MASTER GRADING AND DRAINAGE PLAN
WESTBROOK VILLAGE, SECTION 27
PEORIA, ARIZONA

21

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MASTER GRADING AND DRAINAGE PLAN
WESTBROOK VILLAGE, SECTION 27
PEORIA, ARIZONA

21

Prepared for:
UDC HOMES
19281 North Westbrook Parkway
Peoria, Arizona 85345

FLOOD CONTROL DISTRICT
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AUG 21 1990
CH ENG | P & PM
DEP | HYDRO
ADMIN | LMGT
FINANCE | FILE
O & O
ENGR
REMARKS

Prepared by:
CARTER ASSOCIATES, INC.
5080 North 40th Street, Suite 300
Phoenix, Arizona 85018
(602) 955-0900

Carter Job No. 89238
May 1989
Revised June 1989

Registered Professional Engineer (Civil)
CERTIFICATE NO. 21655
ROBERT B. MURPHY
Date Signed 8-20-90
ARIZONA, U.S.A.

TABLE OF CONTENTS

	Page
INTRODUCTION	1
SITE CONDITIONS	1
PROJECT DESCRIPTION	2
DRAINAGE PLAN	2
DRAINAGE PLAN APPROACH	4
FIGURES	
TABLES	
APPENDIX	

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Introduction

The following is the Master Grading and Drainage Plan and Report for Westbrook Village, a UDC master planned community in Peoria, Arizona. The purpose of this report is to present the proposed master grading and drainage scheme for the site. Additionally, this report presents the data, method and results of analysis conducted in the preparation of this master plan.

The objective of the Master Grading and Drainage Plan is to provide the City of Peoria with UDC's conceptual plans for development of the grading and drainage on the subject project thus allowing the City to evaluate the impact of this development on adjacent landowners and downstream drainage conditions. The following report describes the current site conditions with respect to hydrology and drainage, the proposed development and the proposed grading and drainage scheme to be implemented to address City of Peoria concerns and requirements.

Site Conditions

The proposed site is located in Section 27, Township 4 North, Range 1 East of the Gila and Salt River Base and Meridian, Maricopa County, Peoria, Arizona. The site is bounded on the north by Beardsley Road, on the east by 83rd Avenue, on the south by Union Hills Drive and on the west by 91st Avenue (Figure 1).

It is our understanding the site was historically used for agricultural purposes, although it is currently not cultivated. The site generally slopes from the north to the south and west at about 0.4 percent. The southeast corner of the site slopes to the south and east. The site consists of approximately 640 acres.

Project Description

The proposed project will consist of predominatly residential development with some commercial and office space at the corners of the site. A major amenity to this development will be a golf course with clubhouse and recreation center.

Drainage Plan

The following section describes the pre-development and post-development hydrologic condition coming to and leaving the site. These conditions are presented with the data, City of Peoria criteria, and methods used to estimate them. Also presented in the following section are supplemental drainage considerations requested by the City of Peoria.

Analytical Criteria. The City of Peoria uses two basic return period rainfall events for analysis of proposed drainage systems. The first is that retention/detentions are to be provided for the post-development runoff resulting from a rainfall event with a return period of 10 years and a duration of two hours. The second is that finished floors should be placed above the water levels resulting from a 100-year return period rainfall event. Additionally, runoff from rainfall events with return periods of 10 years or less should be conveyed below the street via culverts where cross-drainage occurs.

Analytical Methods. The flow estimates for the 10-year and 100-year rainfall events were estimated using the Army Corps of Engineer computer model HEC-1.

The approach taken within the HEC-1 model was to use the U.S. Department of Agriculture, Soil Conservation Service (SCS) curve number (CN) and unit hydrograph methods. Routing through detention facilities was conducted using the modified Puls method availabe in HEC-1.

Computer Model Input Data. The basic input data to the HEC-1 computer model for estimating the rainfall-runoff relationship are watershed area in square miles, watershed lag time, watershed runoff coefficients and rainfall. The watershed area tributary to the Westbrook site is shown on Figure 1. The lag time was estimated to be 0.6 times the time of concentration. The time of concentration was estimated based on overland flow velocities given on page 22, Storm Drain Design Manual, Subdivision Drainage Design (hereinafter referred to as Drainage Manual), City of Phoenix, September 1985.

The watershed runoff coefficient or CN was based on the soil types and land use in the study watershed. The hydrologic soil group or soil type was obtained from Soil Survey of Maricopa County Arizona Central Part, prepared by the U.S. Department of Agriculture and published in 1977. The hydrologic soil groups for the soils presented in the tributary watershed (Figure 1) and the weight CN values used in the analysis are given in Appendix A.

The 2-hour duration rainfall values used in this study for the 10-year and 100-year runoff analyses were 1.60 inches and 2.54 inches, respectively. These were obtained

from intensity-duration-frequency curves in the Drainage Manual, page 24. The rainfall data is given in Appendix B.

Pre- and Post-Development Flows. The pre-development 100-year flow at the north property boundary was estimated to equal 877 cfs and only slightly higher at the south propety boundary. The post-development flow due to routing through the golf course was estimated to be approximately 593 cfs.

Drainage Plan Approach

The Master Drainage Plan for Westbrook Village, Section 27 has the following objectives:

1. Cause no increase in peak runoff from the pre- and post-development site.
2. Provide retention for the on-site runoff resulting from a 2-hour, 10-year return period storm.
3. Provide approximately 50-acre feet (ac-ft) of storage, on-site, for off-site flow as requested by the City of Peoria.
4. Drain stored stormwater from dry retention basins in approximately 36 hours.

The proposed drainage system (Figure 2) will function as follows (Figure 3). Flow from off-site tributary area to the north will be collected via interceptor channels (C-1, C-2, C-3 and C-4), in all likelihood, located on the north side of Beardsley Road. These interceptor channels will convey storm runoff to two box culvert systems (BC-1 and BC-2) under Beardsley Road. On the south side of Beardsley

Road, runoff will be conveyed to the golf course by two channels (C-5 and C-6), each with the capacity to carry approximately 50 percent of the 100-year flow coming to the entire north property line.

Retention basin R-3 will fill to an elevation of 1236± and at that point flow will start passing under the loop road through box culvert BC-4 (Figure 4). For flows in excess of the 10-year return period event, flow will pass over the loop road and into the R-4, R-5 and R-6 retention basins.

The R-4 and R-5 retention basin system will each have a lake with a normal water surface elevation of 1227.0 ±. The lake in R-4 and R-5 will be connected via a 36-inch pipe to a lake in R-2 to provide a means of allowing flow between lakes. The irrigation system will be connected to these with capacity to pump them down after a storm. Flows in excess of the 10-year will move to the south east into R-7.

The basin located to the east of R-4 and R-5 is R-6. This basin will be connected to the pipe between the lakes in R-4 & R-5 and R-2. The water stored in R-6 will drain through these pipes into the lakes. Flow excess of the 10-year will flow to the southeast through the golf course and into R-7.

The stormwater entering the golf course through channel C-6 will be split north of the loop road. Most of the flow will pass under the loop road through BC-3 for all frequency storms. The remainder of the flow will enter R-1 through two 36-inch diameter pipes for all frequency storms. Flow in excess of these culvert systems (BC-3 and PC-1) will pass over the loop road and into R-2.

The tributary on-site areas to each of the retention basins are shown on Figure 2. Figure 3 is a schematic of the overall drainage system for the site.

The retention basin R-2 will receive runoff from on-site tributary areas as well as flow from BC-3. Flow in excess of the capacity of R-2 will enter R-7 and combine with flow from R-4 and R-5.

The outlet from R-7 will function as follows: BC-5, a 10'x3' box culvert will connect R-7 to R-8. As R-7 fills, flow will pass under the loop road into R-8. When the water level reaches 1,231.5 in R-7, flow will pass through BC-6, a 8'x3' box under the loop road and into channel C-7. For channel and road section, see Section B-5. At the same point, flow starts passing from R-8 into channel C-8 (Section B-B). The flow leaving R-7 will pass over a grass weir section of approximately 100 feet as will be the case with flow leaving R-8.

The retention basin R-9 and R-10 will receive flow from on site tributary areas only (Figure 3). R-10 will discharge flows in excess of the 10-year and bleed-out to 91st Avenue. R-9 will drain to Union Hills.

The commercial site will provide the on-site retention for the runoff resulting from a 10-year, 2 hour storm.

Once in the golf course, off-site flows will combine with on-site flows in the on-site retention volumes. The on-site storage volume will generally fill from the north end of the course toward the south. As basins to the north fill, flows will cascade through the golf course to the next storage area and then south to Union Hills Drive.

The 100-year peak flows will be conveyed directly through the storage areas filled by the large volume of runoff created by this event. The building pads and finished floors will be set based on the 100-year flood levels.

The volume of retention available in the golf course equals about 112 ac.ft. (Table 1). This consists of the 52.3 ac.ft. required for on-site runoff (Table 2) plus the 50 ac.ft. requested by the City of Peoria.

The routing of the 10-year and the 100-year floods through the golf course are presented in Appendix B. The peak flow at specific locations are given on Table 3 along with a summary of hydrologic data.

The overall grading of major roads and parcels is shown on Figure 2.

The HEC-1 computer input and output are given in Appendix C. The hydraulic calculations for culverts and channels are given in Appendix D. The road overflow sections where the roads function as weirs for flows in excess of the 10-year event are also given in Appendix D.

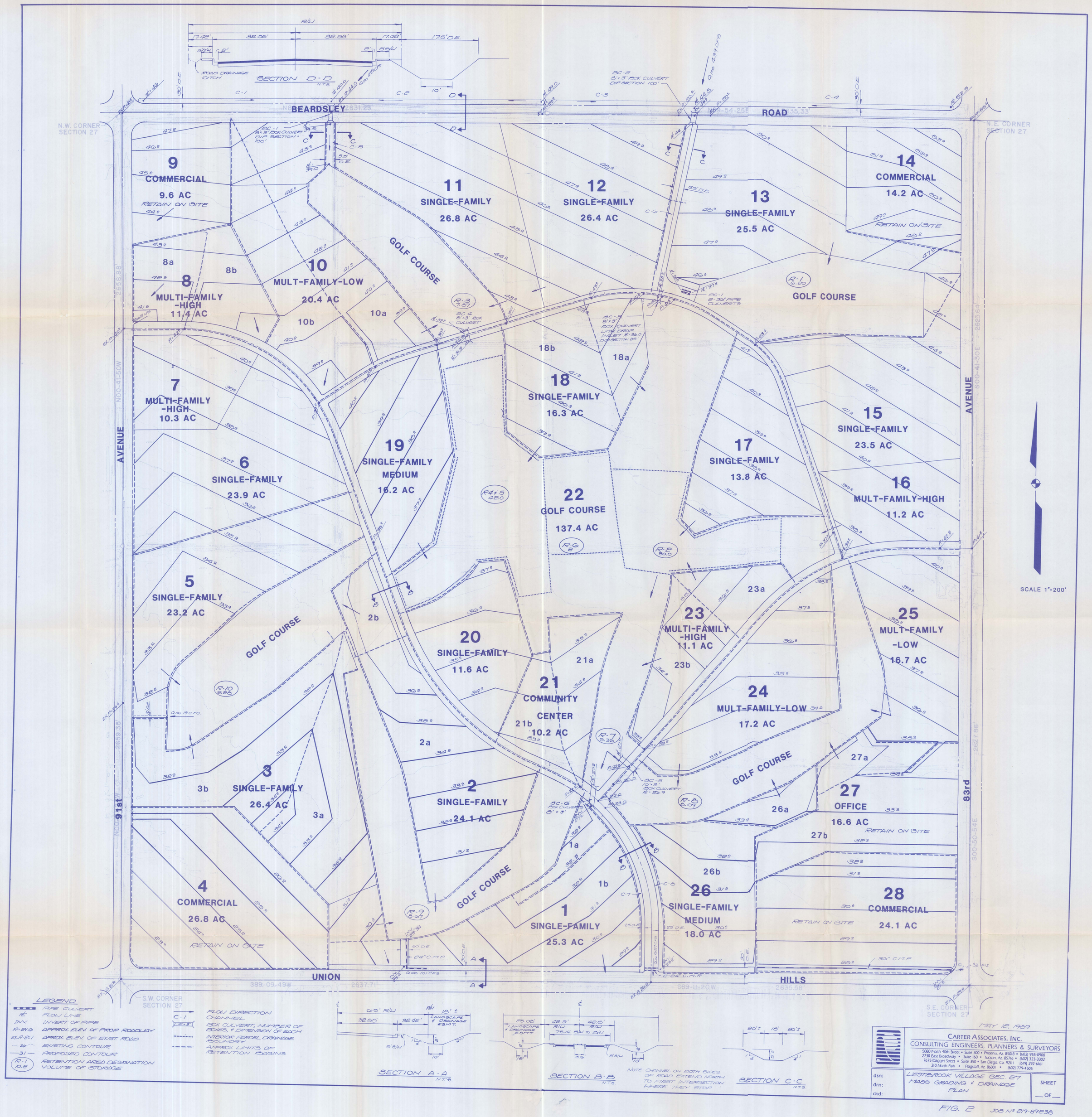
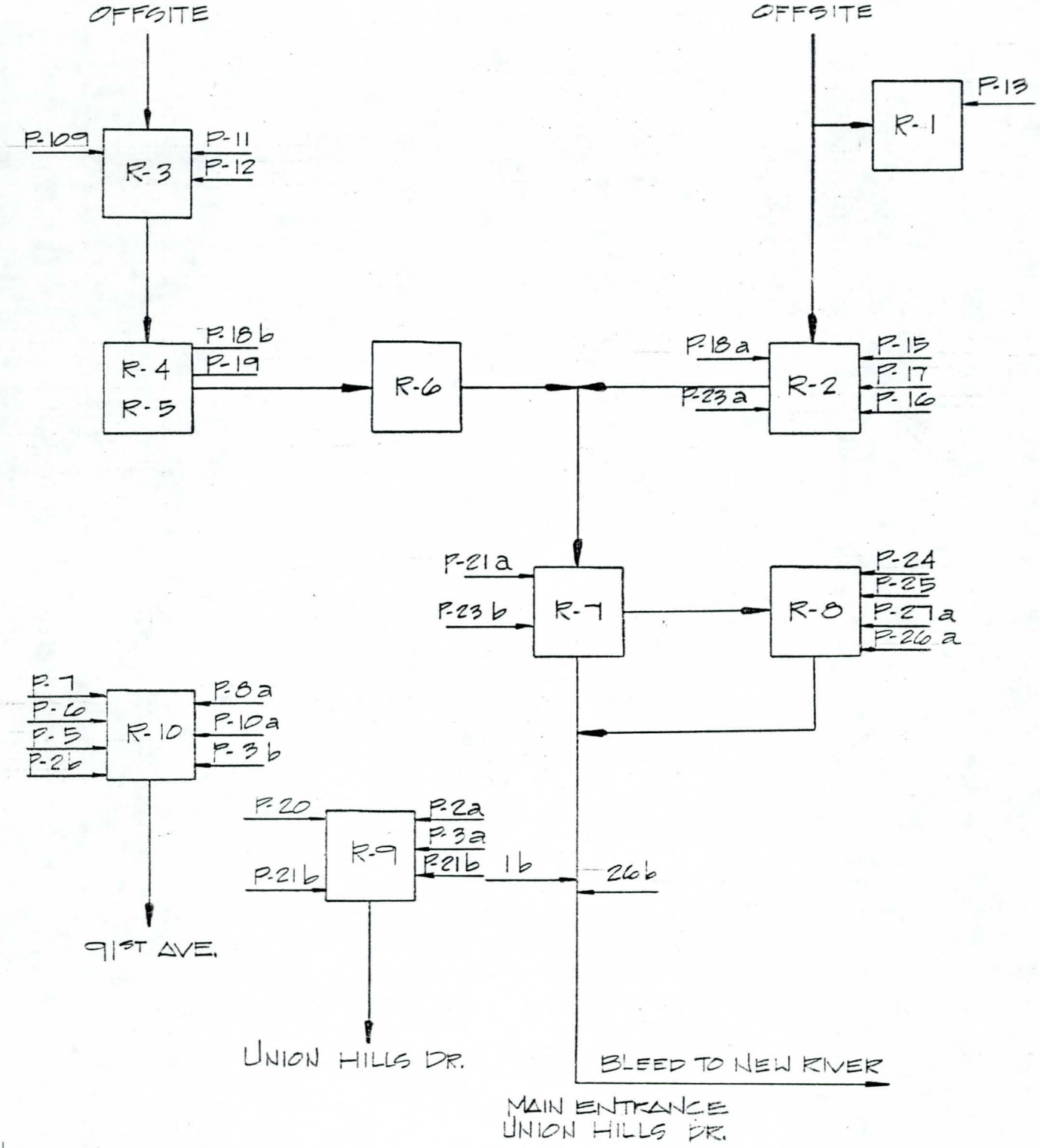


