Kiowa Engineering Corporation

January 30, 2007

Mr. Tim Mitros
Subdivision Engineering
City of Colorado Springs
30 South Nevada, Suite 700
Colorado Springs, Colorado 80903

RE: Wolf Ranch Detention Basin A Final Design, Colorado Springs, Colorado (Kiowa Project No. 05104)

Dear Tim:

At the request of Rockwell Consulting Kiowa was asked to confirm that the peak discharge rate at the existing Powers Boulevard box culvert was held to historic levels. To confirm this Kiowa obtained the outflow hydrograph for the Grand Cordera Detention basin from Matrix and combined it with the hydrologic model for the basins within Wolf Ranch that drain to Detention Basin A and eventually to the culvert under Powers Boulevard.

Attached is our HEC-1 input and output that accounts for the Grand Cordera detention basin. The 100-year peak discharge obtained at design point A was 287 cubic feet per second. This compares to 555 cubic feet per second for the 100-year existing basin condition peak discharge at design point A as summarized in the Cottonwood Creek DBPS update prepared by Ayres and Associates and as referenced in the Grand Cordera MDDP prepared by Matrix. The capacity of the existing box culvert under Powers Boulevard far exceeds the 287 cubic feet per second estimated by Kiowa.

If Kiowa can be of any further assistance, please do not hesitate to contact us.

Sincerely,
KIOWA ENGINEERING CORPORATION

Richard N. Wray, P.E.
Principal

Cc: Keith Cerjan, Rockwell Consulting
Rich Gallegos, Matrix Design Group
RNW/rnw
01130rnw1

file: Wolf Ranch MDDP

1604 South 21st Street, Colorado Springs, CO 80904
(719) 630-7342 (719) 630-0406 FAX

```
1**************************************
*                                    *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)*
*             JUN  1998              *
*          VERSION 4.1               *
*                                    *
*  RUN DATE   30JAN07  TIME  10:27:24*
*                                    *
**************************************
```


```
**************************************
*                                    *
*   U.S. ARMY CORPS OF ENGINEERS     *
*   HYDROLOGIC ENGINEERING CENTER    *
*        609 SECOND STREET           *
*      DAVIS, CALIFORNIA 95616       *
*         (916) 756-1104             *
*                                    *
**************************************
```


```
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

1 HEC-1 INPUT PAGE 1

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

  1       ID          Wolf Ranch, Master Developed Drainage Plan
  2       ID       A Basins, future development condition w/detention DETA-FD.DAT
  3       ID          OUTFLOW FROM CORDERA DETENTION BASIN MODELED   PN 05104
  4       ID           5-year and 100 Year, 24 hr Type IIA  Storm
  5       ID           HYDROGRAPH FROM CORDERA DETENTION BASIN INPUT TO RUN
          *DIAGRAM
  6       IT        5        0        0     300
  7       IO        5        0
  8       UR     PREC      .56        1

  9       KK      A-1
 10       KM        RUNOFF FROM SUB-BASIN A-1
 11       BA     .060
 12       IN       15
```

```
 13          PB     4.4
 14          PC  0.0000  0.0005  0.0015  0.0030  0.0045  0.0060  0.0080  0.0100  0.0120  0.0143
 15          PC  0.0165  0.0188  0.0210  0.0233  0.0255  0.0278  0.0320  0.0390  0.0460  0.0530
 16          PC  0.0600  0.0750  0.1000  0.4000  0.7000  0.7250  0.7500  0.7650  0.7800  0.7900
 17          PC  0.8000  0.8100  0.8200  0.8250  0.8300  0.8350  0.8400  0.8450  0.8500  0.8550
 18          PC  0.8600  0.8638  0.8675  0.8713  0.8750  0.8788  0.8825  0.8863  0.8900  0.8938
 19          PC  0.8975  0.9013  0.9050  0.9083  0.9115  0.9148  0.9180  0.9210  0.9240  0.9270
 20          PC  0.9300  0.9325  0.9350  0.9375  0.9400  0.9425  0.9450  0.9475  0.9500  0.9525
 21          PC  0.9550  0.9575  0.9600  0.9625  0.9650  0.9675  0.9700  0.9725  0.9750  0.9775
 22          PC  0.9800  0.9813  0.9825  0.9838  0.9850  0.9863  0.9875  0.9888  0.9900  0.9913
 23          PC  0.9925  0.9938  0.9950  0.9963  0.9975  0.9988  1.0000
 24          LS       0      61
 25          UD    .292

 26          KK      A3
 27          KM   ROUTE FLOW FROM SUB-BASIN A-1 TO DP A3
 28          RD    2700     .021     0.04             TRAP       10        4

 29          KK     A-3
 30          KM      RUNOFF FROM SUB-BASIN A-3
 31          BA     .15
 32          LS       0       73
 33          UD    .221

 34          KK    DPA3
 35          KM       COMBINE SUB-BASIN A-3 AND A3
 36          HC       2

 37          KK     A3A
 38          KM        ROUTE FLOW FROM DP A3 TO DP A4
 39          RD    1100      .02     .013             CIRC        4

 40          KK     A-4
 41          KM   RUNOFF FROM SUB-BASIN A-4
 42          BA   .0861
 43          LS       0    76.3
 44          UD    0.21
```



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

 45          KK    DPA4
 46          KM        COMBINE FLOW FROM A3A AND SUB-BASIN A-4
 47          HC       2

 48          KK      A4
 49          KM   ROUTE RUNOFF FROM DPA4 TO A6
 50          RD     450      .02     .013             CIRC      4.5

 51          KK      A6
 52          KM   ROUTE FLOW FROM A4 TO DP A6
```

```
 53          RD    1550     .016     .013            TRAP      10        4

 54          KK     A-11
 55          KM    RUNOFF FROM SUB-BASIN A-11
 56          BA     .081
 57          LS        0     76.8
 58          UD      .19

 59          KK      A11
 60          KM    ROUTE SUB-BASIN A-11 TO DP A8
 61          RD    1400      .02     .013            CIRC      3.5

 62          KK      A-8
 63          KM    RUNOFF FROM BASIN A-8
 64          BA     .079
 65          LS        0     83.9
 66          UD     .250

 67          KK    DP A8
 68          KM    COMBINE RUNOFF FROM SB A-8 AND A11
 69          HC        2

 70          KK       A8
 71          KM    ROUTE FLOW FROM DES POINT A8 TO DP A7
 72          RD    1100      .02     .013            CIRC      4.5

 73          KK      A-7
 74          KM    RUNOFF FROM SUB-BASIN A-7
 75          BA    .0500
 76          LS        0     76.6
 77          UD     .172

 78          KK    DP A7
 79          KM    COMBINE RUNOFF FROM SUB-BASIN A-7 AND A8
 80          HC        2

 81          KK       A7
 82          KM    ROUTE FLOW FROM DP A7 TO DP A6
 83          RD     300     0.02    0.013            CIRC        5
1                                      HEC-1 INPUT                                                    PAGE  3

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

 84          KK      A-6
 85          KM    RUNOFF FROM SUB-BASIN A-6
 86          BA     .045
 87          LS        0     80.8
 88          UD      .21

 89          KK     DPA6
 90          KM    DESIGN POINT A6 COMBINE RUNOFF FROM SUB-BASIN A-6, A6 AND A7
```

```
 91          HC       3

 92          KK      A5
 93          KM    ROUTE FLOW FROM DESIGN POINT A6 TO DP A5
 94          RD     2200     .011      .04              TRAP       10        4

 95          KK     A-12
 96          KM    RUNOFF FROM SUB-BASIN A-12
 97          BA     .048
 98          LS        0       78
 99          UD     .181

100          KK      A12
101          KM    ROUTE RUNOFF FROM SUB-BASIN A-12 TO DP A9
102          RD     1950      .02      .013             CIRC        3

103          KK    A-9
104          KM    RUNOFF FROM SUB-BASIN A-9
105          BA     .059
106          LS        0     76.3
107          UD     .263

108          KK    DP A9
109          KM    COMBINE RUNOFF FROM SUB-BASIN A-9 AND A12
110          HC       2

111          KK      A9
112          KM    ROUTE FLOW FROM SUB-BASIN A-9 TO DESIGN POINT A5
113          RD      500      .02      .016             CIRC        4

