

MICROCUMPTER COMPUTATION OF WATER QUALITY DISCHARGES

by Dennis R. Helsel

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CONVERSION FACTORS

Factors for converting inch-pound units to International
System of units (SI)

<u>To convert from</u>	<u>To</u>	<u>Multiply by</u>
cubic feet per second (ft ³ /s)	cubic meters per second (m ³ /s)	0.02832
tons (short)	megagrams (Mg) or metric tons (t)	0.9072

MICROCOMPUTER COMPUTATION OF
WATER-QUALITY DISCHARGES

By Dennis R. Helsel

ABSTRACT

A fully prompted program (SEDQ) has been developed to calculate daily and instantaneous water-quality (QW) discharges. It is written in a version of BASIC, and requires inputs of gage heights, discharge rating curve, shifts, and water-quality concentration information. Concentration plots may be modified interactively using the display screen. Semilogarithmic plots of concentration and water quality discharge are output to the display screen, and optionally to plotters. A summary table of data is also output. SEDQ could be a model program for microcomputer and minicomputer systems likely to be in use within the U.S. Geological Survey Water Resources Division in the near future.

The daily discharge-weighted mean concentration is one output from SEDQ. It is defined in this report, differentiated from the currently used mean concentration, and designated the "equivalent concentration".

INTRODUCTION

Within the Ohio District, Water Resources Division, U.S. Geological Survey (USGS), a need developed to calculate daily sediment discharges through the use of gage-height information stored on cassette tape. A fully prompted program to meet this need was written for a Hewlett-Packard 9845T microcomputer.¹ Using this program (named SEDQ), future inputs of gage height data from digital tapes or solid state memory to the microcomputer will allow computation of daily discharges for all water-quality parameters.

DESCRIPTION OF THE PROGRAM

SEDQ is written in Hewlett-Packard extended BASIC. It requires 153,562 bytes of memory, 52,082 for storage of the program and 101,480 for variable memory. An outline of the program processing sequence is shown in table 1. Detailed (micro) flowcharts for each major division of the program are found in figures 1 through 5 starting on page 5, with figure numbers corresponding to those in table 1. A listing of the program is found at the end of the report.

Gage heights are entered as a two-dimensional array. The first dimension represents the hour and the second dimension represents the minute divided by the time interval, so that the gage height at 1030 hours is found in the (10, 6) element of the array for a 5-minute time interval.

Concentrations and related information (time, type of sample, coefficient) may be entered from the keyboard or from tape. A package of fully prompted programs called SEDPAK is available from the Ohio District; SEDPAK will create, sort, edit and list concentration data files in the appropriate format.

¹ The use of brand names in this report is for identification purposes only and does not imply endorsement by the U.S. Geological Survey.

After all data have been input, SEDQ calculates the number of logarithmic cycles needed and produces semilogarithmic plots of concentration and discharge on the display screen. To minimize the number of cycles necessary, each scale is independently numbered. Modifications to the concentration plot may be made on the display screen by digitizing the location of estimated concentrations. In this way a "concentration curve" can be drawn. A practice routine is available for instruction, as well as routines to add estimated concentration values, delete sample concentrations, and change the times assigned to existing samples. When the plot meets the user's approval, QW discharges are calculated by the midinterval method (Porterfield, 1972, p. 49-52). With this method, the instantaneous water discharge and concentration "represent the average values for time interval that extends ahead and behind halfway to the preceding and following clock times" (p. 49). Water quality discharge calculations are performed for each interval, and then summed to arrive at daily totals. The SEDQ program uses the gage height recorder punch as the midpoint of its interval calculations.

Outputs from the program are plots of concentration and water discharge versus time (fig. 6), QW discharge and water discharge versus time (fig. 7), and a summary data table (table 2). The data table presents the mean and equivalent gage heights, rating table number, daily water discharge (Q), a listing of all concentrations, the mean and equivalent daily concentrations, and the daily QW discharge or load.

The "equivalent concentration", a term not presently in use within the USGS, is calculated by dividing the daily QW discharge (in tons per day) by the water discharge (in cubic feet per second), and dividing this quantity by 0.0027 to convert to milligrams per liter (mg/L):

$$\text{Equivalent Concentration (mg/L)} = (Q_{qw}/Q_w)/0.0027$$

where Q_{qw} is daily water quality discharge (tons per day), and Q_w is daily water discharge (cubic feet per second).

The mean concentration presently reported by the USGS is a time-weighted mean. The equivalent concentration is a discharge-weighted mean, representing the concentration that would be found if all water were collected and composited from the stream for that day. The two will differ when discharge changes appreciably during the day. The equivalent concentration multiplied by the daily discharge and by 0.0027 is by definition the water quality discharge for a subdivided day. The mean concentration, multiplied by the same factors, results in the discharge when subdivision is not used. Porterfield (1972, p. 51) suggests that when the two differ by more than five percent, subdivision is necessary. Therefore, whenever subdivision is necessary, the equivalent concentration would be a more useful measure for comparisons of daily water quality.

Table 1.--Processing sequence of SEDQ program

1. Data Input

- a. Read gage heights from tape storage
- b. Read shifts from tape storage, or enter from keyboard
- c. Read rating curve from tape storage
- d. Calculate unit discharges
- e. Retrieve concentration data from tape or keyboard
- f. Select concentrations for day of interest

2. Screen Plotting

- a. Scale discharge axis
- b. Scale concentration axis
- c. Number axes
- d. Print Discharge legend
- e. Plot discharge
- f. Print Concentration legend
- g. Plot concentrations

3. Modifying Concentration Plot

- a. Add data, delete data, and change times of concentrations

4. Calculating QW Discharge

- a. Interpolate "concentrations" for each punch
- b. Calculate instantaneous and daily QW discharges
- c. Calculate equivalent gage height

5. Final Plotting on Paper

- a. Plot concentrations and water discharge versus time
 - b. Plot QW discharge versus time
 - c. Store modified concentrations on tape
 - d. Optional storage of entire plots on tape
 - e. Optional return to beginning for another day's data
 - f. End
-