FIG. 2 JOB No 219-89838

WESTBROOK VILLAGE SECTION 5
DRAINAGE SYSTEM



LEGEND

P-8a PARCEL AREA TRIBUTARY TO RETENTION

R-4 RETENTION BASIN

CARTER ASSOCIATES, INC.
CONSULTING ENGINEERS, PLANNERS & SURVEYORS
5080 North 40th Street • Suite 300 • Phoenix, AZ 85018 • (602) 955-6900
7675 Dagget Street • Suite 250 • San Diego, Ca. 92111 (619) 292-6611

dsn:
drn:
ckd:

SHEET ___ OF ___

FIG - 3

CARTER ASSOCIATES, INC.
ENGINEERING
SURVEYING
PLANNING

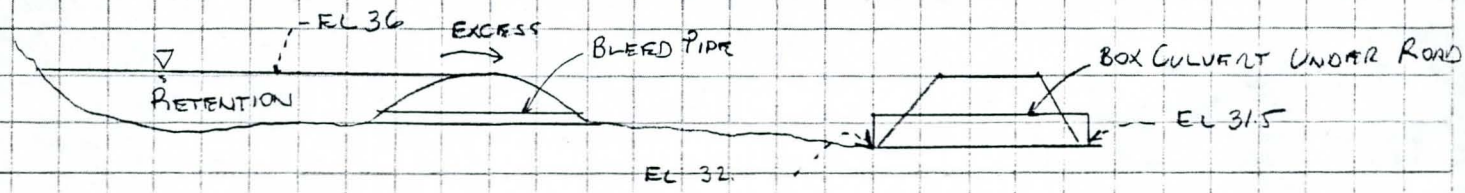
Project No. _____

Project Name _____

Sheet No. _____ of _____

Calculated by _____ Date _____

Checked by _____ Date _____



TYPICAL OUTFALL FROM R-3

OUTFALL FROM R-3

FIG 4

Phoenix
5080 North 40th Street
Suite 300
85018
(602) 955-0900

San Diego
7675 Dagget Street
Suite 350
92111
(619) 292-6161

TABLE 1
Available Retention Volume

Retention Basin	Retention Volume (ac-ft)
R-1	6.20
R-2	30.0
R-3	7.87
R-4 & R-5	42.0
R-6	2.0
R-7	5.36
R-8	8.09
R-9	8.67
R-10	2.28
	112.47

TABLE 2
Summary of On-Site Retention Requirements

Land Use	Coefficient	(acres)	(ac-ft)
Golf Course	.3	137.4	5.5
Single Family - Low	.6	266.8	21.13
Single Family - Medium	.7	34.2	3.2
Multifamily - Low	.75	54.3	5.4
Multifamily - High	.8	44.0	4.7
Commercial[1]	.9	76.5	9.2
Office	.85	16.6	1.9
Community Center	.8	10.2	1.1
			52.3

[1]Commercial site will provide on-site retention.
[2]Based on 1.6 inches of rainfall in 2 hours.

TABLE 3
Summary of On-Site Hydrology

Parcel No.	Area (ac)	CN	Basin[1] Lag (hrs)	Peak Runoff 10-yr (cfs)	Peak Runoff 100-yr (cfs)
1a	20.5	82	0.100	3	7
1b	2.4	82	0.100	11	33
2a	20.0	82	0.157	17	46
2b	4.1	82	0.100	4	12
3a	14.9	82	0.119	13	41
3b	13.8	82	0.100	13	42
4	26.8	95	0.100	-[3]	-
5	23.2	82	0.177	19	50
6	23.9	82	0.167	20	53
7	10.3	86	0.121	14	35
8a	6.0	86	0.119	8	21
8b	5.4	86	0.100	8	21
9	9.6	95	0.100	-[3]	-
10a	8.3	85	.306	20	47
10b	12.1	82	.129	11	31
11	26.8	82	.202	20	53
12	26.4	82	.202	20	53
13	26.5	82	.137	24	67
14	14.2	95	.100	-[3]	-
15	28.5	82	.152	21	56
16	11.2	86	.10	17	43
17	13.8	82	.128	17	36
18a	4.0	82	.100	13	12
18b	12.0	82	.161	10	27
19	16.2	84	.161	-	42
20	11.6	82	0.100	12	35
21a	5.9	95	0.105	18	34
21b	4.3	95	0.100	13	25
22	137.4	70	-[2]	-	-
23a	4.3	86	0.100	7	18
23b	6.8	86	0.106	10	26
24	17.2	82	0.191	13	35
25	16.7	85	0.175	18	43
26a	2.6	84	0.100	3	9
27a	3.4	88	0.100	6	15
27b	13.2	95	0.100	-[3]	-
28	24.1	95	0.100	-[3]	-

[1]Basin lag = 0.6 Tc, calculations of off-site lag in Appendix E.

[2]This includes all of golf course. Lag not applicable. Golf course shown in computer printout Ac GC-1, etc.

[3]Retained on-site, no peak estimated.

APPENDIX A

Off-Site and On-Site
Weighted Curve Number Calculations

CARTER ASSOCIATES, INC.
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PLANNING

Project No. _____
Project Name _____
Sheet No. _____ of _____
Calculated by _____ Date _____
Checked by _____ Date _____

Total AREA = 3.29

ZONE R1-18

A = 0.83 mi^2
Dsoil = 0.775 mi^2 ⇒ 0.11 mi^2
Bsoil = 0.72 mi^2
CN
B soil = 80
D soil = 87
Average CN = $\frac{.11}{.83} * 87 + \frac{.72}{.83} * 80$

= 80.9

mountain

A = 0.57 mi^2
Bsoil 0.0 mi^2
Dsoil .57 mi^2
CN
Bsoil = 98
Dsoil = 98
Average CN = 98

R1-43

A = 1.89 mi^2 .076
Bsoil = 1.56 mi^2
Dsoil = 0.33 mi^2
CN
Bsoil = 77
Dsoil = 86
Average CN = $\frac{1.56}{1.89} * 77 + \frac{0.33}{1.89} * 86$

= 78.6

Total Average CN = $\frac{.83}{3.29} * 80.9 + \frac{1.89}{3.29} * 78.6 + \frac{0.57}{3.29} * 98$
Total AREA = 3.29

= 82.54

COMMUNICATION DOCUMENTATION

LAN SUMMARY:

RCEL SUMMARY:

R. O.	GROSS ACRES	NET ACRES	PROPOSED USE		ZONING EQUIV.
1.	25.3	21.3	SINGLE FAMILY-LOW		R1-8 P.A.D.
2.	24.1	22.3	SINGLE FAMILY-LOW	82	R1-8 P.A.D.
3.	26.4	25.7	SINGLE FAMILY-LOW		R1-8 P.A.D.
4.	26.8	23.6	COMMERCIAL	95	PC-1 P.A.D.
5.	23.2	21.7	SINGLE FAMILY-LOW		R1-8 P.A.D.
6.	23.9	21.9	SINGLE FAMILY-LOW	82	R1-8 P.A.D.
7.	10.3	8.7	MULTI FAMILY-HIGH		RM-1 P.A.D.
8.	11.4	10.0	MULTI FAMILY-HIGH	86	RM-1 P.A.D.
9.	11.4	9.6	COMMERCIAL	95	PC-1 P.A.D.
10.	20.4	19.4	MULTI FAMILY-LOW	85	RM-1 P.A.D.
11.	26.8	24.5	SINGLE FAMILY-LOW		R1-8 P.A.D.
12.	26.4	24.4	SINGLE FAMILY-LOW	82	R1-8 P.A.D.
13.	25.5	24.0	SINGLE FAMILY-LOW		R1-8 P.A.D.
14.	14.2	11.8	COMMERCIAL	95	PC-1 P.A.D.
15.	23.5	21.6	SINGLE FAMILY-LOW	82	R1-8 P.A.D
16.	11.2	9.2	MULTI FAMILY-HIGH	86	RM-1 P.A.D.
17.	13.8	12.9	SINGLE FAMILY-LOW	82	R1-8 P.A.D.
18.	16.3	15.7	SINGLE FAMILY-LOW		R1-8 P.A.D.
19.	16.2	14.6	SINGLE FAMILY-MEDIUM	84	RM-1 P.A.D.
20.	11.6	10.7	SINGLE FAMILY-LOW	82	R1-8 P.A.D.
21.	10.2	9.6	COMMUNITY CENTER	95	R1-35 — 83
22.	137.4	133.7	GOLF COURSE	76	R1-35
23.	11.1	9.8	MULTI FAMILY-HIGH	86	RM-1 P.A.D.
24.	17.2	15.6	MULTI FAMILY-LOW		RM-1 P.A.D.
25.	16.7	14.0	MULTI FAMILY-LOW	85	RM-1 P.A.D.
26.	18.0	16.2	SINGLE FAMILY-MEDIUM	84	RM-1 P.A.D.
27.	16.6	15.6	OFFICE	88	O-1 P.A.D.
28.	24.1	20.1	COMMERCIAL	95	PS-1 P.A.D.

USE SUMMARY:

PROPOSED USE	UNITS/ ACRE	GROSS ACRES	DWELL. UNITS
GOLF COURSE	--	137.4	--
SINGLE FAMILY-LOW	5.0	266.8	1340
SINGLE FAMILY-MEDIUM	9.0	34.2	307
MULTI FAMILY-LOW	10.0	54.3	543
MULTI FAMILY-HIGH	20.0	44.0	880
COMMERCIAL	--	76.5	--
OFFICE	--	16.6	--
COMMUNITY CENTER	--	10.2	--
TOTAL	--	640.0	3070

CURVE NUMBERS BY ZONING
FOR USE WITH SCS OR TR-20 METHODS OF
DETERMINING RUNOFF IN THE CITY OF PHOENIX

ZONING	TYPE B	TYPE C	TYPE D
RE-43) S-1)	77	83	86
RE-35	79	84	87
RE-25	79	84	87
E1-18	80	84	87
R1-14	80	85	88
R1-10	81	85	89
R1-8 SF low	82	87	90
R1-6 SF medium	84	88	90
R-3 mu low	85	88	90
R-4) R-40) mu high R-5)	86	89	91
A-1) A-2)	85	91	93
C-1) C-2) C-3)	92	94	95
CO Garden commercial office	88	91	93
PSC	95	95	95
HR	95	95	95
R4A	87	90	92
Hillside (over 10% sloping).	98	98	98

APPENDIX B

Rainfall Data

CARTER ASSOCIATES, INC.
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Project No. _____
Project Name _____
Sheet No. _____ of _____
Calculated by _____ Date _____
Checked by _____ Date _____

PRECIPITATION

	2 YEAR	10 YEAR	100 YEAR
5 MIN	.24	0.4	0.87
15 MIN	.50	0.83	1.23
1 HR	0.83	1.38	2.12
2 HR	0.96	1.60	2.54

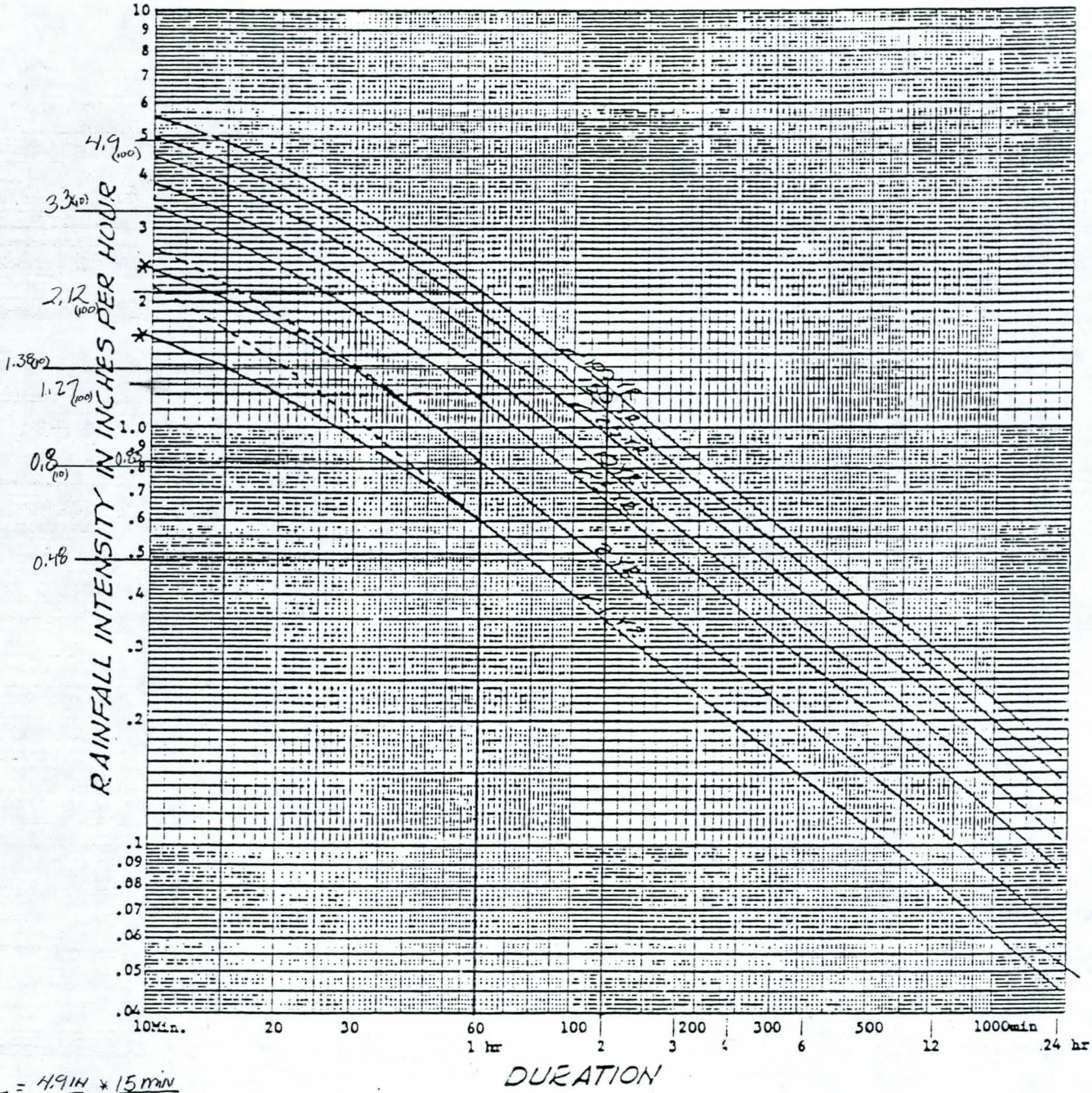
5 MIN 1 hr PRECIP. * 0.29 = PRECIP. (IN)

