.67N392	84.81N393	80.85N394	83.85N395	86.31N398	88.61N399	81.76N400	80.34N401	92.71N402	77.84N429	79.88N432	81.10N433
92.54W128	77.16G268	74.17G270	72.95G338	79.17G343	80.19G347	82.88G348	79.75G349	74.68R654	79.58R964	78.61R970	

*** WATER TABLE ***

98.48N257	77.24N270	83.53N273	78.30N276	92.14N281	93.03N283	96.21N284	98.34N285	82.38N287	81.26N289	97.78N290	96.76N293
99.49N308	97.87N381	96.34N382	88.94N383	96.99N384	89.58N385	89.20N386	81.16N387	80.52N388	81.00N389	82.03N390	82.25N391
82.89N392	85.20N393	81.94N394	75.31N395	86.28N398	87.27N399	78.13N400	75.98N401	93.76N402	77.59N429	80.77N432	81.72N433
85.10W128	79.64G268	76.11G270	73.63G338	78.12G343	77.59G347	84.18G348	80.82G349	73.38R654	80.46R964	79.62R970	

TIME, IN DAYS -- 50.00 DATE -- 2/23/1969

Figure 16, sheet 16 of 21.—Examples of output from SUPERMOCK program.

MAP OF ACCRETION DISTRIBUTION

TIME-- 350.00 DATE-- 12/20/1969

$ -- FULLY PENETRATING STREAM OR LAKE

= -- PARTIALLY PENETRATING STREAM OR LAKE

* -- PUMPING WELL

SYMBOL	RANGE OF AVERAGE ACCRETION RATE (FT/DAY)		
A	-0.0171	TO	-0.0154
B	-0.0154	TO	-0.0137
C	-0.0137	TO	-0.0121
D	-0.0121	TO	-0.0104
E	-0.0104	TO	-0.0087
F	-0.0087	TO	-0.0071
G	-0.0071	TO	-0.0054
H	-0.0054	TO	-0.0037
I	-0.0037	TO	-0.0021
J	-0.0021	TO	-0.0004
K	-0.0004	TO	0.0013
L	0.0013	TO	0.0029
M	0.0029	TO	0.0046
N	0.0046	TO	0.0062
O	0.0062	TO	0.0079
P	0.0079	TO	0.0096
Q	0.0096	TO	0.0112
R	0.0112	TO	0.0129
S	0.0129	TO	0.0146
T	0.0146	TO	0.0162
U		0.02	

Figure 16, sheet 17 of 21.—Examples of output from SUPERMOCK program.

```
1234567890123456789012345678901234567890123456789012345678901234567890
2KKKKKKKKKK=KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKIJKJJJMKKKKKKKKKKKKKKK2
3KKKKKKKKKKK=KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKJJJJILIKKKKKKKKKKKKK3
4KKKKKKKKKKK=KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKMIIJJLLKKKKKKKKKKKKK4
5KKKKKKKKKKKK=KKKKKKKKKKKKKKKKKKKKK*KKKKKKKKKKKKKOIJILKKKKKKKKKKKKKKK5
6KKKKKKKKKKKK=KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKLJJILKKKKKKKKKKKKKKK6
7KKKKKKKKKKK=KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKJKKKKKKKKMIILKKKKKKKKKKKKK7
8KKKKKKKKKKKK=KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKLKJ=KKKKKKKKKKKKKK8
9KK==KKKK*KKKK=KKKKLKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKJK=KKKKKKKKKKKKKK9
0K=K=KKKKKKKKK=KKKKKKKKKKKKKKK*KKKKKKKKKJKKKKKKKKLKLIK==KKKLLML=LJKKK0
1=KK======KKKK=K=KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKLILKK=KKKON==N=KKLKK1
2KKKKKKKKK=KKLK=K=KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKJJLLLL======MMMM=KKKK2
3KKKK=KKKKK=KK=K=K=KKKKKKKKKKKKKKKKKKKKLLMLLLLKKKKLLJKKKKLLLLKL=LKKKK3
4KKKK=KKKKK=K=K=K====KKKKKKKKKKKKKK==========KKKKKMLLLKKKLLLLLKL=KKKK4
5KK==KKKKKKK=KOO=MNOO=KKL===K==KKKKKKKKKKK==KKKKLLLLL=L=====KLKMJJKLLLLLKL=KN==5
6KK=KKKKKKKKKNNNLMNN=KKK=LL=KK=KKKKKKK===KKKKLLLLLLLL=KKKKK==MKJKMLLLLKKKL==LL6
7KK=KKKK==KKKKKNMLMLMK===LLLKKK=KKKK===KKKKKMMKKMMKLLKKKKKKKKM===LMMLLLKKKKLLKK7
8KKK=KK=KK=KKKK=JMLLJKKKKLLLLKLL====KKKKKKKKLLKKLLLKKKKKKKKKJJLM===MLLKKKKKKKKK8
9KKKK=K=KK===KK==KMMKKKKKLLLLKKKKKKKKKKKKKKKKLKKLKLLKKKKKKKKKOOMMM==LLLLKKKKKKKK9
0KKKKK=KKKKKK==K===N==KKJKLLKKKKKKKKKKKKKKKKKKKKKKLLLLK=======OKMLL=LLL=LJJKLKKKK0
1KKKKKKKKKKKKKK=K===L=LKKKKKKKKLKMKLLKK*KKKKKKKLLLLLMK=KKKKK=KLLLK=ML==LLKKKKKK1
2KKKKKKKKKKKKKKL==K=M=KKLKKKKKKKKKKKKKKKKKKKKKKKKKLLLLLLM=KKKKKK==L=====L=LLLLLL=K2
3KKK*KKKKKKKKKKK=LKKM==LKKKKKKKKKKKKKKKKKKKKKKKKKKLLK====KKKKKLLL=KKLMKL===KKLLL=3
4KKKKKKKKKKKKK==KKKJLM==LLLMKKKKKKKKKKKKKKKKKKKKKKKKKK=KKKKKKKKLLKKLKMKKLK=M==LL=4
5LKKKKKJKKKKKK=KKKKKK=====MKKKKKKKKKKKKKKK===KKKKKKK=KKKKKKKKKKKKKJKKMMKKK=M=M==L5
6KKKKKJKKKKKKKL=KKKKKKKKL=KK====KKKKKKKKK=K=KKK==KKK=KKKKKKKKKKKKKKKKKKKM===KLLK6
7KKKKKJKKKKKKKK=KKKKKKKKKK==K====KKKKKKK==K====K=KKK=KKKKKKKKKKKKKKKKK*KMLKKKKKK7
8KKKKKKKKKKKKKKK=LLKKKKKLKKKKKKKK=KKKKKK=LLL=K==KK===KKKKKKKKKKKKKKKKKKKKKMKKKKKKK8
9KKKKKKKKKKKKLMN=LKKKKKKKKKKKKKKK=KLLLL==LKKLKKKKKKKKKKKKKKKKKKKKKLKKKKKMILKKJKJK9
0KKKKKKKKKKKKKKJL=====KKKLKKKK=======J=LLLLKKJKKKKKKKKKKKKKKKKKKKK*KKKKKKJLLJJJIJ0
1KKKKKKKKKKKKKKIJKKKKK====KKK=KK=KK=L=LLLLLKKLKKKKKKKKKKKKKKKKKKKKKKKKKJKIKKKKKKK1
2KKKKKKKKKKKKKLLLKKKKKKKKKK====KKKKKMLLLKKLKKLJKKKKKLKKKKKKKKKKKKKKKKKKKKJLPKKKKKK2
3KKKKKKKKKKKKJIKIJKKKKKKKKLKKKKKKKKLLLKKKJKKJKKKKKKKKKKKKKKKKKKKKKKJJJKMKKLKKKKK3
1234567890123456789012345678901234567890123456789012345678901234567890
```