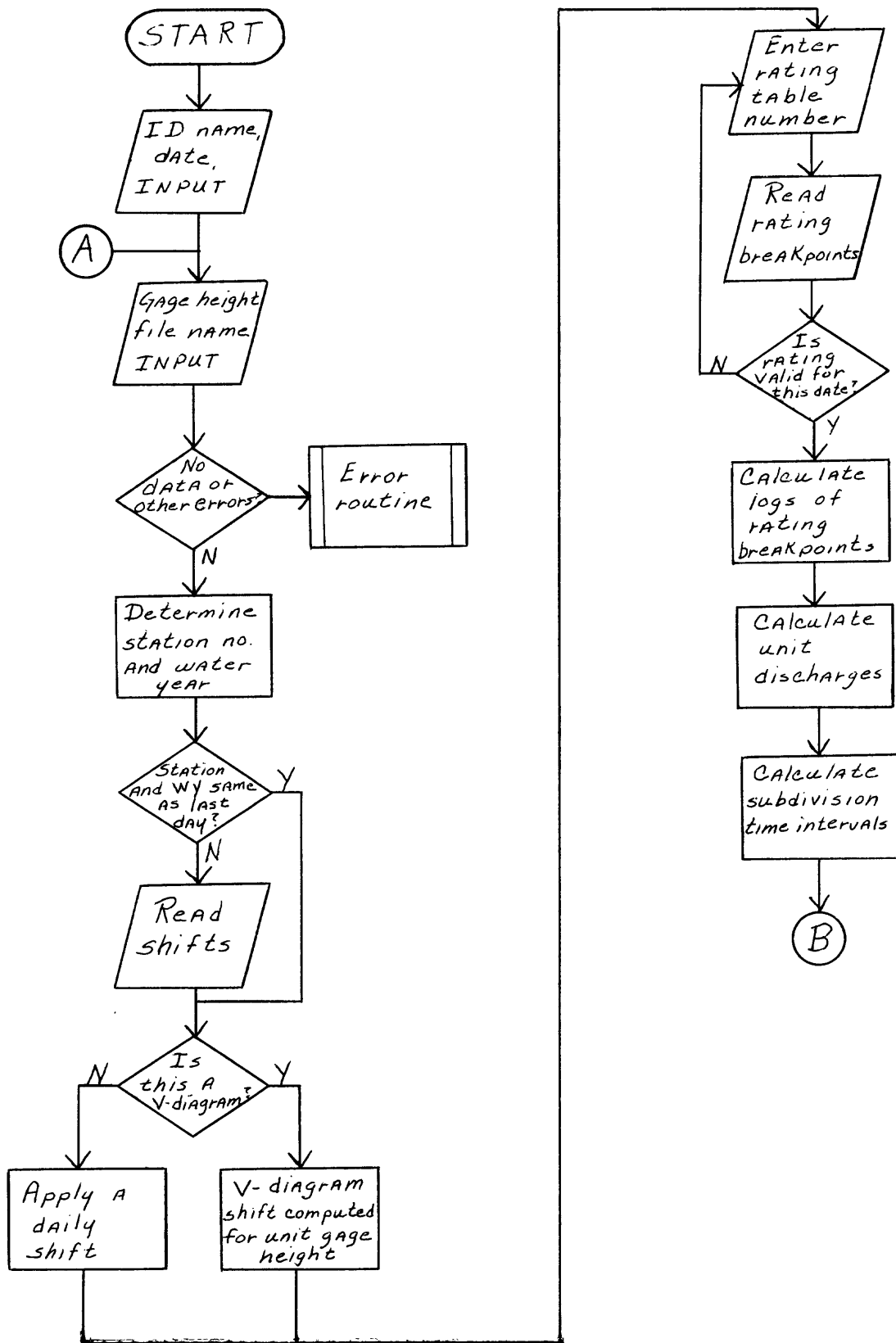


Figure 1.--Data Input, Micro Flowchart

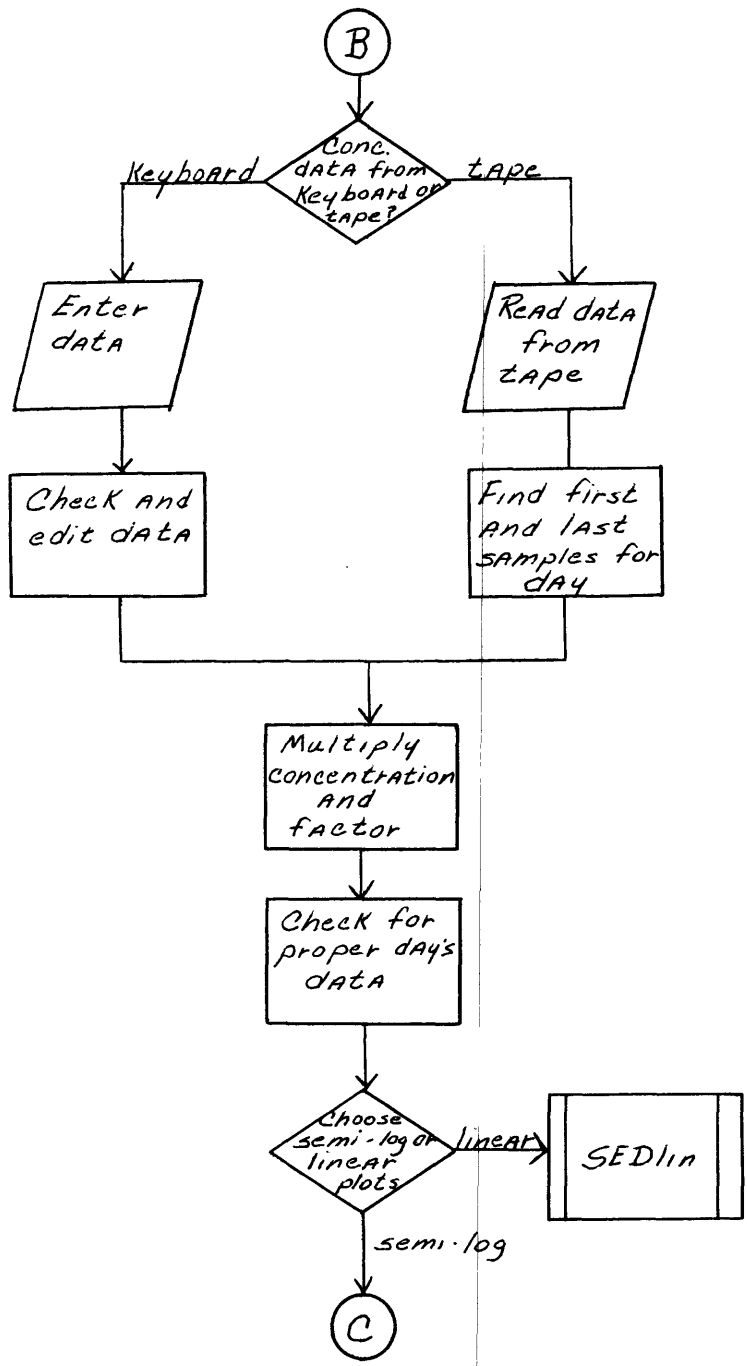


Figure 1.--Data input, Micro Flowchart--Continued

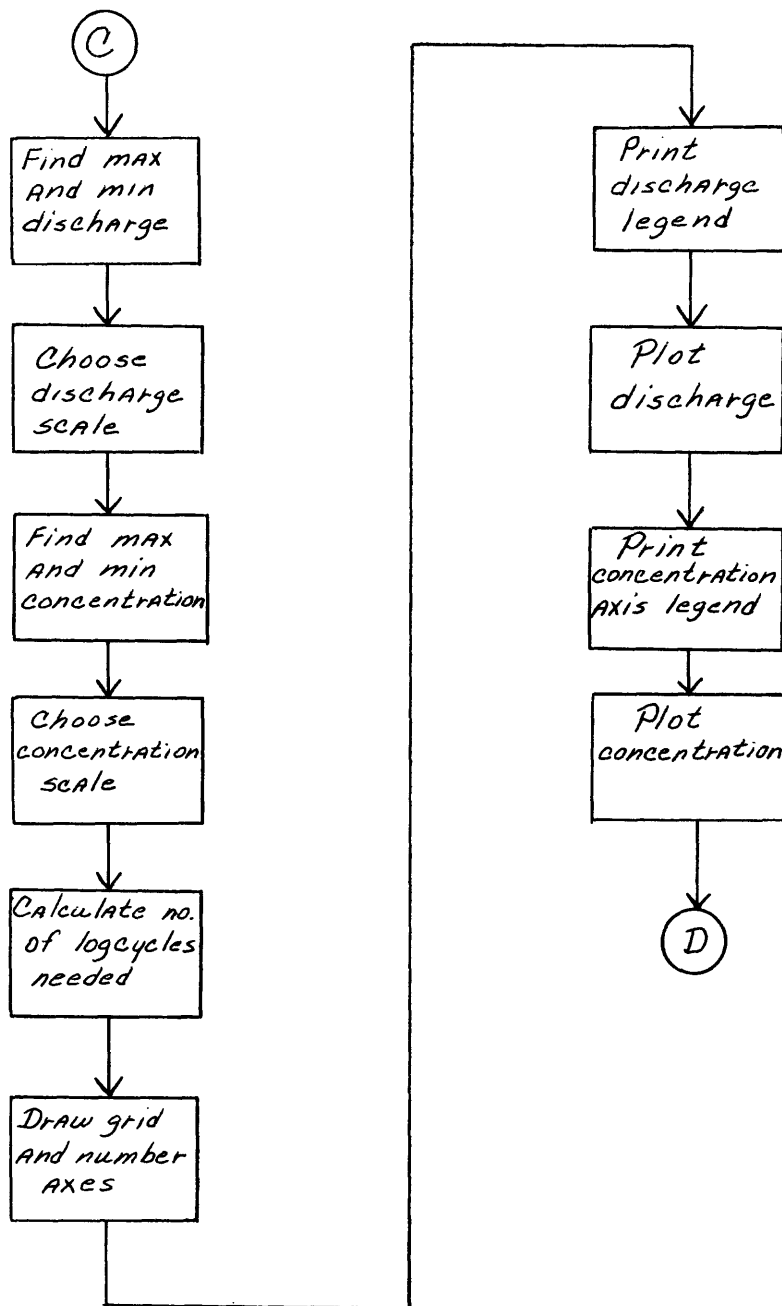


Figure 2.--Screen Plotting, Micro Flowchart

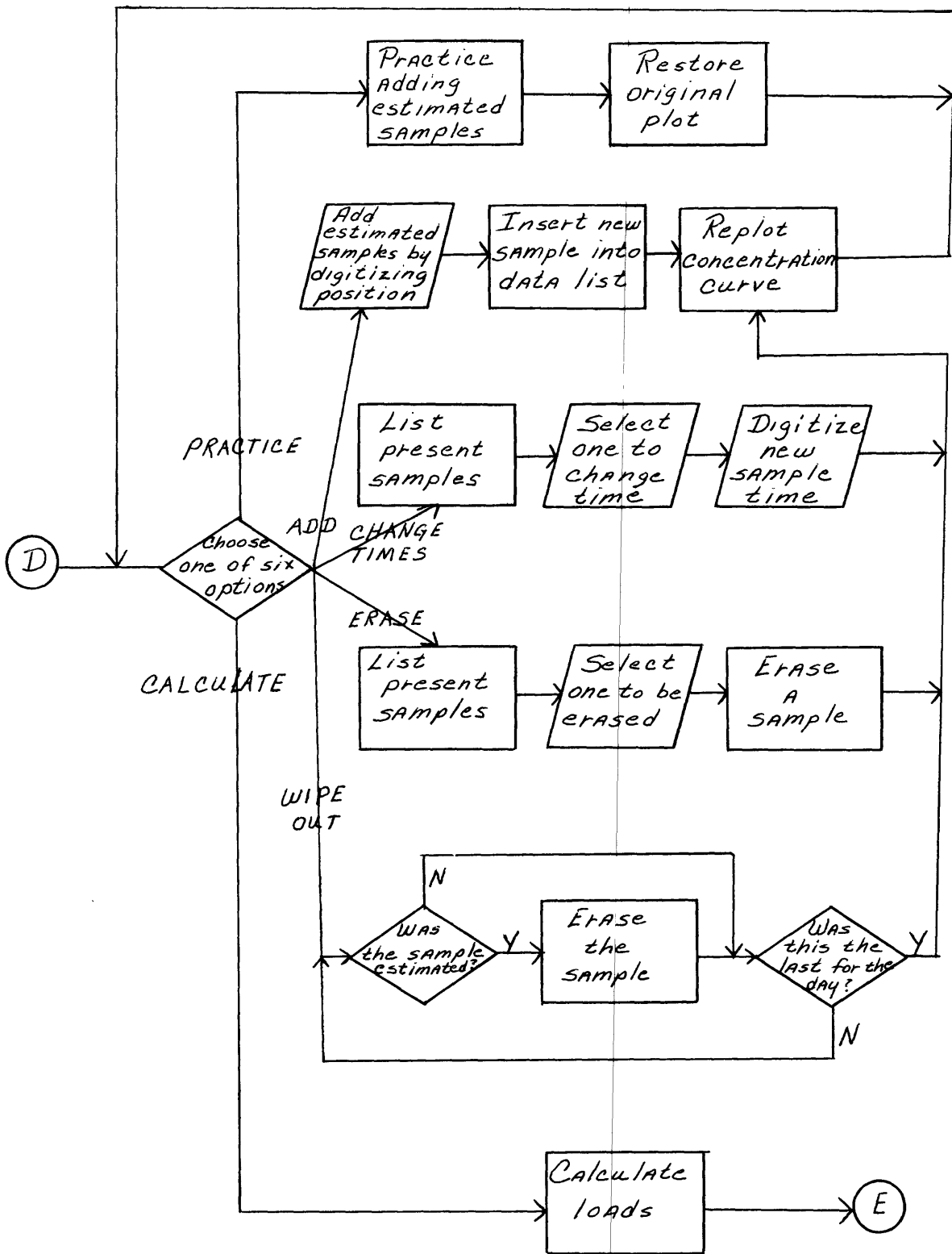


Figure 3.--Modifying Concentration Plots, Micro Flowchart

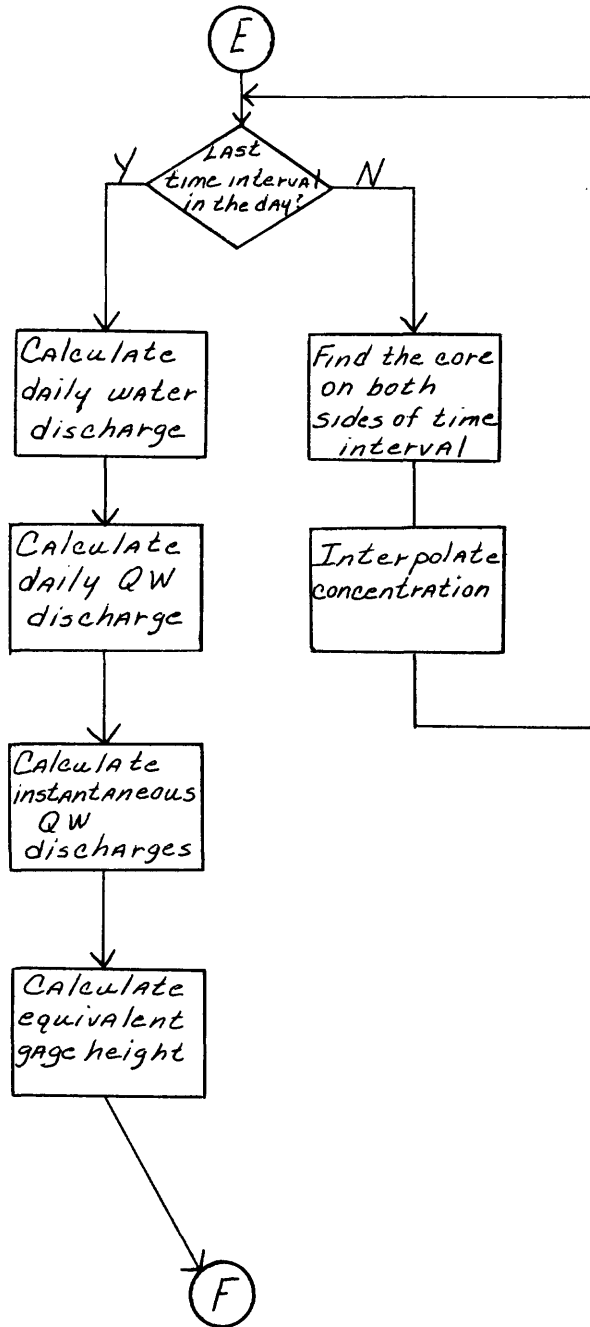


Figure 4.--Calculating QW Discharge, Micro Flowchart

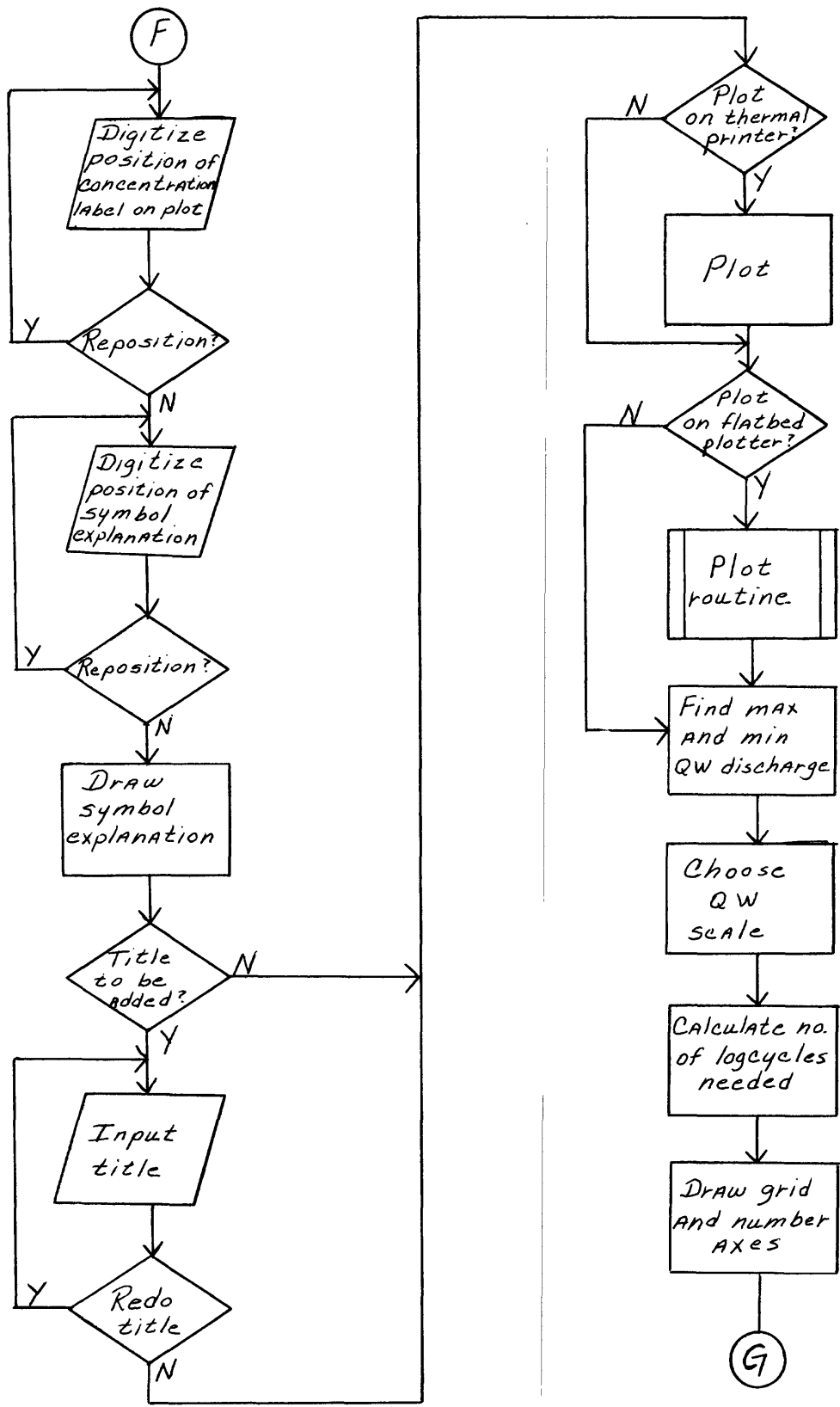


Figure 5.--Final Plotting on Paper, Micro Flowchart

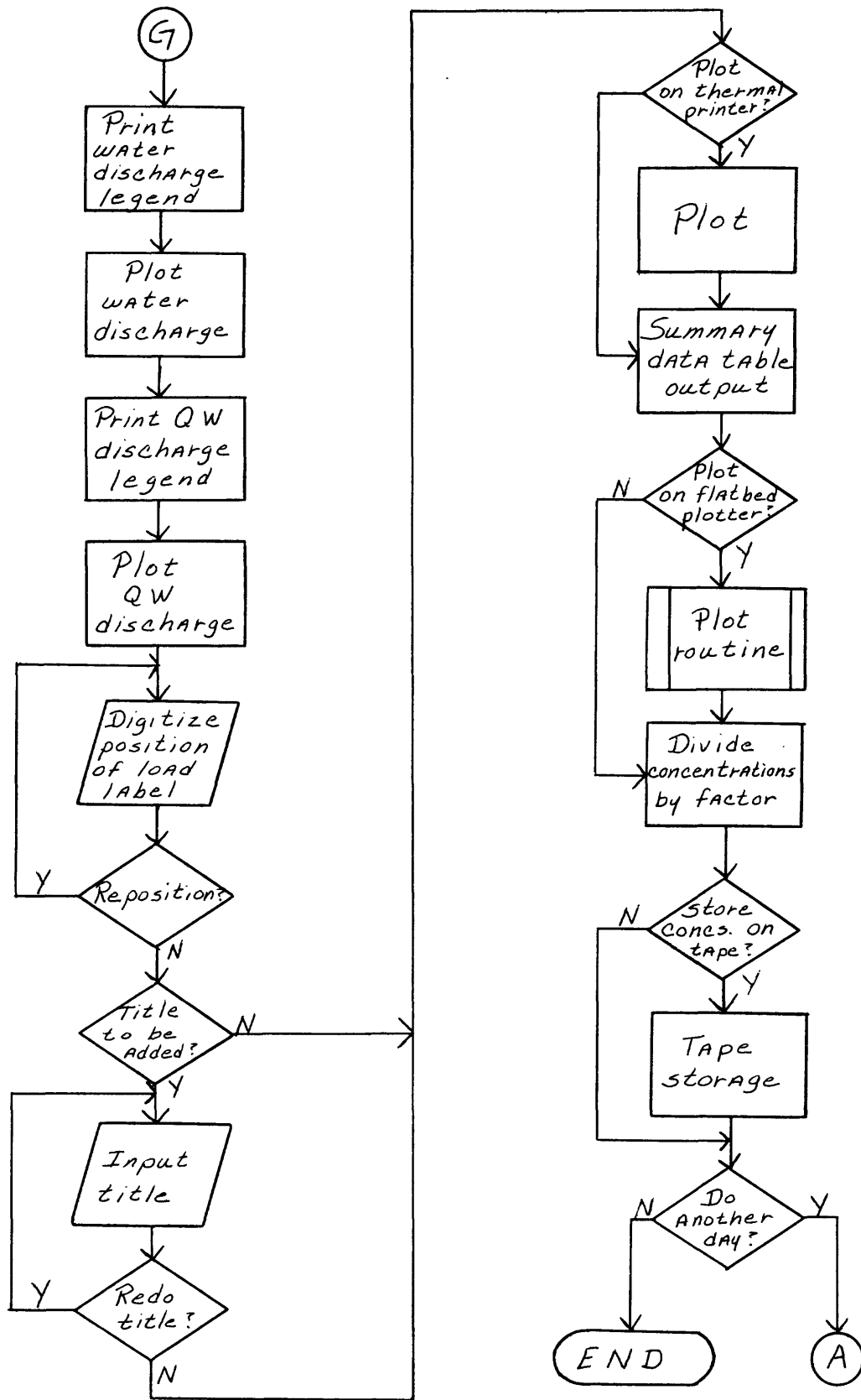
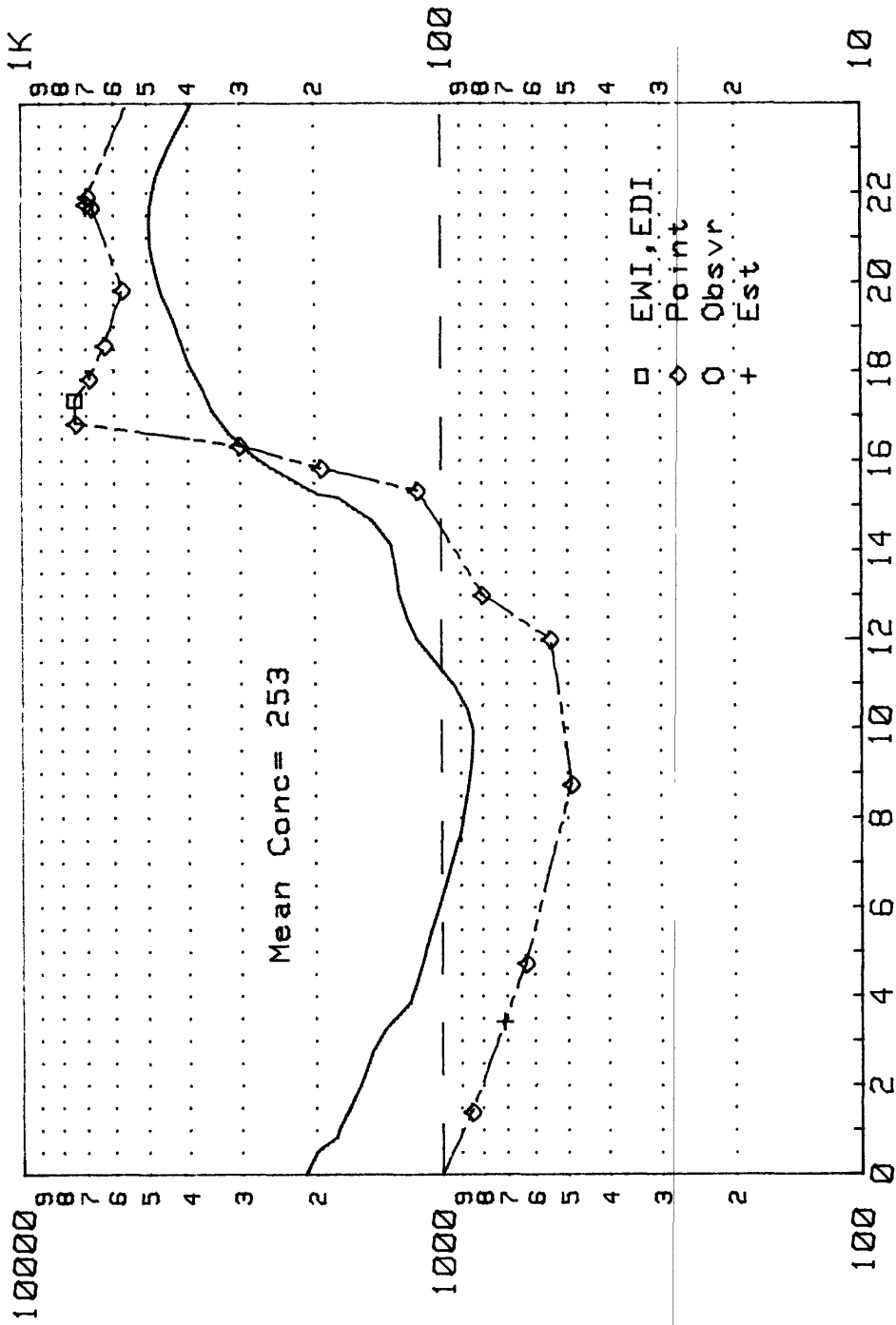


Figure 5.--Final Plotting on paper, Micro Flowchart

SEDIMENT CONCENTRATION, IN MILLIGRAMS PER LITER



Time (2-25-79)

03226885

Figure 6.--Water Discharge and Sediment Concentration Versus Time

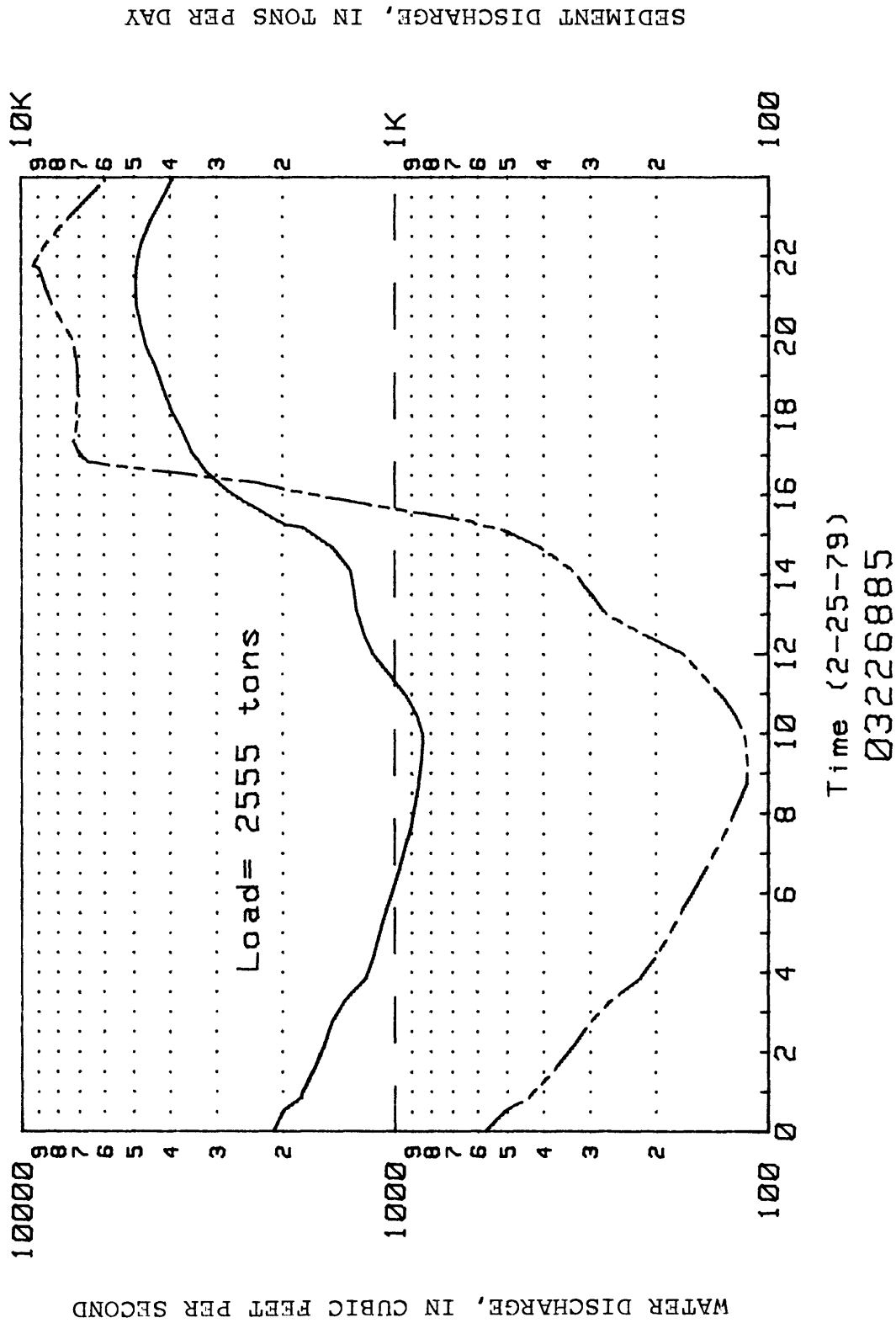


Figure 7.--Water and Sediment Discharges Versus Time

Table 2.--SEDO summary data table

```

.....
      HENDERSON RD. (OLENT. R)      2-25-79      QW DISCHARGE= 2555 tons/day
      Date   Time   Conc.  Type      Q= 2257 cfs
64  2/24/79  2330   106.0  Pt.
65  2/25/79  0125    85.0  Pt.      Mean Conc= 252.9 mg/l      Mean Ght= 69.23
66  2/25/79  0325    71.0  Est      Equiv Conc= 419.3 mg/l     Equiv Ght= 69.53
67  2/25/79  0445    63.0  Pt.
68  2/25/79  0845    49.0  Pt.
69  2/25/79  1200    55.0  Pt.
70  2/25/79  1300    80.0  Pt.
71  2/25/79  1520   114.0  Pt.
72  2/25/79  1550   193.0  Pt.
73  2/25/79  1620   303.0  Pt.
74  2/25/79  1650   742.0  Pt.
75  2/25/79  1720   746.0  EWI
76  2/25/79  1750   687.0  Pt.
77  2/25/79  1835   631.0  Pt.
78  2/25/79  1950   573.0  Pt.
79  2/25/79  2140   676.0  Pt.
80  2/25/79  2145   699.0  Pt.
81  2/25/79  2155   693.0  Pt.
82  2/26/79  0010   546.0  Pt.

```

Processed by D.R.Helse1 3/5/82

Using Rating # 2

POSSIBLE MODIFICATIONS

1. If, because of memory limitations, the program should need to be split into two parts, this could be done at the beginning of section II in Table 1 (line 4190 of the program listing).
2. If unit discharge information were available as program input, all of section I except the input of concentration data could be eliminated and replaced with discharge input.
3. The program at present expects 5-minute gage-height data as input. To modify for another time interval, the time interval should be input between lines 240 and 250. The variables "Hour" and "Min" first found in lines 860 and 870 should then have upper limits other than 23 and 11. The variable "Ti"; found first in line 3390 can then be easily changed so that midinterval calculations will have the appropriate lengths of time.
