ENGINEERING REPORT

FOR

LOWEST FLOOR DESIGN

PROFESSIONAL
ENGINEERING
CONSULTANTS
PROFESSIONAL ASSOCIATION

FOR

BAREFOOT BAY
AN ADDITION
TO WICHITA, SEDGWICK COUNTY, KANSAS

FOR

CITY ENGINEER'S OFFICE
CITY OF WICHITA
MARCH 4, 1994

DEVELOPER: GRANDVIEW, INC.

PREPARED BY

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.
ENGINEERS

WICHITA, KANSAS

303 S. TOPEKA
WICHITA, KANSAS 67202
(316) 262-2691
FAX (316) 262-3003

I. OBJECTIVE

The purpose of this report is to present the analysis performed to establish a design groundwater elevation for the Barefoot Bay plat. This analysis was requested by the Metropolitan Area Planning Commission (MAPC) at the time of plat approval. This report is prepared for review and approval by the City Engineer's Office.

II. PROJECT LOCATION

The Barefoot Bay plat lies in the N 1/2 of Section 3, T. 27 S., R. 1 W. in Sedgwick County, Kansas (see Figure 1). The property is being annexed to the City of Wichita. The property is a lake-front development being constructed around an existing lake. The lake was formed as a result of a sand extraction operation on this site, whereby excavation was made below the groundwater table. The resulting lake is fed both by the groundwater aquifer as well as the Big Slough.

III. HISTORICAL DATA

Except during runoff events, the water elevation in Barefoot Bay lake is determined normally by the groundwater table elevation. As measured by photogrammetric survey in 1986, the normal groundwater/lake elevation is 1319.3. As measured on February 24, 1994, after a prolonged wet season and a regional rise of the groundwater table as reported by various sources, the groundwater/lake elevation was 1319.25. The Owners of the lake report that the groundwater/lake elevation has fallen as low as elevation 1317.5.

During May 1994, and again in July 1994, floods were experienced in the Big Slough basin. In May, the lake water surface elevation reached an estimated elevation of 1324.5. This estimated elevation was established by review of the 1986 photogrammetric surveys at points where flows overtopped roadways, and has been verified with high water marks an existing cabin at the northwest corner of the lake. The outlet from the lake into the remainder of the Big Slough channel was through pipe culverts, which have subsequently been removed.

In the flood of July 1993, the lake elevation was not as high and no road overflows downstream of this lake were reported. The flood of record at this site is taken to be 1324.5. It should be noted that this elevation corresponds to the Base Flood Elevation reported in the Flood Insurance Study for Sedgwick County, Kansas, Profile 27P.

IV. HYDROLOGIC ANALYSIS

To evaluate the impact of flood contributions from the Big Slough, a stage-storage analysis was performed using the US Army Corps of Engineers HEC-1 computer package. Model parameters and assumptions are as follows:

Basin Area: 20 Sq. Mi.
Rainfall (100-Year, 24-Hour): 7.8 In.
Rainfall Distribution: Type II
Unit Hydrograph: SCS
Runoff Curve Number: 58 (Meadow, Hydrologic Soil Group B)
Lag: 9.0 Hr Computed, 9.5 Hr Used

It is recognized that much of the basin is actually cultivated land, and not all soils in the basin are Group C. However, considering the very flat topography and the existance of several ponds and lakes in the watershed which are unaccounted for, that the Runoff Curve Number used reasonably represents watershed conditions. The computed lag time was adjusted slightly to yield a peak flow rate from the model of 2398 cfs, compared to the FIRM published value of 2375 cfs.

The pond stage-storage computation was made by using the pond surface as shown by the 1986 photogrammetric mapping to be 120 acres, and assuming nearly vertical sides. During development of the project, additional water area will be constructed to create additional waterfront home sites and additional storage will be available. The outlet hydraulics are defined by orifice flow through the railroad trestle over the Big Slough, and weir flow over the railroad tracks (see Figure 2).

The results of the Computer modeling are included in Appendix 1. The peak stage in the lake due to these conditions is 1324.56.

V. CONCLUSIONS

The long-term groundwater elevation is 1319.3. Minimum requirement for the lowest floor elevation based on the MAPC criteria is 1323.3. Based on the observed estimated flood elevation and the computer model flood elevation, we recommend that a lowest floor elevation of 1324.5 be established. Figure 3 illustrates the relationship between building sites and the water elevation.

STATE OF KANSAS

FIG. 1.