*** POTENTIOMETRIC SURFACE ***

TIME, IN DAYS -- 350.00 DATE -- 12/20/1969

ROW	COL	ELEV	ROW	COL	ELEV	ROW	COL	ELEV	ROW	COL	ELEV	ROW	COL	ELEV	ROW	COL	ELEV	ROW	COL	ELEV	ROW	COL	ELEV
1	1	0.0	2	1	0.0	3	1	0.0	4	1	0.0	5	1	0.0	6	1	0.0	7	1	0.0	8	1	0.0
9	1	0.0	10	1	0.0	11	1	0.0	12	1	0.0	13	1	0.0	14	1	0.0	15	1	0.0	16	1	0.0
17	1	0.0	18	1	0.0	19	1	0.0	20	1	0.0	21	1	0.0	22	1	0.0	23	1	0.0	24	1	0.0
25	1	0.0	26	1	0.0	27	1	0.0	28	1	0.0	29	1	0.0	30	1	0.0	31	1	0.0	32	1	0.0
33	1	0.0	34	1	0.0	1	2	0.0	2	2	102.73	3	2	99.04	4	2	95.65	5	2	94.23	6	2	93.27
7	2	92.26	8	2	91.19	9	2	90.42	10	2	90.07	11	2	90.40	12	2	92.41	13	2	93.33	14	2	92.19
15	2	95.81	16	2	94.82	17	2	96.15	18	2	92.75	19	2	74.72	20	2	92.44	21	2	101.08	22	2	109.02
23	2	119.55	24	2	131.00	25	2	144.96	26	2	145.56	27	2	153.73	28	2	154.63	29	2	157.91	30	2	163.46
31	2	169.68	32	2	177.05	33	2	177.54	34	2	0.0	1	3	0.0	2	3	100.07	3	3	101.64	4	3	95.34
5	3	93.96	6	3	93.15	7	3	92.15	8	3	91.01	9	3	90.09	10	3	89.61	11	3	90.43	12	3	91.57
13	3	93.12	14	3	94.77	15	3	94.33	16	3	95.68	17	3	95.15	18	3	95.82	19	3	93.36	20	3	96.50
21	3	101.43	22	3	107.95	23	3	117.76	24	3	128.56	25	3	136.52	26	3	140.44	27	3	146.28	28	3	150.88
29	3	156.03	30	3	162.63	31	3	168.55	32	3	174.35	33	3	177.91	34	3	0.0	1	4	0.0	2	4	95.64
3	4	96.69	4	4	94.95	5	4	93.76	6	4	93.07	7	4	92.11	8	4	90.77	9	4	89.34	10	4	89.52
11	4	90.22	12	4	91.68	13	4	93.18	14	4	94.15	15	4	95.07	16	4	95.55	17	4	95.99	18	4	94.92
19	4	97.13	20	4	98.84	21	4	101.07	22	4	103.64	23	4	112.79	24	4	123.10	25	4	125.43	26	4	132.37
27	4	139.29	28	4	146.12	29	4	153.13	30	4	160.56	31	4	167.48	32	4	173.23	33	4	175.08	34	4	0.0
1	5	0.0	2	5	94.61	3	5	94.72	4	5	94.17	5	5	93.56	6	5	92.99	7	5	92.13	8	5	90.79
9	5	89.17	10	5	88.84	11	5	89.27	12	5	91.37	13	5	93.06	14	5	94.37	15	5	95.47	16	5	96.10
17	5	96.41	18	5	97.02	19	5	97.03	20	5	99.12	21	5	100.77	22	5	102.06	23	5	104.74	24	5	109.75
25	5	115.54	26	5	122.78	27	5	132.04	28	5	141.61	29	5	150.05	30	5	158.44	31	5	166.82	32	5	175.57
33	5	175.35	34	5	0.0	1	6	0.0	2	6	94.35	3	6	94.37	4	6	93.98	5	6	93.53	6	6	92.99
7	6	92.27	8	6	91.20	9	6	90.19	10	6	89.58	11	6	89.19	12	6	91.09	13	6	92.89	14	6	94.32
15	6	95.50	16	6	96.34	17	6	96.89	18	6	97.38	19	6	98.01	20	6	99.03	21	6	100.37	22	6	101.77
23	6	102.89	24	6	104.88	25	6	107.34	26	6	115.07	27	6	124.95	28	6	137.15	29	6	147.08	30	6	156.28
31	6	164.37	32	6	170.56	33	6	172.64	34	6	0.0	1	7	0.0	2	7	94.40	3	7	94.34	4	7	94.06
5	7	93.65	6	7	93.10	7	7	92.46	8	7	91.65	9	7	90.76	10	7	89.94	11	7	89.14	12	7	90.85
13	7	92.41	14	7	93.71	15	7	94.94	16	7	96.17	17	7	96.96	18	7	97.50	19	7	98.02	20	7	98.61
21	7	99.64	22	7	100.85	23	7	101.94	24	7	103.12	25	7	104.88	26	7	107.87	27	7	120.76	28	7	134.63
29	7	145.37	30	7	155.03	31	7	162.37	32	7	168.54	33	7	173.27	34	7	0.0	1	8	0.0	2	8	94.53
3	8	94.46	4	8	94.21	5	8	93.84	6	8	93.35	7	8	92.67	8	8	92.05	9	8	91.19	10	8	90.16
11	8	89.04	12	8	90.58	13	8	91.91	14	8	93.10	15	8	94.27	16	8	95.57	17	8	96.66	18	8	97.21
19	8	97.83	20	8	98.50	21	8	99.11	22	8	99.69	23	8	100.50	24	8	101.67	25	8	103.92	26	8	108.43
27	8	121.69	28	8	134.68	29	8	145.01	30	8	154.57	31	8	160.44	32	8	167.20	33	8	174.31	34	8	0.0
1	9	0.0	2	9	94.27	3	9	94.26	4	9	94.09	5	9	93.80	6	9	93.38	7	9	92.84	8	9	92.18
9	9	91.37	10	9	90.35	11	9	88.97	12	9	90.33	13	9	91.43	14	9	92.46	15	9	93.64	16	9	94.89
17	9	96.06	18	9	96.92	19	9	97.64	20	9	98.29	21	9	98.64	22	9	99.01	23	9	99.54	24	9	100.45
25	9	103.66	26	9	111.97	27	9	123.40	28	9	133.83	29	9	143.42	30	9	151.49	31	9	157.74	32	9	164.21
33	9	171.07	34	9	0.0	1	10	0.0	2	10	93.67	3	10	93.77	4	10	93.69	5	10	93.48	6	10	93.14
7	10	92.67	8	10	92.08	9	10	91.36	10	10	90.43	11	10	89.13	12	10	89.89	13	10	90.79	14	10	91.70
15	10	92.97	16	10	94.33	17	10	95.51	18	10	96.39	19	10	97.10	20	10	97.78	21	10	98.02	22	10	98.24
23	10	98.43	24	10	99.18	25	10	101.94	26	10	113.36	27	10	123.49	28	10	133.04	29	10	142.97	30	10	149.09
31	10	155.35	32	10	159.65	33	10	166.55	34	10	0.0	1	11	0.0	2	11	92.92	3	11	93.05	4	11	93.05
5	11	92.94	6	11	92.65	7	11	92.22	8	11	91.69	9	11	91.06	10	11	90.28	11	11	89.44	12	11	88.80
13	11	89.73	14	11	90.66	15	11	92.10	16	11	93.70	17	11	95.01	18	11	95.92	19	11	96.58	20	11	97.23
21	11	97.28	22	11	97.10	23	11	97.08	24	11	97.53	25	11	100.57	26	11	115.28	27	11	121.72	28	11	131.35
29	11	145.17	30	11	147.04	31	11	152.16	32	11	152.57	33	11	154.19	34	11	0.0	1	12	0.0	2	12	91.95
3	12	92.13	4	12	92.23	5	12	92.15	6	12	91.93	7	12	91.56	8	12	91.10	9	12	90.45	10	12	89.81
11	12	89.13	12	12	88.68	13	12	88.39	14	12	89.11	15	12	91.23	16	12	93.26	17	12	94.76	18	12	95.77
19	12	96.22	20	12	96.87	21	12	96.66	22	12	96.17	23	12	95.46	24	12	94.99	25	12	95.38	26	12	105.09
27	12	114.72	28	12	124.61	29	12	134.82	30	12	139.96	31	12	142.95	32	12	143.90	33	12	144.07	34	12	0.0
1	13	0.0	2	13	90.58	3	13	91.02	4	13	91.20	5	13	91.23	6	13	91.02	7	13	90.63	8	13	90.25
9	13	89.51	10	13	88.67	11	13	87.91	12	13	87.63	13	13	87.84	14	13	88.63	15	13	89.93	16	13	92.79
17	13	94.57	18	13	95.77	19	13	96.34	20	13	96.75	21	13	96.42	22	13	95.47	23	13	94.01	24	13	91.35
25	13	92.87	26	13	96.50	27	13	101.81	28	13	115.44	29	13	128.01	30	13	132.57	31	13	134.81	32	13	135.51

Figure 16, sheet 19 of 21.—Examples of output from SUPERMOCK program.

LOCK AND DAM 3 NONSTEADY PRECONST WATER TABLE LEVELS. DATE OF ANALYSIS 05/75
AVERAGE FOR 30 DAYS, ENDING ON DEC 30 1969

NODE MAP OF DEPTH TO WATER TABLE IN FEET ; A "9" INDICATES A DEPTH OF 9 FT. OR GREATER
ROWS 6 THROUGH 28 ; COLUMNS 5 THROUGH 74