114          KK    A-5
115          KM    RUNOFF FROM SUB-BASIN A-5
116          BA    .1114
117          LS        0     69.7
118          UD     .209

119          KK     DPA5
120          KM    DP A5 COMBINE RUNOFF FROM SUB-BASIN A-5, A5 AND A9 THIS IS INFLOW
121          KM    TO DETENTION BASIN A
122          HC       3
```



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

123          KK      DBA
124          KM    ROUTE DP A5 THROUGH DETENTION BASIN A
125          RS        1     ELEV  6975.5
126          SV        0      .11       4.1      11.5      19.5        28      37.5      47.6
127          SE   6975.5     6976      6978      6980      6982      6984      6986      6988
128          SQ        0       10        20        40        60       120       160       900
129          SS     6987      250       2.6       1.5
```

```
130          ST    6938      15      2.6      1.5

131          KK     A10
132          KM   ROUTE FLOW FROM DET BASIN DBA TO DESIGN POINT A1
133          RD    1100    .032    .013             CIRC       4

134          KK      GC
135          KM           OUTFLOW HYDROGRAPH FROM CORDERA DETENTION BASIN
136          BA     .27
137          QI       0       0       0       0       0       0       0       0       0       0
138          QI       0       0       0       0       0       0       0       0       0       0
139          QI       0       0       0       1      37     127     128     126     101      77
140          QI      60      51      45      40      38      37      37      30      24      21

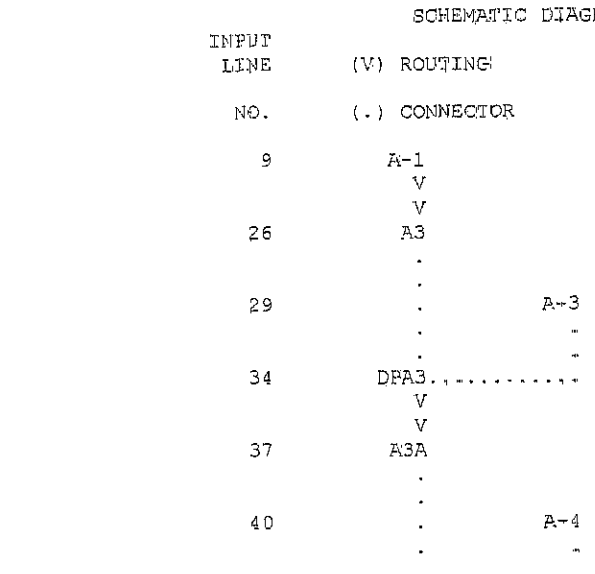
141          KK   DP A1
142          KM       COMBINE OUTFLOW FROM GRAND CORDERA DETENTION BASIN AND A10
143          HC       2

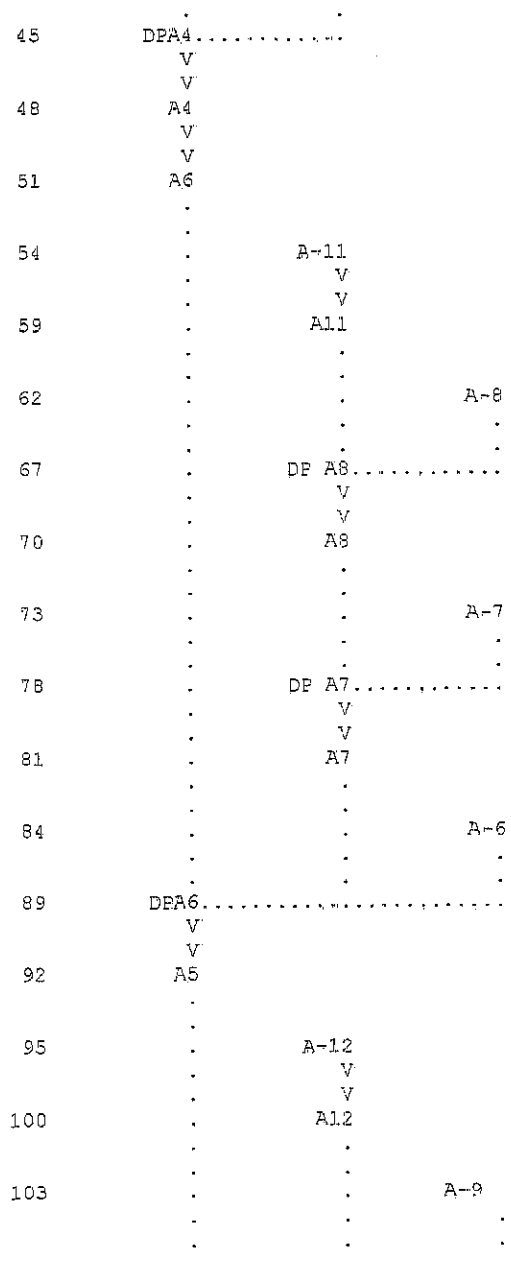
144          KK    A-10
145          KM   RUNOFF FROM SUB-BASIN A-10
146          BA   .0096
147          LS       0    79.6
148          UD    .231

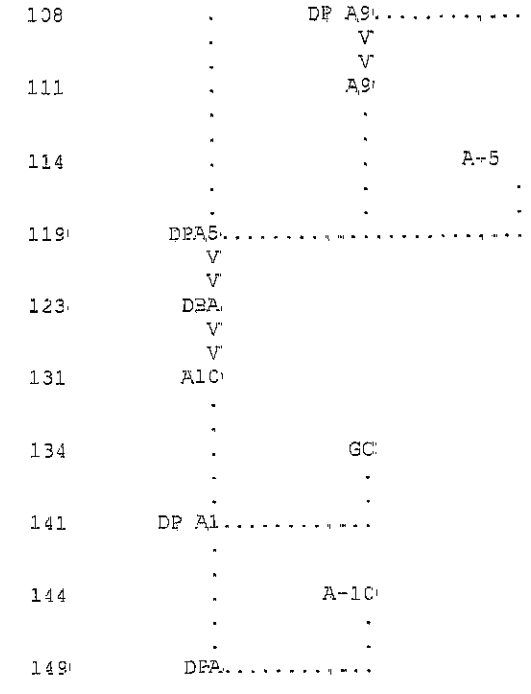
149          KK     DPA
150          KM   DESIGN POINT A COMBINE RUNOFF SUB-BASIN A-10 AND DP A1
151          HC       2
152          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK




45
DPA4
48
A4
51
A6
54
A-11
59
A11
62
A-8
67
DP A8
70
A8
73
A-7
78
DP A7
81
A7
84
A-6
89
DPA6
92
A5
95
A-12
100
A12
103
A-9



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1**********************************************
*                                            *
*    FLOOD HYDROGRAPH PACKAGE  (HEC-1)       *
*                 JUN  1998                  *
*              VERSION 4.1                   *
*                                            *
*  RUN DATE   30JAN97  TIME  10:27:24        *
*                                            *
**********************************************
```

```
**************************************
*                                    *
*    U.S. ARMY CORPS OF ENGINEERS    *
*    HYDROLOGIC ENGINEERING CENTER   *
*          609 SECOND STREET         *
*       DAVIS, CALIFORNIA 95616      *
*           (916) 756-1104           *
*                                    *
**************************************
```

Wolf Ranch, Master Developed Drainage Plan
A Basins, future development condition w/detention DETA-FD.DAT
OUTFLOW FROM CORDERA DETENTION BASIN MODELED PN 05104
5-year and 100 Year, 24 hr Type IIA Storm
HYDROGRAPH FROM CORDERA DETENTION BASIN INPUT TO RUN

```
  7 IO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
```

```
                    IPLOT          0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                     NMIN          5  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1   0  STARTING DATE
                    ITIME         0000  STARTING TIME
                       NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE     2   0  ENDING DATE
                    NDTIME         0055  ENDING TIME
                    ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL      .08 HOURS
                       TOTAL TIME BASE   24.92 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
                      .56      1.00
1

                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

                                                                                  RATIOS APPLIED TO PRECIPITATION
 OPERATION        STATION      AREA     PLAN                    RATIO 1  RATIO 2
                                                                    .56      1.00

 HYDROGRAPH AT
+                    A-1        .06      1   FLOW                  3.       32.
                                              TIME                6.25     6.17

 ROUTED TO
+                    A3         .06      1   FLOW                  4.       32.
                                              TIME                6.50     6.33

 HYDROGRAPH AT
+                    A-3        .15      1   FLOW                 49.      194.
                                              TIME                6.17     6.08
```