4. Input of the station number as a string variable should replace lines 370-400 and 420-440.
5. An optional subroutine to plot concentrations on a linear rather than logarithmic scale is available; contact the USGS Ohio District office (975 W. Third Avenue, Columbus, Ohio 43212, (614) 469-5553).
6. Three types of V-diagram shifts, the types most commonly used within the Ohio District, can be entered by this program. Other types may be added to lines 3280 through 3370.
7. For water-quality parameters other than sediment, input of a short variable name should be added to the concentration input section. This name can then replace "SedQ" on the water-quality discharge plot.

SUMMARY

As computers increase in memory capacity while decreasing in size, in-house data manipulation becomes more feasible. SEDQ performs water quality calculations and produces graphs in a similar fashion to other programs for much larger computers (Porterfield, 1972, p. 42; Robert Bodoh, U.S. Geological Survey, Madison, Wis., oral communication, 1982). Its uniqueness lies in being programmed for a microcomputer with graphics display screen, allowing prompting of the user and interactive modification of concentration plots. It computes water-quality discharges much more quickly and efficiently than current manual methods. SEDQ could be a model program for micro computer and minicomputer systems likely to be used by the USGS in the near future.

REFERENCE

Porterfield, George, 1972, Computation of fluvial-sediment discharge, U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chapter C3, 66 p.

PROGRAM LISTING

Explanation of Major Variable Names

Ar(24,12)	Gage height array (Hour, Min/punch interval)
Q(24,12)	Discharge array
Mgl(24,12)	Interpolated instantaneous concentration array
Load(24,12)	Instantaneous QW discharge array
Ti(24,12)	Time interval array for subdivision
Mo(800)	Month of QW sample time
Da(800)	Day of QW sample time
Yr(800)	Year of QW sample time
Conc(800)	Concentrations of QW samples
Fctr(800)	Sediment rating coefficient
Type\$(800)	Type of QW sample (EWI, etc.)
Factor(800)	A value used to calculate the number of days between dates.
Tl00(800)	Decimal time (in 1/100 of hours) for samples
Bkpts(30,2)	Gage height and Q of rating breakpoints
S(12,31)	Daily shifts for the WY
Point(3)	High, base, and low points of V-diagram
Vshift(3)	Amount of sh shift at each point
Ratnum	Number of discharge rating curve
Tp	Amount of daily shift entered
Wyear	Water Year
Statnum\$	Station number
File\$	Gage height tape file name