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9989999999999991199911999919999999999991111699111171111977691991199919
9997999999999991199911119911999999999911999999999911111997699111199911
9999999999999999199961119991119999999999999999999999199997699919191111
4999999779999999999999111191111619199919999888999999999998999999191111 9
4997999999999999999699191111111111101111196897999999999999586899919999 99
9995499999999999999199919991111111111111111788888889999999496819999999999
9999998989999999999999999999991111119131299888989999999549998111199999 9
9999999999999999999999999999991699999999999999999999998959966688599996 99
9999999798999999999999999999999999999999999999999999999999998799999889
9997779887334224669999999999999999999999999999999999997998966698999 99
9997777887211211199999999999999999999999999999999999998798789999999 9
9977777777992211119999999999999999999999999999998899979999999779999999 99
8976777799999111599999999999995999998999999999999999999998799929999889 8
9967776589999892186899999999999999999999999999999999999999909999999
9977799998999992949979999999999999999999999966789999991199999899999669
8988887899999959897589999999999999999999999988678999999999999950990999 8
7998879789999945984467887999999999999999999988789999999999899986990999 99
9799877978789745798554889999999999999999999998999996119999977799999999
9977787978999667964676799999999999999999999999999119911999293973999 9
9997999119998758689738899999999999999999999999999911119119039993469 9
9981111111999999655799999799999999999999999999991999111199699999999
1991111111199998776986994699999999999999999999999991111111119999999994
1111111111799999988939998879999999999999999999999919909111111191199998
```

TIME. IN DAYS -- 360.00 DATE -- 12/30/1969

*** POTENTIOMETRIC SURFACE ***

97.57N257	73.12N270	82.11N273	76.27N276	86.05N281	89.48N283	94.26N284	98.54N285	82.27N287	75.52N289	95.74N290	93.02N293
92.23N308	94.65N381	99.62N382	86.41N383	96.53N384	88.33N385	87.16N386	77.86N387	78.50N388	73.99N389	79.55N390	80.48N391
80.89N392	84.54N393	79.88N394	73.20N395	86.00N398	83.69N399	74.80N400	73.56N401	89.87N402	79.83N429	81.24N432	83.37N433
84.31W128	76.94G268	75.07G270	75.13G338	74.96G343	75.09G347	82.02G348	78.15G349	72.90R654	78.51R964	78.09R970	

*** WATER TABLE ***

98.18N257	78.06N270	84.69N273	76.41N276	86.31N281	89.66N283	94.34N284	98.79N285	82.99N287	82.18N289	100.21N290	99.17N293
97.04N308	106.55N381	105.00N382	87.30N383	97.47N384	89.82N385	88.96N386	78.97N387	83.53N388	85.04N389	81.42N390	82.80N391
82.37N392	85.41N393	81.12N394	76.56N395	86.00N398	83.83N399	78.52N400	75.98N401	99.07N402	81.70N429	87.57N432	84.59N433
85.54W128	83.34G268	78.09G270	76.05G338	75.28G343	76.36G347	88.53G348	79.58G349	74.95R654	77.44R964	80.80R970	

Figure 16, sheet 20 of 21.—Examples of output from SUPERMOCK program.

LOCK & DAM 4 POSTCONSTRUCTION WATER TABLE LEVELS. DATE OF ANALYSIS 3/4/1975
AVERAGE FOR 30 DAYS, ENDING ON JAN 4 1971

6 6 9	6 7 7	6 8 9	6 9 8	6 10 9	6 11 9	6 12 8	6 13 9	6 14 9	6 15 8	6 16 8	6 17 8	6 18 8	6 19 9	6 20 7	6 21 8
6 22 8	6 23 8	6 24 9	6 25 8	6 26 9	6 27 7	6 28 9	6 29 7	6 30 9	6 31 9	6 32 7	6 33 9	6 34 9	6 35 9	6 36 9	6 37 9
6 38 8	6 39 9	6 40 7	6 41 8	6 42 9	6 43 7	6 44 7	6 45 8	6 46 9	6 47 8	6 48 9	6 49 9	6 50 7	6 51 8	6 52 7	6 53 8
6 54 9	6 55 8	6 56 9	6 57 6	6 58 9	6 59 9	6 60 5	6 61 6	6 62 7	6 63 6	6 64 8	6 65 5	6 66 6	6 67 4	6 68 7	6 69 9
6 70 9	6 71 9	6 72 9	6 73 9	6 74 9	6 75 9	7 6 9	7 7 9	7 8 9	7 9 8	7 10 8	7 11 8	7 12 9	7 13 9	7 14 9	7 15 9
7 16 9	7 17 8	7 18 7	7 19 8	7 20 8	7 21 8	7 22 9	7 23 7	7 24 9	7 25 8	7 26 8	7 27 8	7 28 9	7 29 8	7 30 7	7 31 9
7 32 9	7 33 9	7 34 9	7 35 7	7 36 8	7 37 9	7 38 7	7 39 8	7 40 8	7 41 7	7 42 8	7 43 9	7 44 9	7 45 9	7 46 8	7 47 8
7 48 8	7 49 8	7 50 8	7 51 8	7 52 8	7 53 8	7 54 9	7 55 9	7 56 8	7 57 6	7 58 7	7 59 9	7 60 8	7 61 5	7 62 3	7 63 8
7 64 7	7 65 7	7 66 7	7 67 8	7 68 9	7 69 9	7 70 8	7 71 8	7 72 9	7 73 9	7 74 2	7 75 9	8 6 9	8 7 9	8 8 9	8 9 9
8 10 8	8 11 8	8 12 8	8 13 9	8 14 8	8 15 8	8 16 9	8 17 9	8 18 8	8 19 8	8 20 8	8 21 7	8 22 8	8 23 9	8 24 8	8 25 9
8 26 9	8 27 8	8 28 7	8 29 9	8 30 8	8 31 9	8 32 8	8 33 9	8 34 9	8 35 8	8 36 9	8 37 8	8 38 8	8 39 8	8 40 8	8 41 9
8 42 8	8 43 9	8 44 8	8 45 8	8 46 8	8 47 8	8 48 8	8 49 9	8 50 8	8 51 9	8 52 8	8 53 8	8 54 8	8 55 9	8 56 7	8 57 6
8 58 9	8 59 9	8 60 9	8 61 0	8 62 9	8 63 9	8 64 9	8 65 9	8 66 9	8 67 3	8 68 9	8 69 9	8 70 9	8 71 9	8 72 5	8 73 7
8 74 7	8 75 9	9 6 9	9 7 9	9 8 9	9 9 9	9 10 9	9 11 9	9 12 9	9 13 7	9 14 7	9 15 8	9 16 8	9 17 7	9 18 8	9 19 8
9 20 8	9 21 8	9 22 8	9 23 8	9 24 8	9 25 8	9 26 9	9 27 9	9 28 7	9 29 9	9 30 7	9 31 7	9 32 9	9 33 7	9 34 8	9 35 8
9 36 8	9 37 8	9 38 7	9 39 9	9 40 8	9 41 8	9 42 9	9 43 8	9 44 8	9 45 8	9 46 8	9 47 8	9 48 7	9 49 8	9 50 9	9 51 8
9 52 9	9 53 9	9 54 7	9 55 7	9 56 6	9 57 3	9 58 0	9 59 0	9 60 7	9 61 0	9 62 9	9 63 0	9 64 0	9 65 8	9 66 0	9 67 3
9 68 5	9 69 9	9 70 9	9 71 6	9 72 9	9 73 9	9 74 9	9 75 7	10 6 4	10 7 4	10 8 5	10 9 5	10 10 9	10 11 9	10 12 9	10 13 9
10 14 9	10 15 8	10 16 9	10 17 8	10 18 8	10 19 8	10 20 8	10 21 8	10 22 8	10 23 8	10 24 8	10 25 7	10 26 8	10 27 8	10 28 8	10 29 7
10 30 9	10 31 9	10 32 8	10 33 8	10 34 9	10 35 9	10 36 7	10 37 7	10 38 9	10 39 8	10 40 6	10 41 9	10 42 8	10 43 8	10 44 8	10 45 9
10 46 8	10 47 8	10 48 8	10 49 9	10 50 7	10 51 9	10 52 8	10 53 8	10 54 7	10 55 6	10 56 9	10 57 5	10 58 2	10 59 9	10 60 9	10 61 0
10 62 9	10 63 0	10 64 0	10 65 0	10 66 0	10 67 9	10 68 9	10 69 9	10 70 9	10 71 9	10 72 7	10 73 6	10 74 9	10 75 9	11 6 5	11 7 5
11 8 5	11 9 3	11 10 3	11 11 9	11 12 9	11 13 9	11 14 9	11 15 9	11 16 9	11 17 9	11 18 9	11 19 9	11 20 8	11 21 8	11 22 8	11 23 8
11 24 8	11 25 8	11 26 9	11 27 8	11 28 8	11 29 8	11 30 8	11 31 9	11 32 8	11 33 9	11 34 7	11 35 7	11 36 8	11 37 7	11 38 8	11 39 7
11 40 9	11 41 9	11 42 8	11 43 8	11 44 8	11 45 7	11 46 8	11 47 8	11 48 9	11 49 8	11 50 9	11 51 7	11 52 7	11 53 8	11 54 9	11 55 8
11 56 0	11 57 4	11 58 6	11 59 8	11 60 8	11 61 8	11 62 0	11 63 0	11 64 0	11 65 0	11 66 9	11 67 9	11 68 9	11 69 3	11 70 9	11 71 9
11 72 5	11 73 5	11 74 9	11 75 9	12 6 6	12 7 7	12 8 6	12 9 4	12 10 2	12 11 6	12 12 9	12 13 9	12 14 9	12 15 9	12 16 9	12 17 9
12 18 9	12 19 9	12 20 8	12 21 8	12 22 8	12 23 9	12 24 8	12 25 8	12 26 7	12 27 7	12 28 8	12 29 8	12 30 7	12 31 8	12 32 8	12 33 7
12 34 7	12 35 9	12 36 7	12 37 9	12 38 7	12 39 9	12 40 9	12 41 9	12 42 9	12 43 7	12 44 8	12 45 9	12 46 9	12 47 8	12 48 8	12 49 8
12 50 8	12 51 7	12 52 9	12 53 9	12 54 9	12 55 2	12 56 5	12 57 1	12 58 6	12 59 7	12 60 4	12 61 0	12 62 0	12 63 0	12 64 0	12 65 9
12 66 1	12 67 9	12 68 9	12 69 9	12 70 9	12 71 9	12 72 9	12 73 8	12 74 9	12 75 9	13 6 9	13 7 9	13 8 9	13 9 6	13 10 4	13 11 2
13 12 5	13 13 6	13 14 9	13 15 9	13 16 9	13 17 9	13 18 9	13 19 9	13 20 9	13 21 9	13 22 9	13 23 9	13 24 9	13 25 8	13 26 8	13 27 9
13 28 9	13 29 9	13 30 9	13 31 8	13 32 7	13 33 8	13 34 9	13 35 9	13 36 9	13 37 9	13 38 9	13 39 8	13 40 7	13 41 9	13 42 9	13 43 9
13 44 9	13 45 8	13 46 8	13 47 8	13 48 8	13 49 9	13 50 7	13 51 9	13 52 6	13 53 1	13 54 2	13 55 1	13 56 3	13 57 7	13 58 8	13 59 5
13 60 0	13 61 0	13 62 0	13 63 0	13 64 9	13 65 9	13 66 3	13 67 9	13 68 9	13 69 9	13 70 9	13 71 9	13 72 8	13 73 9	13 74 7	13 75 8
14 6 9	14 7 7	14 8 9	14 9 9	14 10 6	14 11 7	14 12 5	14 13 4	14 14 9	14 15 9	14 16 9	14 17 9	14 18 9	14 19 9	14 20 9	14 21 9
14 22 9	14 23 9	14 24 8	14 25 8	14 26 9	14 27 9	14 28 9	14 29 9	14 30 9	14 31 8	14 32 8	14 33 9	14 34 9	14 35 9	14 36 9	14 37 9
14 38 9	14 39 8	14 40 8	14 41 8	14 42 8	14 43 8	14 44 8	14 45 8	14 46 8	14 47 8	14 48 8	14 49 9	14 50 9	14 51 1	14 52 1	14 53 0
14 54 5	14 55 7	14 56 8	14 57 6	14 58 8	14 59 7	14 60 0	14 61 0	14 62 9	14 63 9	14 64 9	14 65 9	14 66 9	14 67 9	14 68 9	14 69 9