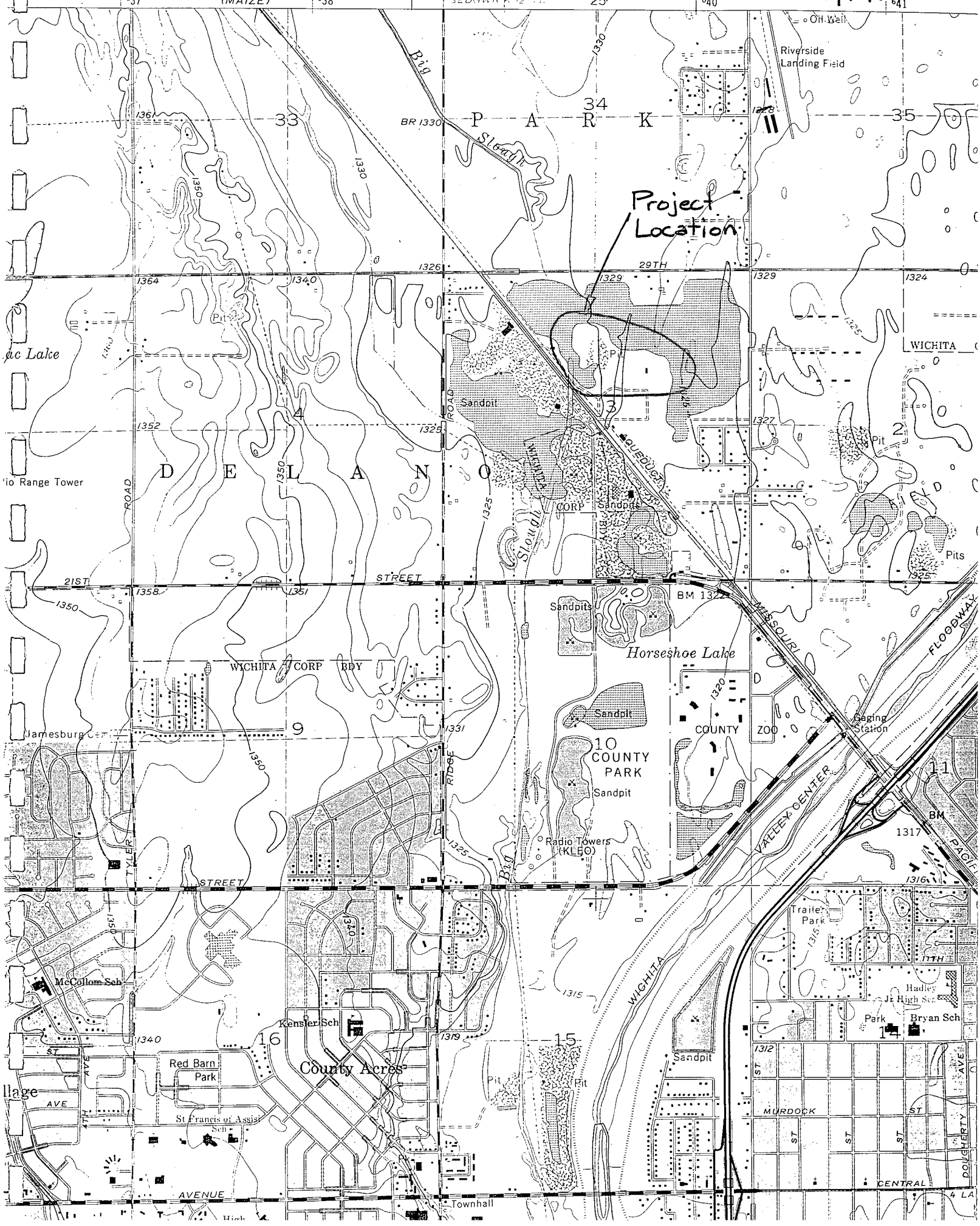
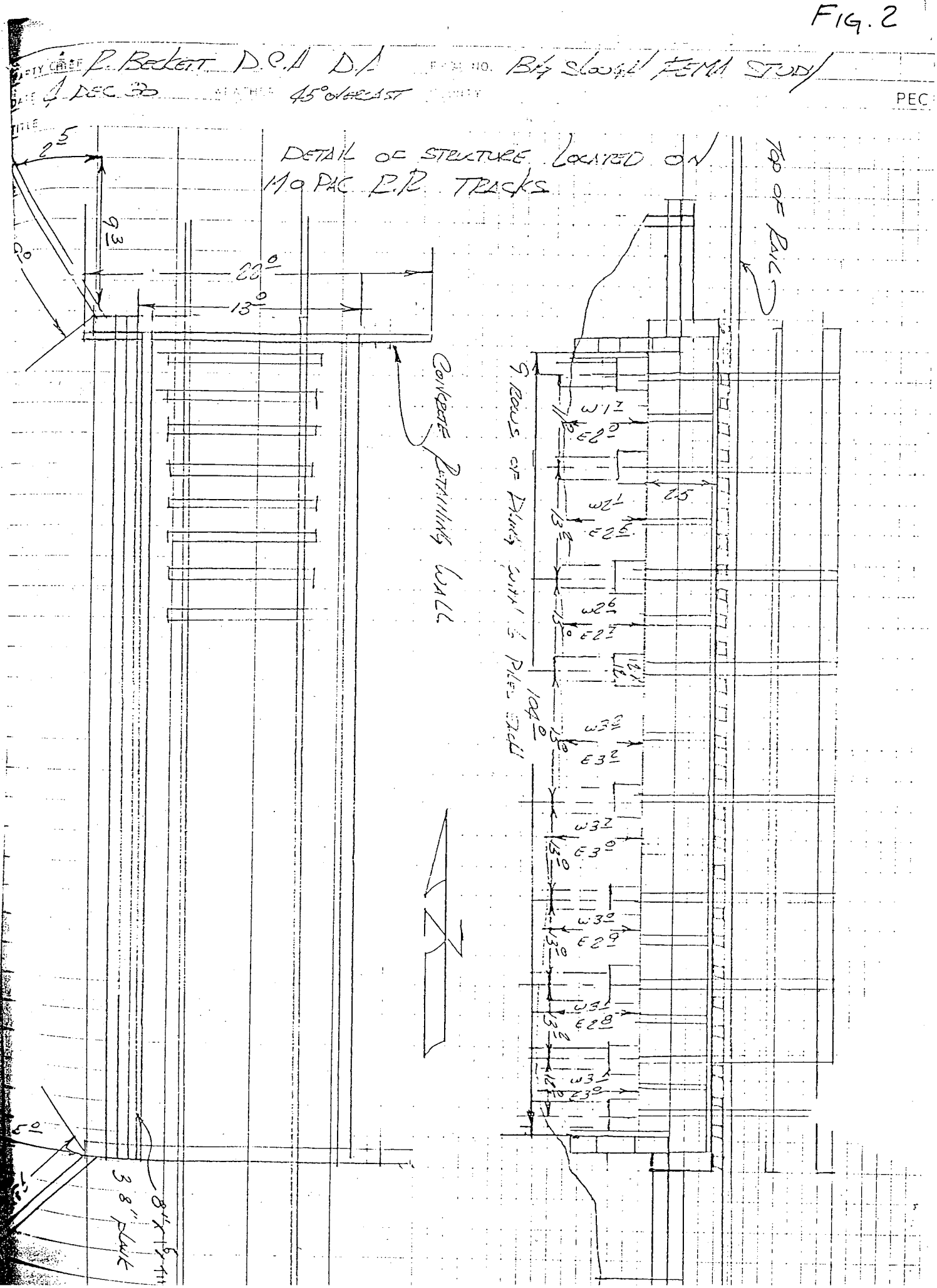


FIG. 2


PARTY CHIEF P. Beckett D.C.A D.A
DATE 1 DEC 93
WEATHER 45° overcast
TITLE
DETAIL OF STRUCTURE LOCATED ON I-10 PAC R.R. TRACKS
Top of Bank
Concrete Retaining Wall
9 rows of piling with 5 piles each
104'-0"
3'8" plank

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*            FEBRUARY 1981              *
*          REVISED 02 AUG 88            *
*                                       *
*  RUN DATE  03/02/1994  TIME  12:12:32 *
*                                       *
*****************************************
```


```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*  THE HYDROLOGIC ENGINEERING CENTER    *
*          609 SECOND STREET            *
*        DAVIS, CALIFORNIA 95616        *
*           (916) 551-1748              *
*                                       *
*****************************************
```


```
X    X  XXXXXXX   XXXXX          X
X    X  X        X    X        XX
X    X  X        X              X
XXXXXXX  XXXX    X       XXXXX  X
X    X  X        X              X
X    X  X        X    X         X
X    X  XXXXXXX   XXXXX        XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
                                        HEC-1 INPUT                                    PAGE  1

          LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

            1           ID       BAREFOOT BAY STUDY
            2           ID       PROJ NO 36-93444-2051
            3           ID       ANALYSIS OF POND SOUTH OF 29TH & NORTH OF KSW RR
            4           ID       5 10 50 100-YR 24-HR STORM
            5           ID       PROFESSIONAL ENGINEERING CONSULTANTS, P.A.
            6           ID       WICHITA, KANSAS
            7           ID       MWB  03/1/94
            8           ID       FILE:BSLOO2.HEC
*** LIST ***
*** FREE ***
                        *DIAGRAM
            9           IT     30 01MAR94    0600     100
           10           IN     30 01MAR94    0600
           11           IO      3       0
           12           JR    PREC  0.5769  0.6795  0.8974  1.0000
                        *
                        *       BIG SLOUGH DRAIN BASIN - UNDEV., MEADOW, TYPE B SOIL
                        *

           13           KK    29TH
           14           BA     20.
           15           PB     7.8
           16           PC    0.08    0.09    0.10    0.11    0.12   0.133   0.147   0.163   0.181   0.204
           17           PC   0.235   0.283   0.663   0.735   0.772   0.799   0.820   0.835   0.850   0.865
           18           PC   0.880   0.890   0.900   0.910   0.916   0.925   0.934   0.943   0.952   0.958
           19           PC   0.964   0.970   0.976   0.982   0.988   0.994   1.000
           20           LS      0      58       0
           21           UD    9.50
                        *
                        *       BAREFOOT BAY POND - BANK EL=1326; STATIC POOL = 1319
                        *       ORIFICE FLOW THRU RR TRESTLE USED FOR FLOOD ROUTING
                        *

           22           KK    POND
           23           KO       0       2
           24           RS       1    ELEV  1319.0
           25           SA    120.    121.
           26           SE   1319.  1326.0
           27           SL  1321.5    284.    0.67     0.5
           28           SS  1325.9  1000.0     2.5     1.5
           29           ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.

(V) ROUTING (.) CONNECTOR (---->) DIVERSION OR PUMP FLOW (<----) RETURN OF DIVERTED OR PUMPED FLOW

13 29TH
V
V
22 POND

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*            FEBRUARY 1981             *
*          REVISED 02 AUG 88           *
*                                      *
*  RUN DATE  03/02/1994  TIME  12:12:32 *
*                                      *
****************************************
```


```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*  THE HYDROLOGIC ENGINEERING CENTER   *
*         609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616        *
*          (916) 551-1748              *
*                                      *
****************************************
```


```
BAREFOOT BAY STUDY
PROJ NO 36-93444-2051
ANALYSIS OF POND SOUTH OF 29TH & NORTH OF KSW RR
5 10 50 100-YR 24-HR STORM
PROFESSIONAL ENGINEERING CONSULTANTS, P.A.
WICHITA, KANSAS
MWB  03/1/94
FILE:BSLOO2.HEC

11 IO         OUTPUT CONTROL VARIABLES
                   IPRNT          3  PRINT CONTROL
                   IPLOT          0  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE

   IT         HYDROGRAPH TIME DATA
                    NMIN         30  MINUTES IN COMPUTATION INTERVAL
                   IDATE      1MAR94  STARTING DATE
                   ITIME        0600  STARTING TIME
                      NQ         100  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE      3MAR94  ENDING DATE
                  NDTIME        0730  ENDING TIME
                   ICENT          19  CENTURY MARK

                COMPUTATION INTERVAL      .50 HOURS
                    TOTAL TIME BASE    49.50 HOURS

       ENGLISH UNITS
            DRAINAGE AREA         SQUARE MILES
            PRECIPITATION DEPTH   INCHES
            LENGTH, ELEVATION     FEET
            FLOW                  CUBIC FEET PER SECOND
            STORAGE VOLUME        ACRE-FEET
            SURFACE AREA          ACRES
            TEMPERATURE           DEGREES FAHRENHEIT

   JP       MULTI-PLAN OPTION
                NPLAN          1  NUMBER OF PLANS

   JR       MULTI-RATIO OPTION
               RATIOS OF PRECIPITATION
               .58      .68      .90     1.00


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


         **************
         *            *
13 KK    *      29TH  *
         *            *
         **************

10 IN         TIME DATA FOR INPUT TIME SERIES
                   JXMIN         30  TIME INTERVAL IN MINUTES
                  JXDATE      1MAR94  STARTING DATE
                  JXTIME        600  STARTING TIME

           SUBBASIN RUNOFF DATA

14 BA       SUBBASIN CHARACTERISTICS
                TAREA       20.00  SUBBASIN AREA

            PRECIPITATION DATA

15 PB             STORM       7.80  BASIN TOTAL PRECIPITATION
```

16 PI INCREMENTAL PRECIPITATION PATTERN

.01	.01	.01	.01	.01	.01	.02	.02	.02	.03
.05	.38	.07	.04	.03	.02	.01	.02	.01	.01
.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01				

20 LS SCS LOSS RATE

STRTL	1.45	INITIAL ABSTRACTION
CRVNBR	58.00	CURVE NUMBER
RTIMP	.00	PERCENT IMPERVIOUS AREA

21 UD SCS DIMENSIONLESS UNITGRAPH

TLAG	9.50 LAG

***

UNIT HYDROGRAPH
97 END-OF-PERIOD ORDINATES

15.	32.	67.	104.	149.	197.	258.	324.	405.	490.
587.	679.	760.	832.	888.	934.	965.	984.	989.	989.
984.	965.	934.	901.	865.	826.	785.	738.	687.	628.
567.	514.	464.	426.	390.	359.	329.	303.	278.	259.
240.	222.	204.	188.	173.	158.	144.	134.	123.	113.
104.	96.	89.	81.	74.	68.	63.	57.	53.	49.
45.	41.	38.	35.	32.	30.	27.	25.	23.	21.
20.	18.	17.	15.	14.	13.	12.	11.	10.	10.
9.	8.	8.	7.	7.	6.	5.	5.	4.	4.
3.	3.	2.	2.	1.	1.	0.			

TOTAL RAINFALL = 7.80, TOTAL LOSS = 4.83, TOTAL EXCESS = 2.97

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	49.50-HR
+ (CFS)	(HR)					
		(CFS)				
+ 2398.	17.00		2311.	1474.	772.	772.
		(INCHES)	1.075	2.742	2.960	2.960
		(AC-FT)	1146.	2925.	3157.	3157.

CUMULATIVE AREA = 20.00 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION 29TH
FOR PLAN 1, RATIO = .58

TOTAL RAINFALL = 4.50, TOTAL LOSS = 3.60, TOTAL EXCESS = .90

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	49.50-HR
+ (CFS)	(HR)					
		(CFS)				
+ 705.	18.50		682.	447.	235.	235.
		(INCHES)	.317	.832	.902	.902
		(AC-FT)	338.	887.	962.	962.

CUMULATIVE AREA = 20.00 SQ MI

*** *** *** *** ***

HYDROGRAPH AT STATION 29TH
FOR PLAN 1, RATIO = .68

TOTAL RAINFALL = 5.30, TOTAL LOSS = 3.96, TOTAL EXCESS = 1.34

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	49.50-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1054.	18.00		1019.	662.	348.	348.
		(INCHES)	.474	1.231	1.333	1.333
		(AC-FT)	505.	1313.	1422.	1422.

CUMULATIVE AREA = 20.00 SQ MI

*** *** *** *** ***

```
                  HYDROGRAPH AT STATION     29TH
                   FOR PLAN 1, RATIO =  .90

    TOTAL RAINFALL =    7.00, TOTAL LOSS =    4.59, TOTAL EXCESS =    2.41

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                  6-HR        24-HR       72-HR     49.50-HR
+   (CFS)       (HR)
                         (CFS)
+   1933.      17.50               1865.       1196.        626.        626.
                       (INCHES)     .867       2.224       2.402       2.402
                        (AC-FT)     925.       2372.       2562.       2562.