15 MIN. INTENSITY * $\frac{15 \text{ MIN.}}{60 \frac{\text{MIN.}}{\text{HR.}}}$ = PRECIP. (IN)

1 HR DIRRECT FROM GRAPH

2 HR INTENSITY * 2 HRS.

COMMUNICATION DOCUMENTATION



$IN_{15} = 4.9 \frac{IN}{hr} * \frac{15\ min}{60\ \frac{min}{hr}}$

$= 1.23\ IN$

$IN_5 = 2.12 * .29$

$= 0.37\ IN$

$IN_2 = 1.27 * 2$

$= 2.54\ IN$

RAINFALL INTENSITY-DURATION-FREQUENCY RELATION
FOR PHOENIX, ARIZONA
(Partial Duration Series)

Curves are based on methods of U.S. Weather Bureau Technical Papers Nos. 28 and 40 and rainfall data prepared by U.S. Weather Bureau Office of Hydrology for the Soil Conservation Service, March 1967

* Curves revised June 1975 to reflect new information from WR-44.

APPENDIX C

HEC-1
Input and Output

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

  1           ID
              *DIAGRAM
  2           ID   WESTBROOK VILLAGE,  SECTION 27
  3           ID   HYDROLOGY REPORT                    FILE: WB10.N
  4           ID   OFFSITE FLOW TO NORTH PROPERTY LINE  10 YEAR STORM
  5           ID    FEB. 28,1989
  6           IT       5 28FEB89    1200     300
  7           IO       2       0

  8           KK    CP-1
  9           KM   SHEET FLOW TO NORTH PROPERTY LINE
 10           BA    3.29
 11           PH       0       0      .4     .83    1.38     1.6
 12           LS       0   82.54
 13           UD    1.76
 14           ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.		
	(V) ROUTING	(---)) DIVERSION OR PUMP FLOW
	(.) CONNECTOR	((<---) RETURN OF DIVERTED OR PUMPED FLOW
8	CP-1	

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
                                        ****
                    FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
          U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95616
                                        ****



                     WESTBROOK VILLAGE,  SECTION 27
                     HYDROLOGY REPORT                    FILE: WB10.N
                     OFFSITE FLOW TO NORTH PROPERTY LINE  10 YEAR STORM
                      FEB. 28,1989

  7 IO         OUTPUT CONTROL VARIABLES
                    IPRNT          2  PRINT CONTROL
                    IPLOT          0  PLOT CONTROL
                    QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT         HYDROGRAPH TIME DATA
                     NMIN          5  MINUTES IN COMPUTATION INTERVAL
                    IDATE     28FEB89  STARTING DATE
                    ITIME       1200  STARTING TIME
                       NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE     1MAR89  ENDING DATE
                   NDTIME       1255  ENDING TIME

                COMPUTATION INTERVAL     .08 HOURS
                     TOTAL TIME BASE   24.92 HOURS

        ENGLISH UNITS


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


          **************
          *            *
  8 KK    *     CP-1   *
          *            *
          **************
                     SHEET FLOW TO NORTH PROPERTY LINE

             SUBBASIN RUNOFF DATA

 10 BA         SUBBASIN CHARACTERISTICS
                    TAREA        3.29  SUBBASIN AREA

               PRECIPITATION DATA

 11 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
               ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
               5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                 .40     .83    1.38    1.60     .00     .00     .00     .00     .00     .00     .00     .00