2 COMBINED AT						
+	DPA3	.21	1	FLOW	49.	196.
				TIME	6.17	6.17
ROUTED TO						
+	A3A	.21	1	FLOW	49.	195.
				TIME	6.17	6.17
HYDROGRAPH AT						
+	A-4	.09	1	FLOW	39.	133.
				TIME	6.08	6.08
2 COMBINED AT						
+	DPA4	.30	1	FLOW	86.	322.
				TIME	6.17	6.08
ROUTED TO						
+	A4	.30	1	FLOW	86.	319.
				TIME	6.17	6.08
ROUTED TO						
+	A6	.30	1	FLOW	85.	315.
				TIME	6.17	6.17
HYDROGRAPH AT						
+	A-11	.08	1	FLOW	41.	134.
				TIME	6.08	6.08
ROUTED TO						
+	A11	.08	1	FLOW	39.	131.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	A-8	.08	1	FLOW	57.	152.
				TIME	6.17	6.08
2 COMBINED AT						
+	DP A8	.16	1	FLOW	95.	283.
				TIME	6.08	6.08
ROUTED TO						
+	A8	.16	1	FLOW	94.	278.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	A-7	.05	1	FLOW	26.	84.
				TIME	6.08	6.08
2 COMBINED AT						
+	DP A7	.21	1	FLOW	118.	362.
				TIME	6.08	6.08

ROUTED TO						
+	A7	.21	1	FLOW	116.	358.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	A-6	.05	1	FLOW	29.	84.
				TIME	6.08	6.08
3 COMBINED AT						
+	DPA6	.55	1	FLOW	228.	745.
				TIME	6.17	6.08
ROUTED TO						
+	A5	.55	1	FLOW	225.	732.
				TIME	6.25	6.17
HYDROGRAPH AT						
+	A-12	.05	1	FLOW	27.	84.
				TIME	6.08	6.08
ROUTED TO						
+	A12	.05	1	FLOW	26.	82.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	A-9	.06	1	FLOW	24.	81.
				TIME	6.17	6.17
2 COMBINED AT						
+	DP A9	.11	1	FLOW	49.	161.
				TIME	6.17	6.08
ROUTED TO						
+	A9	.11	1	FLOW	49.	159.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	A-5	.11	1	FLOW	27.	126.
				TIME	6.17	6.08
3 COMBINED AT						
+	DPA5	.77	1	FLOW	288.	1003.
				TIME	6.25	6.17
ROUTED TO						
+	DBA	.77	1	FLOW	38.	160.
				TIME	7.17	6.83

** PEAK STAGES IN FEET **

1	STAGE	6979.79	6985.98
	TIME	7.17	6.83

ROUTED TO						
+	A10	.77	1	FLOW	38.	160.
				TIME	7.25	6.92
HYDROGRAPH AT						
+	GC	.27	1	FLOW	128.	128.
				TIME	6.50	6.50
2 COMBINED AT						
+	DP A1	1.04	1	FLOW	162.	285.
				TIME	6.75	6.75
HYDROGRAPH AT						
+	A-10	.01	1	FLOW	5.	16.
				TIME	6.08	6.08
2 COMBINED AT						
+	DPA	1.05	1	FLOW	163.	287.
				TIME	6.75	6.75

1

1

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION DBA
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1 .....

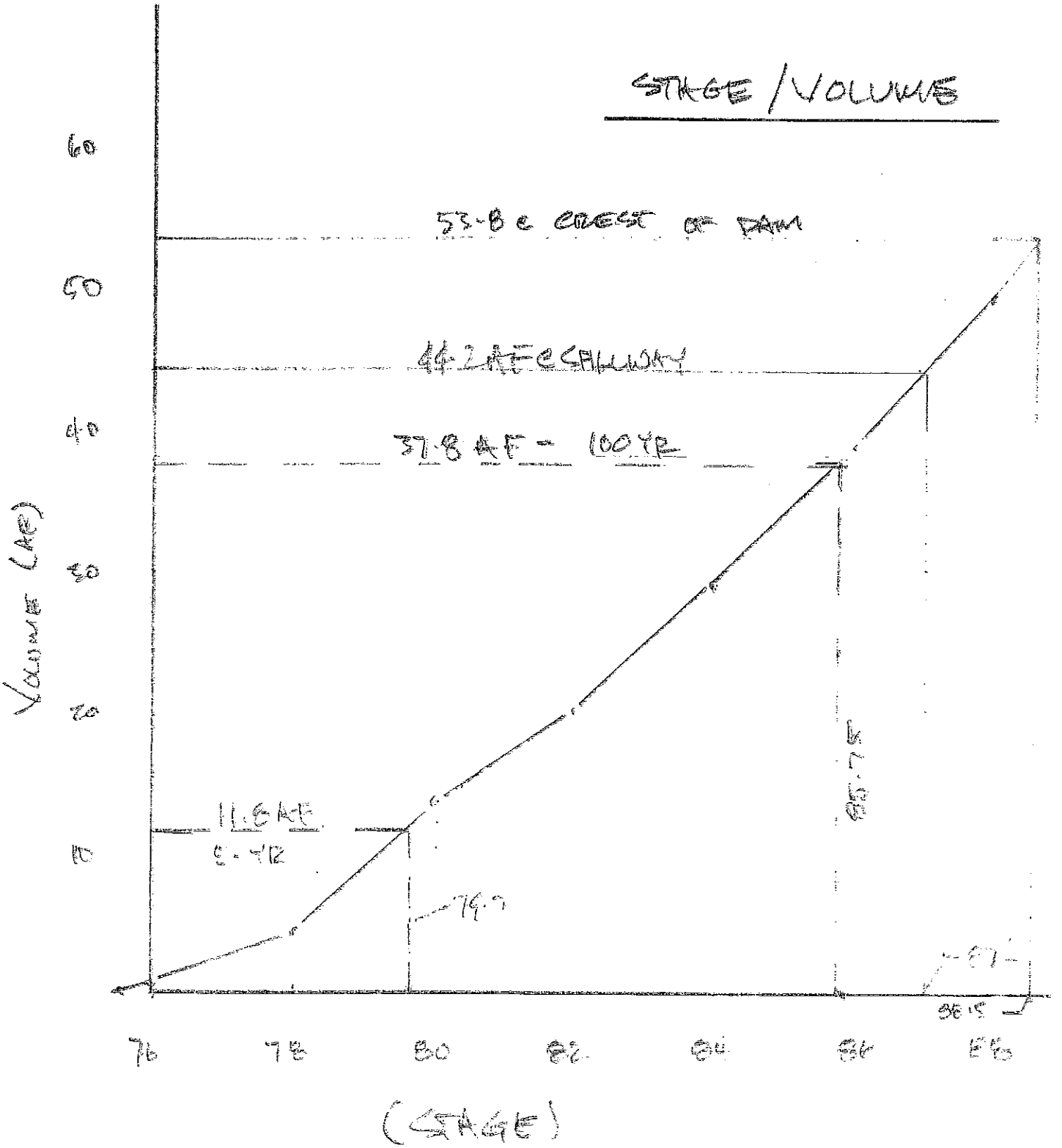
	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	6975.50	6987.00	6988.00
STORAGE	0.	43.	48.
OUTFLOW	0.	580.	900.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.56	6979.79	.00	11.	38.	.00	7.17	.00
1.00	6985.98	.00	37.	160.	.00	6.83	.00

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

Kiowa Engineering Corporation

CLIENT WOLF RANCH | JOB NO. 0704 | PAGE 1/2
PROJECT | DATE CHECKED | DATE 5/27/06
DETAIL Det. Pond A | CHECKED BY | COMPUTED BY