                        CUMULATIVE AREA =    20.00 SQ MI


      ***            ***            ***            ***            ***

                  HYDROGRAPH AT STATION     29TH
                   FOR PLAN 1, RATIO = 1.00

    TOTAL RAINFALL =    7.80, TOTAL LOSS =    4.83, TOTAL EXCESS =    2.97

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                  6-HR        24-HR       72-HR     49.50-HR
+   (CFS)       (HR)
                         (CFS)
+   2398.      17.00               2311.       1474.        772.        772.
                       (INCHES)    1.075       2.742       2.960       2.960
                        (AC-FT)    1146.       2925.       3157.       3157.

                        CUMULATIVE AREA =    20.00 SQ MI



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


              **************
              *            *
   22 KK      *     POND   *
              *            *
              **************

   23 KO        OUTPUT CONTROL VARIABLES
                      IPRNT          3  PRINT CONTROL
                      IPLOT          2  PLOT CONTROL
                      QSCAL         0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH ROUTING DATA

   24 RS        STORAGE ROUTING
                      NSTPS          1  NUMBER OF SUBREACHES
                       ITYP       ELEV  TYPE OF INITIAL CONDITION
                     RSVRIC    1319.00  INITIAL CONDITION
                          X        .00  WORKING R AND D COEFFICIENT

   25 SA               AREA      120.0      121.0

   26 SE        ELEVATION    1319.00    1326.00

   27 SL        LOW-LEVEL OUTLET
                      ELEVL    1321.50  ELEVATION AT CENTER OF OUTLET
                      CAREA     284.00  CROSS-SECTIONAL AREA
                       COQL        .67  COEFFICIENT
                       EXPL        .50  EXPONENT OF HEAD

   28 SS        SPILLWAY
                       CREL    1325.90  SPILLWAY CREST ELEVATION
                      SPWID    1000.00  SPILLWAY WIDTH
                       COQW       2.50  WEIR COEFFICIENT
                       EXPW       1.50  EXPONENT OF HEAD

                                                       ***

                                            COMPUTED STORAGE-ELEVATION DATA

             STORAGE          .00     843.50
```

ELEVATION	1319.00	1326.00								

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	.00	4144.52	3977.06	3822.63	3679.74	3547.14	3423.74	3308.67	3201.07
ELEVATION	1319.00	1321.50	1328.88	1328.29	1327.77	1327.31	1326.90	1326.53	1326.20	1325.90
OUTFLOW	3210.43	3215.21	3221.47	3229.15	3238.65	3249.87	3263.10	3278.50	3296.05	3316.26
ELEVATION	1325.91	1325.92	1325.93	1325.93	1325.94	1325.95	1325.96	1325.97	1325.99	1326.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	.00	300.45	843.50	1192.07
OUTFLOW	.00	.00	3316.26	16978.22
ELEVATION	1319.00	1321.50	1326.00	1328.88

*** *** *** *** ***

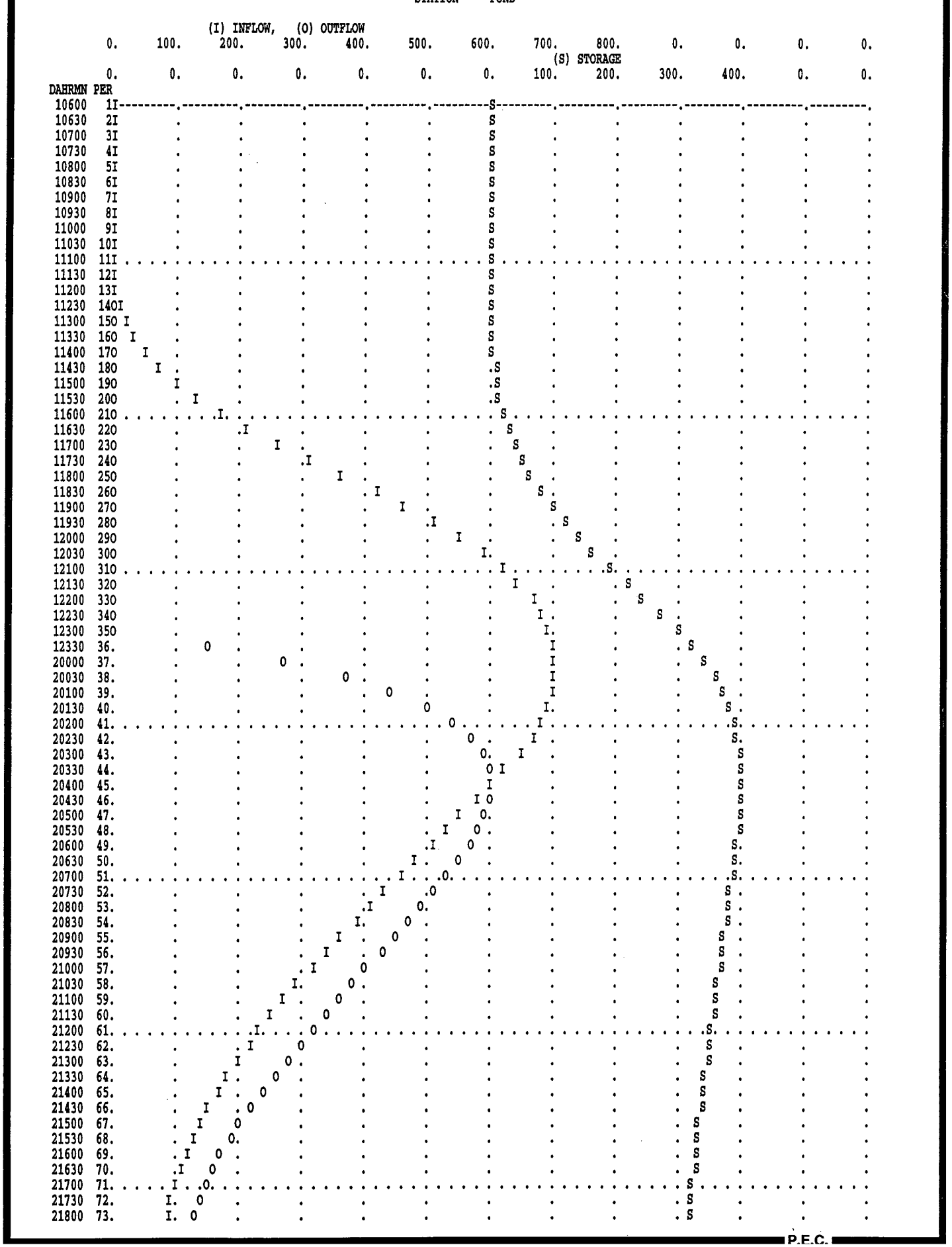
HYDROGRAPH AT STATION POND
FOR PLAN 1, RATIO = .58

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	49.50-HR
+ (CFS)	(HR)					
		(CFS)				
+ 603.	22.00		570.	322.	161.	161.
		(INCHES)	.265	.598	.618	.618
		(AC-FT)	283.	638.	659.	659.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	49.50-HR
+ (AC-FT)	(HR)				
399.	22.00	394.	353.	243.	243.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	49.50-HR
+ (FEET)	(HR)				
1322.32	22.00	1322.27	1321.94	1321.02	1321.02

CUMULATIVE AREA = 20.00 SQ MI


STATION POND
(I) INFLOW, (O) OUTFLOW
(S) STORAGE
0. 100. 200. 300. 400. 500. 600. 700. 800. 0. 0. 0. 0.
0. 0. 0. 0. 0. 0. 0. 100. 200. 300. 400. 0. 0.
DAHRMN PER