Explanation of Major Variable Names--Continued

N\$	Station name
Cfirst	Last sample from previous day
Clast	First sample on next day
Yscale	Maximum for discharge axis scale
Ybase	Minimum for discharge axis scale
Sedscale	Maximum for QW axis scale
Sbase	Minimum for QW axis scale
Logcycle	Number of logcycles required for plotting
Equiv	Equivalent gage height (ft)
Totq	Daily water discharge (cfs)
Qsed	QW daily discharge (tons/day)

```

10      !                               SEDQ                               6/03/82 version
20      ! A PROGRAM TO CALCULATE DAILY SEDIMENT or QW LOADS.
        by Dennis R. Helsel WRD,USGS,Columbus,Ohio Language:
        HP-BASIC Equip: HP 9845T
30      OPTION BASE 1
40      SHORT Ar(0:23,0:11),Q(0:23,0:11),Ti(0:23,0:11),S(12,31)
        ,Bkpts(30,2),Offset,B(30),Qlog(30),Ax,Bx,Cx,Dx,Nn,Nl,
        J1,J2,Qlast,Dum,Tp(20),Factor(0:800),Denom,Ymax
50      SHORT Stest(12),Sedscale,Tl00(800),Xnull,Ynull,
        Mgl(0:23,0:11),Tdec(0:23,0:11),Load(0:23,0:11),Totq,
        Divisor,Sx,Sy,Lx,Ly,Px,Py,Ymin(0:23),Ymin,Smax,Smin
60      SHORT Fctr(0:800),Conc(0:800),Point(5,3),Vshift(5,3),
        Effday(5)
70      INTEGER Mon,Day,Year,K,F,Check,Hour,Min,Kk,I,Mo(0:800),
        Da(0:800),Yr(0:800),L,M,Ratnum,Newrat,Dom(12),Wyear,D,
        Iday,Imon,Endmon,Endday,Endyear,Xlabel,V
80      INTEGER J,Time(0:800),C,Plot(16381),Screen(16381),Wait,
        Logcycle,Ybase,Decade,Interval,Sbase,Pt,Yscale,
        Ytest(10),Type(0:800)
90      DIM N$(27),K$(4),Dash$(4),Ratnum$(2),Rat$(6),Date$(8),
        Store$(6),Fig$(54),Type$(0:800)[3],Vd$(1),Old$(8)
100     COM Statnum$(8),Today$(8),Id$(30)
110     REAL Dayadd,Slope,Qsed
120     EXIT GRAPHICS
125     !***** DATA INPUT SECTION *****

130     MASS STORAGE IS ":T15"
140     LOAD KEY "SEDKEY"
150     DATA 31,28,31,30,31,30,31,31,30,31,30,31
160     MAT READ Dom
170     F=0
180     Dash$="~~~~"
190     PRINT PAGE,TAB(38),"SEDQ",LIN(5),TAB(23),"PUT GAGE
        HEIGHT DATA TAPE INTO T14",LIN(3),TAB(23),"PUT SEDQ
        OVERLAY ON KEYS k0 - k15"
200     INPUT "Your ID ? (initials, nickname,etc.) ",Id$
210     INPUT "Today's date ? (Month/Day/Year)",Today$
215     !----- Gage Height Input from Tape -----
220     Enter: PRINT PAGE,TAB(34),"GAGE HEIGHTS",LIN(5),TAB(13),
        "Enter the file name(HE220,etc.) for the station and
        date"
230     PRINT LIN(1),TAB(25),"you want to get from the tape"
240     INPUT File$
250     MASS STORAGE IS ":T14"
260     PRINT PAGE
270     ON ERROR GOTO Nofile
280     Assign1: DISP " I AM GETTING YOUR DATA"
290     ASSIGN #1 TO File$
300     OFF ERROR
310     ON END #1 GOTO Nodata

```

```

320 IF LEN(File$)<5 THEN 350
330 READ #1;N$,Mon,Day,Year,Ar(*)           ! serial, name=5
      or 6 digits
340 GOTO 370
350 INPUT "WHICH DAY DO YOU WANT DATA FOR ??",K
360 READ #1,K;N$,Mon,Day,Year,Ar(*)       ! random, name=3
      or 4 digits
370 IF File$[1,2]="WO" THEN Statnum$="03226800"
380 IF File$[1,2]="HE" THEN Statnum$="03226885"
390 IF File$[1,2]="BE" THEN Statnum$="03226875"
400 IF File$[1,2]="LI" THEN Statnum$="03226870"
410 Wyear=Year
420 IF File$[1,2]="RU" THEN Statnum$="03226865"
430 IF File$[1,2]="SA" THEN Statnum$="03144400"
440 IF File$[1,2]="CO" THEN Statnum$="03110983"
450 IF (Mon=10) OR (Mon=11) OR (Mon=12) THEN Wyear=Year+1
460 IF Wyear>80 THEN Ar(0,0)=2*Ar(0,1)-Ar(0,2)      ! 81WY
      2400 PUNCH STORED IN 0,0
470 Date$=VAL$(Mon)&"-"&VAL$(Day)&"-"&VAL$(Year)
480 IF F=0 THEN Newshift                    ! F=0 for 1st file
490 IF Statnum$=Old$ THEN Okay             ! Old$=no. of last station
495 ! ----- Shift Input from Tape or Keyboard -----
500 Newshift: Wyear$=VAL$(Wyear)
510 Shift$="S-"&File$[1,2]&Wyear$          ! NAME OF SHIFT FILE
520 ON ERROR GOTO Noshift
530 Assign2: DISP " I AM GETTING SHIFTS FOR THE WATER YEAR"
540 ASSIGN #2 TO Shift$
550 READ #2;Check,S(*),Vd$,Point(*),Vshift(*),Effday(*)
560 OFF ERROR
570 Okay: IF Check<>Wyear THEN Newshift
580 IF (Vd$="Y") AND (S(Mon,Day)<>0) THEN GOTO Vdcalc
      ! Computing V-diagrams
590 MAT Ar=(S(Mon,Day))+Ar
595 !----- Rating Table Input from Tape -----
600 INPUT "With the rating tape in T15, ENTER THE RATING
      TABLE # TO BE USED",Ratnum
610 MASS STORAGE IS ":T15"
620 Ratnum$=VAL$(Ratnum)
630 IF Ratnum<10 THEN Ratnum$="0"&Ratnum$
640 Rat$=Statnum$[5,8]&Ratnum$
650 ON ERROR GOTO Norat
660 Assign3: DISP " I AM GETTING THE RATING CURVE ";Rat$
670 ASSIGN #3 TO Rat$
680 OFF ERROR
690 READ #3;Bkpts(*),Offset,Statnum$,N$,Ratnum$,Endmon,
      Endday,Endyear
700 Rattest: IF Year>Endyear THEN 750
710 IF (Year=Endyear) AND (Mon>Endmon) THEN 750
720 IF (Year=Endyear) AND (Mon=Endmon) AND (Day>Endday)
      THEN 750

```



```

730 GOTO 790
740 IMAGE @////////15X,"Are you sure that rating #DD,"
    is the correct rating"//33X"for "8A"?"
750 PRINT USING 740;Ratnum,Date$
760 INPUT " YES or NO ??",K$
770 IF K$[1]="Y" THEN 790
780 GOTO 600
790 DISP " I AM CALCULATING THE DISCHARGES"
800 FOR I=1 TO 30
810 IF Bkpts(I,1)=0 THEN 850
820 B(I)=LGT(Bkpts(I,1)-Offset)      ! B is log of bkpt Ght
830 Qlog(I)=LGT(Bkpts(I,2))      ! Qlog= log of bkpt discharge
840 NEXT I
850 Kk=I-1                          ! Kk is # of breakpts
860 FOR Hour=0 TO 23
870 FOR Min=0 TO 11
880 !----- Calculating Unit Q's -----
890 IF Ar(Hour,Min)<Offset THEN 1030
900 Nn=LGT(Ar(Hour,Min)-Offset)      ! Nn is log of input Ght
910 IF (Nn<B(1)) OR (Nn>B(Kk)) THEN 1060
    ! When Nn is outside rating
920 IF (Hour=0) AND (Min=0) THEN 950      ! 1st point
930 IF Nn=N1 THEN 1090      ! N1 is previous Ght
940 IF (Nn<J1) AND (Nn>J2) THEN 1120
    ! If same rating seg as last pt
950 FOR I=1 TO 30
960 IF Nn=B(I) THEN 1000
970 IF Nn<B(I) THEN 1160
980 NEXT I
990 GOTO 1160
1000 Q(Hour,Min)=Bkpts(I,2)
1010 J1=1000
1020 GOTO 1240
1030 Q(Hour,Min)=-99.99      ! Missing data or Ght<Offset
1031 PRINTER IS 0
1032 PRINT "WARNING: GAGE HEIGHT(";DROUND(Ar(Hour,Min),4);"
    ) AT ";100*Hour+5*Min;" IS MISSING OR BELOW OFFSET !"
1033 PRINTER IS 16
1040 J1=1000
1050 GOTO 1240
1060 Q(Hour,Min)=0      ! When outside rating
1061 PRINTER IS 0
1062 PRINT "WARNING: GAGE HEIGHT(";PROUND(Ar(Hour,Min),-2);"
    ") AT ";100*Hour+5*Min;" IS OUTSIDE THE RATING !"
1063 PRINTER IS 16
1070 J1=1000
1080 GOTO 1240
1090 Q(Hour,Min)=Qlast      ! Q same as last point
1100 J1=1000
1110 GOTO 1240

```

```

1120 J1=B(I) ! J1=Top bkpt of last segment
1130 J2=B(I-1) ! J2=Bottom bkpt of last seg.
1140 Bx=Nn-J2 !Bx=Diff in Ght btwn input & J2
1150 GOTO 1200
1160 Ax=Qlog(I-1) ! Ax=logQ of low bkpt
1170 Bx=Nn-B(I-1) ! Bx=(Input-J2) Ght
1180 Cx=Qlog(I)-Qlog(I-1) ! Cx=delta log of bkpt Q's
1190 Dx=B(I)-B(I-1) ! Dx=delta log of bkpt Ghts
1200 Dum=Ax+Bx*(Cx/Dx) ! Dum=interpolated input logQ
1210 Q(Hour,Min)=10^Dum
1220 J1=B(I)
1230 J2=B(I-1)
1240 N1=Nn
1250 Qlast=Q(Hour,Min)
1260 Nextmin: NEXT Min
1270 NEXT Hour
1280 GOTO Timeinterval
1285 !----- Error and Data Entering Subroutines -----
1290 ! ~~~~~ No rating or incorrect tape ~~~~~
1300 Norat: IF (ERRN=56) AND (ERRL=670) THEN Switchtape
1305 IF ERRL=4160 THEN Replacetape
1310 IF (ERRN=80) AND (ERRL=670) THEN Ntape
1320 DISP ERRM$
1330 PAUSE
1340 GOTO Assign3
1350 Switchtape: PRINT PAGE,LIN(3),TAB(13),"THE RATING YOU
REQUESTED (";Rat$;) IS NOT ON THIS TAPE",LIN(5),
TAB(13),"Please put the correct tape in T15, and"
1360 PRINT TAB(52),"...PRESS CONT",LIN(10),TAB(9),"I'm
sorry, but if you haven't stored the correct rating on
tape yet,"
1370 DISP TAB(17),"you'll have to do that first, and then
start over."
1380 PAUSE
1390 PRINT PAGE
1400 GOTO Assign3
1402 Replacetape: PRINT PAGE,TAB(20),"PLEASE REPLACE THE
SEDPK TAPE INTO T15",LIN(4),TAB(55),"...and PRESS
CONT"
1404 PRINT LIN(9),TAB(68),"SEDPK TAPE",LIN(1),TAB(73),"|",
LIN(1),TAB(73),"|";LIN(1),TAB(73),"|";LIN(1),TAB(73),
"v"
1406 PAUSE
1408 GOTO 4160
1410 ! ~~~~~ When no shifts entered yet ~~~~~
1420 Noshift: IF (ERRN=56) AND (ERRL=540) THEN Doshifts
1430 IF (ERRN=80) AND (ERRL=540) THEN Not_t14
1440 DISP ERRM$
1450 BEEP
1460 PAUSE