                                                STORM AREA =    3.29

 12 LS         SCS LOSS RATE
                    STRTL         .42  INITIAL ABSTRACTION
```

RTIMP .00 PERCENT IMPERVIOUS AREA

13 UD SCS DIMENSIONLESS UNITGRAPH
TLAG 1.76 LAG

***

VALUE EXCEEDS TABLE IN LOGLOG 2.00000 .01667 2.00000

UNIT HYDROGRAPH
108 END-OF-PERIOD ORDINATES

12.	24.	50.	79.	113.	150.	193.	242.	296.	362.
429.	507.	584.	649.	715.	762.	807.	838.	862.	875.
880.	881.	876.	868.	843.	819.	790.	762.	729.	697.
658.	617.	572.	523.	477.	437.	399.	370.	342.	317.
293.	272.	252.	236.	221.	206.	191.	177.	165.	153.
141.	129.	121.	112.	104.	96.	90.	83.	77.	71.
66.	61.	57.	52.	48.	45.	42.	39.	36.	33.
31.	29.	27.	25.	23.	22.	20.	18.	17.	16.
15.	13.	13.	12.	11.	10.	9.	9.	8.	8.
7.	7.	7.	6.	6.	5.	5.	4.	4.	3.
3.	2.	2.	2.	1.	1.	0.	0.		

****

HYDROGRAPH AT STATION CP-1

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DA MON HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q	*	DA MON HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q
28 FEB 1200	1	.00	.00	.00	0.	*	1 MAR 0030	151	.00	.00	.00	0.
28 FEB 1205	2	.01	.01	.00	0.	*	1 MAR 0035	152	.00	.00	.00	0.
28 FEB 1210	3	.02	.02	.00	0.	*	1 MAR 0040	153	.00	.00	.00	0.
28 FEB 1215	4	.02	.02	.00	0.	*	1 MAR 0045	154	.00	.00	.00	0.
28 FEB 1220	5	.02	.02	.00	0.	*	1 MAR 0050	155	.00	.00	.00	0.
28 FEB 1225	6	.02	.02	.00	0.	*	1 MAR 0055	156	.00	.00	.00	0.
28 FEB 1230	7	.02	.02	.00	0.	*	1 MAR 0100	157	.00	.00	.00	0.
28 FEB 1235	8	.04	.04	.00	0.	*	1 MAR 0105	158	.00	.00	.00	0.
28 FEB 1240	9	.04	.04	.00	0.	*	1 MAR 0110	159	.00	.00	.00	0.
28 FEB 1245	10	.05	.05	.00	0.	*	1 MAR 0115	160	.00	.00	.00	0.
28 FEB 1250	11	.08	.08	.00	0.	*	1 MAR 0120	161	.00	.00	.00	0.
28 FEB 1255	12	.10	.10	.00	0.	*	1 MAR 0125	162	.00	.00	.00	0.
28 FEB 1300	13	.25	.22	.03	0.	*	1 MAR 0130	163	.00	.00	.00	0.
28 FEB 1305	14	.39	.27	.12	2.	*	1 MAR 0135	164	.00	.00	.00	0.
28 FEB 1310	15	.17	.10	.08	5.	*	1 MAR 0140	165	.00	.00	.00	0.
28 FEB 1315	16	.09	.04	.04	11.	*	1 MAR 0145	166	.00	.00	.00	0.
28 FEB 1320	17	.06	.03	.03	18.	*	1 MAR 0150	167	.00	.00	.00	0.
28 FEB 1325	18	.05	.02	.03	27.	*	1 MAR 0155	168	.00	.00	.00	0.
28 FEB 1330	19	.04	.02	.02	38.	*	1 MAR 0200	169	.00	.00	.00	0.
28 FEB 1335	20	.02	.01	.01	50.	*	1 MAR 0205	170	.00	.00	.00	0.
28 FEB 1340	21	.02	.01	.01	65.	*	1 MAR 0210	171	.00	.00	.00	0.
28 FEB 1345	22	.02	.01	.01	82.	*	1 MAR 0215	172	.00	.00	.00	0.
28 FEB 1350	23	.02	.01	.01	102.	*	1 MAR 0220	173	.00	.00	.00	0.
28 FEB 1355	24	.02	.01	.01	124.	*	1 MAR 0225	174	.00	.00	.00	0.
28 FEB 1400	25	.02	.01	.01	149.	*	1 MAR 0230	175	.00	.00	.00	0.
28 FEB 1405	26	.00	.00	.00	176.	*	1 MAR 0235	176	.00	.00	.00	0.
28 FEB 1410	27	.00	.00	.00	202.	*	1 MAR 0240	177	.00	.00	.00	0.
28 FEB 1415	28	.00	.00	.00	228.	*	1 MAR 0245	178	.00	.00	.00	0.
28 FEB 1420	29	.00	.00	.00	251.	*	1 MAR 0250	179	.00	.00	.00	0.
28 FEB 1425	30	.00	.00	.00	273.	*	1 MAR 0255	180	.00	.00	.00	0.
28 FEB 1430	31	.00	.00	.00	292.	*	1 MAR 0300	181	.00	.00	.00	0.
28 FEB 1435	32	.00	.00	.00	309.	*	1 MAR 0305	182	.00	.00	.00	0.
28 FEB 1440	33	.00	.00	.00	322.	*	1 MAR 0310	183	.00	.00	.00	0.
28 FEB 1445	34	.00	.00	.00	332.	*	1 MAR 0315	184	.00	.00	.00	0.

28 FEB 1495	36	.00	.00	.00	345.	*	1 MAR 0325	186	.00	.00	.00	0.
28 FEB 1500	37	.00	.00	.00	348.	*	1 MAR 0330	187	.00	.00	.00	0.
28 FEB 1505	38	.00	.00	.00	346.	*	1 MAR 0335	188	.00	.00	.00	0.
28 FEB 1510	39	.00	.00	.00	343.	*	1 MAR 0340	189	.00	.00	.00	0.
28 FEB 1515	40	.00	.00	.00	337.	*	1 MAR 0345	190	.00	.00	.00	0.
28 FEB 1520	41	.00	.00	.00	329.	*	1 MAR 0350	191	.00	.00	.00	0.
28 FEB 1525	42	.00	.00	.00	320.	*	1 MAR 0355	192	.00	.00	.00	0.
28 FEB 1530	43	.00	.00	.00	310.	*	1 MAR 0400	193	.00	.00	.00	0.
28 FEB 1535	44	.00	.00	.00	298.	*	1 MAR 0405	194	.00	.00	.00	0.
28 FEB 1540	45	.00	.00	.00	284.	*	1 MAR 0410	195	.00	.00	.00	0.
28 FEB 1545	46	.00	.00	.00	269.	*	1 MAR 0415	196	.00	.00	.00	0.
28 FEB 1550	47	.00	.00	.00	253.	*	1 MAR 0420	197	.00	.00	.00	0.
28 FEB 1555	48	.00	.00	.00	236.	*	1 MAR 0425	198	.00	.00	.00	0.
28 FEB 1600	49	.00	.00	.00	219.	*	1 MAR 0430	199	.00	.00	.00	0.
28 FEB 1605	50	.00	.00	.00	203.	*	1 MAR 0435	200	.00	.00	.00	0.
28 FEB 1610	51	.00	.00	.00	189.	*	1 MAR 0440	201	.00	.00	.00	0.
28 FEB 1615	52	.00	.00	.00	175.	*	1 MAR 0445	202	.00	.00	.00	0.
28 FEB 1620	53	.00	.00	.00	162.	*	1 MAR 0450	203	.00	.00	.00	0.
28 FEB 1625	54	.00	.00	.00	150.	*	1 MAR 0455	204	.00	.00	.00	0.
28 FEB 1630	55	.00	.00	.00	139.	*	1 MAR 0500	205	.00	.00	.00	0.
28 FEB 1635	56	.00	.00	.00	128.	*	1 MAR 0505	206	.00	.00	.00	0.
28 FEB 1640	57	.00	.00	.00	119.	*	1 MAR 0510	207	.00	.00	.00	0.
28 FEB 1645	58	.00	.00	.00	111.	*	1 MAR 0515	208	.00	.00	.00	0.
28 FEB 1650	59	.00	.00	.00	103.	*	1 MAR 0520	209	.00	.00	.00	0.
28 FEB 1655	60	.00	.00	.00	95.	*	1 MAR 0525	210	.00	.00	.00	0.
28 FEB 1700	61	.00	.00	.00	89.	*	1 MAR 0530	211	.00	.00	.00	0.
28 FEB 1705	62	.00	.00	.00	82.	*	1 MAR 0535	212	.00	.00	.00	0.
28 FEB 1710	63	.00	.00	.00	76.	*	1 MAR 0540	213	.00	.00	.00	0.
28 FEB 1715	64	.00	.00	.00	71.	*	1 MAR 0545	214	.00	.00	.00	0.
28 FEB 1720	65	.00	.00	.00	65.	*	1 MAR 0550	215	.00	.00	.00	0.
28 FEB 1725	66	.00	.00	.00	61.	*	1 MAR 0555	216	.00	.00	.00	0.
28 FEB 1730	67	.00	.00	.00	56.	*	1 MAR 0600	217	.00	.00	.00	0.
28 FEB 1735	68	.00	.00	.00	52.	*	1 MAR 0605	218	.00	.00	.00	0.
28 FEB 1740	69	.00	.00	.00	49.	*	1 MAR 0610	219	.00	.00	.00	0.
28 FEB 1745	70	.00	.00	.00	45.	*	1 MAR 0615	220	.00	.00	.00	0.
28 FEB 1750	71	.00	.00	.00	42.	*	1 MAR 0620	221	.00	.00	.00	0.
28 FEB 1755	72	.00	.00	.00	39.	*	1 MAR 0625	222	.00	.00	.00	0.
28 FEB 1800	73	.00	.00	.00	36.	*	1 MAR 0630	223	.00	.00	.00	0.
28 FEB 1805	74	.00	.00	.00	33.	*	1 MAR 0635	224	.00	.00	.00	0.
28 FEB 1810	75	.00	.00	.00	31.	*	1 MAR 0640	225	.00	.00	.00	0.
28 FEB 1815	76	.00	.00	.00	29.	*	1 MAR 0645	226	.00	.00	.00	0.
28 FEB 1820	77	.00	.00	.00	27.	*	1 MAR 0650	227	.00	.00	.00	0.
28 FEB 1825	78	.00	.00	.00	25.	*	1 MAR 0655	228	.00	.00	.00	0.
28 FEB 1830	79	.00	.00	.00	23.	*	1 MAR 0700	229	.00	.00	.00	0.
28 FEB 1835	80	.00	.00	.00	21.	*	1 MAR 0705	230	.00	.00	.00	0.
28 FEB 1840	81	.00	.00	.00	20.	*	1 MAR 0710	231	.00	.00	.00	0.
28 FEB 1845	82	.00	.00	.00	18.	*	1 MAR 0715	232	.00	.00	.00	0.
28 FEB 1850	83	.00	.00	.00	17.	*	1 MAR 0720	233	.00	.00	.00	0.
28 FEB 1855	84	.00	.00	.00	16.	*	1 MAR 0725	234	.00	.00	.00	0.
28 FEB 1900	85	.00	.00	.00	15.	*	1 MAR 0730	235	.00	.00	.00	0.
28 FEB 1905	86	.00	.00	.00	13.	*	1 MAR 0735	236	.00	.00	.00	0.
28 FEB 1910	87	.00	.00	.00	12.	*	1 MAR 0740	237	.00	.00	.00	0.
28 FEB 1915	88	.00	.00	.00	12.	*	1 MAR 0745	238	.00	.00	.00	0.
28 FEB 1920	89	.00	.00	.00	11.	*	1 MAR 0750	239	.00	.00	.00	0.
28 FEB 1925	90	.00	.00	.00	10.	*	1 MAR 0755	240	.00	.00	.00	0.
28 FEB 1930	91	.00	.00	.00	9.	*	1 MAR 0800	241	.00	.00	.00	0.
28 FEB 1935	92	.00	.00	.00	9.	*	1 MAR 0805	242	.00	.00	.00	0.
28 FEB 1940	93	.00	.00	.00	8.	*	1 MAR 0810	243	.00	.00	.00	0.
28 FEB 1945	94	.00	.00	.00	7.	*	1 MAR 0815	244	.00	.00	.00	0.
28 FEB 1950	95	.00	.00	.00	7.	*	1 MAR 0820	245	.00	.00	.00	0.
28 FEB 1955	96	.00	.00	.00	6.	*	1 MAR 0825	246	.00	.00	.00	0.
28 FEB 2000	97	.00	.00	.00	6.	*	1 MAR 0830	247	.00	.00	.00	0.
28 FEB 2005	98	.00	.00	.00	5.	*	1 MAR 0835	248	.00	.00	.00	0.
28 FEB 2010	99	.00	.00	.00	5.	*	1 MAR 0840	249	.00	.00	.00	0.
28 FEB 2015	100	.00	.00	.00	5.	*	1 MAR 0845	250	.00	.00	.00	0.

28 FEB 2025	102	.00	.00	.00	4.	*	1 MAR 0855	252	.00	.00	.00	0.
28 FEB 2030	103	.00	.00	.00	4.	*	1 MAR 0900	253	.00	.00	.00	0.
28 FEB 2035	104	.00	.00	.00	4.	*	1 MAR 0905	254	.00	.00	.00	0.
28 FEB 2040	105	.00	.00	.00	3.	*	1 MAR 0910	255	.00	.00	.00	0.
28 FEB 2045	106	.00	.00	.00	3.	*	1 MAR 0915	256	.00	.00	.00	0.
28 FEB 2050	107	.00	.00	.00	3.	*	1 MAR 0920	257	.00	.00	.00	0.
28 FEB 2055	108	.00	.00	.00	3.	*	1 MAR 0925	258	.00	.00	.00	0.
28 FEB 2100	109	.00	.00	.00	3.	*	1 MAR 0930	259	.00	.00	.00	0.
28 FEB 2105	110	.00	.00	.00	2.	*	1 MAR 0935	260	.00	.00	.00	0.
28 FEB 2110	111	.00	.00	.00	2.	*	1 MAR 0940	261	.00	.00	.00	0.
28 FEB 2115	112	.00	.00	.00	2.	*	1 MAR 0945	262	.00	.00	.00	0.
28 FEB 2120	113	.00	.00	.00	2.	*	1 MAR 0950	263	.00	.00	.00	0.
28 FEB 2125	114	.00	.00	.00	2.	*	1 MAR 0955	264	.00	.00	.00	0.
28 FEB 2130	115	.00	.00	.00	1.	*	1 MAR 1000	265	.00	.00	.00	0.
28 FEB 2135	116	.00	.00	.00	1.	*	1 MAR 1005	266	.00	.00	.00	0.
28 FEB 2140	117	.00	.00	.00	1.	*	1 MAR 1010	267	.00	.00	.00	0.
28 FEB 2145	118	.00	.00	.00	1.	*	1 MAR 1015	268	.00	.00	.00	0.
28 FEB 2150	119	.00	.00	.00	1.	*	1 MAR 1020	269	.00	.00	.00	0.
28 FEB 2155	120	.00	.00	.00	1.	*	1 MAR 1025	270	.00	.00	.00	0.
28 FEB 2200	121	.00	.00	.00	0.	*	1 MAR 1030	271	.00	.00	.00	0.
28 FEB 2205	122	.00	.00	.00	0.	*	1 MAR 1035	272	.00	.00	.00	0.
28 FEB 2210	123	.00	.00	.00	0.	*	1 MAR 1040	273	.00	.00	.00	0.
28 FEB 2215	124	.00	.00	.00	0.	*	1 MAR 1045	274	.00	.00	.00	0.
28 FEB 2220	125	.00	.00	.00	0.	*	1 MAR 1050	275	.00	.00	.00	0.
28 FEB 2225	126	.00	.00	.00	0.	*	1 MAR 1055	276	.00	.00	.00	0.
28 FEB 2230	127	.00	.00	.00	0.	*	1 MAR 1100	277	.00	.00	.00	0.
28 FEB 2235	128	.00	.00	.00	0.	*	1 MAR 1105	278	.00	.00	.00	0.
28 FEB 2240	129	.00	.00	.00	0.	*	1 MAR 1110	279	.00	.00	.00	0.
28 FEB 2245	130	.00	.00	.00	0.	*	1 MAR 1115	280	.00	.00	.00	0.
28 FEB 2250	131	.00	.00	.00	0.	*	1 MAR 1120	281	.00	.00	.00	0.
28 FEB 2255	132	.00	.00	.00	0.	*	1 MAR 1125	282	.00	.00	.00	0.
28 FEB 2300	133	.00	.00	.00	0.	*	1 MAR 1130	283	.00	.00	.00	0.
28 FEB 2305	134	.00	.00	.00	0.	*	1 MAR 1135	284	.00	.00	.00	0.
28 FEB 2310	135	.00	.00	.00	0.	*	1 MAR 1140	285	.00	.00	.00	0.
28 FEB 2315	136	.00	.00	.00	0.	*	1 MAR 1145	286	.00	.00	.00	0.
28 FEB 2320	137	.00	.00	.00	0.	*	1 MAR 1150	287	.00	.00	.00	0.
28 FEB 2325	138	.00	.00	.00	0.	*	1 MAR 1155	288	.00	.00	.00	0.
28 FEB 2330	139	.00	.00	.00	0.	*	1 MAR 1200	289	.00	.00	.00	0.
28 FEB 2335	140	.00	.00	.00	0.	*	1 MAR 1205	290	.00	.00	.00	0.
28 FEB 2340	141	.00	.00	.00	0.	*	1 MAR 1210	291	.00	.00	.00	0.
28 FEB 2345	142	.00	.00	.00	0.	*	1 MAR 1215	292	.00	.00	.00	0.
28 FEB 2350	143	.00	.00	.00	0.	*	1 MAR 1220	293	.00	.00	.00	0.
28 FEB 2355	144	.00	.00	.00	0.	*	1 MAR 1225	294	.00	.00	.00	0.
1 MAR 0000	145	.00	.00	.00	0.	*	1 MAR 1230	295	.00	.00	.00	0.
1 MAR 0005	146	.00	.00	.00	0.	*	1 MAR 1235	296	.00	.00	.00	0.
1 MAR 0010	147	.00	.00	.00	0.	*	1 MAR 1240	297	.00	.00	.00	0.
1 MAR 0015	148	.00	.00	.00	0.	*	1 MAR 1245	298	.00	.00	.00	0.
1 MAR 0020	149	.00	.00	.00	0.	*	1 MAR 1250	299	.00	.00	.00	0.
1 MAR 0025	150	.00	.00	.00	0.	*	1 MAR 1255	300	.00	.00	.00	0.
						*						

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TOTAL RAINFALL = 1.58, TOTAL LOSS = 1.17, TOTAL EXCESS = .41

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 348.	3.00		143.	36.	35.	35.
		(INCHES)	.403	.409	.409	.409
		(AC-FT)	71.	72.	72.	72.

CUMULATIVE AREA = 3.29 SQ MI

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	CP-1	348.	3.00	143.	36.	35.	3.29		

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

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

  1           ID
              *DIAGRAM
  2           ID   WESTBROOK VILLAGE,  SECTION 27
  3           ID   HYDROLOGY REPORT                    FILE: WB99.N
  4           ID   OFFSITE FLOW TO NORTH PROPERTY LINE  100 YEAR STORM
  5           ID    FEB. 28,1989
  6           IT       5 28FEB89    1200     300
  7           IO       2       0

  8           KK    CP-1
  9           KM   SHEET FLOW TO NORTH PROPERTY LINE
 10           BA    3.29
 11           PH       0       0     .87    1.23    2.12    2.54
 12           LS       0   82.54
 13           UD    1.76
 14           ZZ
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SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.		
	(V) ROUTING	(--->) DIVERSION OR PUMP FLOW
	(.) CONNECTOR	(<---) RETURN OF DIVERTED OR PUMPED FLOW
8	CP-1	

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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                                        ****
                    FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985
          U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95616
                                        ****



                    WESTBROOK VILLAGE,  SECTION 27
                    HYDROLOGY REPORT                    FILE: WB99.N
                    OFFSITE FLOW TO NORTH PROPERTY LINE  100 YEAR STORM
                     FEB. 28,1989

  7 IO        OUTPUT CONTROL VARIABLES
                  IPRNT          2  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE

    IT        HYDROGRAPH TIME DATA
                   NMIN          5  MINUTES IN COMPUTATION INTERVAL
                  IDATE     28FEB89  STARTING DATE
                  ITIME       1200  STARTING TIME
                     NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      1MAR89  ENDING DATE
                 NDTIME       1255  ENDING TIME

              COMPUTATION INTERVAL     .08 HOURS
                  TOTAL TIME BASE   24.92 HOURS

        ENGLISH UNITS


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


          **************
          *            *
  8 KK    *     CP-1   *
          *            *
          **************
                    SHEET FLOW TO NORTH PROPERTY LINE

            SUBBASIN RUNOFF DATA

 10 BA        SUBBASIN CHARACTERISTICS
                  TAREA        3.29  SUBBASIN AREA

              PRECIPITATION DATA

 11 PH                              DEPTHS FOR   0-PERCENT HYPOTHETICAL STORM
              ..... HYDRO-35 .....   ............... TP-40 ...............   ........... TP-49 ...........
              5-MIN  15-MIN  60-MIN    2-HR    3-HR    6-HR   12-HR   24-HR   2-DAY   4-DAY   7-DAY  10-DAY
                .87    1.23    2.12    2.54     .00     .00     .00     .00     .00     .00     .00     .00

                                                STORM AREA =    3.29

 12 LS        SCS LOSS RATE
                  STRTL         .42  INITIAL ABSTRACTION
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RTIMP .00 PERCENT IMPERVIOUS AREA

13 UD SCS DIMENSIONLESS UNITGRAPH
TLAG 1.76 LAG

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VALUE EXCEEDS TABLE IN LOGLOG 2.00000 .01667 2.00000

UNIT HYDROGRAPH
108 END-OF-PERIOD ORDINATES

12.	24.	50.	79.	113.	150.	193.	242.	296.	362.
429.	507.	584.	649.	715.	762.	807.	838.	862.	875.
880.	881.	876.	868.	843.	819.	790.	762.	729.	697.
658.	617.	572.	523.	477.	437.	399.	370.	342.	317.
293.	272.	252.	236.	221.	206.	191.	177.	165.	153.
141.	129.	121.	112.	104.	96.	90.	83.	77.	71.
66.	61.	57.	52.	48.	45.	42.	39.	36.	33.
31.	29.	27.	25.	23.	22.	20.	18.	17.	16.
15.	13.	13.	12.	11.	10.	9.	9.	8.	8.
7.	7.	7.	6.	6.	5.	5.	4.	4.	3.
3.	2.	2.	2.	1.	1.	0.	0.		

****

HYDROGRAPH AT STATION CP-1

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DA MON HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q	*	DA MON HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q
						*						
28 FEB 1200	1	.00	.00	.00	0.	*	1 MAR 0030	151	.00	.00	.00	0.
28 FEB 1205	2	.03	.03	.00	0.	*	1 MAR 0035	152	.00	.00	.00	0.
28 FEB 1210	3	.03	.03	.00	0.	*	1 MAR 0040	153	.00	.00	.00	0.
28 FEB 1215	4	.03	.03	.00	0.	*	1 MAR 0045	154	.00	.00	.00	0.
28 FEB 1220	5	.04	.04	.00	0.	*	1 MAR 0050	155	.00	.00	.00	0.
28 FEB 1225	6	.04	.04	.00	0.	*	1 MAR 0055	156	.00	.00	.00	0.
28 FEB 1230	7	.04	.04	.00	0.	*	1 MAR 0100	157	.00	.00	.00	0.