```
21830  74.       I . O      .       .       .       .       .       .       .       . S     .       .       .
21900  75.      I  .O       .       .       .       .       .       .       .       . S     .       .       .
21930  76.      I  O        .       .       .       .       .       .       .       . S     .       .       .
22000  77.     I  O.        .       .       .       .       .       .       .       . S     .       .       .
22030  78.     I O .        .       .       .       .       .       .       .       .S      .       .       .
22100  79.    I  O .        .       .       .       .       .       .       .       .S      .       .       .
22130  80.    I O  .        .       .       .       .       .       .       .       .S      .       .       .
22200  81. . I .O. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . .
22230  82.   I O   .        .       .       .       .       .       .       .       .S      .       .       .
22300  83.   I O   .        .       .       .       .       .       .       .       .S      .       .       .
22330  84.  I O    .        .       .       .       .       .       .       .       .S      .       .       .
30000  85.  I O    .        .       .       .       .       .       .       .       .S      .       .       .
30030  86.  IO     .        .       .       .       .       .       .       .       .S      .       .       .
30100  87.  IO     .        .       .       .       .       .       .       .       .S      .       .       .
30130  88. I O     .        .       .       .       .       .       .       .       .S      .       .       .
30200  89. IO      .        .       .       .       .       .       .       .       .S      .       .       .
30230  90. IO      .        .       .       .       .       .       .       .       .S      .       .       .
30300  91. IO. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
30330  92. IO      .        .       .       .       .       .       .       .       S       .       .       .
30400  93. I       .        .       .       .       .       .       .       .       S       .       .       .
30430  94. I       .        .       .       .       .       .       .       .       S       .       .       .
30500  95.IO       .        .       .       .       .       .       .       .       S       .       .       .
30530  96.IO       .        .       .       .       .       .       .       .       S       .       .       .
30600  97.IO       .        .       .       .       .       .       .       .       S       .       .       .
30630  98.IO       .        .       .       .       .       .       .       .       S       .       .       .
30700  99.I        .        .       .       .       .       .       .       .       S       .       .       .
30730 100.I--------.--------.--------.--------.--------.--------.--------.--------.--------S--------.--------.--------.
```

*** *** *** *** ***

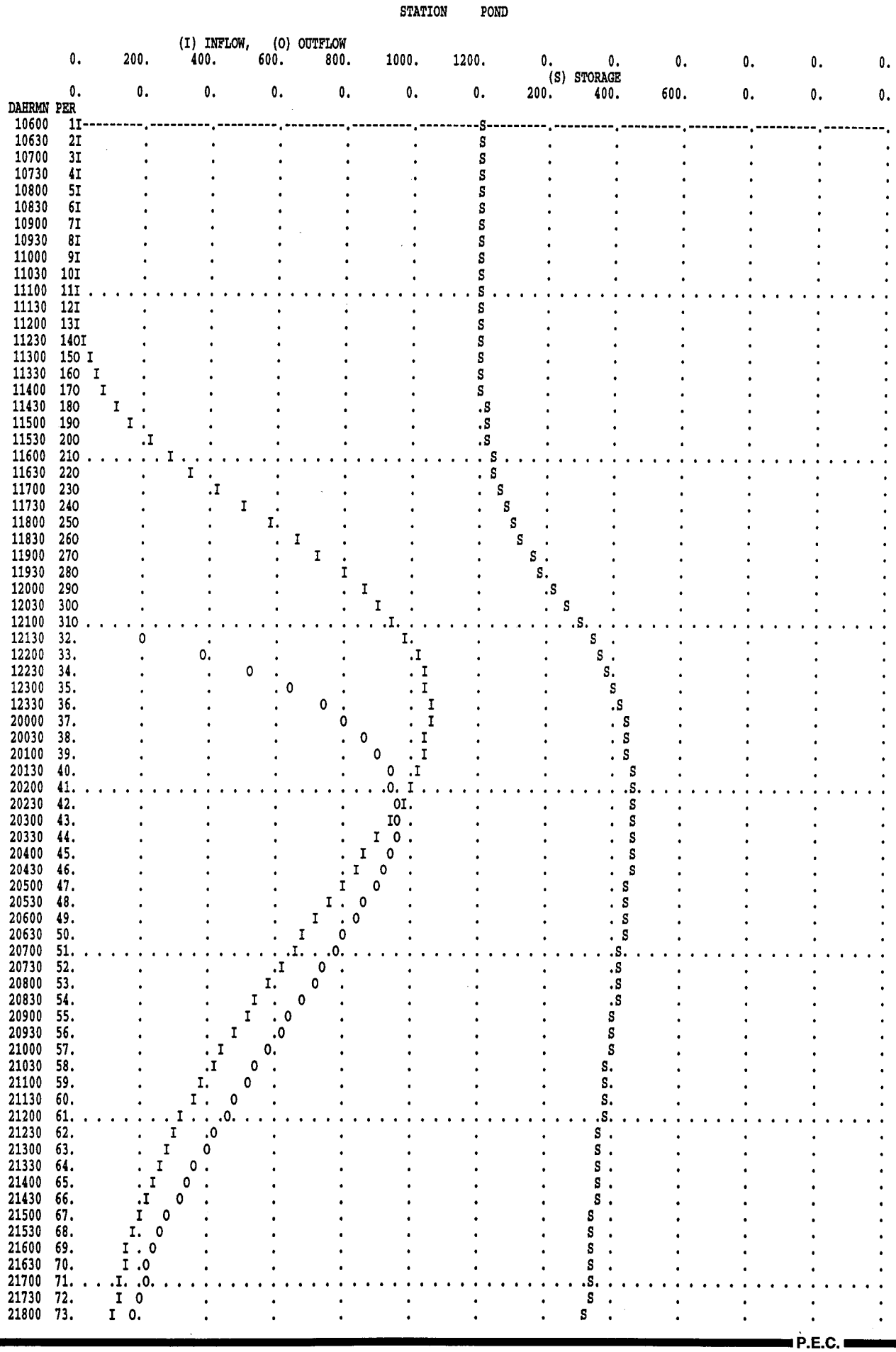
HYDROGRAPH AT STATION POND
FOR PLAN 1, RATIO = .68

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	49.50-HR
+ (CFS)	(HR)					
		(CFS)				
+ 959.	21.00		912.	541.	273.	273.
		(INCHES)	.424	1.007	1.049	1.049
		(AC-FT)	452.	1074.	1118.	1118.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	49.50-HR
+ (AC-FT)	(HR)				
457.	21.00	450.	389.	269.	269.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	49.50-HR
+ (FEET)	(HR)				
1322.80	21.00	1322.74	1322.23	1321.24	1321.24

CUMULATIVE AREA = 20.00 SQ MI


STATION POND
(I) INFLOW, (O) OUTFLOW
(S) STORAGE
DAHRMN PER