```

```

1470 GOTO Assign2
1480 ! ~~~~~ No tape in T15 ~~~~~
1490 Ntape: BEEP
1500 DISP " "
1510 PRINT PAGE,LIN(5),TAB(10),"** PLEASE PUT THE TAPE
CONTAINING THE RATING CURVE INTO T15 **",LIN(10),
TAB(61),"...and PRESS CONT."
1520 PAUSE
1530 PRINT PAGE
1540 GOTO Assign3
1550 ! ~~~~~ Shift tape not in T14 ~~~~~
1560 Not_t14: BEEP
1570 DISP " "
1580 PRINT PAGE,LIN(5),TAB(13),"** PLEASE PUT THE TAPE
CONTAINING THE SHIFTS INTO T14 ** ",LIN(10),TAB(61),
"...and PRESS CONT."
1590 PAUSE
1600 PRINT PAGE
1610 GOTO Assign2
1620 !~~~~~ If no data stored in file ~~~~~
1630 Nodata:PRINT PAGE,LIN(2),TAB(12),"There is no data for
this day stored on the tape.....Sooo"
1640 BEEP
1650 WAIT 3000
1660 GOTO Nextfile
1670 !~~~~~ Wrong file name or T14 tape out ~~~~~
1680 Nofile:IF (ERRN=56) AND (ERRL=290) THEN 1740
1690 IF (ERRN=80) AND (ERRL=290) THEN Not14
1700 DISP ERRM$
1710 BEEP
1720 PAUSE
1730 GOTO Assign1
1740 PRINT PAGE,LIN(3),"There is no file by this name (";
File$;")",LIN(4),TAB(35),"TRY AGAIN"
1750 BEEP
1760 WAIT 4000
1770 GOTO Enter
1780 Not14: BEEP
1790 DISP " "
1800 PRINT PAGE,LIN(5),TAB(10),"** PLEASE PUT THE TAPE
CONTAINING THE GAGE HT. DATA INTO T14 ** ",LIN(10),
TAB(61),"...and PRESS CONT."
1810 PAUSE
1820 PRINT PAGE
1830 GOTO Assign1
1840 ! ~~~~~ When all shifts=0 ~~~~~
1850 Zeroshift: PRINT PAGE,LIN(3),TAB(35),"NO SHIFTS"
1860 INPUT "Is this data correct ?? YES or NO ?",K$
1870 IF K$[1]="N" THEN Doshifts
1880 MAT S=ZER

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1890 GOTO Storeshift
1900 ! ~~~~~~ When 9872 not linked to this HP ~~~~~~
1910 No9872: BEEP
1920 IF ERRN=150 THEN 1960
1930 DISP ERRM$
1940 PAUSE
1950 RETURN
1960 PRINT PAGE,LIN(5),TAB(20),"I'm sorry, but the 9872 is
not hooked up to this H-P."
1970 WAIT 5000
1980 RETURN
1990 ! ~~~~~~ Entering shifts ~~~~~~
2000 IMAGE @36X"SHIFTS"////12X"Please enter any shifts for
"27A//28X"for the 19"DD" Water Year."
2003 Doshifts: INPUT "ARE SHIFTS ALREADY STORED ON TAPE FOR
THIS WY ??",K$
2005 IF K$[1,1]="Y" THEN Not_t14
2010 INPUT "IS THIS A V-diagram SHIFT ??",Vd$
2020 IF Vd$[1,1]="Y" THEN GOSUB Vdenter
2030 PRINT USING 2000;N$,Wyear
2040 IF Vd$[1,1]="Y" THEN 2070
2050 PRINT LIN(5),TAB(13),"(ENTER MO,DA,YR, Amount of shift
.....THEN PRESS CONT.)"
2060 GOTO 2080
2070 PRINT LIN(5),"(ENTER MO,DA,YR, Amount of shift at
the base gage height.....",LIN(2),TAB(58),
".....THEN PRESS CONT.)"
2080 INPUT "PRESS k5 WHEN ALL SHIFTS DONE (right now if no
shifts for year)",Mo(1),Da(1),Yr(1),Tp(1)
2090 FOR L=2 TO 20
2100 PRINT PAGE
2110 FOR M=1 TO L-1
2120 PRINT USING "19X,DD,A,DD,A,DD,20X,DD.DD";Mo(M),"-",
Da(M),"-",Yr(M),Tp(M)
2130 NEXT M
2140 IMAGE ///14X"Enter any more shifts for "25A//26X"for
the 19"DD" Water Year."
2150 PRINT USING 2140;N$,Wyear
2160 IF Vd$[1,1]="Y" THEN 2190
2170 PRINT LIN(5),TAB(13),"(ENTER MO,DA,YR, Amount of shift
.....THEN PRESS CONT.)"
2180 GOTO 2200
2190 PRINT LIN(5),"(ENTER MO,DA,YR, Amount of shift at
the base gage height.....",LIN(2),TAB(58),
".....THEN PRESS CONT.)"
2200 INPUT "PRESS k5 WHEN ALL SHIFTS DONE ",Mo(L),Da(L),
Yr(L),Tp(L)
2210 NEXT L
2220 Outloop: IF (Mo(1)=0) AND (Da(1)=0) AND (Yr(1)=0) THEN
Zeroshift

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2230 PRINT PAGE
2240 FOR M=1 TO L-1
2250 PRINT USING "19X,DD,A,DD,A,DD,20X,DD.DD";Mo(M),"-",
Da(M),"-",Yr(M),Tp(M)
2260 NEXT M
2270 INPUT "IS THIS DATA CORRECT ? YES or NO ??",K$
2280 IF K$[1]="N" THEN Doshifts
2290 ! ~~~~~ Calculating shifts ~~~~~
2300 FOR L=1 TO 20
2310 IF Mo(L)=0 THEN Proceed
2320 ! ~~~~~ Calculating time between points ~~~~~
2330 GOSUB Timer
2340 GOTO Lnext
2350 Timer:IF Mo(L)>2 THEN 2380
2360 Factor(L)=365*(1900+Yr(L))+Da(L)+31*(Mo(L)-1)+INT
((1900+Yr(L)-1)/4)-INT(.75*INT((1900+Yr(L)-1)/100+1))
2370 GOTO 2390
2380 Factor(L)=365*(1900+Yr(L))+Da(L)+31*(Mo(L)-1)-INT(.4*
Mo(L)+2.3)+INT((1900+Yr(L))/4)-INT(.75*(INT((1900+
Yr(L))/100)+1))
2390 RETURN
2400 Lnext:NEXT L
2410 Proceed: FOR M=2 TO L-1
2420 Denom=Factor(M)-Factor(M-1)
2430 Dayadd=(Tp(M)-Tp(M-1))/Denom ! Dayadd=Daily
incremental shift
2440 FOR D=0 TO Denom
2450 Imon=Mo(M-1)
2460 Iday=Da(M-1)+D
2470 IF Iday<=Dom(Imon) THEN Skip
2480 Iday=Iday-Dom(Imon)
2490 Imon=Imon+1
2500 IF Imon<13 THEN 2470
2510 Imon=Imon-12
2520 GOTO 2470
2530 Skip: S(Imon,Iday)=DROUND(Tp(M-1)+D*Dayadd,3)
! S=Shift array
2540 NEXT D
2550 NEXT M
2560 IMAGE @/////15X"WOULD YOU LIKE A PRINTOUT OF THE
SHIFTS FOR THE"//31X"19",DD," WATER YEAR?"
2570 PRINT USING 2560;Wyear
2580 INPUT "YES or NO ??",K$
2590 IF K$[1]="N" THEN Storeshift
2600 PRINTER IS 0
2610 IMAGE 4X"SHIFTS--19"DD" Water Year"3X,27A,10X"Entered
by ",10A,4X8A
2620 PRINT USING 2610;Wyear,N$,Id$,Today$
2630 IMAGE +/"Month: 10 11 12 1 2
3 4 5 6 7 8 9 "/"Day"

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2640 PRINT USING 2630
2650 IMAGE 3XDDX,12(MD.DDX)
2660 FOR D=1 TO 28
2670 PRINT USING 2650;D,S(10,D),S(11,D),S(12,D),S(1,D),
S(2,D),S(3,D),S(4,D),S(5,D),S(6,D),S(7,D),S(8,D),
S(9,D)
2680 NEXT D
2690 IMAGE 3XAAX,4(MD.DDX),X4AX,7(MD.DDX)
2700 PRINT USING 2690;"29",S(10,D),S(11,D),S(12,D),S(1,D),
Dash$,S(3,D),S(4,D),S(5,D),S(6,D),S(7,D),S(8,D),S(9,D)
2710 PRINT USING 2690;"30",S(10,D),S(11,D),S(12,D),S(1,D),
Dash$,S(3,D),S(4,D),S(5,D),S(6,D),S(7,D),S(8,D),S(9,D)
2720 IMAGE 3XAAX,MD.DDX,X4AX,2(MD.DDX),X4AX,MD.DDX,X4AX,
MD.DDX,X4AX,2(MD.DDX),X4AX///
2730 PRINT USING 2720;"31",S(10,D),Dash$,S(12,D),S(1,D),
Dash$,S(3,D),Dash$,S(5,D),Dash$,S(7,D),S(8,D),Dash$
2740 PRINTER IS 16
2750 Storeshift: PRINT PAGE
2760 CREATE Shift$,1,1650
2770 ASSIGN #2 TO Shift$
2780 Check=Wyear
2790 PRINT #2;Check,S(*),Vd$,Point(*),Vshift(*),Effday(*)
2800 GOTO 560
2810 Baddata: PRINT PAGE,TAB(24),"YOUR CONCENTRATION DATA
DOES NOT",LIN(2),TAB(18),"INCLUDE POINTS ONE DAY
BEFORE AND AFTER ";Date$
2820 BEEP
2830 PRINT LIN(2),TAB(26),"Date Time Conc. Type
Factor"
2840 IF Factor(1)>=Factor(0) THEN Nofirst
2850 Nolast: FOR I=C-3 TO C
2860 PRINT USING 6770;I,Mo(I),"/",Da(I),"/",Yr(I),Time(I),
Conc(I),Type$(I),Fctr(I)
2870 NEXT I
2880 IF Factor(1)>=Factor(0) THEN DISP "Add a sample using
SEDPK for the day prior to ";Date$;" by PRESSING
CONT."
2890 IF Factor(C)<=Factor(0) THEN DISP "Add a sample using
SEDPK for the day after ";Date$;" by PRESSING CONT."
2900 PAUSE
2910 LOAD "EDIT",250
2920 Nofirst: FOR I=1 TO 4
2930 GOTO 2860
2940 Vdenter: FOR V=1 TO 5 !~~~ Entering v-diagrams ~~~
2950 PRINT PAGE,TAB(35),"V-DIAGRAMS",LIN(3),TAB(28),"Enter
the V-";V;" data below:",LIN(2),TAB(24),"(If there is
no V-";V;" , then PRESS k0)"
2960 INPUT "GAGE HEIGHT OF HIGH POINT , Value of shift at
high point ?",Point(V,1),Vshift(V,1)
2970 INPUT "BASE GAGE HEIGHT , Value of shift at base gage

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height ?",Point(V,2),Vshift(V,2)
2980 INPUT "GAGE HEIGHT OF LOW POINT , Value of shift at
low point ?",Point(V,3),Vshift(V,3)
2990 INPUT "EFFECTIVE DATE (first day) OF THIS V-DIAGRAM ?
--- Month,Day,Year",M,D,Y
3000 Effday(V)=10000*Y+100*M+D
3010 PRINT PAGE,TAB(38),"V-";V,LIN(3),TAB(29),"IS THIS DATA
CORRECT ?",LIN(4)
3020 GOSUB 3040
3030 GOTO 3110
3040 PRINT USING 3050;"Starting Date= ";INT(FRACT(Effday(V)
/10000)*100);"-";INT(FRACT(Effday(V)/100)*100);"-";
INT(Effday(V)/10000)
3050 IMAGE 22X,"Gage Ht",5X,"Shift",8X15A,DD,A,DD,A,DD
3060 IMAGE 14X,4A,5X,DD.DD,7X,D.DD
3070 PRINT USING 3060;"HIGH",Point(V,1);Vshift(V,1)
3080 PRINT USING 3060;"BASE",Point(V,2);Vshift(V,2)
3090 PRINT USING 3060;"LOW",Point(V,3);Vshift(V,3)
3100 RETURN
3110 INPUT " Y or N ??",K$
3120 IF K$[1,1]="N" THEN 2950
3130 NEXT V
3140 Vdone: PRINT PAGE
3150 I=V
3160 FOR V=1 TO I-1
3170 PRINT LIN(2),TAB(30),"V-";V
3180 GOSUB 3040
3190 NEXT V
3200 INPUT "EVERYTHING O.K. ?",K$
3210 IF K$[1,1]="N" THEN Vdenter
3220 RETURN
3230 Vdcalc: FOR V=1 TO 4 ! FINDING WHICH V-DIAGRAM
APPLIES
3240 IF 10000*Year+100*Mon+Day<Effday(1) THEN 600
! NO SHIFT YET
3250 IF Effday(V+1)=0 THEN Vfound ! LAST V-DIAGRAM OF WY
3260 IF (10000*Year+100*Mon+Day<Effday(V+1))
AND (10000*Year+100*Mon+Day>=Effday(V)) THEN Vfound
3270 NEXT V
3280 Vfound: FOR Hour=0 TO 23 ! CALCULATING THE V-SHIFTS
3290 FOR Min=0 TO 11
3300 IF (Ar(Hour,Min)>=Point(V,2)) AND (Ar(Hour,Min)<Point
(V,1)) THEN 3305
3301 GOTO 3310
3305 Ar(Hour,Min)=Ar(Hour,Min)+(S(Mon,Day)-Vshift(V,1))/
(Point(V,2)-Point(V,1))*(Point(V,2)-Ar(Hour,Min))+
Vshift(V,1)
3310 IF Ar(Hour,Min)>=Point(V,1) THEN Ar(Hour,Min)=Ar(Hour,
Min)+Vshift(V,1)
3320 IF (Ar(Hour,Min)<Point(V,2)) AND (Vshift(V,3)=0) THEN

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Ar(Hour,Min)=Ar(Hour,Min)+S(Mon,Day)/(Point(V,2)-Point
(V,3))*(Ar(Hour,Min)-Point(V,3))
3330 IF (Ar(Hour,Min)<Point(V,2)) AND (Vshift(V,3)<>0) THEN
Ar(Hour,Min)=Ar(Hour,Min)+S(Mon,Day)
3340 IF (Ar(Hour,Min)<Point(V,3)) AND (Vshift(V,3)=0) THEN
Ar(Hour,Min)=Ar(Hour,Min)+Vshift(V,3)
3350 NEXT Min
3360 NEXT Hour
3370 GOTO 600
3380 ! ----- Time Intervals -----
3390 Timeinterval: MAT Ti=(5) ! Punch interval for
5 minute tape
3400 Ti(0,0)=2.5 ! 1st punch=0000, so 1st Ti=2.5 minutes
3410 Ti(23,11)=7.5 ! Last punch=2355,so last
Ti=7.5 minutes
3420 MAT Ti=Ti/(60) ! Time interval in hours
3430 ! ---- Concentration Input from Tape or Keyboard ----
3470 PRINT PAGE,LIN(4),TAB(19),"DO YOU WANT TO RETRIEVE
CONCENTRATION DATA",LIN(2),TAB(11),"FROM AN EXISTING
TAPE FILE, OR ENTER IT FROM THE KEYBOARD ?"
3480 PRINT ,LIN(3),TAB(25),"1. tape (put
tape into T14)",LIN(2),TAB(25),"2. From the keyboard"
3490 PRINT LIN(4),"CONCENTRATION TAPE",LIN(1)," |",LIN(1),
" |",LIN(1)," v"
3500 INPUT " 1 or 2 ??",D
3510 IF D=1 THEN GOTO Tapefile
3512 MAT Mo=ZER
3515 MAT Da=ZER
3518 MAT Yr=ZER
3520 PRINT PAGE,LIN(5),TAB(12),"Enter concentration data,
including the last data point from"
3530 PRINT LIN(1),TAB(12),"the previous day, and the first
data point for the next day."
3540 Cfirst=1
3550 IMAGE +15X,DD.,2XDD,A,DD,A,DD," @",XZZZZ,5X"Conc="
DDDD.DD,4X,"Type=",3A,4X,"Factor=",D.DD
3560 FOR L=1 TO 50
3570 DISP L;". ";
3580 INPUT "ENTER THE DATE: Month,Day,Year --IF SAME AS
LAST POINT, PRESS CONT.",Mo(L),Da(L),Yr(L)
3590 IF Mo(L)>0 THEN 3630
3600 Mo(L)=Mo(L-1)
3610 Da(L)=Da(L-1)
3620 Yr(L)=Yr(L-1)
3630 DISP L;". ";
3640 INPUT "ENTER THE TIME",Time(L)
3650 DISP L;". ";
3660 INPUT "ENTER THE CONCENTRATION",Conc(L)
3670 INPUT "ENTER THE SAMPLE TYPE (11=EWI 12=EDI 13=Point
14=Observer 15=Guess)",Type(L)

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3680 IF Type(L)=11 THEN Type$(L)="EWI"
3690 IF Type(L)=12 THEN Type$(L)="EDI"
3700 IF Type(L)=13 THEN Type$(L)="Pt."
3710 IF Type(L)=14 THEN Type$(L)="Obs"
3720 IF Type(L)=15 THEN Type$(L)="Est"
3730 IF J=1 THEN PRINT LIN(2),TAB(4),"The RATING FACTOR is
the coefficient adjusting an observer or point",LIN(2)
,TAB(4),"sample to an EWI/EDI."
3740 IF J=1 THEN PRINT LIN(2),TAB(4),"EXAMPLE: To adjust
an obs sample up 10%, the RATING FACTOR would =1.1"
3750 INPUT "ENTER THE RATING FACTOR IF IT DOES NOT
=1. (If=1 just PRESS CONT)",Fctr(L)
3760 IF Fctr(L)=0 THEN Fctr(L)=1
3770 IF L=1 THEN PRINT PAGE,TAB(19),"When all data below is
complete, PRESS k3:",LIN(2)
3780 PRINT USING 3550;L,Mo(L),"-",Da(L),"-",Yr(L),Time(L),
Conc(L),Type$(L),Fctr(L)
3790 INPUT "IS THIS DATA CORRECT ? YES or NO ??",K$
3800 IF K$[1]="N" THEN 3570
3810 DISP " ENTER DATA FOR THE NEXT POINT...."
3820 PRINT
3830 WAIT 2000
3840 NEXT L
3850 Tapefile: IF (Statnum$=Old$) AND (Mo(Cfirst)<>0)
THEN 3890
3855 Tape$=Statnum$[3,8]&":T14"
3860 ASSIGN #4 TO Tape$
3870 READ #4;N$,Mo(*),Da(*),Yr(*),Time(*),Conc(*),Type(*),
Fctr(*)
3890 Mo(0)=Mon
3900 Da(0)=Day
3910 Yr(0)=Year
3915 ! ----- Finding Samples for the Day -----
3920 Cfirst=Clast=0
3930 FOR L=0 TO 800
3940 IF Clast<>0 THEN 4000 ! How many samples are there?
3950 GOSUB Timer
3960 IF L=0 THEN 4060
3970 IF (Factor(L)=Factor(0)) AND (Cfirst=0) THEN
Cfirst=L-1
3980 IF (Factor(L)>Factor(0)) AND (Clast=0) THEN Clast=L
3990 IF (Factor(L)>Factor(0)) AND (Factor(L-1)<Factor(0))
THEN Cfirst=L-1
4000 IF Type(L)=11 THEN Type$(L)="EDI"
4010 IF Type(L)=12 THEN Type$(L)="EWI"
4020 IF Type(L)=13 THEN Type$(L)="Pt."
4030 IF Type(L)=14 THEN Type$(L)="Obs"
4040 IF Type(L)=15 THEN Type$(L)="Est"
4050 IF (Mo(L)=0) AND (Conc(L)=0) THEN Visual
4060 NEXT L

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4070 ! ***** CRT DATA PLOTS *****
4080 Visual:IF (Mo(L)=0) AND (Conc(L)=0) THEN C=L-1
      ! C=# of samples
4090 IF D=2 THEN Clast=C          ! IF D=2 THEN DATA ENTERED
      FROM KEYBOARD
4100 L=C
4110 GOSUB Timer
4120 IF (Factor(1)>=Factor(0)) OR (Factor(C)<=Factor(0))
      THEN GOTO Baddata
4130 ! PRINT PAGE,LIN(3),TAB(10),"YOU MAY CHOOSE EITHER A
      LINEAR OR SEMI-LOG PLOT OF YOUR DATA.",LIN(6),TAB(26),
      "Which do you prefer ??"
4135 L=2
4140 ! PRINT LIN(2),TAB(26),"1. LINEAR",LIN(2),TAB(26),
      "2. SEMI-LOG"
4145 MAT Conc=Conc.Fctr
4150 ! INPUT " 1 or 2 ??",L
4152 IF L=2 THEN Display
4155 ON ERROR GOTO Norat
4160 ASSIGN #9 TO "SEDlin"          ! SEDlin subprogram
      produces linear plots
4170 LINK "SEDlin",4130,4140
4180 OFF ERROR
4190 Display: PLOTTER IS "GRAPHICS"
4200 GRAPHICS
4210 SCALE -1,1,-1,1
4220 CSIZE 5
4230 LORG 5
4240 MOVE 0,.5
4250 BEEP
4260 LABEL "I Will Now Plot Your Data"
4270 MOVE 0,0
4280 CSIZE 10
4290 LABEL "PAY ATTENTION"
4300 WAIT 1000
4310 PLOTTER IS "GRAPHICS"
4320 LOCATE 12,112,19,99
4330 ! ----- Scaling Discharge Axis -----
4340 Scale: Ymax=0
4350 Ymin=Q(0,0)
4360 FOR J=0 TO 23
4370 Ymax=MAX(Q(J,0),Q(J,1),Q(J,2),Q(J,3),Q(J,4),Q(J,5),
      Q(J,6),Q(J,7),Q(J,8),Q(J,9),Q(J,10),Q(J,11),Ymax)
4380 Ymin=MIN(Q(J,0),Q(J,1),Q(J,2),Q(J,3),Q(J,4),Q(J,5),
      Q(J,6),Q(J,7),Q(J,8),Q(J,9),Q(J,10),Q(J,11),Ymin)
4390 NEXT J
4400 DATA -3,-2,-1,0,1,2,3,4,5,6
4410 RESTORE 4400
4420 MAT READ Ytest
4430 FOR I=1 TO 10

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4440 IF LGT(Ymax)<=Ytest(I) THEN 4460
4450 NEXT I
4460 Yscale=Ytest(I)
4470 FOR I=10 TO 2 STEP -1
4480 IF LGT(Ymin)>Ytest(I) THEN 4500
4490 NEXT I
4500 Ybase=Ytest(I)
4510 Logcycle=Yscale-Ybase
4520 Sedscale: !----- Scaling Concentration Axis -----
4530 Smax=0
4540 Smin=Conc(Cfirst)
4550 FOR I=Cfirst TO Clast
4560 Smax=MAX(Smax,Conc(I))
4565 IF Conc(I)=0 THEN 4580
4570 Smin=MIN(Smin,Conc(I))
4580 NEXT I
4590 GOSUB Sedaxis
4600 GOTO 5480
4610 Sedaxis: FOR I=1 TO 10
4620 IF LGT(Smax)<=Ytest(I) THEN 4640
4630 NEXT I
4640 Sedscale=Ytest(I)
4650 FOR I=10 TO 2 STEP -1
4660 IF LGT(Smin)>Ytest(I) THEN 4680
4670 NEXT I
4680 Sbase=Ytest(I)
4690 Logcycle=MAX(Yscale-Ybase,Sedscale-Sbase)
! # of logcycles for plot
4695 Plotter$="" ! If null=CRT;not=flatbed
4700 GOSUB 4720
4710 GOTO 5140
4720 SCALE 0,2400,Yscale-Logcycle,Yscale
4730 FRAME
4740 AXES 100,Logcycle,0,Yscale-Logcycle,12,1
4750 ! ----- Numbering Axes -----
4760 LORG 6
4765 IF Plotter$[1,1]="Y" THEN CSIZE 2.5
! Y=Flatbed Plot
4770 FOR Xlabel=0 TO 2200 STEP 200
4780 MOVE Xlabel,Yscale-Logcycle-Logcycle/100
4790 Label$=VAL$(Xlabel/100)
4800 LABEL Label$
4810 NEXT Xlabel
4820 LORG 8
4830 FOR Decade=Yscale-Logcycle TO Yscale-1
4840 MOVE -30,Decade
4850 LABEL 10^Decade
4860 MOVE 0,Decade
4863 IF Decade=Yscale-Logcycle THEN 4870
4865 LINE TYPE 4

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4870 DRAW 2400,Decade
4875 LINE TYPE 1
4880 Csize=2.3
4890 IF Logcycle>=4 THEN Csize=2
4900 IF (Logcycle=3) AND (Plotter$[1,1]="Y") THEN Csize=2
4905 IF Plotter$[1,1]="Y" THEN Csize=Csize-.5
4908 CSIZE Csize
4910 FOR Interval=2 TO 9
4920 LINE TYPE 2
4930 MOVE 0,Decade+LGT(Interval)
4940 FOR J=0 TO 2400 STEP 50
4950 DRAW J,Decade+LGT(Interval)
4960 NEXT J
4970 LINE TYPE 1
4980 MOVE 2385,Decade+LGT(Interval)
4990 LORG 2
5000 LABEL Interval
5010 LORG 8
5020 MOVE 0,Decade+LGT(Interval)
5030 LABEL Interval
5040 NEXT Interval
5050 CSIZE 3.3
5055 IF Plotter$[1,1]="Y" THEN CSIZE 2.5
5060 NEXT Decade
5070 MOVE -30,Decade
5080 LABEL 10^Yscale
5090 !----- Discharge Axis Legend -----
5100 DEG
5110 SETGU
5120 LDIR 90
5130 RETURN
5140 LORG 2
5150 MOVE .8,40
5160 LABEL "Q"
5170 MOVE .8,44
5180 LABEL "(cfs)"
5190 MOVE .8,55
5200 DRAW .8,65
5210 LDIR 0
5220 LORG 5
5230 MOVE 62,14.5
5240 LABEL "Time ("&Date$&")"
5250 MOVE 62,10
5260 GOSUB Uu
5270 GOTO 5450
5280 Uu: CSIZE 4
5285 IF Plotter$[1,1]="Y" THEN CSIZE 3.3
5290 LABEL Statnum$
5300 CSIZE 3.3
5310 ! ----- Plotting Discharge -----

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5320 SETUU
5330 MOVE 0,0
5340 FOR Hour=0 TO 23
5350 FOR Min=0 TO 11
5360 Time=100*Hour+Min*25/3           !Minutes in decimal format
5370 IF Q(Hour,Min)=0 THEN 5390
5380 RPLOT Time,LGT(Q(Hour,Min)),1
5390 NEXT Min
5400 NEXT Hour
5410 ! ----- Concentration Axis Legend -----
5420 SETGU
5430 LDIR 90
5440 RETURN
5450 LORG 2
5460 MOVE 121.4,38
5470 RETURN
5480 LABEL "CONC"
5490 MOVE 121.4,47
5500 LABEL "(mg/l)"
5510 GOSUB 5530
5520 GOTO 5690
5530 MOVE 121.4,60
5540 LINE TYPE 8
5550 DRAW 121.4,70
5560 LINE TYPE 1
5570 LDIR 0
5580 ! ----- Numbering Concentration Axis -----
5590 SCALE 0,2400,Sbase,Sbase+Logcycle
5600 LORG 2
5610 FOR Ylabel=Sbase TO Sbase+Logcycle
5620 MOVE 2445,Ylabel
5630 IF Plotter$(1,1)="Y" THEN MOVE 2470,Ylabel
5640 Label$=VAL$(10^Ylabel)
5650 IF 10^Ylabel>=1000 THEN Label$=VAL$(10^(Ylabel-3))&"K"
5660 LABEL Label$
5670 NEXT Ylabel
5680 RETURN
5690 GSTORE Plot(*)           ! Plot used to plot Q vs Conc
5700 ! ----- Plotting Concentrations -----
5710 Sedplot: LINE TYPE 8
5720 LORG 5
5730 MOVE 0,0
5740 FOR J=Cfirst TO Clast
5750 T100(J)=(INT(Time(J)/100)+FRACT(Time(J)/100)*5/3)*100
      !Decimal minutes
5760 IF Da(J)=Day THEN Plot
5770 T100(J)=T100(J)+2400*(Factor(J)-Factor(0))
5780 Plot: RPLOT T100(J),LGT(Conc(J))
5790 NEXT J
5800 FOR I=Cfirst TO Clast

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5810 IF Da(I)<>Day THEN 5840
5820 MOVE T100(I),LGT(Conc(I))
5830 GOSUB Symbol
5840 NEXT I
5850 WAIT 10000
5860 ! *** MODIFYING CONCENTRATION PLOT &
      COMPUTING QW DISCHARGE ***
5870 Options: EXIT GRAPHICS
5880 ON KEY #7 GOTO 6310
5890 PRINT PAGE,TAB(28),"YOUR OPTIONS You may:",LIN(4),
      TAB(5),"1. ADD estimated sediment concs. to modify the
      shape of the conc. curve."
5900 PRINT LIN(2),TAB(5),"2. PRACTICE #1 (if you are unsure
      of how to do #1 with this program)."
5910 PRINT LIN(2)," 3. ERASE one concentration specified by
      you.",LIN(3)," 4. CHANGE THE TIME of a sample."
5920 PRINT LIN(2)," 5. WIPE OUT all estimated sediment
      concentrations."
5930 PRINT LIN(2),TAB(5),"6. CALCULATE LOADS (sediment
      conc. curve is O.K.)."
5940 INPUT " CHOOSE OPTIONS BY PRESSING 1, 2, 3, 4, 5 or
      6",M
5950 ON M GOTO Add,Practice,Erase_one,Timechange,Wipeout,
      Qcalc
5960 ! ~~~~~
5970 Practice: PRINT PAGE,TAB(28),"TO ADD A NEW DATA POINT:"
      ,LIN(3),TAB(20),"A + symbol will appear on your
      graph."
5980 PRINT LIN(2),TAB(12),"You should move it to the
      location of the new data point",LIN(1),TAB(12),
      "using the following keys in the DISPLAY section:"
5990 PRINT LIN(4),TAB(24),"-";CHR$(240);" ";CHR$(224);" ";
      CHR$(248);"- ";CHR$(247);" CAUSES LARGE JUMP IN
      DIRECTION"
6000 PRINT LIN(2),TAB(12),"SHIFT plus -";CHR$(240);" ";
      CHR$(224);" ";CHR$(248);"- ";CHR$(247);" CAUSES SMALL
      JUMP IN DIRECTION"
6010 DISP " FIND THESE KEYS.....THEN TO PRACTICE, PUSH
      CONT."
6020 PAUSE
6030 PRINT PAGE,TAB(24),"TO ADD A NEW DATA POINT(cont.):",
      LIN(5),TAB(24),"As you are moving the + symbol..."
6040 PRINT LIN(3),TAB(15),"To check what conc. you are at,
      PRESS k7.",LIN(3),TAB(15),"When at the final position,
      PRESS CONT to add this data point."
6050 PAUSE
6060 DISP " "
6070 GRAPHICS
6080 MOVE 1200,Sbase-Logcycle/5.5
6090 LINE TYPE 1