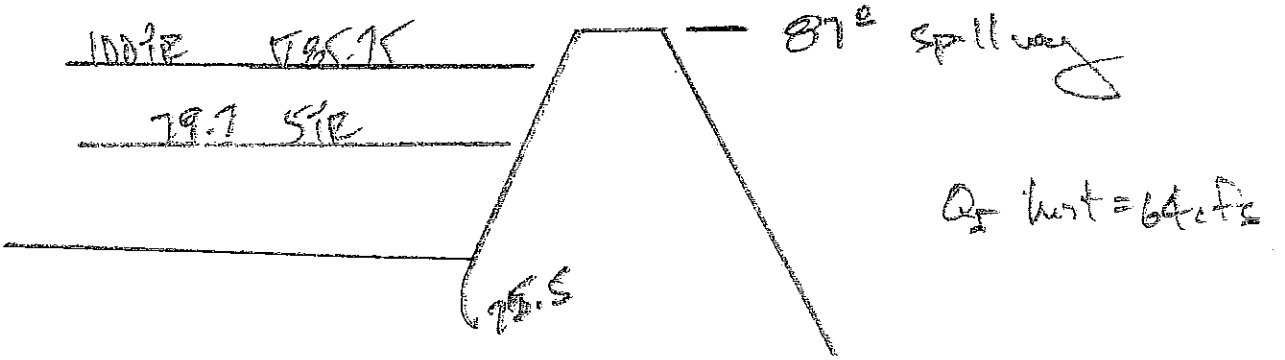


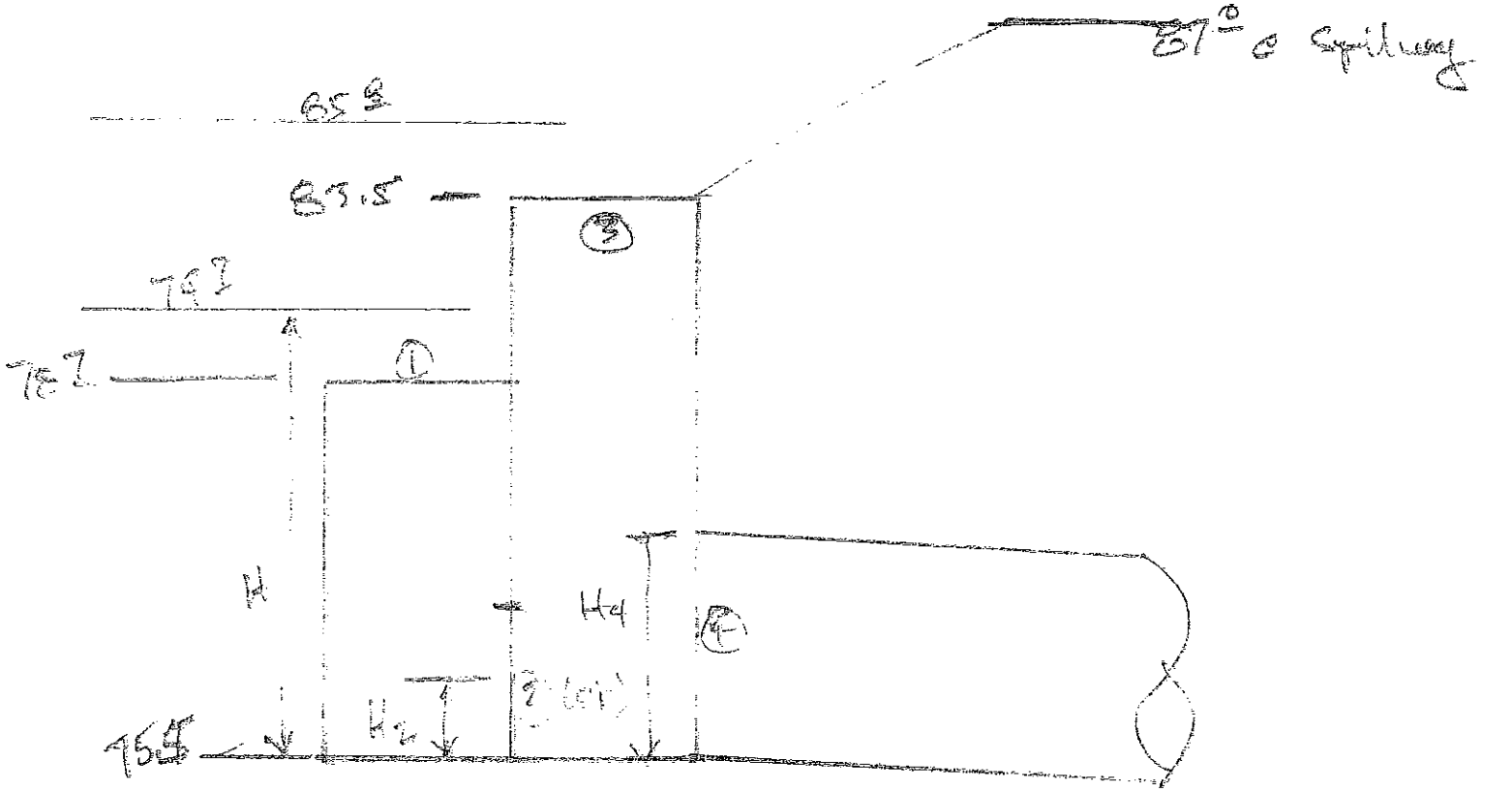
Detention Basin Volume Calculation
Detention Basin A Wolf Ranch

elevation	area (sf)	area (ac)	average area (ac)	Interval (ft)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)
6975.5	0	0				
			0.22	0.5	0.11	0.11
6976	18775	0.43				
			2.04	2	4.07	4.18
6978	158708	3.64				
			3.80	2	7.60	11.79
6980	172477	3.96				
			4.12	2	8.23	20.02
6982	186220	4.28				
			4.49	2	8.97	28.99
6984	204550	4.70				
			4.94	2	9.87	38.86
6986	225540	5.18				
			5.34	2	10.69	49.55
6988	239950	5.51				

Kiowa Engineering Corporation

CLIENT Port Basin A JOB NO. 05104 PAGE 1
PROJECT Wharf Rehab DATE CHECKED DATE 5/29/04
DETAIL CHECKED BY COMPUTED BY RJW





① Check upper @ ①: Assume orifice w/ $C_c = .65$ $C_v = .75$ (25% blockage)

$Q = C_c C_v A \sqrt{2gH}$ $H = 1.0 (EEL\ 78.7)$

$= .65(.75) A \sqrt{2g(1)}$ $= 3.79A$ w/ $Q = 64$ cfs

$\therefore A = 64/3.79 \rightarrow 16.9$ sf. w/ w: 2', h = 8.44

use 2' x 8'-6" opening

(2) Check @ opening @ (2) $C = .63$, $C_B = 1.0$ (no blockage)

$H_2 = (79.7 - 75.5') - (\frac{1}{2} H_2) = 4.2 - \frac{1}{2} H_2$

w/ $H_2 = 2'$, $H_2 = 4.2 - (\frac{1}{2}(2)) = 3.2'$

$Q = .63 A \sqrt{2gH} = .63(A)\sqrt{2g(3.2)} = 9.0 A$

w/ Q = 64 cfs $\therefore A = 64/9 = 7.1$ sf.

w/ $H_2 = 2' \therefore W_2 = 7.1/2 = 3.56'$

use 3.5'

(3) Check opening @ (3) : 100 year $C = .63$ $C_B = .75$

$H = 85.75 - 83.5 = 2.3'$

$Q = .63(.75) A \sqrt{2g(2.3)} = 5.75 A$

w/ Q = 157 cfs $L = 157/57.5 = 27.3$ ft

w/ 8' - 6" width of structure, $H_2 = 27.3/8.5$

$= 3.2'$

Say 3.25'

Check @ Opening #4

$C_D = .63 \quad C_E = 1.0$

$H = (85.5 - 75.5) - \frac{1}{2}H_q = 10.3' - \frac{1}{2}H_q$

w/ $H_q = 4' \quad \therefore \quad H = 10.3 - \frac{1}{2}(4) = 8.3'$

$Q = .63(A)\sqrt{2g(8.3)} = 14.5A$

w/ $Q = 157$: $A = 157/14.5 = 10.8$ sf

Area of 48" RCP = 12.6 sf.; too large.

use Orifice plate over 48" RCP

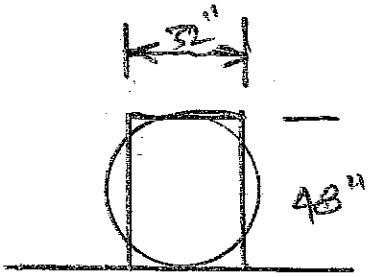
assume H_q of opening = 4'

$\therefore \quad Q = 14.5A$ as above

$\therefore \quad A = 157/14.5 = 10.8$ sf.

w/ $H_q = 4'$, $W_q = 10.8/4 = 2.7' = 2'-8.4"$

Use orifice plate 32½" wide by 32"



Kiowa Engineering Corporation

CLIENT Dist. Basin A | JOB NO. 20114 | PAGE 4
PROJECT Wolf Basin | DATE CHECKED | DATE 5/27/03
DETAIL | CHECKED BY | COMPUTED BY B. W.