```
21830  74.     I O .       .       .       .       .       .       .   S   .       .       .       .       .       .
21900  75.    I  O .       .       .       .       .       .       .   S   .       .       .       .       .       .
21930  76.    I O  .       .       .       .       .       .       .   S   .       .       .       .       .       .
22000  77.   I O   .       .       .       .       .       .       .   S   .       .       .       .       .       .
22030  78.   I O   .       .       .       .       .       .       .   S   .       .       .       .       .       .
22100  79.   IO    .       .       .       .       .       .       .   S   .       .       .       .       .       .
22130  80.  I O    .       .       .       .       .       .       .   S   .       .       .       .       .       .
22200  81. .I.O. . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . .
22230  82.  IO     .       .       .       .       .       .       .   S   .       .       .       .       .       .
22300  83.  IO     .       .       .       .       .       .       .   S   .       .       .       .       .       .
22330  84. I O     .       .       .       .       .       .       .   S   .       .       .       .       .       .
30000  85. IO      .       .       .       .       .       .       .   S   .       .       .       .       .       .
30030  86. IO      .       .       .       .       .       .       .   S   .       .       .       .       .       .
30100  87. IO      .       .       .       .       .       .       .   S   .       .       .       .       .       .
30130  88. IO      .       .       .       .       .       .       .   S   .       .       .       .       .       .
30200  89. I       .       .       .       .       .       .       .   S   .       .       .       .       .       .
30230  90.IO       .       .       .       .       .       .       .   S   .       .       .       .       .       .
30300  91.IO . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . . .
30330  92.IO       .       .       .       .       .       .       .   S   .       .       .       .       .       .
30400  93.IO       .       .       .       .       .       .       .   S   .       .       .       .       .       .
30430  94.IO       .       .       .       .       .       .       .   S   .       .       .       .       .       .
30500  95.I        .       .       .       .       .       .       .   S   .       .       .       .       .       .
30530  96.I        .       .       .       .       .       .       .   S   .       .       .       .       .       .
30600  97.I        .       .       .       .       .       .       .   S   .       .       .       .       .       .
30630  98.I        .       .       .       .       .       .       .   S   .       .       .       .       .       .
30700  99.I        .       .       .       .       .       .       .   S   .       .       .       .       .       .
30730 100.I--------.--------.--------.--------.--------.--------.--------.---S---.--------.--------.--------.--------.
```

*** *** *** *** ***

HYDROGRAPH AT STATION POND
FOR PLAN 1, RATIO = .90

PEAK FLOW + (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	49.50-HR
		(CFS)				
1814.	20.00		1739.	1081.	552.	552.
		(INCHES)	.808	2.011	2.115	2.115
		(AC-FT)	862.	2145.	2256.	2256.

PEAK STORAGE + (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	49.50-HR
598.	20.00	585.	478.	324.	324.

PEAK STAGE + (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	49.50-HR
1323.96	20.00	1323.86	1322.97	1321.69	1321.69

CUMULATIVE AREA = 20.00 SQ MI

STATION POND

(I) INFLOW, (O) OUTFLOW

	0.	400.	800.	1200.	1600.	2000.	0.	0.	0.	0.	0.	0.	0.
									(S) STORAGE				
	0.	0.	0.	0.	0.	0.	0.	200.	400.	600.	0.	0.	0.
DAHRMN	PER												
10600	1	I						S					
10630	2	I						S					
10700	3	I						S					
10730	4	I						S					
10800	5	I						S					
10830	6	I						S					
10900	7	I						S					
10930	8	I						S					
11000	9	I						S					
11030	10	I						S					
11100	11	I						S					
11130	12	I						S					
11200	13	I						S					
11230	14	OI						S					
11300	15	O I						S					
11330	16	O I						S					
11400	17	O I						.S					
11430	18	O I						.S					
11500	19	O I						. S					
11530	20	O I						. S					
11600	21	O . I						. S					
11630	22	O . I						. S					
11700	23	O . I						. S					
11730	24	O . I						. S					
11800	25	O . I						. S					
11830	26	O . I						. S					
11900	27.0	O . I						. S					
11930	28.	O . I						. S					
12000	29.	O . I						. S					
12030	30.	O . I						. S					
12100	31.	O . I						. S					
12130	32.	O . I						. S					
12200	33.	O . I						. S					
12230	34.	O . I						. S					
12300	35.	O . I						. S					
12330	36.	O . I						. S					
20000	37.	O . I						. S					
20030	38.	O . I						. S					
20100	39.	O . I						. S					
20130	40.	O . I						. S					
20200	41.	O . I						. S					
20230	42.	O . I						. S					
20300	43.	O . I						. S					
20330	44.	O . I						. S					
20400	45.	O . I						. S					
20430	46.	O . I						. S					
20500	47.	O . I						. S					
20530	48.	O . I						. S					
20600	49.	O . I						. S					
20630	50.	O . I						. S					
20700	51.	O . I						. S					
20730	52.	O . I						. S					
20800	53.	O . I						. S					
20830	54.	O . I						. S					
20900	55.	O . I						. S					
20930	56.	O . I						. S					
21000	57.	O . I						. S					
21030	58.	O . I						. S					
21100	59.	O . I						. S					
21130	60.	O . I						. S					
21200	61.	O . I						. S					
21230	62.	O . I						. S					
21300	63.	O . I						. S					
21330	64.	O . I						. S					
21400	65.	O . I						. S					
21430	66.	O . I						. S					
21500	67.	O . I						. S					
21530	68.	O . I						. S					
21600	69.	O . I						. S					
21630	70.	O . I						. S					
21700	71.	O . I						. S					
21730	72.	O . I						. S					
21800	73.	O . I						. S					