14 70 9	14 71 9	14 72 7	14 73 8	14 74 7	14 75 9	15 6 3	15 7 9	15 8 9	15 9 9	15 10 1	15 11 6	15 12 5	15 13 2	15 14 7	15 15 9
15 16 9	15 17 8	15 18 8	15 19 9	15 20 9	15 21 9	15 22 9	15 23 9	15 24 9	15 25 9	15 26 8	15 27 9	15 28 9	15 29 9	15 30 9	15 31 9
15 32 9	15 33 9	15 34 9	15 35 7	15 36 9	15 37 9	15 38 9	15 39 9	15 40 8	15 41 8	15 42 8	15 43 8	15 44 9	15 45 7	15 46 8	15 47 9
15 48 9	15 49 9	15 50 9	15 51 0	15 52 1	15 53 0	15 54 0	15 55 7	15 56 7	15 57 7	15 58 8	15 59 8	15 60 9	15 61 7	15 62 9	15 63 9
15 64 8	15 65 9	15 66 9	15 67 9	15 68 9	15 69 9	15 70 9	15 71 9	15 72 7	15 73 7	15 74 8	15 75 5	16 6 6	16 7 9	16 8 9	16 9 9
16 10 9	16 11 3	16 12 5	16 13 9	16 14 4	16 15 3	16 16 9	16 17 9	16 18 9	16 19 9	16 20 9	16 21 9	16 22 9	16 23 9	16 24 9	16 25 9
16 26 9	16 27 9	16 28 9	16 29 9	16 30 9	16 31 9	16 32 9	16 33 9	16 34 8	16 35 8	16 36 8	16 37 9	16 38 9	16 39 8	16 40 8	16 41 8
16 42 9	16 43 9	16 44 9	16 45 8	16 46 9	16 47 9	16 48 6	16 49 6	16 50 6	16 51 1	16 52 1	16 53 0	16 54 0	16 55 6	16 56 8	16 57 8
16 58 6	16 59 9	16 60 9	16 61 7	16 62 8	16 63 9	16 64 9	16 65 9	16 66 9	16 67 9	16 68 9	16 69 9	16 70 9	16 71 9	16 72 9	16 73 9
16 74 9	16 75 9	17 6 6	17 7 6	17 8 7	17 9 9	17 10 9	17 11 9	17 12 9	17 13 6	17 14 7	17 15 0	17 16 9	17 17 6	17 18 8	17 19 9
17 20 9	17 21 9	17 22 7	17 23 9	17 24 7	17 25 7	17 26 8	17 27 7	17 28 9	17 29 9	17 30 9	17 31 9	17 32 9	17 33 9	17 34 9	17 35 9
17 36 9	17 37 8	17 38 8	17 39 9	17 40 9	17 41 9	17 42 9	17 43 8	17 44 9	17 45 8	17 46 8	17 47 9	17 48 6	17 49 6	17 50 6	17 51 0
17 52 0	17 53 0	17 54 0	17 55 8	17 56 8	17 57 4	17 58 7	17 59 9	17 60 9	17 61 9	17 62 9	17 63 9	17 64 9	17 65 9	17 66 9	17 67 9
17 68 9	17 69 9	17 70 9	17 71 7	17 72 7	17 73 7	17 74 8	17 75 7	18 6 7	18 7 9	18 8 0	18 9 9	18 10 4	18 11 9	18 12 9	18 13 8
18 14 0	18 15 9	18 16 3	18 17 9	18 18 5	18 19 5	18 20 5	18 21 5	18 22 5	18 23 5	18 24 5	18 25 6	18 26 5	18 27 9	18 28 9	18 29 9
18 30 9	18 31 9	18 32 9	18 33 7	18 34 9	18 35 9	18 36 9	18 37 9	18 38 9	18 39 9	18 40 9	18 41 9	18 42 6	18 43 9	18 44 2	18 45 9
18 46 9	18 47 9	18 48 9	18 49 9	18 50 0	18 51 0	18 52 0	18 53 0	18 54 0	18 55 1	18 56 8	18 57 9	18 58 8	18 59 9	18 60 9	18 61 9
18 62 9	18 63 9	18 64 9	18 65 9	18 66 9	18 67 9	18 68 9	18 69 9	18 70 9	18 71 8	18 72 8	18 73 8	18 74 7	18 75 9	19 6 8	19 7 8
19 8 9	19 9 9	19 10 6	19 11 9	19 12 9	19 13 8	19 14 6	19 15 6	19 16 7	19 17 8	19 18 7	19 19 5	19 20 5	19 21 5	19 22 5	19 23 5
19 24 6	19 25 6	19 26 6	19 27 8	19 28 9	19 29 7	19 30 9	19 31 9	19 32 4	19 33 5	19 34 6	19 35 5	19 36 5	19 37 1	19 38 9	19 39 5

Figure 16, sheet 21 of 21.—Examples of output from SUPERMOCK program.

Sheet 6 contains an alphameric map that defines transmissivity throughout the area.

Sheets 7 and 8 contain an alphameric map that defines coefficients of storage throughout the area for both the aquifer and the water-table material. This map is a duplicate of the one defining hydraulic conductivity and evapotranspiration on sheet 2. On sheet 8 the conductivity of the streambed and lakebed material is also printed.

Sheet 9 contains an alphameric map that defines the thickness, in feet, of streambed and lakebed material for all partially penetrating streams and (or) lakes.

Sheet 10 contains a tabular listing of invariant partially penetrating stream stages and their associated nodes. A similar table can be printed for invariant fully penetrating stages modeled. This table can be printed optionally, according to the value given KPNT in outline reference 21.

Sheet 11 contains an alphameric map showing the locations of all streams and lakes modeled. SUPERMOCK computes this map using node locations of stream and lake input data.

Sheet 12 contains a numeric map indicating the status of each node in the matrix. Only the borders of the matrix are assigned a 3 and specified to be outside the flow system. The number 2, inside the aquifer at a point where the head is specified, indicates a stream or lake that is being modeled as having full connection with the aquifer (fully penetrating). This map is also computed by SUPERMOCK on the basis of input stage data.

Sheets 13 and 14 contain a legend and an alphameric map showing the initial head distribution in the aquifer at time=0, the locations of all surface-water bodies being modeled, and the locations of all pumping wells.

Sheet 15 contains a tabular list of withdrawal rates modeled and their node locations in the matrix. If withdrawal rates and (or) locations of withdrawal vary with time, a similar table will be printed for each new set of data. The table reflects the time, in days, and the calendar date when this particular set of data was imposed on the system. The printing of these tables can be suppressed even when withdrawal is modeled by setting IWDT, outline reference number 24, to zero or blank.

Sheet 16 contains a listing of altitudes for the potentiometric surface and water table at all observation wells at each time step. To obtain this output, IPCO(1), outline reference number 7, must be set equal to one.

Sheets 17 and 18 contain a legend and distribution map of accretion rates. This type of distribution may be obtained for the potentiometric surface, accretion rates, and (or) the water table at any time step during the duration. This optional output may be obtained by following the instructions in outline references 7 and 20.

Sheet 19 contains a tabular listing of altitudes of the potentiometric surface. Such a listing includes a value for each node in the grid. This type of output is available for the potentiometric surface, accretion rates, and the water table. Such output may be printed at any desired time step by following the instructions in outline references 7 and 20.

The upper half of sheet 20 contains a numeric map of average depths to the water table for a 30-day period. This type of map may be printed for either average or maximum depths to the water table for any period of time during the duration. Instructions for obtaining this output are in outline reference 5.

Sheet 21 contains a tabular listing of average depths to the water table for a 30-day period. The maximum depth printed is 9 feet, so a 9 indicates a depth greater than or equal to 9 feet. This type of printout may be obtained for either the average or maximum depth to the water table for any period of time during the duration. Also, optional card output may be obtained in this same general format, where each line of print is compressed into an 80-column-card format. This type of output is available according to the instructions in outline reference 5.

The only printed output from DATE is optional tables of comparisons between observed and computed values of the potentiometric surface and the water table of each observation well. A table for both the spring and fall of specified years is printed. Examples of these tables are on sheets 1 and 2 of figure 17. These tables may be obtained by following the instructions in outline references 1, 7, 8, and 9 in the input instructions for DATE.

Output from HYDROG consists of hydrographs for the computed potentiometric surface and water table for any period of time during the duration of SUPERMOCK. Sheets 1 and 2 of figure 18 contain examples of output from HYDROG. Both horizontal and vertical scales may be varied. See details in the input instructions for HYDROG.

JOB CONTROL

SUPERMOCK, DATE, and HYDROG are members of the SYS1.LOADLIB library. Their respective member names are C322, C323, and C324. Each program may be accessed by using standard EXEC and JOBLIB or STEPLIB cards.