28 FEB 1235	8	.06	.06	.00	0.	*	1 MAR 0105	158	.00	.00	.00	0.
28 FEB 1240	9	.07	.07	.00	0.	*	1 MAR 0110	159	.00	.00	.00	0.
28 FEB 1245	10	.08	.08	.00	0.	*	1 MAR 0115	160	.00	.00	.00	0.
28 FEB 1250	11	.12	.12	.01	0.	*	1 MAR 0120	161	.00	.00	.00	0.
28 FEB 1255	12	.16	.13	.03	1.	*	1 MAR 0125	162	.00	.00	.00	0.
28 FEB 1300	13	.21	.15	.06	2.	*	1 MAR 0130	163	.00	.00	.00	0.
28 FEB 1305	14	.85	.42	.43	9.	*	1 MAR 0135	164	.00	.00	.00	0.
28 FEB 1310	15	.14	.05	.09	18.	*	1 MAR 0140	165	.00	.00	.00	0.
28 FEB 1315	16	.14	.05	.09	34.	*	1 MAR 0145	166	.00	.00	.00	0.
28 FEB 1320	17	.09	.03	.06	54.	*	1 MAR 0150	167	.00	.00	.00	0.
28 FEB 1325	18	.08	.02	.05	79.	*	1 MAR 0155	168	.00	.00	.00	0.
28 FEB 1330	19	.07	.02	.05	108.	*	1 MAR 0200	169	.00	.00	.00	0.
28 FEB 1335	20	.05	.01	.03	142.	*	1 MAR 0205	170	.00	.00	.00	0.
28 FEB 1340	21	.04	.01	.03	182.	*	1 MAR 0210	171	.00	.00	.00	0.
28 FEB 1345	22	.04	.01	.03	227.	*	1 MAR 0215	172	.00	.00	.00	0.
28 FEB 1350	23	.03	.01	.02	280.	*	1 MAR 0220	173	.00	.00	.00	0.
28 FEB 1355	24	.03	.01	.02	338.	*	1 MAR 0225	174	.00	.00	.00	0.
28 FEB 1400	25	.03	.01	.02	403.	*	1 MAR 0230	175	.00	.00	.00	0.
28 FEB 1405	26	.00	.00	.00	470.	*	1 MAR 0235	176	.00	.00	.00	0.
28 FEB 1410	27	.00	.00	.00	535.	*	1 MAR 0240	177	.00	.00	.00	0.
28 FEB 1415	28	.00	.00	.00	599.	*	1 MAR 0245	178	.00	.00	.00	0.
28 FEB 1420	29	.00	.00	.00	655.	*	1 MAR 0250	179	.00	.00	.00	0.
28 FEB 1425	30	.00	.00	.00	708.	*	1 MAR 0255	180	.00	.00	.00	0.
28 FEB 1430	31	.00	.00	.00	753.	*	1 MAR 0300	181	.00	.00	.00	0.
28 FEB 1435	32	.00	.00	.00	791.	*	1 MAR 0305	182	.00	.00	.00	0.
28 FEB 1440	33	.00	.00	.00	822.	*	1 MAR 0310	183	.00	.00	.00	0.
28 FEB 1445	34	.00	.00	.00	845.	*	1 MAR 0315	184	.00	.00	.00	0.

28 FEB 1495	36	.00	.00	.00	878.	*	1 MAR 0325	186	.00	.00	.00	0.
28 FEB 1500	37	.00	.00	.00	877.	*	1 MAR 0330	187	.00	.00	.00	0.
28 FEB 1505	38	.00	.00	.00	871.	*	1 MAR 0335	188	.00	.00	.00	0.
28 FEB 1510	39	.00	.00	.00	860.	*	1 MAR 0340	189	.00	.00	.00	0.
28 FEB 1515	40	.00	.00	.00	844.	*	1 MAR 0345	190	.00	.00	.00	0.
28 FEB 1520	41	.00	.00	.00	824.	*	1 MAR 0350	191	.00	.00	.00	0.
28 FEB 1525	42	.00	.00	.00	800.	*	1 MAR 0355	192	.00	.00	.00	0.
28 FEB 1530	43	.00	.00	.00	773.	*	1 MAR 0400	193	.00	.00	.00	0.
28 FEB 1535	44	.00	.00	.00	741.	*	1 MAR 0405	194	.00	.00	.00	0.
28 FEB 1540	45	.00	.00	.00	705.	*	1 MAR 0410	195	.00	.00	.00	0.
28 FEB 1545	46	.00	.00	.00	666.	*	1 MAR 0415	196	.00	.00	.00	0.
28 FEB 1550	47	.00	.00	.00	624.	*	1 MAR 0420	197	.00	.00	.00	0.
28 FEB 1555	48	.00	.00	.00	581.	*	1 MAR 0425	198	.00	.00	.00	0.
28 FEB 1600	49	.00	.00	.00	540.	*	1 MAR 0430	199	.00	.00	.00	0.
28 FEB 1605	50	.00	.00	.00	501.	*	1 MAR 0435	200	.00	.00	.00	0.
28 FEB 1610	51	.00	.00	.00	466.	*	1 MAR 0440	201	.00	.00	.00	0.
28 FEB 1615	52	.00	.00	.00	432.	*	1 MAR 0445	202	.00	.00	.00	0.
28 FEB 1620	53	.00	.00	.00	400.	*	1 MAR 0450	203	.00	.00	.00	0.
28 FEB 1625	54	.00	.00	.00	370.	*	1 MAR 0455	204	.00	.00	.00	0.
28 FEB 1630	55	.00	.00	.00	343.	*	1 MAR 0500	205	.00	.00	.00	0.
28 FEB 1635	56	.00	.00	.00	317.	*	1 MAR 0505	206	.00	.00	.00	0.
28 FEB 1640	57	.00	.00	.00	295.	*	1 MAR 0510	207	.00	.00	.00	0.
28 FEB 1645	58	.00	.00	.00	274.	*	1 MAR 0515	208	.00	.00	.00	0.
28 FEB 1650	59	.00	.00	.00	254.	*	1 MAR 0520	209	.00	.00	.00	0.
28 FEB 1655	60	.00	.00	.00	236.	*	1 MAR 0525	210	.00	.00	.00	0.
28 FEB 1700	61	.00	.00	.00	219.	*	1 MAR 0530	211	.00	.00	.00	0.
28 FEB 1705	62	.00	.00	.00	203.	*	1 MAR 0535	212	.00	.00	.00	0.
28 FEB 1710	63	.00	.00	.00	189.	*	1 MAR 0540	213	.00	.00	.00	0.
28 FEB 1715	64	.00	.00	.00	175.	*	1 MAR 0545	214	.00	.00	.00	0.
28 FEB 1720	65	.00	.00	.00	161.	*	1 MAR 0550	215	.00	.00	.00	0.
28 FEB 1725	66	.00	.00	.00	150.	*	1 MAR 0555	216	.00	.00	.00	0.
28 FEB 1730	67	.00	.00	.00	140.	*	1 MAR 0600	217	.00	.00	.00	0.
28 FEB 1735	68	.00	.00	.00	130.	*	1 MAR 0605	218	.00	.00	.00	0.
28 FEB 1740	69	.00	.00	.00	120.	*	1 MAR 0610	219	.00	.00	.00	0.
28 FEB 1745	70	.00	.00	.00	111.	*	1 MAR 0615	220	.00	.00	.00	0.
28 FEB 1750	71	.00	.00	.00	104.	*	1 MAR 0620	221	.00	.00	.00	0.
28 FEB 1755	72	.00	.00	.00	96.	*	1 MAR 0625	222	.00	.00	.00	0.
28 FEB 1800	73	.00	.00	.00	89.	*	1 MAR 0630	223	.00	.00	.00	0.
28 FEB 1805	74	.00	.00	.00	82.	*	1 MAR 0635	224	.00	.00	.00	0.
28 FEB 1810	75	.00	.00	.00	76.	*	1 MAR 0640	225	.00	.00	.00	0.
28 FEB 1815	76	.00	.00	.00	71.	*	1 MAR 0645	226	.00	.00	.00	0.
28 FEB 1820	77	.00	.00	.00	65.	*	1 MAR 0650	227	.00	.00	.00	0.
28 FEB 1825	78	.00	.00	.00	60.	*	1 MAR 0655	228	.00	.00	.00	0.
28 FEB 1830	79	.00	.00	.00	56.	*	1 MAR 0700	229	.00	.00	.00	0.
28 FEB 1835	80	.00	.00	.00	52.	*	1 MAR 0705	230	.00	.00	.00	0.
28 FEB 1840	81	.00	.00	.00	48.	*	1 MAR 0710	231	.00	.00	.00	0.
28 FEB 1845	82	.00	.00	.00	45.	*	1 MAR 0715	232	.00	.00	.00	0.
28 FEB 1850	83	.00	.00	.00	42.	*	1 MAR 0720	233	.00	.00	.00	0.
28 FEB 1855	84	.00	.00	.00	39.	*	1 MAR 0725	234	.00	.00	.00	0.
28 FEB 1900	85	.00	.00	.00	36.	*	1 MAR 0730	235	.00	.00	.00	0.
28 FEB 1905	86	.00	.00	.00	33.	*	1 MAR 0735	236	.00	.00	.00	0.
28 FEB 1910	87	.00	.00	.00	31.	*	1 MAR 0740	237	.00	.00	.00	0.
28 FEB 1915	88	.00	.00	.00	29.	*	1 MAR 0745	238	.00	.00	.00	0.
28 FEB 1920	89	.00	.00	.00	27.	*	1 MAR 0750	239	.00	.00	.00	0.
28 FEB 1925	90	.00	.00	.00	25.	*	1 MAR 0755	240	.00	.00	.00	0.
28 FEB 1930	91	.00	.00	.00	23.	*	1 MAR 0800	241	.00	.00	.00	0.
28 FEB 1935	92	.00	.00	.00	21.	*	1 MAR 0805	242	.00	.00	.00	0.
28 FEB 1940	93	.00	.00	.00	20.	*	1 MAR 0810	243	.00	.00	.00	0.
28 FEB 1945	94	.00	.00	.00	18.	*	1 MAR 0815	244	.00	.00	.00	0.
28 FEB 1950	95	.00	.00	.00	17.	*	1 MAR 0820	245	.00	.00	.00	0.
28 FEB 1955	96	.00	.00	.00	16.	*	1 MAR 0825	246	.00	.00	.00	0.
28 FEB 2000	97	.00	.00	.00	15.	*	1 MAR 0830	247	.00	.00	.00	0.
28 FEB 2005	98	.00	.00	.00	14.	*	1 MAR 0835	248	.00	.00	.00	0.
28 FEB 2010	99	.00	.00	.00	13.	*	1 MAR 0840	249	.00	.00	.00	0.
28 FEB 2015	100	.00	.00	.00	12.	*	1 MAR 0845	250	.00	.00	.00	0.

28 FEB 2025	102	.00	.00	.00	10.	*	1 MAR 0855	252	.00	.00	.00	0.
28 FEB 2030	103	.00	.00	.00	10.	*	1 MAR 0900	253	.00	.00	.00	0.
28 FEB 2035	104	.00	.00	.00	9.	*	1 MAR 0905	254	.00	.00	.00	0.
28 FEB 2040	105	.00	.00	.00	8.	*	1 MAR 0910	255	.00	.00	.00	0.
28 FEB 2045	106	.00	.00	.00	8.	*	1 MAR 0915	256	.00	.00	.00	0.
28 FEB 2050	107	.00	.00	.00	7.	*	1 MAR 0920	257	.00	.00	.00	0.
28 FEB 2055	108	.00	.00	.00	7.	*	1 MAR 0925	258	.00	.00	.00	0.
28 FEB 2100	109	.00	.00	.00	6.	*	1 MAR 0930	259	.00	.00	.00	0.
28 FEB 2105	110	.00	.00	.00	6.	*	1 MAR 0935	260	.00	.00	.00	0.
28 FEB 2110	111	.00	.00	.00	5.	*	1 MAR 0940	261	.00	.00	.00	0.
28 FEB 2115	112	.00	.00	.00	5.	*	1 MAR 0945	262	.00	.00	.00	0.
28 FEB 2120	113	.00	.00	.00	4.	*	1 MAR 0950	263	.00	.00	.00	0.
28 FEB 2125	114	.00	.00	.00	4.	*	1 MAR 0955	264	.00	.00	.00	0.
28 FEB 2130	115	.00	.00	.00	3.	*	1 MAR 1000	265	.00	.00	.00	0.
28 FEB 2135	116	.00	.00	.00	3.	*	1 MAR 1005	266	.00	.00	.00	0.
28 FEB 2140	117	.00	.00	.00	3.	*	1 MAR 1010	267	.00	.00	.00	0.
28 FEB 2145	118	.00	.00	.00	2.	*	1 MAR 1015	268	.00	.00	.00	0.
28 FEB 2150	119	.00	.00	.00	2.	*	1 MAR 1020	269	.00	.00	.00	0.
28 FEB 2155	120	.00	.00	.00	1.	*	1 MAR 1025	270	.00	.00	.00	0.
28 FEB 2200	121	.00	.00	.00	1.	*	1 MAR 1030	271	.00	.00	.00	0.
28 FEB 2205	122	.00	.00	.00	1.	*	1 MAR 1035	272	.00	.00	.00	0.
28 FEB 2210	123	.00	.00	.00	1.	*	1 MAR 1040	273	.00	.00	.00	0.
28 FEB 2215	124	.00	.00	.00	0.	*	1 MAR 1045	274	.00	.00	.00	0.
28 FEB 2220	125	.00	.00	.00	0.	*	1 MAR 1050	275	.00	.00	.00	0.
28 FEB 2225	126	.00	.00	.00	0.	*	1 MAR 1055	276	.00	.00	.00	0.
28 FEB 2230	127	.00	.00	.00	0.	*	1 MAR 1100	277	.00	.00	.00	0.
28 FEB 2235	128	.00	.00	.00	0.	*	1 MAR 1105	278	.00	.00	.00	0.
28 FEB 2240	129	.00	.00	.00	0.	*	1 MAR 1110	279	.00	.00	.00	0.
28 FEB 2245	130	.00	.00	.00	0.	*	1 MAR 1115	280	.00	.00	.00	0.
28 FEB 2250	131	.00	.00	.00	0.	*	1 MAR 1120	281	.00	.00	.00	0.
28 FEB 2255	132	.00	.00	.00	0.	*	1 MAR 1125	282	.00	.00	.00	0.
28 FEB 2300	133	.00	.00	.00	0.	*	1 MAR 1130	283	.00	.00	.00	0.
28 FEB 2305	134	.00	.00	.00	0.	*	1 MAR 1135	284	.00	.00	.00	0.
28 FEB 2310	135	.00	.00	.00	0.	*	1 MAR 1140	285	.00	.00	.00	0.
28 FEB 2315	136	.00	.00	.00	0.	*	1 MAR 1145	286	.00	.00	.00	0.
28 FEB 2320	137	.00	.00	.00	0.	*	1 MAR 1150	287	.00	.00	.00	0.
28 FEB 2325	138	.00	.00	.00	0.	*	1 MAR 1155	288	.00	.00	.00	0.
28 FEB 2330	139	.00	.00	.00	0.	*	1 MAR 1200	289	.00	.00	.00	0.
28 FEB 2335	140	.00	.00	.00	0.	*	1 MAR 1205	290	.00	.00	.00	0.
28 FEB 2340	141	.00	.00	.00	0.	*	1 MAR 1210	291	.00	.00	.00	0.
28 FEB 2345	142	.00	.00	.00	0.	*	1 MAR 1215	292	.00	.00	.00	0.
28 FEB 2350	143	.00	.00	.00	0.	*	1 MAR 1220	293	.00	.00	.00	0.
28 FEB 2355	144	.00	.00	.00	0.	*	1 MAR 1225	294	.00	.00	.00	0.
1 MAR 0000	145	.00	.00	.00	0.	*	1 MAR 1230	295	.00	.00	.00	0.
1 MAR 0005	146	.00	.00	.00	0.	*	1 MAR 1235	296	.00	.00	.00	0.
1 MAR 0010	147	.00	.00	.00	0.	*	1 MAR 1240	297	.00	.00	.00	0.
1 MAR 0015	148	.00	.00	.00	0.	*	1 MAR 1245	298	.00	.00	.00	0.
1 MAR 0020	149	.00	.00	.00	0.	*	1 MAR 1250	299	.00	.00	.00	0.
1 MAR 0025	150	.00	.00	.00	0.	*	1 MAR 1255	300	.00	.00	.00	0.
						*						

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TOTAL RAINFALL = 2.51, TOTAL LOSS = 1.47, TOTAL EXCESS = 1.03

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+ (CFS)	(HR)					
		(CFS)				
+ 877.	3.00		361.	92.	88.	88.
		(INCHES)	1.019	1.035	1.035	1.035
		(AC-FT)	179.	182.	182.	182.

CUMULATIVE AREA = 3.29 SQ MI

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	CP-1	877.	3.00	361.	92.	88.	3.29		

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

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

  1           ID
              *DIAGRAM
  2           ID   WESTBROOK VILLAGE,  SECTION 27
  3           ID   HYDROLOGY REPORT                                          FILE:  WB99.S
  4           ID  OFF AND ONSITE EXISTING FLOWS TO SOUTH PROPERTY LINE       100 YEAR STORM
  5           ID    FEB. 28,1989
  6           IT       5 28FEB89    1200     300
  7           IO       5       0

  8           KK    CP-2
  9           KM   SHEET FLOW TO SOUTH PROPERTY LINE
 10           BA    4.29
 11           PH       0       0     .87    1.23    2.12    2.54
 12           LS       0   81.25
 13           UD    2.13
 14           ZZ
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SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.		
	(V) ROUTING	(---)) DIVERSION OR PUMP FLOW
	(.) CONNECTOR	((---) RETURN OF DIVERTED OR PUMPED FLOW
8	CP-2	

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985

U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95616

****

WESTBROOK VILLAGE, SECTION 27
HYDROLOGY REPORT
OFF AND ONSITE EXISTING FLOWS TO SOUTH PROPERTY LINE
FEB. 28,1989

FILE: WB99.S
100 YEAR STORM

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 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     28FEB89  STARTING DATE
                 ITIME       1200  STARTING TIME
                    NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                NDDATE      1MAR89  ENDING DATE
                NDTIME       1255  ENDING TIME

            COMPUTATION INTERVAL     .08 HOURS
                 TOTAL TIME BASE   24.92 HOURS

       ENGLISH UNITS

VALUE EXCEEDS TABLE IN LOGLOG        2.00000        .01667       2.00000
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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	CP-2	887.	3.42	425.	110.	106.	4.29		

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

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

  1           ID
              *DIAGRAM
  2           ID   WESTBROOK VILLAGE,  SECTION 27
  3           ID   HYDROLOGY REPORT                    FILE: WB10.D2
  4           ID   OFFSITE & ONSITE DRAINAGE PATTERN   10 YEAR STORM
  5           ID     MAY  3,1989
  6           IT       1  3MAY89    1200     300
  7           IO       5       0

  8           KK    CP-1
  9           KM   SHEET FLOW HYDROGRAPH TO NORTH PROPERTY LINE
 10           BA    3.29
 11           IN      20  3MAY89    1220
 12           QI       0       0       0      18      65     149     251     322     348     329
 13           QI     284     219     162     119      89      65      49      36      27      20
 14           QI      15      11       8       6       4       3       3       2       1       0
 15           QI       0

 16           KK   CP-1W
 17           KM        CP-1 SPLIT EVENLY TO INTERCEPTER CHANNELS
 18           DT   CP-1E
 19           DI       0    1600
 20           DQ       0     800

 21           KK    P10a
 22           KM        PARCEL 10a TO RETENTION # 3-5
 23           BA     .04
 24           PH       0       0      .4     .83    1.38    1.60
 25           LS       0      85
 26           UD    .306

 27           KK     P11
 28           KM        PARCEL 11 TO RETENTION # 3-5
 29           BA   .0419
 30           LS       0      82
 31           UD    .107

 32           KK     P12
 33           KM        PARCEL 12 TO RETENTION # 3-5
 34           BA   .0413
 35           LS       0      82
 36           UD    .202

 37           KK     PG3
 38           KM        COMBINE PARCEL AND GOLF COURSE TO RETENTION #3
 39           HC       4

 40           KK      R3
 41           KM        RETENTION CALC. FOR RETENTION BASIN #3
 42           RS       1    STOR      -1       0
 43           SV       0     .19    1.23    3.71    7.87    12.1
 44           SE      32      33      34      35      36      37
 45           SQ       0       2      12      19     195     811
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PRE DEVELOPMENT

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

  46          KK    P19
  47          KM       PARCEL 19 TO RETENTION # 3-5
  48          BA   .0253
  49          LS      0      84
  50          UD    .161

  51          KK    P18b
  52          KM       PARCEL 18 TO RETENTION # 3-5
  53          BA   .0187
  54          LS      0      82
  55          UD    .161

  56          KK   GC4-5
  57          KM       GOLF COURCE TO RETENTION # 4-5
  58          BA   .0574
  59          LS      0      70
  60          UD    .412

  61          KK   PG4-5
  62          KM       COMBINE PARCEL AND GOLF COURSE TO RETENTION # 4-5
  63          HC      4

  64          KK    R4-5
  65          KM       RETENTION CALC. FOR RETENTION # 4-5
  66          RS      1    STOR     -1      0
  67          SV      0    2.57    7.19   13.71    22.4     32     37     42     47     52
  68          SE     27      28      29      30      31     33     34     35     36     37
  69          SQ      0       2      12      19      21     21     21     21    386   1207

  70          KK     G6
  71          KM       GOLF COURSE AT DRIVING RANGE
  72          BA   .0126
  73          LS      0      70
  74          UD     .1

  75          KK    PG-6
  76          KM              COMBINE WEST OFFSITE INFLOW AND PG4-5
  77          HC      2

  78          KK     R6
  79          KM       RETENTION CALC. FOR RETENTION #6
  80          RS      1    STOR     -1      0
  81          SV      0       2      4      6
  82          SE     33      34     35     36
  83          SQ      0       0    227    811

  84          KK   CP-1E
  85          KM       REINSTALLING OFFSITE SPLIT FLOW
  86          DR   CP-1E
```