```

```

6100 LABEL "** CHECK CONC.? PRESS k7 **"
6110 MOVE 1200,Sbase-Logcycle/4.4
6120 LABEL "** THRU PRACTICE?? PRESS CONT **"
6130 POINTER 1200,Sbase+Logcycle/2,2
6140 DIGITIZE Xnull,Ynull
6150 GCLEAR
6160 PRINT PAGE,LIN(8),TAB(23),"NOW THAT YOU HAVE THE HANG
OF IT...."
6170 EXIT GRAPHICS
6180 GLOAD Plot(*)
6190 LINE TYPE 8
6200 MOVE 0,0
6210 FOR J=Cfirst TO Clast
6220 RPLOT T100(J),LGT(Conc(J))
6230 NEXT J
6240 FOR I=Cfirst TO Last
6250 IF Da(I)<>Day THEN 6280
6260 MOVE T100(I),LGT(Conc(I))
6270 GOSUB Symbol
6280 NEXT I
6290 GOTO Options
6300 ! ~~~~~ Display routine while digitizing ~~~~~
6310 EXIT GRAPHICS
6320 IMAGE @10/15X"Conc="DDDDD.D,XXX" at "zzzz,12X"Q="K
6322 IF FRACT(Xnull/100)*12<11.5 THEN 6330
6325 PRINT USING 6320;PROUND(10^Ynull,-1),PROUND((INT(Xnull
/100)+FRACT(Xnull/100)*3/5)*100,0),DROUND(Q(INT(Xnull
/100),11),3) ! 60>Min>55
6327 GOTO 6340
6330 PRINT USING 6320;PROUND(10^Ynull,-1),PROUND((INT(Xnull
/100)+FRACT(Xnull/100)*3/5)*100,0),DROUND(Q(INT(Xnull/
100),PROUND(FRACT(Xnull/100)*12,0)),3)
6340 DISP TAB(29),"PRESS CONT WHEN READY"
6350 PAUSE
6360 IF M=1 THEN 6410
6365 IF M=4 THEN 7281
6370 GOTO 6140
6380 ! ~~~~~
6390 Add: GRAPHICS
6400 POINTER 1200,Sbase+Logcycle/2,2
6410 DIGITIZE Xnull,Ynull
6420 FOR J=Cfirst TO Clast
6430 IF T100(J)>Xnull THEN Insert
6440 NEXT J
6450 GOTO Replot
6460 Insert: C=C+1
6470 Clast=Clast+1
6480 FOR K=C TO J+1 STEP -1
6490 T100(K)=T100(K-1)
6500 Time(K)=Time(K-1)