```
//Stepname EXEC PGM=Program number
//STEPLIB DD DSN=SYS1.LOADLIB, DISP=SHR
```

SPRING 1972
(FEB.-JUNE)

POTENTIOMETRIC SURFACE

WELL NUMBER	MEASURED DEPTH BELOW LAND SURFACE	COMPUTED DEPTH BELOW LAND SURFACE	DIFFERENCE *
N257	16.0	16.4	-0.4
N270	20.4	19.0	1.4
N273	20.2	20.0	0.2
N276	16.4	14.3	2.1
N281	7.3	7.5	-0.2
N283	7.1	8.3	-1.2
N284	5.0	4.9	0.1
N285	10.1	8.5	1.6
N287	17.8	17.1	0.7
N289	19.8	19.1	0.7
N290	18.6	19.6	-1.0
N293	20.0	19.3	0.7
N308	20.2	19.7	0.5
N381	16.3	15.5	0.8
N382	4.4	4.7	-0.3
N383	15.5	17.0	-1.5
N384	4.0	5.0	-1.0
N385	12.7	14.6	-1.9
N386	13.6	14.8	-1.2
N387	17.7	17.2	0.5
N388	18.0	17.2	0.8
N389	14.2	16.6	-2.4
N390	13.7	15.3	-1.6
N391	17.9	17.8	0.1
N392	13.5	12.8	0.7
N393	14.8	15.9	-1.1
N394	15.0	15.0	-0.0
N395	20.5	17.6	2.9
N398	11.6	13.5	-1.9
N399	11.3	10.0	1.3
N400	22.8	23.0	-0.2
N401	24.7	23.1	1.6
N402	17.7	16.3	1.4
N429	5.9	7.2	-1.3
N432	10.4	8.5	1.9
N433	5.3	4.1	1.2
W128	18.4	20.2	-1.8
G268	12.0	12.2	-0.2
G270	6.4	4.3	2.1
G338	10.0	11.1	-1.1
G343	11.5	9.9	1.6
G347	25.5	24.5	1.0
G348	11.6	9.2	2.4
G349	10.4	10.3	0.1
R654	13.6	11.8	1.8
R964	2.1	1.3	0.8
R970	3.8	3.8	0.0

TOTAL = 10.6

AVERAGE = 0.2

MAX ABSOLUTE DIFFERENCE = 2.9   STANDARD
MIN ABSOLUTE DIFFERENCE = 0.0   DEVIATION = 1.3

WATER TABLE

WELL NUMBER	MEASURED DEPTH BELOW LAND SURFACE	COMPUTED DEPTH BELOW LAND SURFACE
N257	**	15.4
N270	**	17.6
N273	**	17.8
N276	5.0<WL	14.8
N281	**	7.0
N283	**	8.1
N284	3.0<WL< 5.8	4.8
N285	**	8.4
N287	**	17.3
N289	**	16.0
N290	12.0<WL< 12.6	13.8
N293	**	11.9
N308	**	15.8
N381	3.0	2.1
N382	**	0.0
N383	15.0<WL	15.6
N384	0.5<WL< 1.5	1.9
N385	13.0	12.9
N386	14.0	13.9
N387	17.2	18.1
N388	10.5	11.6
N389	8.5	5.9
N390	15.3	13.3
N391	15.0<WL	16.6
N392	14.1	14.1
N393	15.0<WL	15.4
N394	15.0	15.8
N395	15.0<WL	17.0
N398	11.7	13.4
N399	11.1	10.5
N400	15.0<WL	22.4
N401	5.0<WL	25.6
N402	5.9	6.4
N429	5.0<WL< 7.0	4.7
N432	1.2<WL< 5.0	1.6
N433	3.0<WL< 5.0	2.9
W128	14.0<WL	20.5
G268	3.0<WL< 5.0	4.0
G270	3.0<WL< 5.0	4.9
G338	5.0<WL< 10.0	9.9
G343	5.0<WL< 10.0	9.4
G347	**	23.2
G348	**	3.2
G349	5.0<WL< 10.0	8.8
R654	**	7.7
R964	2.0	3.2
R970	2.5	-0.0

* NEGATIVE IF COMPUTED WATER LEVEL IS LOWER THAN MEASURED WATER LEVEL.
** NO MEASURED WATER LEVELS AVAILABLE AT THIS SITE.

Figure 17, sheet 1 of 2.—Examples of output from DATE program.

FALL 1972
(JULY-NOV.)

POTENTIOMETRIC SURFACE

WELL NUMBER	MEASURED DEPTH BELOW LAND SURFACE	COMPUTED DEPTH BELOW LAND SURFACE	DIFFERENCE *
N257	19.1	19.1	-0.0
N270	23.3	24.8	-1.5
N273	23.8	23.2	0.6
N276	21.2	20.6	0.6
N281	10.6	13.5	-2.9
N283	11.6	11.6	0.0
N284	11.2	9.8	1.4
N285	11.9	12.0	-0.1
N287	21.2	20.2	1.0
N289	27.7	28.4	-0.7
N290	20.6	22.3	-1.7
N293	23.4	23.2	0.2
N308	24.4	25.3	-0.9
N381	20.6	20.1	0.5
N382	16.1	15.3	0.8
N383	25.1	24.1	1.0
N384	8.0	8.3	-0.3
N385	15.8	16.8	-1.0
N386	16.7	16.6	0.1
N387	25.0	23.3	1.7
N388	26.6	23.2	3.4
N389	28.6	25.2	3.4
N390	17.8	18.2	-0.4
N391	20.5	20.1	0.4
N392	15.4	15.2	0.2
N393	17.4	16.8	0.6
N394	17.4	17.4	-0.0
N395	29.5	26.6	2.9
N398	15.3	14.6	0.7
N399	14.8	13.1	1.7
N400	26.4	28.0	-1.6
N401	26.8	28.2	-1.4
N402	22.9	22.5	0.4
N429	17.8	16.3	1.5
N432	12.1	12.7	-0.6
N433	8.8	9.7	-0.9
W128	25.9	27.1	-1.2
G268	17.1	18.1	-1.0
G270	9.5	9.4	0.1
G338	14.0	15.7	-1.7
G343	16.3	17.0	-0.7
G347	29.0	31.8	-2.8
G348	15.5	14.7	0.8
G349	14.0	14.9	-0.9
R654	19.0	18.8	0.2
R964	6.7	7.8	-1.1
R970	10.7	11.4	-0.7
		TOTAL =	0.3
		AVERAGE =	0.0

MAX ABSOLUTE DIFFERENCE = 3.4 STANDARD
MIN ABSOLUTE DIFFERENCE = 0.0 DEVIATION = 1.4

WATER TABLE

WELL NUMBER	MEASURED DEPTH BELOW LAND SURFACE	COMPUTED DEPTH BELOW LAND SURFACE
N257	**	17.6
N270	**	18.1
N273	**	20.7
N276	5.0<WL	19.8
N281	**	13.1
N283	**	11.3
N284	9.0<WL< 11.0	9.6
N285	**	12.4
N287	**	19.3
N289	**	16.0
N290	14.0<WL< 14.6	14.5
N293	**	12.9
N308	**	19.8
N381	10.4	8.3
N382	**	16.3
N383	15.0<WL	23.6
N384	4.0<WL< 8.2	9.0
N385	14.2	15.3
N386	15.6	14.5
N387	19.5<WL	22.5
N388	18.0<WL	13.5
N389	15.0	14.8
N390	18.0	17.1
N391	15.0<WL	17.3
N392	14.8	14.3
N393	15.0<WL	15.9
N394	17.4	16.3
N395	15.0<WL	17.0
N398	14.5<WL	14.6
N399	14.4	12.8
N400	15.0<WL	22.4
N401	5.0<WL	25.8
N402	13.0	10.3
N429	10.0<WL< 15.0	15.0
N432	5.0<WL< 8.0	5.8
N433	5.0<WL< 8.0	8.5
W128	14.0<WL	20.6
G268	8.0<WL< 10.0	9.9
G270	7.0<WL< 9.0	9.0
G338	10.0<WL	14.5
G343	10.0<WL	16.3
G347	**	30.3
G348	**	8.2
G349	10.0<WL	12.7
R654	**	18.4
R964	4.0<WL< 7.2	7.2
R970	8.0<WL< 9.9	9.2

* NEGATIVE IF COMPUTED WATER LEVEL IS LOWER THAN MEASURED WATER LEVEL.
** NO MEASURED WATER LEVELS AVAILABLE AT THIS SITE.

Figure 17, sheet 2 of 2.—Examples of output from DATE program.

RED RIVER LOCK & DAM AREA 3 COMPUTED PRECONSTRUCTION POTENTIOMETRIC SURFACE.

NA-281. COMPUTED HYDROGRAPH

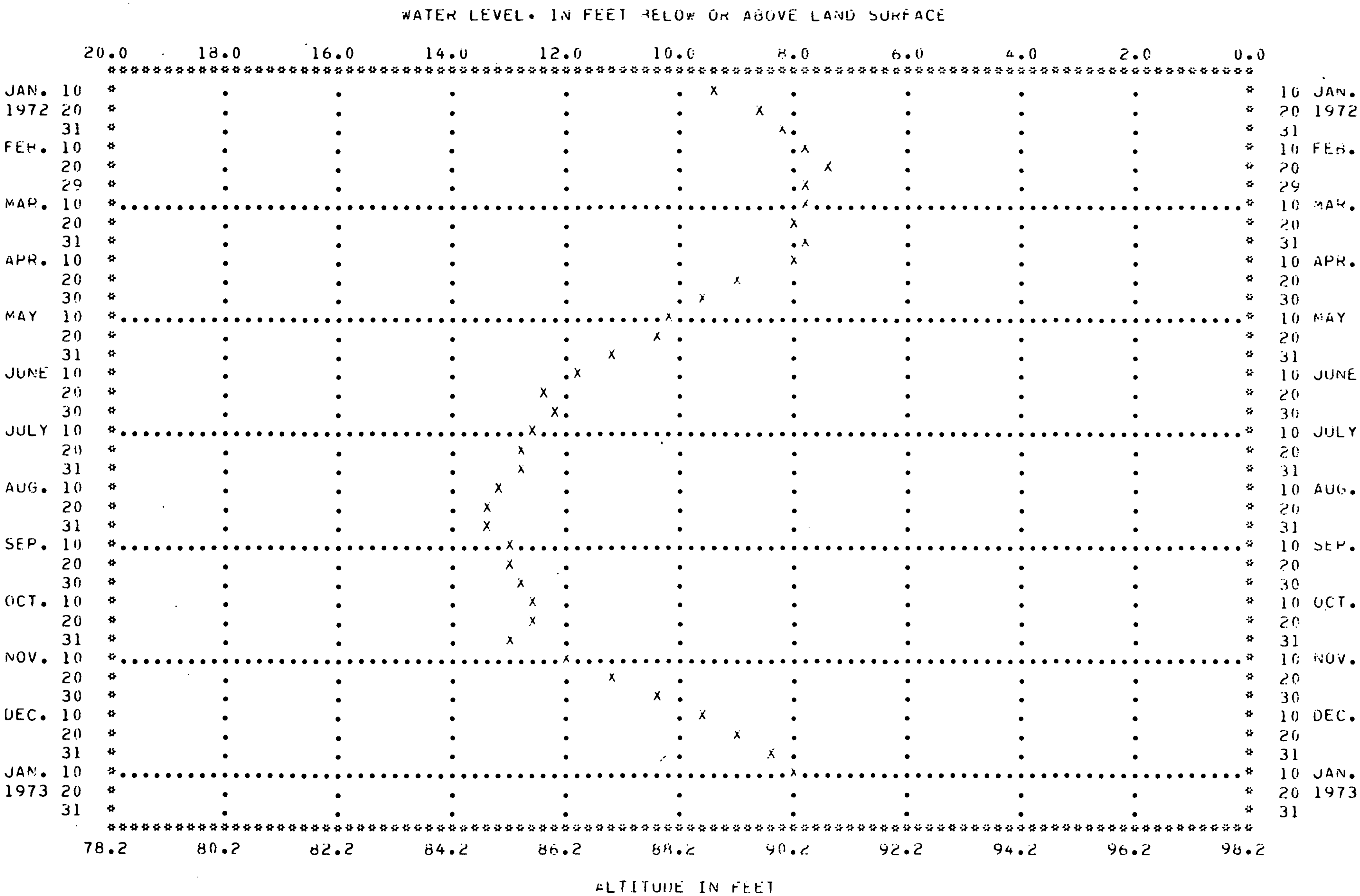

Figure 18, sheet 1 of 2.—Examples of output from HYDROG program.

RED RIVER LOCK & DAM AREA 3 COMPUTED PRECONSTRUCTION WATER TABLE.

NA-281. COMPUTED WLTAB HYDROGRAPH

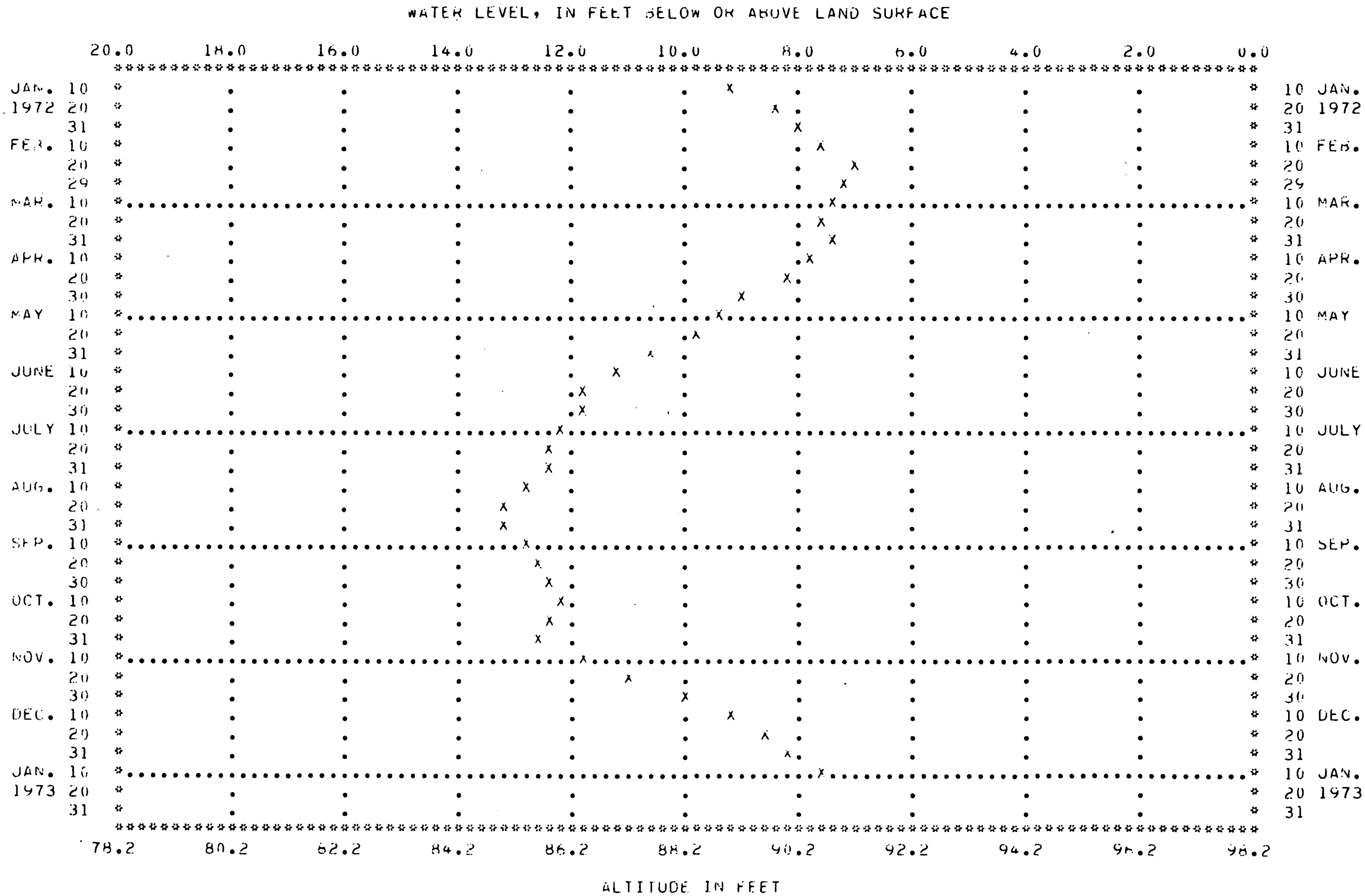

Figure 18, sheet 2 of 2.—Examples of output from HYDROG program.

The SUPERMOCK load module was created using the H-level FORTRAN compiler employing the compiler option, PARM.FORT='OPT=1', in order to maximize execution time efficiency. The DATE and HYDROG load modules were created with the G-level FORTRAN compiler. They are short-running programs and execution time is not critical.

These loaded programs may be executed by anyone who has access to the Geological Survey IBM 370/155 computers in Reston, Va., or the Department of the Interior IBM 360/65 computer in Washington, D.C.

The following list is an example of the job-control cards necessary to run the model. These particular cards were used in preconstruction calibration runs for the Lock and Dam 5 area in the Red River Navigation Study. The region sizes and times indicated in each job step were sufficient when using a 34 by 80 grid, input and output data sets of the indicated size, a time-step increment of 10 days, and a duration of 1,460 days. The region size will vary with the grid size and the size of the input and output data sets. The time will vary with the duration of the model and the time-step increment.