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

 87           KK  CP-1E1
 88           KM        FLOW SPLIT INTO R1
 89           DT  CP-1E2
 90           DI       0     268
 91           DQ       0      40

 92           KK  CP-1E2
 93           KM        REINSTALLING SPLIT FLOW
 94           DR  CP-1E2

 95           KK     P13
 96           KM        PARCEL 13 AND CHANNEL TO RETENTION # 1
 97           BA   .0414
 98           LS       0      82
 99           UD    .137

100           KK      G1
101           KM        GOLF COURSE FLOW TO RETENTION # 1
102           BA    .023
103           LS       0      70
104           UD    .145

105           KK     PG1
106           KM                COMBINE OFFSITE, PARCEL AND GOLF  COURSE
107           HC       3

108           KK      R1
109           KM        RETENTION CALC. FOR RETENTION BASIN #1
110           RS       1    STOR      -1       0
111           SV       0   .1138   .6342  1.4316     3.3     5.5    6.46    6.94
112           SE      36      37      38      39      40      41      42      43
113           SQ       0       2      12      19    21.8    23.1    24.1      25

114           KK     PG1
115           KM                COMBINE R1 AND CP-1E1
116           HC       2

117           KK     P17
118           KM        PARCEL 17 TO RETENTION #2
119           BA   .0216
120           LS       0      82
121           UD    .128

122           KK    P18a
123           KM        PARCEL 18a TO RETENTION # 2
124           BA   .0063
125           LS       0      82
126           UD      .1
```

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

 127          KK    P23a
 128          KM        PARCEL 23a TO RETENTION #2
 129          BA   .0073
 130          LS       0      86
 131          UD      .1

 132          KK     GC2
 133          KM        GOLF COURSE 2 TO RETENTION #2
 134          BA   .0438
 135          LS       0      70
 136          UD    .171

 137          KK      G2
 138          KM                COMBINE RETAINED, PARCEL AND GOLF COURSE FLOWS
 139          HC       5

 140          KK     P15
 141          KM        PARCEL 15 TO RETENTION #8
 142          BA    .037
 143          LS       0      82
 144          UD    .152

 145          KK     P16
 146          KM        PARCEL 16 TO RETENTION #8
 147          BA   .0175
 148          LS       0      86
 149          UD      .1

 150          KK      G2
 151          KM                COMBINE RETAINED, PARCEL AND GOLF COURSE FLOWS
 152          HC       3

 153          KK      R2
 154          KM        RETENTION CALC. AT RETENTION BASIN #2
 155          RS       1    STOR      -1       0
 156          SV       0    1.97    4.86    9.02   14.99      20      25      30      34
 157          SE      26      27      28      29      30      31      32      33      34
 158          SQ       0       2      12      19      21      21      21      21     930

 159          KK    P23b
 160          KM        PARCEL 23b TO RETENTION #7
 161          BA   .0107
 162          LS       0      86
 163          UD    .106

 164          KK    P21a
 165          KM        PARCEL 21a TO RETENTION #7
 166          BA   .0093
 167          LS       0      95
 168          UD    .105
```

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

 169          KK      G7
 170          KM        GOLF COURSE TO RETENTION #7
 171          BA    .013
 172          LS       0      70
 173          UD    .131

 174          KK     PG7
 175          KM                COMBINE GOLF COURSE, PARCELS AND RETENTION OUTFLOWS
 176          HC       5

 177          KK      R7
 178          KM        RETENTION CALC. AT RETENTION BASIN #7
 179          RS       1    STOR      -1       0
 180          SV       0     .15     .85    2.26    4.71     6.0     7.0
 181          SE      27      28      29      30      31      32      33
 182          SQ       0      11      23      35      46     526    1391

 183          KK    SF-1
 184          KM        PIPE FLOW TO RETENTION #8
 185          DT    SF-2
 186          DI       0      14      27      45      60     526    1391
 187          DQ       0      11      23      35      46      59      70

 188          KK     P25
 189          KM        PARCEL 25 TO RETENTION #8
 190          BA    .026
 191          LS       0      85
 192          UD    .175

 193          KK     P24
 194          KM        PARCEL 24 TO RETENTION #8
 195          BA   .0269
 196          LS       0      82
 197          UD    .191

 198          KK     GC8
 199          KM        GOLF COURSE TO RETENTION #8
 200          BA   .0216
 201          LS       0      70
 202          UD     .26

 203          KK    P27a
 204          KM        PARCEL 27a TO RETENTION #8
 205          BA   .0053
 206          LS       0      88
 207          UD      .1

 208          KK    P26a
 209          KM        PARCEL 26a TO RETENTION #8
 210          BA   .0041
 211          LS       0      84
 212          UD      .1
```

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

 213          KK     PG8
 214          KM                COMBINE DRAINAGETO RETENTION #8
 215          HC       5

 216          KK    SF-2
 217          KM        REINSTALL SPLIT FLOW TO RETENTION #8
 218          DR    SF-2

 219          KK     PG8
 220          KM                COMBINE DRAINAGE TO RETENTION #8
 221          HC       2

 222          KK      R8
 223          KM        RETENTION CALC. AT RETENTION #8
 224          RS       1    STOR      -1       0
 225          SV       0     .36    2.13    5.54   10.63
 226          SE      27      28      29      30      31
 227          SQ       0       2      12      19      22

 228          KK     R/C
 229          KM        GOLF COURSE AND CHANNEL TO OUTFALL
 230          BA    .006
 231          LS       0      86
 232          UD      .1

 233          KK     P1b
 234          KM        PARCEL 1b TO SOUTH COLLECTOR CHANNEL
 235          BA   .0172
 236          LS       0      82
 237          UD      .1

 238          KK    P26b
 239          KM        PARCEL 26b TO CHANNEL
 240          BA    .011
 241          LS       0      84
 242          UD      .1

 243          KK      ME        MAIN SOUTH ENTRANCE TO PROJECT
 244          KM                COMBINE RUNOFF FROM PARCELS, RETENTION AND CHANNEL
 245          HC       5

 246          KK     P1a
 247          KM        PARCEL 1b TO RETENTION #9
 248          BA   .0038
 249          LS       0      82
 250          UD      .1

 251          KK     P20
 252          KM        PARCEL 20 TO RETENTION #9
 253          BA    .018
 254          LS       0      82
 255          UD      .1
```

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

 256          KK    P21b
 257          KM        PARCEL 21b TO RETENTION #9
 258          BA   .0067
 259          LS       0      95
 260          UD      .1

 261          KK     G9a
 262          KM        GOLF COURSE TO RETENTION BASIN #9
 263          BA    .013
 264          LS       0      70
 265          UD    .133

 266          KK     PG9
 267          KM                COMBINE RUNOFF FROM PARCELS AND GOLF COURSE
 268          HC       4

 269          KK     P2a
 270          KM        PARCEL 2a TO RETENTION #10
 271          BA   .0313
 272          LS       0      82
 273          UD    .157

 274          KK     P3a
 275          KM        PARCEL 3a TO RETENTION #10
 276          BA   .0233
 277          LS       0      82
 278          UD    .119

 279          KK     G9b
 280          KM        GOLF COURSE TO RETENTION #9
 281          BA   .0157
 282          LS       0      70
 283          UD    .163

 284          KK     PG9
 285          KM                COMBINE PARCEL AND GOLF COURSE FLOWS TO RETENTION BASIN #9
 286          HC       4

 287          KK      R9
 288          KM        RETENTION CALC. FOR RETENTION BASIN #9
 289          RS       1    STOR      -1       0
 290          SV       0   .2148    1.46    4.18    8.67
 291          SE      26      27      28      29      30
 292          SQ       0       2      12     400    1130

 293          KK     P8A
 294          KM        PARCEL 8a TO RETENTION #10
 295          BA   .0094
 296          LS       0      86
 297          UD    .119
```

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

 298          KK    P10b
 299          KM        PARCEL 10b TO RETENTION #10
 300          BA   .0186
 301          LS       0      82
 302          UD    .129

 303          KK      P7
 304          KM        PARCEL 7 TO RETENTION #10
 305          BA    .016
 306          LS       0      86
 307          UD    .121

 308          KK      P6
 309          KM        PARCEL 6 TO RETENTION #10
 310          BA   .0373
 311          LS       0      82
 312          UD    .167

 313          KK      P5
 314          KM        PARCEL 5 TO RETENTION #10
 315          BA   .0363
 316          LS       0      82
 317          UD    .177

 318          KK     P11
 319          KM        COMBINE PARCEL AND GOLF COURSE  IN RETENTION #10
 320          HC       5

 321          KK     G10
 322          KM        GOLF COURSE TO RETENTION #10
 323          BA    .024
 324          LS       0      70
 325          UD    .171

 326          KK     P2b
 327          KM        PARCEL 2b TO RETENTION #10
 328          BA   .0064
 329          LS       0      82
 330          UD      .1

 331          KK     P3b
 332          KM        PARCEL 3b TO RETENTION #10
 333          BA   .0216
 334          LS       0      82
 335          UD      .1

 336          KK    PG10
 337          KM                COMBINE PARCEL AND GOLF COURSE DRAINAGE
 338          HC       4
```

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

 339          KK     R10
 340          KM        DETENTION CALC. AT RETENTION BASIN #10
 341          RS       1    STOR      -1       0
 342          SV       0     .35    2.28     6.4   12.82
 343          SE    27.5    28.5    29.5    30.5    31.5
 344          SQ       0       2      12      19      22

 345          KK     P8b
 346          KM        PARCEL 8b DRAINING DIRECTLY TO 91st ST.
 347          BA   .0085
 348          LS       0      86
 349          UD      .1

 350          KK     CP-5
 351          KM        OUTFALL FROM PROJECT TO 91st ST.
 352          HC       2
 353          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