```
21830  74.    I O  .       .       .       .       .       .       .       S  .       .       .       .       .       .
21900  75.   I O   .       .       .       .       .       .       .       S  .       .       .       .       .       .
21930  76.   I O   .       .       .       .       .       .       .       S  .       .       .       .       .       .
22000  77.   IO    .       .       .       .       .       .       .       S  .       .       .       .       .       .
22030  78.  I O    .       .       .       .       .       .       .       S  .       .       .       .       .       .
22100  79.  I O    .       .       .       .       .       .       .       S  .       .       .       .       .       .
22130  80.  IO     .       .       .       .       .       .       .      S   .       .       .       .       .       .
22200  81. .IO . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . .
22230  82. I O     .       .       .       .       .       .       .      S   .       .       .       .       .       .
22300  83. IO      .       .       .       .       .       .       .      S   .       .       .       .       .       .
22330  84. IO      .       .       .       .       .       .       .      S   .       .       .       .       .       .
30000  85. IO      .       .       .       .       .       .       .      S   .       .       .       .       .       .
30030  86. IO      .       .       .       .       .       .       .      S   .       .       .       .       .       .
30100  87. I       .       .       .       .       .       .       .      S   .       .       .       .       .       .
30130  88.IO       .       .       .       .       .       .       .      S   .       .       .       .       .       .
30200  89.IO       .       .       .       .       .       .       .      S   .       .       .       .       .       .
30230  90.IO       .       .       .       .       .       .       .      S   .       .       .       .       .       .
30300  91.IO . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . S . . . . . . . . . . . . . . . . . . . . . . .
30330  92.IO       .       .       .       .       .       .       .      S   .       .       .       .       .       .
30400  93.I        .       .       .       .       .       .       .     S    .       .       .       .       .       .
30430  94.I        .       .       .       .       .       .       .     S    .       .       .       .       .       .
30500  95.I        .       .       .       .       .       .       .     S    .       .       .       .       .       .
30530  96.I        .       .       .       .       .       .       .     S    .       .       .       .       .       .
30600  97.I        .       .       .       .       .       .       .     S    .       .       .       .       .       .
30630  98.I        .       .       .       .       .       .       .     S    .       .       .       .       .       .
30700  99.I        .       .       .       .       .       .       .     S    .       .       .       .       .       .
30730 100.I--------.--------.--------.--------.--------.--------.--------.----S----.--------.--------.--------.--------.
```

*** *** *** *** ***

HYDROGRAPH AT STATION POND
FOR PLAN 1, RATIO = 1.00

PEAK FLOW + (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	49.50-HR
		(CFS)				
+ 2258.	19.50		2166.	1361.	697.	697.
		(INCHES)	1.007	2.531	2.672	2.672
		(AC-FT)	1074.	2700.	2850.	2850.

PEAK STORAGE + (AC-FT)	TIME (HR)	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	49.50-HR
+ 670.	19.50	655.	523.	350.	350.

PEAK STAGE + (FEET)	TIME (HR)	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	49.50-HR
+ 1324.56	19.50	1324.44	1323.35	1321.91	1321.91

CUMULATIVE AREA = 20.00 SQ MI

STATION POND

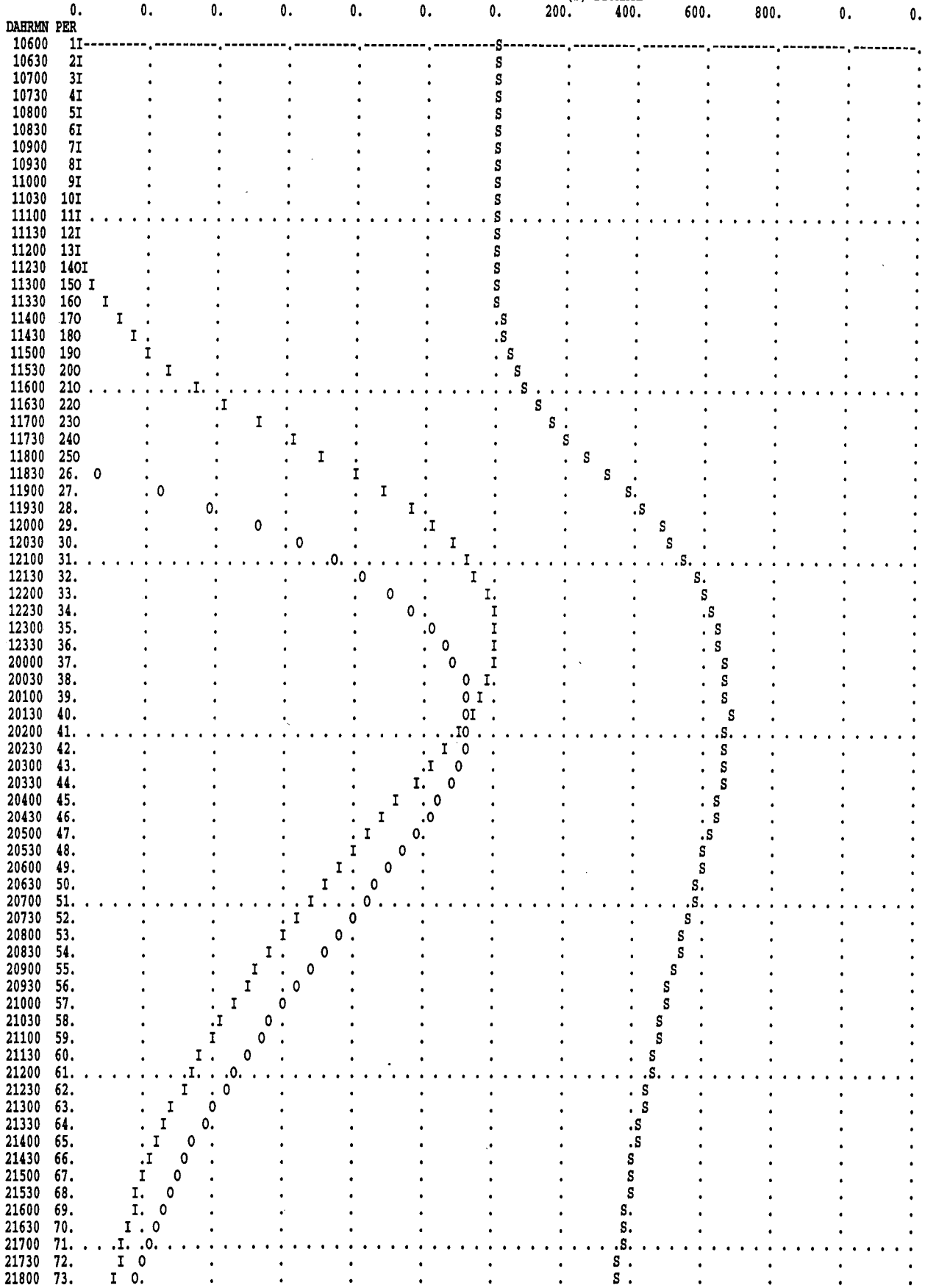
(I) INFLOW, (O) OUTFLOW

0. 400. 800. 1200. 1600. 2000. 2400.

0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 200. 400. 600. 800. 0. 0.

(S) STORAGE