Minimum Slope for 18 RCP = 1.2%

Qfull = 15 cfs ∴ ok

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   30MAY06  TIME  12:57:02   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET             *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
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

1 HEC-1 INPUT PAGE 1

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

  1           ID          Wolf Ranch, Master Developed Drainage Plan
  2           ID       A Basins, future development condition w/detention DETA-FD.DAT
  3           ID           OUTFLOW FROM CORDERA DETENTION BASIN MODELED   PN 05104
  4           ID            5-year and 100 Year, 24 hr Type IIA  Storm
              *DIAGRAM
  5           IT       5       0       0     300
  6           IO       5       0
  7           JR    PREC     .56       1

  8           KK     A-1
  9           KM       RUNOFF FROM SUB-BASIN A-1
 10           BA    .060
 11           LS      15
 12           PB     4.4
```

DETAIL BASIN A

```
 13          PC  0.0000  0.0005  0.0015  0.0030  0.0045  0.0060  0.0080  0.0100  0.0120  0.0143
 14          PC  0.0165  0.0188  0.0210  0.0233  0.0255  0.0278  0.0320  0.0390  0.0460  0.0530
 15          PC  0.0600  0.0750  0.1000  0.4000  0.7000  0.7250  0.7500  0.7650  0.7800  0.7900
 16          PC  0.8000  0.8100  0.8200  0.8250  0.8300  0.8350  0.8400  0.8450  0.8500  0.8550
 17          PC  0.8600  0.8638  0.8675  0.8713  0.8750  0.8788  0.8825  0.8863  0.8900  0.8938
 18          PC  0.8975  0.9013  0.9050  0.9083  0.9115  0.9148  0.9180  0.9210  0.9240  0.9270
 19          PC  0.9300  0.9325  0.9350  0.9375  0.9400  0.9425  0.9450  0.9475  0.9500  0.9525
 20          PC  0.9550  0.9575  0.9600  0.9625  0.9650  0.9675  0.9700  0.9725  0.9750  0.9775
 21          PC  0.9800  0.9813  0.9825  0.9838  0.9850  0.9863  0.9875  0.9888  0.9900  0.9913
 22          PC  0.9925  0.9938  0.9950  0.9963  0.9975  0.9988  1.0000
 23          LS     0      61
 24          UB   .292

 25          KK     A3
 26          KM   ROUTE FLOW FROM SUB-BASIN A-1 TO DP A3
 27          RD   2700    .021    0.04            TRAP      10       4

 28          KK    A-3
 29          KM     RUNOFF FROM SUB-BASIN A-3
 30          BA    .15
 31          LS     0      73
 32          UB   .221

 33          KK    DPA3
 34          KM      COMBINE SUB-BASIN A-3 AND A3
 35          HC      2

 36          KK    A3A
 37          KM       ROUTE FLOW FROM DP A3 TO DP A4
 38          RD   1100     .02    .013            CIRC       4

 39          KK    A-4
 40          KM   RUNOFF FROM SUB-BASIN A-4
 41          BA   .0861
 42          LS     0    76.3
 43          UB   0.21
```



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

 44          KK    DPA4
 45          KM       COMBINE FLOW FROM A3A AND SUB-BASIN A-4
 46          HC      2

 47          KK     A4
 48          KM   ROUTE RUNOFF FROM DPA4 TO A6
 49          RD    450     .02    .013            CIRC     4.5

 50          KK     A6
 51          KM   ROUTE FLOW FROM A4 TO DP A6
 52          RD   1550    .016    .013            TRAP      10       4
```

```
53          KK    A-11
54          KM    RUNOFF FROM SUB-BASIN A-11
55          BA     .081
56          LS        0    76.8
57          UD      .19

58          KK     A11
59          KM    ROUTE SUB-BASIN A-11 TO DP A8
60          RD     1400      .02     .013            CIRC      3.5

61          KK     A-8
62          KM    RUNOFF FROM BASIN A-8
63          BA     .079
64          LS        0    83.9
65          UD     .250

66          KK    DP A8
67          KM    COMBINE RUNOFF FROM SB A-8 AND A11
68          HC        2

69          KK     A8
70          KM    ROUTE FLOW FROM DES POINT A8 TO DP A7
71          RD     1100      .02     .013            CIRC      4.5

72          KK     A-7
73          KM    RUNOFF FROM SUB-BASIN A-7
74          BA    .0500
75          LS        0    76.6
76          UD     .172

77          KK    DP A7
78          KM    COMBINE RUNOFF FROM SUB-BASIN A-7 AND A8
79          HC        2

80          KK     A7
81          KM    ROUTE FLOW FROM DP A7 TO DP A6
82          RD      800    0.02    0.013            CIRC        5
```



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

83          KK     A-6
84          KM    RUNOFF FROM SUB-BASIN A-6
85          BA     .045
86          LS        0    80.8
87          UD      .21

88          KK     DPA6
89          KM    DESIGN POINT A6 COMBINE RUNOFF FROM SUB-BASIN A-6, A6 AND A7
90          HC        3
```

```
 91          KK      A5
 92          KM    ROUTE FLOW FROM DESIGN POINT A6 TO DP A5
 93          RD     2200     .011      .04             TRAP       10        4

 94          KK     A-12
 95          KM    RUNOFF FROM SUB-BASIN A-12
 96          BA     .048
 97          LS        0       78
 98          UD     .181

 99          KK      A12
100          KM    ROUTE RUNOFF FROM SUB-BASIN A-12 TO DP A9
101          RD     1950      .02     .013             CIRC        3

102          KK    A-9
103          KM    RUNOFF FROM SUB-BASIN A-9
104          BA     .059
105          LS        0     76.3
106          UD     .263

107          KK    DP A9
108          KM    COMBINE RUNOFF FROM SUB-BASIN A-9 AND A12
109          HC        2

110          KK      A9
111          KM    ROUTE FLOW FROM SUB-BASIN A-9 TO DESIGN POINT A5
112          RD     500      .02     .016             CIRC        4

113          KK    A-5
114          KM    RUNOFF FROM SUB-BASIN A-5
115          BA    .1114
116          LS        0     69.7
117          UD     .209

118          KK     DPA5
119          KM    DP A5 COMBINE RUNOFF FROM SUB-BASIN A-5, A5 AND A9 THIS IS INFLOW
120          KM    TO DETENTION BASIN A
121          HC        3
1                                        HEC-1 INPUT                                                    PAGE  4

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


122          KK      DBA
123          KM    ROUTE DP A5 THROUGH DETENTION BASIN A
124          RS        1    ELEV  6975.5
125          SV        0     .11     4.2    11.8    20.0    29.0    38.9    49.6
126          SE   6975.5    6976    6978    6980    6982    6984    6986    6988
127          SQ        0      10      20      40      80     120     160     300
128          SS     6987     250     2.6     1.5
129          ST     6988      15     2.6     1.5
```

```
130           KK     A10
131           KM   ROUTE FLOW FROM DET BASIN DBA TO DESIGN POINT A1
132           RD    1100    .032    .013            CIRC       4

133           KK      GC
134           KM          OUTFLOW HYDROGRAPH FROM CORDERA DETENTION BASIN
135           BA    .075
136           QI       0       0       0       0       0       0       0       0       0       0
137           QI       0       0       0       0       0       0       0       0       0       0
138           QI       0       0       0       0       0       0       0       0       0       0
139           QI       0       0       0       0       0       5      51     122     149     136
140           QI     119     103      90      76      66      57      51      41      35      28
141           QI      26      23      21      19      17      12      10      10       9       9

142           KK   DP A1
143           KM       COMBINE OUTFLOW FROM GRAND CORDERA DETENTION BASIN AND A10
144           HC        2

145           KK    A-10
146           KM   RUNOFF FROM SUB-BASIN A-10
147           BA   .0096
148           LS       0    79.6
149           UD    .231