  8        CP-1
              .
              .
 18           .-------> CP-1E
 16       CP-1W
              .
              .
 21           .       P10a
              .          .
              .          .
 27           .          .       P11
              .          .         .
              .          .         .
 32           .          .         .        P12
              .          .         .          .
              .          .         .          .
 37        PG3.................................
            V
            V
 40         R3
              .
              .
 46           .        P19
              .          .
              .          .
 51           .          .      P18b
              .          .         .
              .          .         .
 56           .          .         .      GC4-5
              .          .         .          .
              .          .         .          .
 61       PG4-5.................................
            V
            V
 64        R4-5
              .
              .
 70           .         G6
              .          .
              .          .
 75       PG-6............
            V
            V
 78         R6
              .
              .
 86           .          .<-------  CP-1E
 84           .      CP-1E
              .          .
              .          .
 89           .          .-------> CP-1E2
 87           .     CP-1E1
              .          .
              .          .
```

```
92          .           .      CP-1E2
            .           .          .
            .           .          .
95          .           .          .        P13
            .           .          .          .
            .           .          .          .
100         .           .          .          .          G1
            .           .          .          .           .
            .           .          .          .           .
105         .           .        PG1.......................
            .           .         V
            .           .         V
108         .           .        R1
            .           .          .
            .           .          .
114         .         PG1............
            .           .
            .           .
117         .           .        P17
            .           .          .
            .           .          .
122         .           .          .       P18a
            .           .          .          .
            .           .          .          .
127         .           .          .          .       P23a
            .           .          .          .          .
            .           .          .          .          .
132         .           .          .          .          .         GC2
            .           .          .          .          .           .
            .           .          .          .          .           .
137         .          G2.........................................
            .           .
            .           .
140         .           .        P15
            .           .          .
            .           .          .
145         .           .          .        P16
            .           .          .          .
            .           .          .          .
150         .          G2........................
            .          V
            .          V
153         .          R2
            .           .
            .           .
159         .           .       P23b
            .           .          .
            .           .          .
164         .           .          .       P21a
            .           .          .          .
            .           .          .          .
169         .           .          .          .          G7
            .           .          .          .           .
            .           .          .          .           .
174       PG7.........................................
           V
           V
177        R7
            .
            .
185         .-------)    SF-2
183       SF-1
            .
            .
188         .         P25
```

```
193          .          .        P24
             .          .         .
             .          .         .
198          .          .         .        GC8
             .          .         .         .
             .          .         .         .
203          .          .         .         .        P27a
             .          .         .         .          .
             .          .         .         .          .
208          .          .         .         .          .        P26a
             .          .         .         .          .          .
             .          .         .         .          .          .
213          .       PG8.......................................
             .          .
             .          .
218          .          .         .<-------    SF-2
216          .          .      SF-2
             .          .         .
             .          .         .
219          .       PG8............
             .        V
             .        V
222          .        R8
             .          .
             .          .
228          .          .        R/C
             .          .         .
             .          .         .
233          .          .         .        P1b
             .          .         .         .
             .          .         .         .
238          .          .         .         .        P26b
             .          .         .         .          .
             .          .         .         .          .
243       ME.......................................
             .
             .
246          .       P1a
             .          .
             .          .
251          .          .        P20
             .          .         .
             .          .         .
256          .          .         .       P21b
             .          .         .         .
             .          .         .         .
261          .          .         .         .        G9a
             .          .         .         .          .
             .          .         .         .          .
266          .       PG9.......................
             .          .
             .          .
269          .          .        P2a
             .          .         .
             .          .         .
274          .          .         .        P3a
             .          .         .         .
             .          .         .         .
279          .          .         .         .        G9b
             .          .         .         .          .
             .          .         .         .          .
284          .       PG9.......................
             .        V
             .        V
```

```
                .         .
                .         .
293             .         .       P8A
                .         .        .
                .         .        .
298             .         .        .       P10b
                .         .        .         .
                .         .        .         .
303             .         .        .         .        P7
                .         .        .         .         .
                .         .        .         .         .
308             .         .        .         .         .        P6
                .         .        .         .         .         .
                .         .        .         .         .         .
313             .         .        .         .         .         .        P5
                .         .        .         .         .         .         .
                .         .        .         .         .         .         .
318             .         .       P11.........................................
                .         .        .
                .         .        .
321             .         .        .       G10
                .         .        .         .
                .         .        .         .
326             .         .        .         .        P2b
                .         .        .         .         .
                .         .        .         .         .
331             .         .        .         .         .        P3b
                .         .        .         .         .         .
                .         .        .         .         .         .
336             .         .      PG10.................................
                .         .        V
                .         .        V
339             .         .       R10
                .         .        .
                .         .        .
345             .         .        .       P8b
                .         .        .         .
                .         .        .         .
350             .         .      CP-5............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

****

FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985

U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95616

****

WESTBROOK VILLAGE, SECTION 27
HYDROLOGY REPORT FILE: WB10.D2
OFFSITE & ONSITE DRAINAGE PATTERN 10 YEAR STORM
MAY 3,1989

7 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN	1	MINUTES IN COMPUTATION INTERVAL
IDATE	3MAY89	STARTING DATE
ITIME	1200	STARTING TIME
NQ	300	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	3MAY89	ENDING DATE
NDTIME	1659	ENDING TIME

COMPUTATION INTERVAL .02 HOURS
TOTAL TIME BASE 4.98 HOURS

ENGLISH UNITS

VALUE EXCEEDS TABLE IN LOGLOG	.01667	.01667	2.00000
VALUE EXCEEDS TABLE IN LOGLOG	.01667	.01667	2.00000
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VALUE EXCEEDS TABLE IN LOGLOG	.01667	.01667	2.00000
VALUE EXCEEDS TABLE IN LOGLOG	.01667	.01667	2.00000

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	CP-1	348.	3.00	154.	154.	154.	3.29		
+	DIVERSION TO	CP-1E	174.	3.00	77.	77.	77.	3.29		
+	HYDROGRAPH AT	CP-1W	174.	3.00	77.	77.	77.	3.29		
+	HYDROGRAPH AT	P10a	20.	1.40	3.	3.	3.	.04		
+	HYDROGRAPH AT	P11	27.	1.17	2.	2.	2.	.04		
+	HYDROGRAPH AT	P12	20.	1.28	2.	2.	2.	.04		
+	4 COMBINED AT	PG3	174.	3.00	84.	84.	84.	3.41		
+	ROUTED TO	R3	165.	3.33	73.	73.	73.	3.41		
+									35.83	3.33
+	HYDROGRAPH AT	P19	17.	1.23	2.	2.	2.	.03		
+	HYDROGRAPH AT	P18b	10.	1.23	1.	1.	1.	.02		
+	HYDROGRAPH AT	GC4-5	5.	1.68	1.	1.	1.	.06		
+	4 COMBINED AT	PG4-5	165.	3.33	76.	76.	76.	3.51		
+	ROUTED TO	R4-5	21.	4.12	10.	10.	10.	3.51		
+									32.03	4.98
+	HYDROGRAPH AT	G6	2.	1.23	0.	0.	0.	.01		
+	2 COMBINED AT	PG-6	21.	4.12	10.	10.	10.	3.53		
+	ROUTED TO	R6	21.	4.87	9.	9.	9.	3.53		
+									34.09	4.75
	HYDROGRAPH AT									

	DIVERSION TO								
+		CP-1E2	26.	3.00	12.	12.	12.	.00	
	HYDROGRAPH AT								
+		CP-1E1	148.	3.00	66.	66.	66.	.00	
	HYDROGRAPH AT								
+		CP-1E2	26.	3.00	12.	12.	12.	.00	
	HYDROGRAPH AT								
+		P13	24.	1.20	2.	2.	2.	.04	
	HYDROGRAPH AT								
+		G1	3.	1.30	0.	0.	0.	.02	
	3 COMBINED AT								
+		PG1	27.	1.22	14.	14.	14.	.06	
	ROUTED TO								
+		R1	19.	3.80	12.	12.	12.	.06	
+									39.05 3.80
	2 COMBINED AT								
+		PG1	165.	3.00	77.	77.	77.	.06	
	HYDROGRAPH AT								
+		P17	13.	1.20	1.	1.	1.	.02	
	HYDROGRAPH AT								
+		P18a	4.	1.17	0.	0.	0.	.01	
	HYDROGRAPH AT								
+		P23a	7.	1.15	1.	1.	1.	.01	
	HYDROGRAPH AT								
+		GC2	5.	1.33	1.	1.	1.	.04	
	5 COMBINED AT								
+		G2	165.	3.00	80.	80.	80.	.14	
	HYDROGRAPH AT								
+		P15	21.	1.22	2.	2.	2.	.04	
	HYDROGRAPH AT								
+		P16	17.	1.15	1.	1.	1.	.02	
	3 COMBINED AT								
+		G2	165.	3.00	83.	83.	83.	.20	
	ROUTED TO								
+		R2	21.	3.10	13.	13.	13.	.20	
+									32.81 4.98
	HYDROGRAPH AT								
+		P23b	10.	1.15	1.	1.	1.	.01	
	HYDROGRAPH AT								
+		P21a	18.	1.13	1.	1.	1.	.01	
	HYDROGRAPH AT								
+		G7	2.	1.28	0.	0.	0.	.01	
	5 COMBINED AT								
+		PG7	42.	4.87	24.	24.	24.	3.76	

+	ROUTED TO	R7	36.	4.98	18.	18.	18.	3.76	
+								30.09	4.98
+	DIVERSION TO	SF-2	29.	4.98	15.	15.	15.	3.76	
+	HYDROGRAPH AT	SF-1	7.	4.98	3.	3.	3.	3.76	
+	HYDROGRAPH AT	P25	18.	1.23	2.	2.	2.	.03	
+	HYDROGRAPH AT	P24	13.	1.27	1.	1.	1.	.03	
+	HYDROGRAPH AT	GC8	2.	1.47	0.	0.	0.	.02	
+	HYDROGRAPH AT	P27a	6.	1.15	0.	0.	0.	.01	
+	HYDROGRAPH AT	P26a	3.	1.15	0.	0.	0.	.00	
+	5 COMBINED AT	P68	39.	1.23	4.	4.	4.	.08	
+	HYDROGRAPH AT	SF-2	29.	4.98	15.	15.	15.	.00	
+	2 COMBINED AT	P68	49.	1.25	19.	19.	19.	.08	
+	ROUTED TO	R8	16.	4.98	9.	9.	9.	.08	
+								29.57	4.98
+	HYDROGRAPH AT	R/C	6.	1.15	0.	0.	0.	.01	
+	HYDROGRAPH AT	P1b	11.	1.17	1.	1.	1.	.02	
+	HYDROGRAPH AT	P26b	9.	1.15	1.	1.	1.	.01	
+	5 COMBINED AT	ME	30.	1.17	14.	14.	14.	3.88	
+	HYDROGRAPH AT	P1a	3.	1.17	0.	0.	0.	.00	
+	HYDROGRAPH AT	P20	12.	1.17	1.	1.	1.	.02	
+	HYDROGRAPH AT	P21b	13.	1.13	1.	1.	1.	.01	
+	HYDROGRAPH AT	G9a	2.	1.28	0.	0.	0.	.01	
+	4 COMBINED AT	P69	28.	1.15	2.	2.	2.	.04	

+		P2a	17.	1.23	2.	2.	2.	.03		
	HYDROGRAPH AT									
+		P3a	14.	1.18	1.	1.	1.	.02		
	HYDROGRAPH AT									
+		G9b	2.	1.33	0.	0.	0.	.02		
	4 COMBINED AT									
+		PG9	58.	1.18	5.	5.	5.	.11		
	ROUTED TO									
+		R9	12.	1.72	5.	5.	5.	.11		
+									27.97	1.72
	HYDROGRAPH AT									
+		P8A	8.	1.17	1.	1.	1.	.01		
	HYDROGRAPH AT									
+		P10b	11.	1.20	1.	1.	1.	.02		
	HYDROGRAPH AT									
+		P7	14.	1.17	1.	1.	1.	.02		
	HYDROGRAPH AT									
+		P6	20.	1.25	2.	2.	2.	.04		
	HYDROGRAPH AT									
+		P5	19.	1.25	2.	2.	2.	.04		
	5 COMBINED AT									
+		P11	69.	1.22	7.	7.	7.	.12		
	HYDROGRAPH AT									
+		G10	3.	1.33	0.	0.	0.	.02		
	HYDROGRAPH AT									
+		P2b	4.	1.17	0.	0.	0.	.01		
	HYDROGRAPH AT									
+		P3b	14.	1.17	1.	1.	1.	.02		
	4 COMBINED AT									
+		PG10	88.	1.20	8.	8.	8.	.17		
	ROUTED TO									
+		R10	12.	1.97	7.	7.	7.	.17		
+									29.56	1.98
	HYDROGRAPH AT									
+		P8b	8.	1.15	1.	1.	1.	.01		
	2 COMBINED AT									
+		CP-5	14.	1.55	7.	7.	7.	.18		

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

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

  1           ID
              *DIAGRAM
  2           ID   WESTBROOK VILLAGE,  SECTION 27
  3           ID   HYDROLOGY REPORT                    FILE: WB99.D2
  4           ID   OFFSITE & ONSITE DRAINAGE PATTERN   100 YEAR STORM
  5           ID     MAY  3,1989
  6           IT       1  3MAY89    1200     300
  7           IO       5       0

  8           KK    CP-1
  9           KM   SHEET FLOW HYDROGRAPH TO NORTH PROPERTY LINE
 10           BA    3.29
 11           IN      20  3MAY89    1220
 12           QI       0       0       2      54     182     403     655     822     877     824
 13           QI     705     540     400     295     219     161     120      89      65      48
 14           QI      36      27      20      15      11       8       6       4       3       1
 15           QI       0

 16           KK   CP-1W
 17           KM        CP-1 SPLIT EVENLY TO INTERCEPTER CHANNELS
 18           DT   CP-1E
 19           DI       0    1600
 20           DQ       0     800

 21           KK    P10a
 22           KM        PARCEL 10a TO RETENTION # 3-5
 23           BA     .04
 24           PH       0       0     .87    1.23    2.21    2.54
 25           LS       0      85
 26           UD    .306

 27           KK     P11
 28           KM        PARCEL 11 TO RETENTION # 3-5
 29           BA   .0419
 30           LS       0      82
 31           UD    .107

 32           KK     P12
 33           KM        PARCEL 12 TO RETENTION # 3-5
 34           BA   .0413
 35           LS       0      82
 36           UD    .202