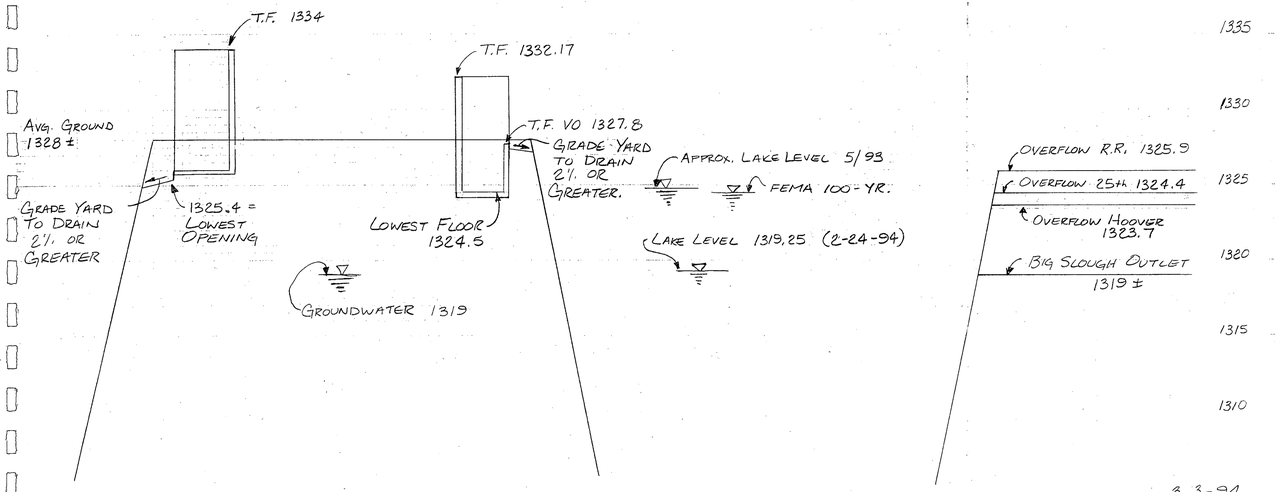
```
21830  74.     I O .       .       .       .       .       .       .     S .       .       .       .       .       .
21900  75.    I  O .       .       .       .       .       .       .     S .       .       .       .       .       .
21930  76.    I O  .       .       .       .       .       .       .   S   .       .       .       .       .       .
22000  77.   I  O  .       .       .       .       .       .       .   S   .       .       .       .       .       .
22030  78.   I O   .       .       .       .       .       .       .   S   .       .       .       .       .       .
22100  79.   I O   .       .       .       .       .       .       .   S   .       .       .       .       .       .
22130  80.  I O    .       .       .       .       .       .       .   S   .       .       .       .       .       .
22200  81. .I.O. . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . .
22230  82.  IO     .       .       .       .       .       .       .   S   .       .       .       .       .       .
22300  83.  IO     .       .       .       .       .       .       .   S   .       .       .       .       .       .
22330  84. I O     .       .       .       .       .       .       .   S   .       .       .       .       .       .
30000  85. IO      .       .       .       .       .       .       .   S   .       .       .       .       .       .
30030  86. IO      .       .       .       .       .       .       .   S   .       .       .       .       .       .
30100  87. IO      .       .       .       .       .       .       .   S   .       .       .       .       .       .
30130  88. IO      .       .       .       .       .       .       .   S   .       .       .       .       .       .
30200  89. I       .       .       .       .       .       .       .   S   .       .       .       .       .       .
30230  90.IO       .       .       .       .       .       .       .   S   .       .       .       .       .       .
30300  91.IO . . . . . . . . . . . . . . . . . . . . . . . . . . . . .S. . . . . . . . . . . . . . . . . . . . . . .
30330  92.IO       .       .       .       .       .       .       .   S   .       .       .       .       .       .
30400  93.IO       .       .       .       .       .       .       .   S   .       .       .       .       .       .
30430  94.IO       .       .       .       .       .       .       .   S   .       .       .       .       .       .
30500  95.I        .       .       .       .       .       .       .   S   .       .       .       .       .       .
30530  96.I        .       .       .       .       .       .       . S     .       .       .       .       .       .
30600  97.I        .       .       .       .       .       .       . S     .       .       .       .       .       .
30630  98.I        .       .       .       .       .       .       . S     .       .       .       .       .       .
30700  99.I        .       .       .       .       .       .       . S     .       .       .       .       .       .
30730 100.I--------.--------.--------.--------.--------.--------.--------S---------.--------.--------.--------.--------.
```

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 .58	RATIO 2 .68	RATIO 3 .90	RATIO 4 1.00
HYDROGRAPH AT								
+	29TH	20.00	1	FLOW	705.	1054.	1933.	2398.
				TIME	18.50	18.00	17.50	17.00
ROUTED TO								
+	POND	20.00	1	FLOW	603.	959.	1814.	2258.
				TIME	22.00	21.00	20.00	19.50
			** PEAK STAGES IN FEET **					
			1	STAGE	1322.32	1322.80	1323.96	1324.56
				TIME	22.00	21.00	20.00	19.50

*** NORMAL END OF HEC-1 ***

FIG. 3


T.F. 1334
T.F. 1332.17
AVG. GROUND 1328 ±
T.F. VO 1327.8
GRADE YARD TO DRAIN 2% OR GREATER.
APPROX. LAKE LEVEL 5/93
FEMA 100-YR.
GRADE YARD TO DRAIN 2% OR GREATER
1325.4 = LOWEST OPENING
LOWEST FLOOR 1324.5
LAKE LEVEL 1319.25 (2-24-94)
GROUNDWATER 1319
OVERFLOW R.R. 1325.9
OVERFLOW 25th 1324.4
OVERFLOW HOOVER 1323.7
BIG SLOUGH OUTLET 1319 ±
1335
1330
1325
1320
1315
1310

3-3-94