```
//XXXXXXXX JOB(--------)
/*SETUP     CCD193/DISK
//STEP1   EXEC PGM=C322,TIME=35,REGION=350K
//STEPLIB DD DSN=SYS1.LOADLIB,DISP=SHR
//FT07F001 DD SYSOUT=B
//FT02F001 DD DSN=PRES,UNIT=2314,VOL=SER=CCD193,DISP=(OLD,KEEP,KEEP),
//    DCB=(RECFM=VBS,LRECL=780,BLKSIZE=7056)
//FT09F001 DD DSN=PRETRES,VOL=SER=CCD193,UNIT=2314,
//    DCB=(RECFM=VBS,LRECL=1540,BLKSIZE=6176),DISP=(OLD,KEEP,KEEP)
//FT04F001 DD DSN=&&PTMSF,UNIT=SYSDK,SPLIT=(10,CYL,(1,1)),
//    DCB=(RECFM=VBS,LRECL=476,BLKSIZE=12960),DISP=(NEW,PASS)
//FT10F001 DD DSN=&&WTABL,UNIT=SYSDK,SPLIT=9,
//    DCB=(RECFM=VBS,LRECL=476,BLKSIZE=12960),DISP=(NEW,PASS)
//FT06F001 DD SYSOUT=A
//FT11F001 DD DUMMY
//FT05F001 DD *