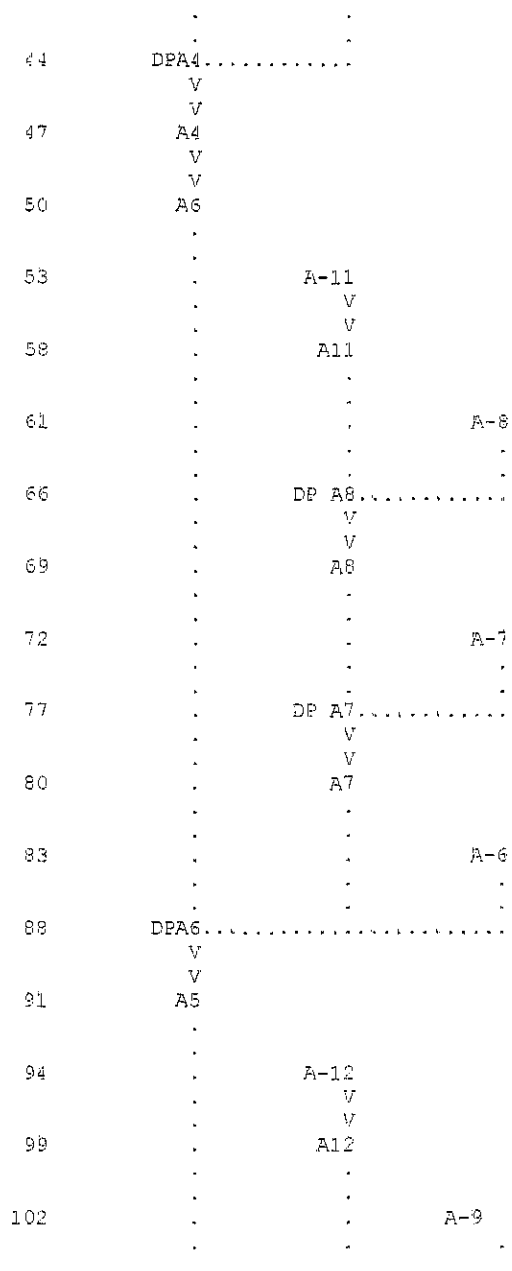
150           KK     DPA
151           KM   DESIGN POINT A COMBINE RUNOFF SUB-BASIN A-10 AND DP A1
152           HC        2
153           ZZ
1
```

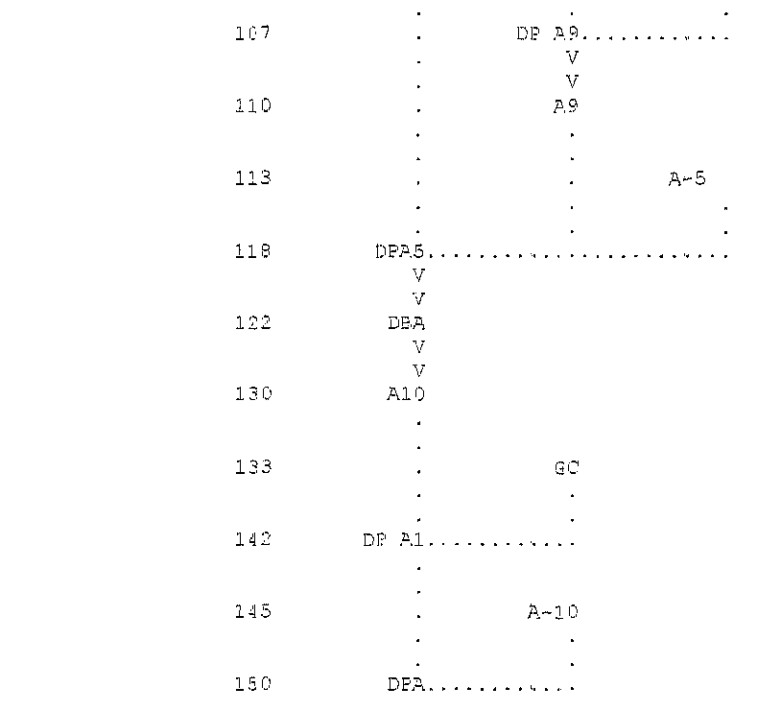
SCHEMATIC DIAGRAM OF STREAM NETWORK

```
 INPUT
  LINE      (V) ROUTING           (---->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR         (<----) RETURN OF DIVERTED OR PUMPED FLOW

     8         A-1
                 V
                 V
    25          A3
                  .
                  .
    28            .          A-3
                  .            .
                  .            .
    33         DPA3............
                 V
                 V
    36          A3A
                  .
                  .
    39            .          A-4
```


44 DPA4
47 A4
50 A6
53 A-11
58 A11
61 A-8
66 DP A8
69 A8
72 A-7
77 DP A7
80 A7
83 A-6
88 DPA6
91 A5
94 A-12
99 A12
102 A-9



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   30MAY06  TIME  12:57:02   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET            *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

Wolf Ranch, Master Developed Drainage Plan
A Basins, future development condition w/detention DETA-FD.DAT
OUTFLOW FROM CORDERA DETENTION BASIN MODELED PN 05104
5-year and 100 Year, 24 hr Type IIA Storm

```
  6 IO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
```

```
                    IPLOT          0  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                     NMIN          5  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1   0  STARTING DATE
                    ITIME         0000  STARTING TIME
                       NQ         300  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      2   0  ENDING DATE
                   NDTIME         0055  ENDING TIME
                   ICENT          19  CENTURY MARK

                COMPUTATION INTERVAL      .08 HOURS
                     TOTAL TIME BASE    24.92 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
                      .56      1.00
1

              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


                                                                          RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION      AREA     PLAN                    RATIO 1  RATIO 2
                                                                   .56     1.00

 HYDROGRAPH AT
+                    A-1        .06      1    FLOW                3.      32.
                                                TIME             6.25    6.17

 ROUTED TO
+                    A3         .06      1    FLOW                4.      32.
                                                TIME             6.50    6.33

 HYDROGRAPH AT
+                    A-3        .15      1    FLOW               49.     194.
                                                TIME             6.17    6.08
```

2 COMBINED AT						
+	DPA3	.21	1	FLOW	49.	196.
				TIME	6.17	6.17
ROUTED TO						
+	A3A	.21	1	FLOW	49.	195.
				TIME	6.17	6.17
HYDROGRAPH AT						
+	A-4	.09	1	FLOW	39.	133.
				TIME	6.08	6.08
2 COMBINED AT						
+	DPA4	.30	1	FLOW	86.	322.
				TIME	6.17	6.08
ROUTED TO						
+	A4	.30	1	FLOW	86.	319.
				TIME	6.17	6.08
ROUTED TO						
+	A6	.30	1	FLOW	85.	315.
				TIME	6.17	6.17
HYDROGRAPH AT						
+	A-11	.08	1	FLOW	41.	134.
				TIME	6.08	6.08
ROUTED TO						
+	A11	.08	1	FLOW	39.	131.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	A-8	.08	1	FLOW	57.	152.
				TIME	6.17	6.08
2 COMBINED AT						
+	DP A8	.16	1	FLOW	95.	283.
				TIME	6.08	6.08
ROUTED TO						
+	A8	.16	1	FLOW	94.	278.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	A-7	.05	1	FLOW	26.	84.
				TIME	6.08	6.08
2 COMBINED AT						
+	DP A7	.21	1	FLOW	118.	362.
				TIME	6.08	6.08

ROUTED TO						
+	A7	.21	1	FLOW	116.	358.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	A-6	.05	1	FLOW	29.	84.
				TIME	6.08	6.08
3 COMBINED AT						
+	DPA6	.56	1	FLOW	228.	745.
				TIME	6.17	6.08
ROUTED TO						
+	A5	.55	1	FLOW	225.	732.
				TIME	6.25	6.17
HYDROGRAPH AT						
+	A-12	.05	1	FLOW	27.	84.
				TIME	6.08	6.08
ROUTED TO						
+	A12	.05	1	FLOW	26.	82.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	A-9	.06	1	FLOW	24.	81.
				TIME	6.17	6.17
2 COMBINED AT						
+	DP A9	.11	1	FLOW	49.	161.
				TIME	6.17	6.08
ROUTED TO						
+	A9	.11	1	FLOW	49.	159.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	A-5	.11	1	FLOW	27.	126.
				TIME	6.17	6.08
3 COMBINED AT						
+	DPA5	.77	1	FLOW	288.	1003. ← INFLOW
				TIME	6.25	6.17
ROUTED TO						
+	DBA	.77	1	FLOW	37.	155. ← OUTFLOW
				TIME	7.25	6.92

** PEAK STAGES IN FEET **

1	STAGE	6979.73	6985.75
	TIME	7.25	6.92

ROUTED TO

+	A10	.77	1	FLOW	37.	155.
				TIME	7.25	6.92

HYDROGRAPH AT

+	GC	.08	1	FLOW	149.	149.
				TIME	9.50	9.50

← OUTFLOW FROM COLDBELL DET. BASIN

2 COMBINED AT

+	DP A1	.84	1	FLOW	179.	243.
				TIME	9.50	9.50

HYDROGRAPH AT

+	A-10	.01	1	FLOW	5.	16.
				TIME	6.08	6.08

2 COMBINED AT

+	DPA	.85	1	FLOW	180.	244.
				TIME	9.50	9.50

1

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

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   30MAY06  TIME  17:12:36   *
*                                       *
*****************************************
```

```
*****************************************
*                                       *
*    U.S. ARMY CORPS OF ENGINEERS       *
*    HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET             *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
*****************************************
```

```
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

1 HEC-1 INPUT PAGE 1

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

   1          ID          Wolf Ranch, DETENTION BASIN A FINAL DESIGN pn 05104
   2          ID          A Basins, Future development condition w/detention a-detSP.dat
   3          ID          5-year and 100 Year, 24 hr Type IIA  Storm
   4          ID          SPILLWAY SIZING RUN
              *DIAGRAM
   5          IT       5       0       0     300
   6          IO       5       0
   7          JR    PREC     .56       1

   8          KK     A-1
   9          KM       RUNOFF FROM SUB-BASIN A-1
  10          BA    .060
  11          IN      15
  12          PB     4.4
```