```

! NEW POINT AT END

```

6510 Conc(K)=Conc(K-1)
6520 Da(K)=Da(K-1)
6530 Mo(K)=Mo(K-1)
6540 Yr(K)=Yr(K-1)
6550 Type(K)=Type(K-1)
6560 Type$(K)=Type$(K-1)
6570 Fctr(K)=Fctr(K-1)
6580 Factor(K)=Factor(K-1)
6590 NEXT K
6600 Tl00(J)=Xnull
6610 Time(J)=PROUND((INT(Tl00(J)/100)+FRACT(Tl00(J)/100)
*3/5)*100,0)
6620 Conc(J)=10^Ynull
6630 Type$(J)="Est"
6640 Type(J)=15
6650 Mo(J)=Mon
6660 Yr(J)=Year
6670 Fctr(J)=1
6680 Factor(J)=Factor(0)
6690 Da(J)=Day
6700 IF (Conc(J)<=10^Sedscale) AND (Conc(J)>=10^Sbase)
THEN Replot
6710 Rescale: GRAPHICS
6720 GCLEAR
6730 GOTO 4310
6740 Replot: MOVE 0,0
6750 GLOAD Plot(*)
6760 PRINTER IS 0
6770 IMAGE 18XDDD,XX,DD,A,DD,A,DD3X,ZZZZ,3X,DDDD.D,5X,3A,
5X,D.DD
6780 PRINT TAB(30),"SEDIMENT DATA POINTS",LIN(1),TAB(26),
>Date Time Conc. Type Factor "
6790 LINE TYPE 8
6800 FOR I=Cfirst TO Clast
6810 RPLOT Tl00(I),LGT(Conc(I))
6820 PRINT USING 6770;I,Mo(I),"/",Da(I),"/",Yr(I),Time(I),
Conc(I),Type$(I),Fctr(I)
6840 NEXT I
6850 PRINT LIN(2)
6860 FOR I=Cfirst TO Clast
6870 IF Da(I)<>Day THEN 6900
6880 MOVE Tl00(I),LGT(Conc(I))
6890 GOSUB Symbol
6900 NEXT I
6910 WAIT 9000
6920 PRINTER IS 16
6930 GOTO Options
6940 ! ~~~~~
6950 Erase_one: PRINT PAGE,TAB(10),"Which of the following
data points would you like to erase ?"

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6953 GOSUB Olist
6955 GOTO 7010
6960 Olist: PRINT LIN(3),TAB(17),"NUMBER Date Time Conc.
      Type Factor",LIN(1)
6970 FOR I=Cfirst TO Clast
6980 IF Da(I)<>Day THEN 7000
6990 PRINT USING 6770;I,Mo(I),"/",Da(I),"/",Yr(I),Time(I),
      Conc(I),Type$(I),Fctr(I)
7000 NEXT I
7005 RETURN
7010 INPUT "SELECT THE NUMBER TO BE ERASED (use SEDPAK for
      other day's samples)",J
7020 ! ~~~~~
7030 Erase: FOR K=J TO C
7040 Type$(K)=Type$(K+1)
7050 Type(K)=Type(K+1)
7060 Tl00(K)=Tl00(K+1)
7070 Time(K)=Time(K+1)
7080 Conc(K)=Conc(K+1)
7090 Fctr(K)=Fctr(K+1)
7100 Factor(K)=Factor(K+1)
7110 Mo(K)=Mo(K+1)
7120 Da(K)=Da(K+1)
7130 Yr(K)=Yr(K+1)
7140 NEXT K
7150 C=C-1
7160 Clast=Clast-1
7170 IF M=5 THEN 7250
7180 GRAPHICS
7190 GOTO Replot
7200 ! ~~~~~
7210 Wipeout: D=Clast
7220 FOR J=Cfirst TO D
7230 IF J>Clast THEN 7260
7240 IF Type$(J)="Est" THEN GOTO Erase
7250 NEXT J
7260 GRAPHICS
7270 GOTO Replot
7271 ! ~~~~~
7272 Timechange: PRINT PAGE,TAB(10),"Which of the following
      sample times would you like to change?"
7273 GOSUB Olist
7274 INPUT "SELECT THE NUMBER OF THE SAMPLE TO BE
      CHANGED",J
7275 GRAPHICS
7276 MOVE 1200,Sbase-Logcycle/5.5
7277 LABEL "Move cursor to correct time"
7278 MOVE 1200,Sbase-Logcycle/4.4
7279 LABEL "...then PRESS CONT"
7280 POINTER Tl00(J),LGT(Conc(J)),2

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```

7281 DIGITIZE Xnull,Ynull
7282 T100(J)=Xnull
7283 Time(J)=PROUND((INT(T100(J)/100)+FRACT(T100(J)/100)*
3/5)*100,0)
7284 GOTO Replot
7285 Qcalc: !----- Interpolating Concs For Each Punch -----
7290 PRINT PAGE,LIN(7),TAB(31),"CALCULATING LOADS"
7300 OFF KEY #7
7310 GSTORE Plot(*)
7320 J=Cfirst
7330 FOR Hour=0 TO 23
7340 FOR Min=0 TO 55 STEP 5
7350 Tdec(Hour,Min/5)=PROUND(100*(Hour+Min/60),0)
! Tdec is decimal time
7360 FOR J=J TO Clast-1
7370 IF (Tdec(Hour,Min/5)>=T100(J)) AND (Tdec(Hour,Min/5)
<T100(J+1)) THEN 7390
7380 NEXT J
7390 Slope=(LGT(Conc(J+1))-LGT(Conc(J)))/(T100(J+1)
-T100(J))
7400 Mgl(Hour,Min/5)=10^(LGT(Conc(J))+Slope*(Tdec(Hour,
Min/5)-T100(J)))
7410 NEXT Min
7420 NEXT Hour
7430 ! Calculating Daily and Instantaneous QW Discharges
7440 Totq=SUM(Q)/288
7450 MAT Load=Mgl.Q
7460 MAT Load=Load.Ti
7470 Qsed=DROUND(SUM(Load)/24*.002697,4) ! Daily load
(24 hrs & `.0027')
7475 IF Qsed<10 THEN Qsed=PROUND(Qsed,-2)
7480 MAT Load=Load/Ti ! This will give instantaneous
7490 MAT Load=Load*(.002697) ! loads in tons/day.
7500 !----- Calculating Equiv. Gage Height -----
7510 Logq=LGT(Totq)
7520 FOR I=1 TO 30
7530 IF Logq=Qlog(I) THEN 7580
7540 IF Logq<Qlog(I) THEN 7600
7550 NEXT I
7560 Equiv=-1 ! When outside rating
7570 GOTO 7670
7580 Equiv=Bkpts(I,1)
7590 GOTO 7670
7600 Ax=B(I-1)
7610 Bx=Logq-Qlog(I-1)
7620 Cx=Qlog(I)-Qlog(I-1)
7630 Dx=B(I)-B(I-1)
7640 Dum=Ax+Bx*(Dx/Cx)
7650 Dum=10^Dum
7660 Equiv=Dum+Offset