                    ***** SUPERMOCK *****
                    ***** DATA DECK *****


/*
//STEP2   EXEC PGM=C323,REGION=190K,TIME=4
//STEPLIB   DD   DSN=SYS1.LOADLIB,DISP=SHR
//FT04F001 DD DSN=&&PTMSF,UNIT=SYSDK,DISP=(OLD,DELETE)
//FT10F001 DD DSN=&&WTABL,UNIT=SYSDK,DISP=(OLD,DELETE)
//FT03F001 DD DSN=&&HYDO,UNIT=SYSDK,SPACE=(TRK,(20,2),RLSE),
//   DCB=(RECF      ,LRECL=80,BLKSIZE=7200),DISP=(NEW,PASS)
//FT06F0            UT=A
//FT05F0


                    ******* DATE ********
                    ***** DATA DECK *****


/*
//STEP3    EXEC   PGM=C324,REGION=185K,TIME=3
//STEPLIB   DD   DSN=SYS1.LOADLIB,DISP=SHR
//FT06F001 DD SYSOUT=A
//FT03F001 DD DSN=&&HYDO,DISP=(OLD,DELETE),UNIT=SYSDK
//FT05F001 DD *


                    ****** HYDROG *******
                    ***** DATA DECK *****
```

In step 1, FT02F001 describes a data set containing the preconstruction river stages for the Red River and their associated grid nodes in area 5. FT09F001 describes a data set containing the preconstruction tributary or secondary stream stages for area 5. Data read from these files are described in "Preparation of Input Data" for SUPERMOCK, outline references 23, 25, 27, and 28.

SUPERMOCK is designed to read data from these files in unformatted, variable-length, spanned records. When working with unformatted data, the I/O list determines the record length. With variable-length records, the logical record length is determined from the maximum I/O list. When creating these files, data must be entered in the same order and in the same mode as it is to be read. (See data-input references given in the preceding paragraph.) The longest record will be the list of stages and associated nodes. To determine the logical record length, use the following equation:

$$LRECL=[8(\text{number of stages})+4]\text{bytes}$$

The block size, BLKSIZE, for the data set must be some multiple of (LRECL+4)bytes. To increase efficiency and minimize storage space, the block size should be made as nearly as possible the track capacity of the storage device used. The track capacity for a 2314 and a 3330 disk pack is 7294 bytes and 13,030 bytes, respectively. By knowing the number of blocks of data being worked with, the amount of space that must be allocated can be determined.

The data-set disposition, DISP, has three subparameters that may be coded. The first subparameter indicates the status of the data set. The second and third parameters determine what is to be done with the data set upon normal or abnormal termination, respectively, of the job step. When creating the data set, the disposition should be coded DISP=(NEW,KEEP, DELETE) or DISP=(NEW,KEEP,KEEP). If the latter is used and the job step terminates abnormally, then the first subparameter must be changed to OLD or MOD when next attempting to fill the data set. When using these data sets as input files, as in step 1 of the above-cited example, the disposition should always be DISP=(OLD,KEEP,KEEP).

The UNIT parameter identifies the hardware device on which the data set resides. The volume specification specifies the serial number of the volume on which the data set resides.

FT04F001 and FT10F001 describe output-data sets that are used to pass computed altitudes for the potentiometric surface and water table, respectively, from SUPERMOCK to DATE. Each of these files will have the same logical record length and block size and will require the same amount of space. To determine the LRECL, use the following equation:

LRECL=[8(number of observation wells)+4]bytes

The block size for these data sets should be determined in the same manner as that indicated in the preceding.

These data sets are temporary. The disposition of both should be coded DISP=(NEW,PASS). The second subparameter, PASS, insures that the system will retain the data set for use by subsequent job steps. The unit parameter should be coded UNIT=SYSDK. This unit refers to volumes for temporary work space during a job. No volume serial—number specification is necessary.

Space for these temporary data sets may be allocated in any acceptable manner. However, because they are sequential and have corresponding records, split cylinders may be defined in order to save time by reducing access arm movement. When allocating space in this manner, the associated DD statements must be arranged in sequence in the input stream. The first DD statement specifies the amount of space required by the first data set and the total amount of space allocated for all of the associated data sets. (See FT04F001, in example JCL list.)