L = 160

SPILLWAY RUN

```
 13          PC  0.0000  0.0005  0.0015  0.0030  0.0045  0.0060  0.0080  0.0100  0.0120  0.0143
 14          PC  0.0165  0.0188  0.0210  0.0233  0.0255  0.0278  0.0320  0.0390  0.0460  0.0530
 15          PC  0.0600  0.0750  0.1000  0.4000  0.7000  0.7250  0.7500  0.7650  0.7800  0.7900
 16          PC  0.8000  0.8100  0.8200  0.8250  0.8300  0.8350  0.8400  0.8450  0.8500  0.8550
 17          PC  0.8600  0.8638  0.8675  0.8713  0.8750  0.8788  0.8825  0.8863  0.8900  0.8938
 18          PC  0.8975  0.9013  0.9050  0.9083  0.9115  0.9148  0.9180  0.9210  0.9240  0.9270
 19          PC  0.9300  0.9325  0.9350  0.9375  0.9400  0.9425  0.9450  0.9475  0.9500  0.9525
 20          PC  0.9550  0.9575  0.9600  0.9625  0.9650  0.9675  0.9700  0.9725  0.9750  0.9775
 21          PC  0.9800  0.9813  0.9825  0.9838  0.9850  0.9863  0.9875  0.9888  0.9900  0.9913
 22          PC  0.9925  0.9938  0.9950  0.9963  0.9975  0.9988  1.0000
 23          LS       0      61
 24          UD    .292

 25          KK      A3
 26          KM    ROUTE FLOW FROM SUB-BASIN A-1 TO DP A3
 27          RD    2700    .021    0.04            TRAP      10       4

 28          KK     A-3
 29          KM    RUNOFF FROM SUB-BASIN A-3
 30          BA    .1500
 31          LS       0      73
 32          UD    .221

 33          KK     DPA3
 34          KM    DESIGN POINT A3 COMBINE RUNOFF FROM SUB-BASIN A-3     AND A3
 35          HC       2

 36          KK     A3A
 37          KM       ROUTE FLOW FROM DP A3 TO DP A4
 38          RD    1100     .02    .013            CIRC       4

 39          KK     A-4
 40          KM      RUNOFF FROM SUB-BASIN A-4
 41          BA    .0861
 42          LS       0    76.3
 43          UD     .21
```



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

 44          KK   DP A4
 45          KM     COMBINE FLOW FLRO DPA3A AND SUB-BASIN A-4
 46          HC       2

 47          KK      A4
 48          KM     ROUTE FLOW FROM DP A4 TO A6
 49          RD     450     .02    .013            CIRC     4.5

 50          KK      A6
 51          KM    ROUTE FLOW FROM DP A4 TO DP A6
 52          RD    1550    .016   0.013            TRAP      10       4
```

```
53          KK    A-11
54          KM   RUNOFF FROM SUB-BASIN A-11
55          BA    .081
56          LS       0    76.8
57          UD     .19

58          KK     A11
59          KM   ROUTE SUB-BASIN A-11 TO DP A8
60          RD    1400     .02    .013            CIRC     3.5

61          KK     A-8
62          KM   RUNOFF FROM BASIN A-8
63          BA    .079
64          LS       0    83.9
65          UD    .250

66          KK   DP A8
67          KM   COMBINE RUNOFF FROM SB A-8 AND A11
68          HC       2

69          KK      A8
70          KM   ROUTE FLOW FROM SUB-BASIN A-8 TO DP A7
71          RD    1100     .02    .013            CIRC     4.5

72          KK     A-7
73          KM   RUNOFF FROM SUB-BASIN A-7
74          BA   .0600
75          LS       0    76.6
76          UD    .172

77          KK   DP A7
78          KM   COMBINE RUNOFF FROM SUB-BASIN A-7 AND A8
79          HC       2

80          KK      A7
81          KM   ROUTE FLOW FROM DP A7 TO DP A6
82          RD     800    0.02   0.013            CIRC       5
```



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

83          KK   A-6
84          KM   RUNOFF FROM SUB-BASIN A-6
85          BA    .045
86          LS       0    80.8
87          UD     .21

88          KK    DPA6
89          KM   DESIGN POINT A6 COMBINE RUNOFF FROM SUB-BASIN A-6, A6 AND A7
90          HC       3
```

```
 91          KK      A5
 92          KM   ROUTE FLOW FROM DESIGN POINT A6 TO DP A5
 93          RD    2200    .011     .04            TRAP      10       4

 94          KK    A-12
 95          KM   RUNOFF FROM SUB-BASIN A-12
 96          BA    .048
 97          LS       0      78
 98          UD    .181

 99          KK     A12
100          KM   ROUTE RUNOFF FROM SUB-BASIN A-12 TO DP A9
101          RD    1950     .02    .013            CIRC       3

102          KK   A-9
103          KM   RUNOFF FROM SUB-BASIN A-9
104          BA    .059
105          LS       0    76.3
106          UD    .263

107          KK   DP A9
108          KM   COMBINE RUNOFF FROM SUB-BASIN A-12 AND A9
109          HC       2

110          KK      A9
111          KM   ROUTE FLOW FROM SUB-BASIN A-9 TO DESIGN POINT A5
112          RD     500     .02    .016            CIRC       4

113          KK   A-5
114          KM   RUNOFF FROM SUB-BASIN A-5
115          BA   .1114
116          LS       0    69.7
117          UD    .209

118          KK    DPA5
119          KM   DP A5 COMBINE RUNOFF FROM SUB-BASIN A-5, A5 AND A9 THIS IS INFLOW
120          KM   TO DETENTION BASIN A
121          HC       3
```



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

122          KK     DBA
123          KM   ROUTE DP A5 THROUGH DETENTION BASIN A
124          RS       1    ELEV 6985.75
125          SV       0       0       0       0       0     6.4      12      16
126          SE  6975.5    6978    6980    6982    6984    6987    6988  6988.5
127          SQ       0       0       0       0       0       0     442     812
128          SS    6987     170     2.6     1.5
129          ST  6988.5      15     2.6     1.5
```

```
130            KK     A10
131            KM   ROUTE FLOW FROM DESIGN POINT A5 TO DESIGN POINT A
132            RD     720    .021     .04            TRAP      15       4

133            KK    A-10
134            KM   RUNOFF FROM SUB-BASIN A-10
135            BA   .0096
136            LS       0    79.6
137            UD    .231