```

```

7665 !***** FINAL PLOTTING ON PAPER *****
7670 !----- Conc & Q Plot vs Time -----
7680 PRINT PAGE,LIN(3),TAB(25),"MEAN CONC.= ";PROUND(SUM
(Mg1)/288,-1);" mg/l",LIN(10),TAB(11),"Place the + at
the position you would like this to appear"
7690 PRINT LIN(1),TAB(11),"on your graph."
7700 WAIT 4000
7710 GRAPHICS
7720 LINE TYPE 1
7730 CSIZE 3.3,9/15,PI/8
7740 LORG 5
7750 POINTER 500,Sbase+Logcycle*.75,2
7760 DIGITIZE Sx,Sy
7770 MOVE Sx,Sy
7780 LABEL "Mean Conc=";PROUND(SUM(Mg1)/288,0)
7790 WAIT 5000
7800 EXIT GRAPHICS
7810 PRINT PAGE,LIN(5),TAB(19),"I hope you are satisfied
with this product",LIN(7),TAB(13),"However, WOULD YOU
LIKE TO RE-POSITION THE CONC LABEL ??"
7820 INPUT " Y or N ? ",K$
7830 IF K$[1]="N" THEN Goodplot
7840 GLOAD Plot(*)
7850 GRAPHICS
7860 GOTO 7760
7870 Goodplot: GSTORE Plot(*)
7880 LORG 2
7890 PRINT PAGE,LIN(3),TAB(17),"Place the + at the position
you would like the",LIN(3),TAB(26),"symbol explanation
to appear.",LIN(6)
7900 PRINT ,CHR$(234);
7910 PRINT RPT$(CHR$(236),7);
7920 PRINT CHR$(237)
7930 PRINT ,"|";SPA(7);"|"
7940 PRINT ,"|+";SPA(6);"|";" (approx size)"
7950 PRINT ,"|";SPA(7);"|"
7960 PRINT ,CHR$(242);
7970 PRINT RPT$(CHR$(236),7);
7980 PRINT CHR$(245)
7990 WAIT 4000
8000 GRAPHICS
8010 CSIZE 3.3,9/15,0
8020 Pt=43
8030 POINTER 1200,Sbase+LGT(2.5),2
8040 DIGITIZE Px,Py
8050 GOSUB 8070
8060 GOTO 8220
8070 MOVE Px,Py+Logcycle/15
8080 LABEL "EWI,EDI"
8090 LABEL "Point"

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8100 LABEL "O Obsvr"
8110 LABEL "+ Est"
8120 MOVE Px,Py+Logcycle*11/150
8130 DRAW Px,Py+Logcycle*9/150
8140 DRAW Px+30,Py+Logcycle*9/150
8150 DRAW Px+30,Py+Logcycle*11/150
8160 DRAW Px,Py+Logcycle*11/150
8170 MOVE Px-7,Py+Logcycle/Pt
8180 LABEL "<"
8190 MOVE Px+15,Py+Logcycle/Pt
8200 LABEL ">"
8210 RETURN
8220 WAIT 5000
8230 EXIT GRAPHICS
8240 PRINT PAGE,LIN(5),TAB(13),"Would you like to
      re-position the symbol explanation?"
8250 INPUT " Y or N ?",K$
8260 IF K$[1]="N" THEN Ok_plot
8270 GLOAD Plot(*)
8280 GOTO 7890
8290 Ok_plot: GSTORE Plot(*)
8300 LORG 5
8310 PRINT PAGE,LIN(5),TAB(12),"WOULD YOU LIKE TO ADD A
      TITLE (Fig.1,etc.) TO THIS PLOT?"
8320 INPUT " Y or N ?",K$
8330 IF K$[1]="N" THEN Thruplot
8340 PRINT PAGE,LIN(5),TAB(15),"TYPE IN BELOW THE TITLE YOU
      WOULD LIKE ON THE PLOT",LIN(2),TAB(32),"(54 letters
      max)"
8350 PRINT LIN(5),TAB(17),"EXAMPLE: Fig.1 CONC vs.Q @
      LINWORTH CREEK"
8360 INPUT "----- max. length -----
      ----->|",Fig$
8370 GRAPHICS
8380 SETGU
8390 CSIZE 5,.45,0
8400 MOVE 62,6
8410 LABEL Fig$
8420 WAIT 5000
8430 EXIT GRAPHICS
8440 PRINT PAGE,LIN(7),TAB(27),"IS YOUR TITLE
      SATISFACTORY?"
8450 INPUT " Y or N ?",K$
8460 IF K$[1]="Y" THEN Saveplot
8470 GLOAD Plot(*)
8480 GOTO 8340
8490 Saveplot: GSTORE Plot(*)
8500 Thruplot: PRINT PAGE,LIN(5),TAB(8),"Would you like a
      printout of your plot on the internal printer?"
8510 INPUT " Y or N ?",K$

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8520 IF K$(1)="Y" THEN DUMP GRAPHICS
8530 PRINTER IS 0
8540 IF K$(1)="Y" THEN PRINT
8550 PRINTER IS 16
8560 PRINT PAGE,LIN(5),TAB(16),"Would you like a copy drawn
      on the 9872 plotter?"
8570 INPUT " Y or N ?",Plotter$
8580 ON ERROR GOSUB No9872
8590 IF Plotter$(1)="Y" THEN GOSUB C9872
8600 OFF ERROR
8605 !----- Instantaneous QW Discharge Plot -----
8610 GCLEAR
8620 GRAPHICS
8630 CSIZE 3.3,9/15,0
8640 Smax=0
8650 Smin=Load(0,0)
8660 FOR I=0 TO 23
8670 Smax=MAX(Load(I,0),Load(I,1),Load(I,2),Load(I,3),Load
      (I,4),Load(I,5),Load(I,6),Load(I,7),Load(I,8),Load
      (I,9),Load(I,10),Load(I,11),Smax)
8680 Smin=MIN(Load(I,0),Load(I,1),Load(I,2),Load(I,3),Load
      (I,4),Load(I,5),Load(I,6),Load(I,7),Load(I,8),Load
      (I,9),Load(I,10),Load(I,11),Smin)
8690 NEXT I
8700 GOSUB Sedaxis
8710 LABEL "SedQ"
8720 MOVE 121.4,47
8730 LABEL "(t/dy)"
8740 MOVE 121.4,60
8750 LINE TYPE 8
8760 DRAW 121.4,70
8770 GOSUB 8790
8780 GOTO 8890
8790 GOSUB 5560
8800 LINE TYPE 8
8810 MOVE 0,0
8820 FOR Hour=0 TO 23
8830 FOR Min=0 TO 11
8840 Time=100*Hour+Min*25/3
8850 RPLOT Time,LGT(Load(Hour,Min)),1
8860 NEXT Min
8870 NEXT Hour
8880 RETURN
8890 WAIT 5000
8900 GSTORE Screen(*)
8910 EXIT GRAPHICS
8920 PRINT PAGE,LIN(3),TAB(24),"QW DISCHARGE = ";Qsed;"
      tons/day",LIN(10),TAB(11),"Place the + at the position
      you would like this to appear"
8930 PRINT LIN(1),TAB(11),"on your graph."

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8940 WAIT 4000
8950 GRAPHICS
8960 LINE TYPE 1
8970 CSIZE 3.3,9/15,PI/8
8980 LORG 5
8990 POINTER 550,Sbase+Logcycle*.75,2
9000 DIGITIZE Lx,Ly
9010 MOVE Lx,Ly
9020 LABEL "Load=";Qsed;"tons"
9030 WAIT 5000
9040 EXIT GRAPHICS
9050 PRINT PAGE,LIN(5),TAB(19),"I hope you are satisfied
with this product",LIN(7),TAB(13),"However, WOULD YOU
LIKE TO RE-POSITION THE LOAD LABEL ?? "
9060 INPUT " Y or N ?",K$
9070 IF K$[1]="N" THEN Goodscreen
9080 GLOAD Screen(*)
9090 GRAPHICS
9100 GOTO 8920
9110 Goodscreen: GSTORE Screen(*)
9120 PRINT PAGE,LIN(5),TAB(12),"WOULD YOU LIKE TO ADD A
TITLE (Fig.1,etc.) TO THIS PLOT?"
9130 INPUT " Y or N ?",K$
9140 IF K$[1]="N" THEN Thruscreen
9150 PRINT PAGE,LIN(5),TAB(15),"TYPE IN BELOW THE TITLE
YOU WOULD LIKE ON THE PLOT",LIN(2),TAB(32),"(54
letters max)"
9160 PRINT LIN(5),TAB(17),"EXAMPLE: Fig.2 Instantaneous Sed
Load vs Discharge"
9170 Fig$="Instantaneous Sed Load vs Discharge"
9180 INPUT "----- max. length -----
----->|",Fig$
9190 GRAPHICS
9200 SETGU
9210 CSIZE 5,.45,0
9220 MOVE 62,6
9230 LABEL Fig$
9240 WAIT 5000
9250 EXIT GRAPHICS
9260 PRINT PAGE,LIN(7),TAB(27),"IS YOUR TITLE
SATISFACTORY?"
9270 INPUT " Y or N ?",K$
9280 IF K$[1]="Y" THEN Savescreen
9290 GLOAD Screen(*)
9300 GOTO 9150
9310 Savescreen: GSTORE Screen(*)
9320 Thruscreen: PRINT PAGE,LIN(5),TAB(8),"Would you like a
printout of your plot on the internal printer?"
9330 INPUT " Y or N ?",K$
9340 IF K$[1]="Y" THEN DUMP GRAPHICS

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9350 IMAGE #7X,37A,26X,"Q= "K,X3A
9370 IMAGE #,2X,"Mean Conc= "DDDDD.D,X4A,5X,
"Mean Ght= "DD.DD
9380 IMAGE #,X,"Equiv Conc= "DDDDD.D,X4A,4X,
"Equiv Ght= "DD.DD
9390 IMAGE #/DDD,XX,DD,A,DD,A,DD2X,ZZZZ,2X,DDDDD.D,3X,AAA
9400 PRINTER IS 0
9410 PRINT RPT$(Dash$,20),TAB(10),N$;SPA(6);Date$;SPA(6),
"QW DISCHARGE=";Qsed;"tons/day"
9420 PRINT USING 9350;"Date Time Conc. Type ",
DROUND(SUM(Q)/288,4),"cfs"
9430 FOR J=Cfirst TO Clast
9440 PRINT USING 9390;J,Mo(J),"/",Da(J),"/",Yr(J),Time(J),
Conc(J),Type$(J)
9460 IF J=Cfirst+1 THEN PRINT USING 9370;SUM(Mgl)/288,
"mg/l",SUM(Ar)/288
9470 IF J=Cfirst+2 THEN PRINT USING 9380;Qsed/Totq/.0027,
"mg/l",Equiv
9480 NEXT J
9490 PRINT LIN(2),"Processed by ";Id$;" ";Today$,
"Using Rating #";Ratnum,LIN(3)
9500 PRINTER IS 16
9510 PRINT PAGE,LIN(5),TAB(16),"Would you like a copy drawn
on the 9872 plotter?"
9520 INPUT " Y or N ?",Plotter$
9530 ON ERROR GOSUB No9872
9540 IF Plotter$[1]="Y" THEN GOSUB L9872
9542 FOR I=1 TO C
9544 Conc(I)=PROUND(Conc(I)/Fctr(I),-1)
9545 NEXT I
9550 ON ERROR GOTO Conctape
9560 !----- Re-Storing Concs on Tape -----
9570 PRINT PAGE,LIN(5),TAB(24),"DO YOU WANT THESE
CONCENTRATIONS ",LIN(2),TAB(29),"STORED ON YOUR
TAPE ?"
9580 INPUT K$
9600 IF K$[1,1]="N" THEN 9650
9610 PRINT PAGE,LIN(5),TAB(21),"I AM RE-STORING YOUR CONC
DATA ON THE ",LIN(2),TAB(36),"T14 TAPE"
9620 ASSIGN #9 TO Tape$
9630 PRINT #9;N$,Mo(*),Da(*),Yr(*),Time(*),Conc(*),Type(*),
Fctr(*)
9635 OFF ERROR
9640 ! ----- Optional Storage of Plots on Tape -----
9650 PRINT PAGE,LIN(5),TAB(11),"Would you like to store
either plot on tape for later use?"
9660 INPUT " Y or N ?",K$
9670 IF K$[1]="N" THEN Donedata
9680 PRINT PAGE,LIN(5),TAB(10),"Would you like to store the
CONC plot, LOAD plot, or both ??"

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9690 PRINT LIN(4),TAB(25),"1. CONC plot only",LIN(2),
      TAB(25),"2. LOAD plot only",LIN(2),TAB(25),"3. Both
      CONC and LOAD plots"
9700 INPUT " 1, 2, or 3 ??",K
9710 PRINT PAGE,TAB(24),"INSERT THE STORAGE TAPE INTO T14"
9720 ON K GOTO 9730,9760,9730
9730 PRINT LIN(16),TAB(9),"CONC PLOT STORAGE"
9750 GOTO 9790
9760 PRINT LIN(16),TAB(9),"LOAD PLOT STORAGE"
9780 K=2
9790 INPUT "What file name will this be stored under
      (6 letters max)?",Store$
9800 MASS STORAGE IS ":T14"
9810 PRINT PAGE,LIN(8),TAB(25),"THIS WILL TAKE ABOUT 6
      MINUTES"
9820 ON ERROR GOTO Store_error
9830 CREATE Store$,2,32767
9840 ASSIGN #5 TO Store$
9850 OFF ERROR
9860 IF (K=1) OR (K=3) THEN MAT PRINT #5;Plot
9865 IF K=2 THEN MAT PRINT #5;Screen
9870 IF K=3 THEN PRINT PAGE
9880 IF K=3 THEN GOTO 9760
9885 ! ----- Another Day ? -----
9890 Donedata: MASS STORAGE IS ":T15"
9900 F=1
9910 Old$=Statnum$
9920 Nextfile: PRINT PAGE,LIN(5),TAB(20),"WOULD YOU LIKE TO
      DO ANOTHER DAY'S DATA?"
9930 INPUT " YES or NO ??",K$
9940 IF K$[1]="Y" THEN Enter
9950 PRINT PAGE,LIN(10),TAB(36),"FINISHED"
9960 END
9962 Conctape: BEEP ! ~~~~~ Miscellaneous subroutines ~~~~~
9963 IF ERRL=9620 THEN Putitback
9964 DISP ERRM$
9965 PAUSE
9966 GOTO 9610
9967 Putitback: PRINT PAGE,LIN(4),TAB(21),"PLEASE REPLACE
      THE CONCENTRATION TAPE",LIN(2),TAB(36),"INTO T14"
9968 GOTO 9965
9970 ! ~~~~~ Error in display storage ~~~~~
9980 Store_error: BEEP
9990 IF ERRN=80 THEN T14out
10000 IF ((ERRN=64) OR (ERRN=55)) AND (ERRL=9820) THEN
      Tapefull
10010 DISP ERRM$
10020 PAUSE
10030 GOTO 9830
10040 T14out:PRINT PAGE,LIN(5)," ** IT WILL TAKE LONGER THAN

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        6 MINUTES IF YOU DON'T PUT THE TAPE IN T14 ! **"
10050 PRINT LIN(3),TAB(25),"When the tape's in,
      PRESS CONT."
10060 GOTO 10020
10070 Tapefull:PRINT PAGE,LIN(5),TAB(10),"THERE IS NOT
      ENOUGH ROOM ON THIS TAPE TO STORE YOUR DIAGRAM",LIN
      (4),TAB(21),"PUT A NEW TAPE IN T14, AND PRESS CONT."
10080 GOTO 10020
10090 Symbol: LINE TYPE 1
10100 IF Type$(I)="Est" THEN LABEL "+"
10110 IF Type$(I)="Obs" THEN LABEL "O"
10120 IF Type$(I)<>"Pt." THEN 10170
10130 MOVE T100(I)-10,LGT(Conc(I))
10140 LABEL "<"
10150 MOVE T100(I)+10,LGT(Conc(I))
10160 LABEL ">"
10170 IF (Type$(I)<>"EWI") AND (Type$(I)<>"EDI") THEN
      RETURN
10180 MOVE T100(I)-15,LGT(Conc(I))+Logcycle/120
10190 DRAW T100(I)-15,LGT(Conc(I))-Logcycle/120
10200 DRAW T100(I)+15,LGT(Conc(I))-Logcycle/120
10210 DRAW T100(I)+15,LGT(Conc(I))+Logcycle/120
10220 DRAW T100(I)-15,LGT(Conc(I))+Logcycle/120
10230 RETURN
10240 ! ~~~~~ 9872 plot routines ~~~~~
10250 C9872:GOSUB Plotter
10260 GOTO Label
10270 Plotter: PLOTTER IS 10,5,"9872A"
10290 PRINT PAGE,TAB(17),"Position the paper on its side
      on the plotter.",LIN(5),TAB(16),"Using ARROW buttons
      on plotter, position pen over"
10300 PRINT TAB(18),"LOWER LEFT and UPPER RIGHT CORNERS of
      paper."
10310 PRINT LIN(1),TAB(30),CHR$(234);RPT$(CHR$(236),20);
      CHR$(255)
10320 FOR J=1 TO 7
10330 PRINT TAB(30),"|";SPA(20);"|"
10340 NEXT J
10350 PRINT TAB(30),CHR$(255);RPT$(CHR$(236),20);CHR$(245)
10360 PRINT LIN(1),TAB(16),"...After positioning, PRESS
      ENTER key on plotter."
10370 LIMIT
10380 PRINT PAGE
10390 LOCATE 33,102,31,85.5
10400 GOSUB 4720
10410 MOVE 20,58
10420 CSIZE 3.3
10430 LABEL "Q (cfs) "
10440 CSIZE 2.5
10450 MOVE 20,58

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10460 DRAW 20,68
10470 LDIR 0
10480 LORG 5
10490 MOVE 67.5,26
10500 LABEL "Time (&Date$&)"
10510 MOVE 67.5,23
10520 GOSUB Uu
10530 PEN 4
10535 LORG 8
10540 RETURN
10550 Label:MOVE 113.6,63.7
10560 LABEL "CONC (mg/l) "
10590 MOVE 113.6,63.7
10600 LINE TYPE 8
10610 DRAW 113.6,73.7
10615 CSIZE 2.5
10620 GOSUB 5560
10630 LINE TYPE 8
10640 LORG 5
10650 MOVE 0,0
10660 FOR I=Cfirst TO Clast
10670 RPLLOT T100(I),LGT(Conc(I)),1
10680 NEXT I
10690 FOR I=Cfirst TO Clast
10700 IF (T100(I)<0) OR (T100(I)>2400) THEN 10730
10710 MOVE T100(I),LGT(Conc(I))
10720 GOSUB Symbol
10730 NEXT I
10740 MOVE Sx,Sy
10750 CSIZE 2.3
10760 LABEL "Mean Conc=";PROUND(SUM(Mg1)/288,0)
10770 LORG 2
10780 GOSUB 8070
10790 LORG 5
10800 GOSUB 10820
10810 RETURN
10820 SETGU
10830 PEN 1
10840 CSIZE 4,.45,0
10850 MOVE 67.5,16
10860 IF LEN(Fig$)>40 THEN CSIZE 3.5,.45,0
10870 LABEL Fig$
10880 PEN 0
10890 Pt=43
10900 PLOTTER IS "GRAPHICS"
10910 LOCATE 12,112,19,99
10920 RETURN
10930 L9872:GOSUB Plotter
10940 MOVE 113.6,63.7
10950 LABEL "SedQ (t/dy) "

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10980 MOVE 113.6,63.7
10990 LINE TYPE 8
11010 DRAW 113.6,73.7
11020 CSIZE 2.5
11030 GOSUB 8790
11040 LINE TYPE 1
11050 CSIZE 2.8,9/15,PI/8
11060 LORG 5
11070 MOVE Lx,Ly
11080 LABEL "Load=";PROUND(Qsed,-2);"t/day"
11090 PEN 1
11100 GOSUB 10820
11110 RETURN
11120 Addon: GRAPHICS
11130 PLOTTER IS 10,5,"9872A"
11140 LIMIT
11150 DIGITIZE Qx,Qy
11161 DIGITIZE Timex,Timey
11170 EXIT GRAPHICS
11171 PRINTER IS 0
11180 PRINT "Sedx=";Qx,"Sedy=";Qy,"Titlex=";Timex,
      "Titley=";Timey
11181 PRINTER IS 16
11190 END
```