```
Space, in tracks,
 required by this         Primary number
 data set.                 of cylinders.
      \                        /
       \    Type of space     /
        \    allocation.     /
         \        |         /   Secondary number
          \       |        / /--  of cylinders.
           \      |       / /
     SPLIT=(10,CYL,(1,1))
```

Secondary space is assigned only to those data sets that run out of primary space. If a secondary quantity is not specified and one of the associated data sets runs out of space, the job step will terminate abnormally. All of the succeeding associated data sets request a portion of the total space allocated.

```
         Space, in tracks, required
          by this data set  from
         /each cylinder allocated.
        /
SPLIT=9
```

The DD statement FT11F001 is used to describe the output data set for depths to the water table, as described in the SUPERMOCK outline, number 5. If card output is desired, code FT11F001 as:

```
//FT11F001 DD SYSOUT=B.
```

However, these data can be put out on some other device in card images and held until the printed output can be checked for possible errors. This may be done by coding:

```
//FT11F001 DD DSN=data-set name, UNIT=3330, DISP=(NEW,KEEP,DELETE),
   VOL=SER=SYS211, DCB=(RECFM=FB,LRECL=80, BLKSIZE=7200), SPACE
                  =(TRK,(15,5),RLSE.
```

These data may then be retrieved by using a system utility program IEBGENER. If no card output is desired, code

//FT11F001 DD DUMMY,

as in the example JCL listing.

In step 2, FT04F001 and FT10F001 simply point to the data sets passed from step 1. FT03F001 describes a temporary data set in which card images in the format of standard water-level cards are passed to HYDROG to be plotted.

In step 3, FT03F001 points to the water-level data set passed from step 2.

APPLICATION OF THE MODEL

The system of programs described in this report was designed to fill a specific need. Consequently, input data and resulting output are specialized. The model is not sufficiently generalized to be applicable to a wide range of problems without some modification of the programs to eliminate extraneous input and output. Nevertheless, the model has several useful features that expedite the analysis of hydrologic problems.

SUPERMOCK simulates recharge from precipitation and discharge by evapotranspiration from input climatic data rather than requiring input of vertical flux. This procedure allows, after model calibration, the analysis of the response of an aquifer to droughts or wet periods. Also, a model that has a parametric representation of vertical flux requires input data that are more easily obtained than one that requires input specification of the areal and time variations of vertical recharge and discharge.

HYDROG displays the output from SUPERMOCK in the form of hydrographs. This form of output makes it easier to compare model results with data at observation points. An additional aid to calibration is the comparison between model results and observed data in the DATE program.

To produce a substantial similarity between model results and observed data generally required about 20 model runs, with changes in some parameters between runs. This process of trial-and-error adjustment is termed "model calibration." The parameters to be adjusted are the ones with the most uncertainty about their true value. Constraints limiting the amount of adjustment should be set up before model calibration. No parameter should be adjusted to a physically implausible value just to improve model results. Observed data should be examined for inconsistencies and possible errors. Forcing a model to fit erroneous data may cause incorrect adjustments to model parameters.

HCU, HCL, WTSTO, AM, and S were the parameters that were adjusting during model calibration. If the model-derived water-table position is too low, then HCU should be increased in order to increase recharge to the water table. Conversely, if the model-derived water-table position is too high, then HCU should be decreased. The change in model-derived water-table position caused by changing HCU will probably also change the model-derived position of the potentiometric surface, particularily if HCL is relatively large. HCL has a strong influence on the difference between the positions of the water table and the potentiometric surface in the model results. Increasing HCL makes the two surfaces approach the same level. If HCU is small, increasing HCL will make the level of the water table change and approach the potentiometric surface. If HCU is large, increasing HCL will probably increase recharge to the aquifer and will raise the potentiometric level in the model. Seasonal fluctuations, between spring highs and fall lows, are functions of the water table and aquifer storage coefficients. Increasing WTSTO and S tends to dampen seasonal fluctuations. Conversely, decreasing

WTSTO and S tends to magnify seasonal fluctuations. Large differences in head, as compared with horizontal gradients between stream stages and water levels in nearby wells, indicate resistance to flow at the streambed. This resistance is inversely proportional to the hydraulic conductivity of the streambed material and proportional to the thickness of the streambed material. Therefore, the desired effect can be achieved by changing either factor. In calibrating the model, the hydraulic conductivity was constant and the thickness was changed. If model response for the head difference between well and stream is too small, then AM should be increased. Conversely, if the head difference is too large, then AM should be decreased.

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Table 7.—*Definitions of selected program variables*

Variable	Definition
ACCRET	Two-dimensional array holding accretion rates (feet/day).
ACSUM	Single-dimension array containing cumulative annual accretion to the artesian aquifer at each observation well (feet).
AM	Two-dimensional array holding thickness values of streambed and lakebed material and (or) confining beds (feet).
AMON	Single-dimension array containing abbreviated-month names.
AREA	Two-dimensional array holding sequence numbers used in defining the upper and lower hydraulic conductivities and evapotranspiration at each node.
BALSTD	Mass-balance standard; when computed mass balance exceeds this value, a message will be printed.
BMSIN	Initial value for base-moisture storage (inches).
BMSM	Maximum water held in base-moisture storage (inches).
C	Scalar, representing transmissivity in the direction of increasing index, used in the definition of W.
CAC	Accretion component in the difference equation for a node.
CPZ	Leakage component (from another aquifer or from a stream) in the difference equation for a node.
CSD	Storage component in the difference equation for a node.
CTIME	Single-dimension array holding numbers equal to time steps defining periods of interest for output of average or maximum depths to the water table. (See table 2, number 5.)
DRN	Maximum drainage rate for soil (inches/day).
DTIME	Number of days in time step.

Table 7.—*Definitions of selected program variables*—Continued

Variable	Definition
DUM 1	Dummy variable for month in date read from main-stem river-stage data set.
DUM 2	Dummy variable for day in date read from main-stem river-stage data set.
DUM 3	Dummy variable for year in date read from main-stem river-stage data set.
ELEV	Two-dimensional array containing land-surface altitudes (feet).
G	Single-dimension array used to store values created by forward substitution in solving the difference equations for a row or a column.
GWETO	Two-dimensional array containing values of ET/SAT.HYD.COND for four ranges in hydraulic conductivity of material above the water table. (See figure 16, sheet 4.)
H	Three-dimensional array containing potentiometric-surface altitudes (feet). Each plane contains values at each node in the grid at different stages in the computational scheme. Plane 3 contains final values for each time step.
HCL	Hydraulic conductivity of material from the water table to the top of the artesian aquifer.
HCU	Hydraulic conductivity of material from root zone to the water table.
HO	Two-dimensional array holding water-surface altitudes of partially penetrating streams (feet).

Table 7.—*Definitions of selected program variables*—Continued

Variable	Definition
HS	Computational variable equal to maximum or average water-table altitude in specified periods of interest (feet). HS=HSAVE(I,J)+0.5. This overcomes truncation problem in conversion from real to integer mode.
HSAVE	Two-dimensional array holding maximum or average water-table altitudes for periods of interest (feet).
HWT	Distance (feet) between water table and the top of the artesian aquifer. Flow path for computation of accretion from the water table to the artesian aquifer.
HX	Single-dimension array into which main-stem river altitudes for each time step are read. At each time step, each member of this array is entered into either the H or the HO array, depending on whether it is fully or partially penetrating (feet).
HXP	Single-dimension array into which water-surface altitudes for tributary streams are read at each time step. Because all tributary streams are treated as partially penetrating, these altitudes go into the HO array (feet).
HYCND	Computational variable equal to HCL in MAIN and HCU in DREAM (feet/day).
IAREA	Computational variable equal to individual sequence numbers from the AREA array.
IC	Single-dimension array used for reading in column locations. Used for inputing locations of fully or partially penetrating stream nodes or locations of observation wells.

Table 7.—*Definitions of selected program variables*—Continued

Variable	Definition
ICODE	Code indicating that average or maximum depths to water table for specified periods of interest are desired. (See table 2, number 5.)
ICY	Variable used in computing node levels.
IDA	Read unit for main-stem river-stage data set.
IDAY	Day in calendar date computed each time step.
IDEPTH	Two-dimensional array holding depths to the water table for output as specified (feet).
IDEPX	Variable used in computing entries to the IDEPTH array.
IDK	Read unit for tributary-stream data set.
IDNT	Time increment for variable withdrawal. Must be multiple of NDAZ.
IDO	Write unit for output of potentiometric-surface altitudes and associated nodes to be passed to DATE.
IDQ	Write unit for output of water-table altitudes and associated nodes passed to DATE.
IFLAG	Computational variable indicating number of time steps remaining in a period for output of maximum or average depths to water table.
IJ	Single-dimension array that has a dual function. First, nodes for the main stem that are to be treated as fully penetrating are read into it. Then, when these data have been used in computing the stream-location map and the node level map, the array is used to contain all nodes for the main-stem river stages that are read each time step.

Table 7.—*Definitions of selected program variables*—Continued

Variable	Definition
IJC	Number of days in a period for output of maximum or average depths to water table.
IJP	Single-dimension array holding nodes to which partially penetrating tributary-stream altitudes are assigned each time step.
IMON	Month in the calendar date computed each time step.
INDC	Code indicating whether printed output of maximum or average depths to the water table for specified periods of interest will be in tabular or numeric map form. (See table 2, number 5.)
INO	Representative well number. Each well should be chosen as typical of a subarea in the area-definition map for hydraulic conductivity and evapotranspiration. Data collected at these wells are used to determine HCU, HCL, and THK for each subarea.
IPCO	Single-dimension array containing output codes. (See table 2, number 7.)
IPP	Single-dimension array holding main-stem river nodes to be treated as partially penetrating.
IPS	Switch indicating if conductivity of streambed and lakebed material is constant.
IPT	Write unit for line printer.
IR	Single-dimension array used for reading in row locations. Used for inputing locations of fully or partially penetrating stream nodes or locations of observation wells.

Table 7.—*Definitions of selected program variables*—Continued

Variable	Definition
IRD	Read unit for card reader.
IRX	Variable used in computing node levels.
IRX8	Offset pointer into the PRECIP array, which holds daily precipation.
ISCS	Punch unit for output of average or maximum depths to the water table for selected periods of interest.
ISTR	Two-dimensional array holding a computed stream-location map which is printed for each run.
ISYM	Single-dimension array containing character data used to construct a stream-location map.
ITDX	Switch indicating if node spacing is constant or variable.
IV	Two-dimensional array holding a computed node-level map which is printed for each run.
IWDINT	Switch indicating if withdrawal rates will vary from node to node or if one withdrawal rate will be imposed at several nodes. (See table 2, number 24.)
IWDR	Switch indicating if pumpage will be modeled. (See table 2, number 24.)
IWDT	Switch indicating if withdrawal rates will be printed. (See table 2, number 24.)
IXMAX, IXMIN	Column numbers used as spacing boundaries if variable grid spacing is used. (See table 2, number 10, and table 1, page 27, lines 85-88.)
IYEAR	Year in calendar date computed each time step.

Table 7.—*Definitions of selected program variables*—Continued

Variable	Definition
IYMAX, IYMIN	Row numbers used as spacing boundaries if variable grid spacing is used. (See table 2, number 10, and table 1, page 33, lines 85-88.)
JCODE	Single-dimension array whose members are the numbers of consecutive time steps for which average or maximum depths to the water table are to be computed. (See table 2, number 5.)
JDAY	Single-dimension array whose members are the number of days in each month.
JJ	Sequence number of each set of stream-stage data for both main-stem and tributary-stream data sets read each time step. The program uses these sequence numbers to locate the appropriate beginning record in each data set.
JQ	Counter variable used to terminate a line of print in printing tables of invariant stream stages. It is equal to the number of nodes associated with each stream stage.
JXA	Equal to QPER/NDAZ. It is used in computing L, which terminates the main time loop in SUPERMOCK.
K	Loop index for main time loop in SUPERMOCK.
KDNT	Switch indicating if tables for invariant stream stages will be printed.
KLINES	Variable used to control the number of lines in tables printed for invariant fully and partially penetrating streams.
KSAT	Saturated hydraulic conductivity for SOIL (inches/day).

Table 7.—*Definitions of selected program variables*—Continued

Variable	Definition
KSYM	Decoding array used to determine at what time step and in what form ouput from the H array is desired. (See table 2, number 20.)
KWSYM	Decoding array used to determine at what time step and in what form output from the WT array is desired. (See table 2, number 20.)
L	Computed variable that terminates the main time loop in SUPERMOCK (L=JXA+1).
LABEL	Identification heading for tabular and card output of depths to the water table. (See table 2, number 5.)
LQT	Counter used in assigning status to main-stem river-stage nodes.
LSYM	Decoding array used to determine at what time step and in what form output from the ACCRET array is desired.
M	Number of rows in grid.
M1	Equals M-1.
M2	Equals M1-1.
MO1, MO2	Row limits for output of maximum or average depths to the water table. (See table 2, number 5.)
N	Number of columns in grid.
N1	Equals N-1.
NBEGN	Sequence number on main-stem and tributary-stream data sets where SUPERMOCK is to begin using data.
NDAZ	Time step (days).

Table 7.—*Definitions of selected program variables*—Continued

Variable	Definition
NEWYR	Variable used to signal the beginning of a new year for the computation of annual-cumulative accretion to the artesian aquifer.
NODAYS	Time increment read from main-stem river-stage data set.
NOSTAG	Total number of main-stem river stages and associated nodes to be read each time step.
NO1, NO2	Column limits for output of maximum or average depths to the water table. (See table 2, number 5.)
NOPP	The number of main-stem river nodes to be treated as partially penetrating.
NOSET	Number of sets of NDAZ average river stages and associated nodes in the main-stem river-stage data set.
NOST	Number of main-stem river nodes to be treated as fully penetrating (NOST=NOSTAG-NOPP).
NPSTAG	Number of tributary-stream stages and associated nodes to be read at each time step.
NPSTGE	Number of invariant partially penetrating stream stages to be read.
NSTGE	Number of invariant fully penetrating stream stages to be read.
PE	Single-dimension array holding daily potential evapotranspiration (inches).
PESUM	Dummy argument in call to subroutine PROCESS in the row cycles.

Table 7.—*Definitions of selected program variables*—Continued

Variable	Definition
PRECIP	Single-dimension array containing daily precipitation (inches).
PSM	Conductivity of streambed and lakebed material when a constant value is used. Appropriate nodes in the PZ array are initialized to PSM (feet/day).
PZ	Array containing the hydraulic conductivities of streambed and lakebed material and (or) confining beds. PZ may be read as an alphameric map or filled using PSM and (or) PZM (feet/day).
Q	Two-dimensional array holding withdrawal rates at specified nodes ($feet^3$/day).
QPER	Length of model run (days).
QS	Component of flow associated with constant head nodes computed as an intermediate step in the mass-balance computation.
QSTR	Component used in the mass-balance computation (QSTR=QSTR +QS*DTIME).
RD	Two-dimensional array containing root-depth values (feet).
RGF	Ratio of suction at field capacity to suction at wilting point (dimensionless).
RRM	Counter used to signal read-in times for withdrawal rates.
S	Two-dimensional array containing storage-coefficient values for the artesian aquifer.
SAMM	Constant value for thickness of streambed and lakebed material. This is used if ISAM=1. Appropriate nodes in array AM are initialized to SAMM (feet).

Table 7.—*Definitions of selected program variables*—Continued

Variable	Definition
SAT	Two-dimensional array which contains the definition of symbols for each alphameric map entered. Using data read into SAT, each alphameric map is decoded one row at a time and values are assigned to the appropriate arrays.
SCAC	Component of mass balance, represents the sum of vertical flow from the artesian aquifer to the water table.
SHD	Average of planes 2 and 3 of the H array (potentiometric-surface altitudes) (feet).
SHEAD	Term used in converting CPZ and CAC into volume of water, equal to SHD*DTIME.
SM	Constant value for the artesian-aquifer storage coefficient.
SMSIN	Initial value for surface-moisture storage (inches).
SMSM	Maximum water held in surface moisture (inches).
SRPZ	Component of mass balance, represents the sum of leakage (to another aquifer or to a stream) out of the artesian aquifer.
SRSD	Component of mass balance, represents the sum of changes in storage in the artesian aquifer.
SWF	Soil suction at field capacity (inches).
SWQ	Component of mass balance, represents the sum of flow into the artesian aquifer (from other aquifers or partially penetrating streams, from the water table, and from lateral nodes).
T	Two-dimensional array containing transmissivity values for the artesian aquifer ($feet^2$/day).

Table 7.—*Definitions of selected program variables*—Continued

Variable	Definition
THK	Single-dimension array whose members are the thickness values (in feet) of the fine-grained material between the land surface and the top of the artesian aquifer for each subarea defined in the area-definition map for hydraulic conductivity and evapotranspiration.
TM	Constant value for transmissivity in the artesian aquifer.
TTIME	Single-dimension array containing time steps (days).
W	Single-dimension array used to store values created by forward substitution in solving the difference equations for a row or column.
WELLS	Number of observation wells.
WENO	Observation-well numbers. These are the wells for which data are passed to DATE.
WT	Two-dimensional array containing altitudes of the water table at each node (feet).
WTSTO	Single-dimension array containing coefficients of storage for the saturated material between the top of the artesian aquifer and the water table.
X	If node spacing is constant, X and Y are equal to XM and YM, respectively. If spacing is variable, X and Y are read from cards. (See table 2, number 10.)
XINF	If variable node spacing is used, XINF is the spacing from column 1 to IXMIN and from IXMAX to N (feet).

Table 7.—*Definitions of selected program variables*—Continued

Variable	Definition
XM	When node spacing is constant, XM is the spacing in the x direction, column spacing.
XNORM	Parameter that limits recharge rate. (See table 2, number 17.)
XPSTAGE	Invariant fully penetrating stream stage (feet).
XPSTGE	Invariant partially penetrating stream stage (feet).
XY1, XY2, XY3, XY4	Spacing parameters used in the row cycles.
Y	If node spacing is constant, X and Y are equal to XM and YM, respectively. If spacing is variable, X and Y are read from cards. (See table 2, number 10).
YINF	If variable node spacing is used, YINF is the spacing from row 1 to IYMIN and from IYMAX to M.
YM	When node spacing is constant, YM is the spacing in the y-direction row spacing.
YX1, YX2, YX3, YX4	Spacing parameters used in the column cycles.

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