138            KK     DPA
139            KM   DESIGN POINT A COMBINE RUNOFF SUB-BASIN A-10 AND A10
140            HC       2
141            ZZ
```

1

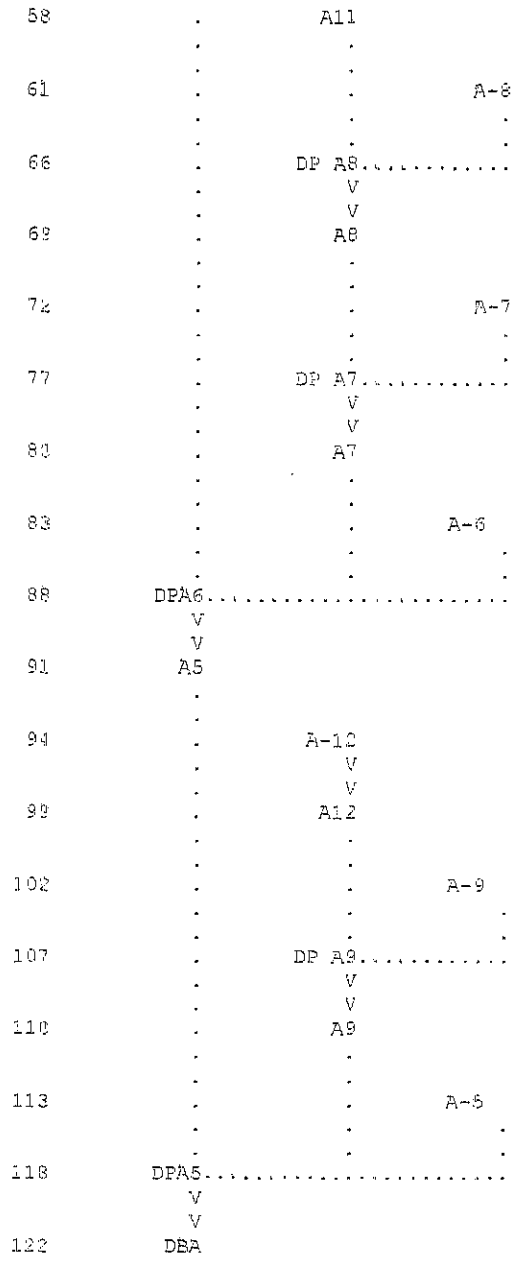
SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.

(V) ROUTING (---->) DIVERSION OR PUMP FLOW

(.) CONNECTOR (<----) RETURN OF DIVERTED OR PUMPED FLOW

```
  8        A-1
             V
             V
 25         A3
             .
             .
 28          .          A-3
             .            .
             .            .
 33        DPA3............
             V
             V
 36         A3A
             .
             .
 39          .          A-4
             .            .
             .            .
 44        DP A4............
             V
             V
 47         A4
             V
             V
 50         A6
             .
             .
 53          .        A-11
             .          V
             .          V
```


58
A11
61
A-8
66
DP A8
69
A8
74
A-7
77
DP A7
80
A7
83
A-6
88
DPA6
91
A5
94
A-12
99
A12
102
A-9
107
DP A9
110
A9
113
A-5
118
DPA5
122
DBA

```
                V
                V
  130         A10
                .
                .
  133           .        A-10
                .          .
                .          .
  138         DPA..........
```

```
 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1**************************************
 *                                    *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)*
 *               JUN  1998            *
 *            VERSION 4.1             *
 *                                    *
 *  RUN DATE   30MAY06  TIME  17:12:36*
 *                                    *
 **************************************
```

```
 ************************************
 *                                  *
 *    U.S. ARMY CORPS OF ENGINEERS  *
 *    HYDROLOGIC ENGINEERING CENTER *
 *          609 SECOND STREET       *
 *       DAVIS, CALIFORNIA 95616    *
 *           (916) 756-1104         *
 *                                  *
 ************************************
```

Wolf Ranch, DETENTION BASIN A FINAL DESIGN pn 05104
A Basins, future development condition w/detention a-detSP.dat
5-year and 100 Year, 24 hr Type IIA Storm
SPILLWAY SIZING RUN

```
  6 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           5  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

    IT          HYDROGRAPH TIME DATA
                       NMIN           5  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1    0  STARTING DATE
                      ITIME         0000  STARTING TIME
                         NQ          300  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      2    0  ENDING DATE
                     NDTIME         0055  ENDING TIME
                     ICENT           19  CENTURY MARK

                  COMPUTATION INTERVAL      .08 HOURS
                       TOTAL TIME BASE   24.92 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
.56 1.00

1

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 .56	RATIO 2 1.00
HYDROGRAPH AT						
+	A-1	.06	1	FLOW	3.	32.
				TIME	6.25	6.17
ROUTED TO						
+	A3	.06	1	FLOW	4.	32.
				TIME	6.50	6.33
HYDROGRAPH AT						
+	A-3	.15	1	FLOW	49.	194.
				TIME	6.17	6.08
2 COMBINED AT						
+	DPA3	.21	1	FLOW	49.	196.
				TIME	6.17	6.17
ROUTED TO						
+	A3A	.21	1	FLOW	49.	195.
				TIME	6.17	6.17
HYDROGRAPH AT						
+	A-4	.09	1	FLOW	39.	133.
				TIME	6.08	6.08
2 COMBINED AT						
+	DP A4	.30	1	FLOW	86.	322.
				TIME	6.17	6.08
ROUTED TO						
+	A4	.30	1	FLOW	86.	319.
				TIME	6.17	6.08

ROUTED TO						
+	A6	.30	1	FLOW	85.	315.
				TIME	6.17	6.17
HYDROGRAPH AT						
+	A-11	.08	1	FLOW	41.	134.
				TIME	6.08	6.08
ROUTED TO						
+	A11	.08	1	FLOW	39.	131.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	A-8	.08	1	FLOW	57.	152.
				TIME	6.17	6.08
2 COMBINED AT						
+	DP A8	.16	1	FLOW	95.	283.
				TIME	6.08	6.08
ROUTED TO						
+	A8	.16	1	FLOW	94.	278.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	A-7	.05	1	FLOW	26.	84.
				TIME	6.08	6.08
2 COMBINED AT						
+	DP A7	.21	1	FLOW	118.	362.
				TIME	6.08	6.08
ROUTED TO						
+	A7	.21	1	FLOW	116.	358.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	A-6	.05	1	FLOW	29.	84.
				TIME	6.08	6.08
3 COMBINED AT						
+	DPA6	.55	1	FLOW	228.	745.
				TIME	6.17	6.08
ROUTED TO						
+	A5	.55	1	FLOW	225.	732.
				TIME	6.25	6.17
HYDROGRAPH AT						
+	A-12	.05	1	FLOW	27.	84.
				TIME	6.08	6.08

ROUTED TO						
+	A12	.05	1	FLOW	26.	82.
				TIME	6.08	6.08
HYDROGRAPH AT						
+	A-9	.06	1	FLOW	24.	81.
				TIME	6.17	6.17
2 COMBINED AT						
+	DP A9	.11	1	FLOW	49.	161.
				TIME	6.17	6.08
ROUTED TO						
+	A9	.11	1	FLOW	49.	159.
				TIME	6.17	6.08
HYDROGRAPH AT						
+	A-5	.11	1	FLOW	27.	126.
				TIME	6.17	6.08
3 COMBINED AT						
+	DBA5	.77	1	FLOW	288.	1003.
				TIME	6.25	6.17
ROUTED TO						
+	DBA	.77	1	FLOW	206.	834.
				TIME	6.42	6.25
			** PEAK STAGES IN FEET **			
			1	STAGE	6987.47	6988.53
				TIME	6.42	6.25
ROUTED TO						
+	A10	.77	1	FLOW	204.	823.
				TIME	6.42	6.33
HYDROGRAPH AT						
+	A-10	.01	1	FLOW	5.	16.
				TIME	6.08	6.08
2 COMBINED AT						
+	DPA	.78	1	FLOW	206.	831.
				TIME	6.42	6.33

1

1 SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STAION DBA
(PEAKS SHOWN ARE FOR INTERNAL TIME STEP USED DURING BREACH FORMATION)

PLAN 1	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM

ELEVATION	6985.75	6987.00	6988.50
STORAGE	4.	6.	16.
OUTFLOW	0.	0.	812.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.56	6987.47	.00	9.	206.	.00	6.42	.00
1.00	6988.53	.03	16.	834.	.17	6.25	.00

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