 37           KK     PG3
 38           KM        COMBINE PARCEL AND GOLF COURSE TO RETENTION #3
 39           HC       4

 40           KK      R3
 41           KM        RETENTION CALC. FOR RETENTION BASIN #3
 42           RS       1    STOR      -1       0
 43           SV       0     .19    1.23    3.71    7.87    12.1
 44           SE      32      33      34      35      36      37
 45           SQ       0       2      12      19     195     811
```

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

  46          KK     P19
  47          KM        PARCEL 19 TO RETENTION # 3-5
  48          BA   .0253
  49          LS       0      84
  50          UD    .161

  51          KK    P18b
  52          KM        PARCEL 18 TO RETENTION # 3-5
  53          BA   .0187
  54          LS       0      82
  55          UD    .161

  56          KK   GC4-5
  57          KM        GOLF COURCE TO RETENTION # 4-5
  58          BA   .0574
  59          LS       0      70
  60          UD    .412

  61          KK   PG4-5
  62          KM        COMBINE PARCEL AND GOLF COURSE TO RETENTION # 4-5
  63          HC       4

  64          KK    R4-5
  65          KM        RETENTION CALC. FOR RETENTION # 4-5
  66          RS       1    STOR      -1       0
  67          SV       0    2.57    7.19   13.71    22.4      32      37      42      47      52
  68          SE      27      28      29      30      31      33      34      35      36      37
  69          SQ       0       2      12      19      21      21      21      21     386    1207

  70          KK      G6
  71          KM        GOLF COURSE AT DRIVING RANGE
  72          BA   .0126
  73          LS       0      70
  74          UD      .1

  75          KK    PG-6
  76          KM                COMBINE WEST OFFSITE INFLOW AND PG4-5
  77          HC       2

  78          KK      R6
  79          KM        RETENTION CALC. FOR RETENTION #6
  80          RS       1    STOR      -1       0
  81          SV       0       2       4       6
  82          SE      33      34      35      36
  83          SQ       0       0     227     811

  84          KK   CP-1E
  85          KM        REINSTALLING OFFSITE SPLIT FLOW
  86          DR   CP-1E
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  87          KK  CP-1E1
  88          KM       FLOW SPLIT INTO R1
  89          DT  CP-1E2
  90          DI       0     268
  91          DQ       0      40

  92          KK  CP-1E2
  93          KM       REINSTALLING SPLIT FLOW
  94          DR  CP-1E2

  95          KK     P13
  96          KM       PARCEL 13 AND CHANNEL TO RETENTION # 1
  97          BA   .0414
  98          LS       0      82
  99          UD    .137

 100          KK      G1
 101          KM       GOLF COURSE FLOW TO RETENTION # 1
 102          BA    .023
 103          LS       0      70
 104          UD    .145

 105          KK     PG1
 106          KM              COMBINE OFFSITE, PARCEL AND GOLF  COURSE
 107          HC       3

 108          KK      R1
 109          KM       RETENTION CALC. FOR RETENTION BASIN #1
 110          RS       1    STOR      -1       0
 111          SV       0   .1138   .6342  1.4316     3.3     5.5    6.46    6.94
 112          SE      36      37      38      39      40      41      42      43
 113          SQ       0       2      12      19    21.8    23.1    24.1      25

 114          KK     PG1
 115          KM              COMBINE R1 AND CP-1E1
 116          HC       2

 117          KK     P17
 118          KM       PARCEL 17 TO RETENTION #2
 119          BA   .0216
 120          LS       0      82
 121          UD    .128

 122          KK    P18a
 123          KM       PARCEL 18a TO RETENTION # 2
 124          BA   .0063
 125          LS       0      82
 126          UD      .1
```

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

 127          KK    P23a
 128          KM        PARCEL 23a TO RETENTION #2
 129          BA   .0073
 130          LS       0       86
 131          UD      .1

 132          KK     GC2
 133          KM        GOLF COURSE 2 TO RETENTION #2
 134          BA   .0438
 135          LS       0       70
 136          UD    .171

 137          KK      G2
 138          KM                 COMBINE RETAINED, PARCEL AND GOLF COURSE FLOWS
 139          HC       5

 140          KK     P15
 141          KM        PARCEL 15 TO RETENTION #8
 142          BA    .037
 143          LS       0       82
 144          UD    .152

 145          KK     P16
 146          KM        PARCEL 16 TO RETENTION #8
 147          BA   .0175
 148          LS       0       86
 149          UD      .1

 150          KK      G2
 151          KM                 COMBINE RETAINED, PARCEL AND GOLF COURSE FLOWS
 152          HC       3

 153          KK      R2
 154          KM        RETENTION CALC. AT RETENTION BASIN #2
 155          RS       1    STOR      -1       0
 156          SV       0    1.97    4.86    9.02   14.99      20      25      30      34
 157          SE      26      27      28      29      30      31      32      33      34
 158          SQ       0       2      12      19      21      21      21      21     930

 159          KK    P23b
 160          KM        PARCEL 23b TO RETENTION #7
 161          BA   .0107
 162          LS       0       86
 163          UD    .106

 164          KK    P21a
 165          KM        PARCEL 21a TO RETENTION #7
 166          BA   .0093
 167          LS       0       95
 168          UD    .105
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 169          KK      G7
 170          KM        GOLF COURSE TO RETENTION #7
 171          BA    .013
 172          LS       0       70
 173          UD    .131

 174          KK     PG7
 175          KM                COMBINE GOLF COURSE, PARCELS AND RETENTION OUTFLOWS
 176          HC       5

 177          KK      R7
 178          KM        RETENTION CALC. AT RETENTION BASIN #7
 179          RS       1    STOR      -1       0
 180          SV       0     .15     .85    2.26    4.71     6.0     7.0
 181          SE      27      28      29      30      31      32      33
 182          SQ       0      11      23      35      46     526    1391

 183          KK    SF-1
 184          KM        PIPE FLOW TO RETENTION #8
 185          DT    SF-2
 186          DI       0      11      23      35      46     526    1391
 187          DQ       0      11      23      35      46      59      70

 188          KK     P25
 189          KM        PARCEL 25 TO RETENTION #8
 190          BA    .026
 191          LS       0      85
 192          UD    .175

 193          KK     P24
 194          KM        PARCEL 24 TO RETENTION #8
 195          BA   .0269
 196          LS       0      82
 197          UD    .191

 198          KK     GC8
 199          KM        GOLF COURSE TO RETENTION #8
 200          BA   .0216
 201          LS       0      70
 202          UD     .26

 203          KK    P27a
 204          KM        PARCEL 27a TO RETENTION #8
 205          BA   .0053
 206          LS       0      88
 207          UD      .1

 208          KK    P26a
 209          KM        PARCEL 26a TO RETENTION #8
 210          BA   .0041
 211          LS       0      84
 212          UD      .1
```

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

 213          KK     PG8
 214          KM                COMBINE DRAINAGETO RETENTION #8
 215          HC       5

 216          KK    SF-2
 217          KM        REINSTALL SPLIT FLOW TO RETENTION #8
 218          DR    SF-2

 219          KK     PG8
 220          KM                COMBINE DRAINAGE TO RETENTION #8
 221          HC       2

 222          KK      R8
 223          KM        RETENTION CALC. AT RETENTION #8
 224          RS       1    STOR      -1       0
 225          SV       0     .36    2.13    5.54   10.63
 226          SE      27      28      29      30      31
 227          SQ       0       2      12      19      22

 228          KK     R/C
 229          KM        GOLF COURSE AND CHANNEL TO OUTFALL
 230          BA    .006
 231          LS       0      86
 232          UD      .1

 233          KK     P1b
 234          KM        PARCEL 1b TO SOUTH COLLECTOR CHANNEL
 235          BA   .0172
 236          LS       0      82
 237          UD      .1

 238          KK    P26b
 239          KM        PARCEL 26b TO CHANNEL
 240          BA    .011
 241          LS       0      84
 242          UD      .1

 243          KK      ME        MAIN SOUTH ENTRANCE TO PROJECT
 244          KM                COMBINE RUNOFF FROM PARCELS, RETENTION AND CHANNEL
 245          HC       5

 246          KK     P1a
 247          KM        PARCEL 1b TO RETENTION #9
 248          BA   .0038
 249          LS       0      82
 250          UD      .1

 251          KK     P20
 252          KM        PARCEL 20 TO RETENTION #9
 253          BA    .018
 254          LS       0      82
 255          UD      .1
```

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

 256          KK    P21b
 257          KM        PARCEL 21b TO RETENTION #9
 258          BA   .0067
 259          LS       0       95
 260          UD      .1

 261          KK     G9a
 262          KM        GOLF COURSE TO RETENTION BASIN #9
 263          BA    .013
 264          LS       0       70
 265          UD    .133

 266          KK     PG9
 267          KM                 COMBINE RUNOFF FROM PARCELS AND GOLF COURSE
 268          HC       4

 269          KK     P2a
 270          KM        PARCEL 2a TO RETENTION #10
 271          BA   .0313
 272          LS       0       82
 273          UD    .157

 274          KK     P3a
 275          KM        PARCEL 3a TO RETENTION #10
 276          BA   .0233
 277          LS       0       82
 278          UD    .119

 279          KK     G9b
 280          KM        GOLF COURSE TO RETENTION #9
 281          BA   .0157
 282          LS       0       70
 283          UD    .163

 284          KK     PG9
 285          KM                 COMBINE PARCEL AND GOLF COURSE FLOWS TO RETENTION BASIN #9
 286          HC       4

 287          KK      R9
 288          KM        RETENTION CALC. FOR RETENTION BASIN #9
 289          RS       1    STOR      -1       0
 290          SV       0   .2148    1.46    4.18    8.67
 291          SE      26      27      28      29      30
 292          SQ       0       2      12     400    1130

 293          KK     P8A
 294          KM        PARCEL 8a TO RETENTION #10
 295          BA   .0094
 296          LS       0       86
 297          UD    .119
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

  298         KK    P10b
  299         KM        PARCEL 10b TO RETENTION #10
  300         BA   .0186
  301         LS      0      82
  302         UD    .129

  303         KK     P7
  304         KM        PARCEL 7 TO RETENTION #10
  305         BA    .016
  306         LS      0      86
  307         UD    .121

  308         KK     P6
  309         KM        PARCEL 6 TO RETENTION #10
  310         BA   .0373
  311         LS      0      82
  312         UD    .167

  313         KK     P5
  314         KM        PARCEL 5 TO RETENTION #10
  315         BA   .0363
  316         LS      0      82
  317         UD    .177

  318         KK    P11
  319         KM        COMBINE PARCEL AND GOLF COURSE  IN RETENTION #10
  320         HC      5

  321         KK    G10
  322         KM        GOLF COURSE TO RETENTION #10
  323         BA    .024
  324         LS      0      70
  325         UD    .171

  326         KK    P2b
  327         KM        PARCEL 2b TO RETENTION #10
  328         BA   .0064
  329         LS      0      82
  330         UD     .1

  331         KK    P3b
  332         KM        PARCEL 3b TO RETENTION #10
  333         BA   .0216
  334         LS      0      82
  335         UD     .1

  336         KK   PG10
  337         KM                COMBINE PARCEL AND GOLF COURSE DRAINAGE
  338         HC      4
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 339          KK     R10
 340          KM        DETENTION CALC. AT RETENTION BASIN #10
 341          RS       1    STOR      -1       0
 342          SV       0     .35    2.28     6.4   12.82
 343          SE    27.5    28.5    29.5    30.5    31.5
 344          SQ       0       2      12      19      22

 345          KK     P8b
 346          KM        PARCEL 8b DRAINING DIRECTLY TO 91st ST.
 347          BA   .0085
 348          LS       0      86
 349          UD      .1

 350          KK    CP-5
 351          KM        OUTFALL FROM PROJECT TO 91st ST.
 352          HC       2
 353          ZZ
```

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

  8        CP-1
              .
              .
 18           .------->  CP-1E
 16       CP-1W
              .
              .
 21           .       P10a
              .          .
              .          .
 27           .          .        P11
              .          .         .
              .          .         .
 32           .          .         .        P12
              .          .         .         .
              .          .         .         .
 37        PG3.................................
            V
            V
 40         R3
              .
              .
 46           .       P19
              .          .
              .          .
 51           .          .       P18b
              .          .         .
              .          .         .
 56           .          .         .      GC4-5
              .          .         .         .
              .          .         .         .
 61       PG4-5.................................
            V
            V
 64        R4-5
              .
              .
 70           .        G6
              .          .
              .          .
 75       PG-6............
            V
            V
 78         R6
              .
              .
 86           .          .<-------   CP-1E
 84           .      CP-1E
              .          .
              .          .
 89           .          .------->  CP-1E2
 87           .     CP-1E1
              .          .
```

```
94          .          .          .<------- CP-1E2
92          .          .     CP-1E2
            .          .          .
            .          .          .
95          .          .          .        P13
            .          .          .          .
            .          .          .          .
100         .          .          .          .         G1
            .          .          .          .          .
            .          .          .          .          .
105         .          .        PG1.......................
            .          .          V
            .          .          V
108         .          .         R1
            .          .          .
            .          .          .
114         .        PG1............
            .          .
            .          .
117         .          .       P17
            .          .          .
            .          .          .
122         .          .          .      P18a
            .          .          .          .
            .          .          .          .
127         .          .          .          .       P23a
            .          .          .          .          .
            .          .          .          .          .
132         .          .          .          .          .        GC2
            .          .          .          .          .          .
            .          .          .          .          .          .
137         .         G2.........................................
            .          .
            .          .
140         .          .       P15
            .          .          .
            .          .          .
145         .          .          .        P16
            .          .          .          .
            .          .          .          .
150         .         G2........................
            .          V
            .          V
153         .         R2
            .          .
            .          .
159         .          .      P23b
            .          .          .
            .          .          .
164         .          .          .      P21a
            .          .          .          .
            .          .          .          .
169         .          .          .          .         G7
            .          .          .          .          .
            .          .          .          .          .
174       PG7.........................................
           V
           V
177       R7
            .
            .
185         .-------)    SF-2
183      SF-1
            .
            .
```

```
                .         .
                .         .
193             .         .        P24
                .         .         .
                .         .         .
198             .         .         .        GC8
                .         .         .         .
                .         .         .         .
203             .         .         .         .        P27a
                .         .         .         .          .
                .         .         .         .          .
208             .         .         .         .          .        P26a
                .         .         .         .          .          .
                .         .         .         .          .          .
213             .       PG8.........................................
                .         .
                .         .
218             .         .         .<-------    SF-2
216             .         .       SF-2
                .         .         .
                .         .         .
219             .       PG8............
                .         V
                .         V
222             .        R8
                .         .
                .         .
228             .         .        R/C
                .         .         .
                .         .         .
233             .         .         .        P1b
                .         .         .         .
                .         .         .         .
238             .         .         .         .        P26b
                .         .         .         .          .
                .         .         .         .          .
243           ME.........................................
                .
                .
246             .       P1a
                .         .
                .         .
251             .         .        P20
                .         .         .
                .         .         .
256             .         .         .        P21b
                .         .         .         .
                .         .         .         .
261             .         .         .         .        G9a
                .         .         .         .          .
                .         .         .         .          .
266             .       PG9.................................
                .         .
                .         .
269             .         .        P2a
                .         .         .
                .         .         .
274             .         .         .        P3a
                .         .         .         .
                .         .         .         .
279             .         .         .         .        G9b
                .         .         .         .          .
                .         .         .         .          .
284             .       PG9.................................
                .         V
```

```
287          .        R9
             .        .
             .        .
293          .        .      P8A
             .        .       .
             .        .       .
298          .        .       .      P10b
             .        .       .        .
             .        .       .        .
303          .        .       .        .        P7
             .        .       .        .         .
             .        .       .        .         .
308          .        .       .        .         .        P6
             .        .       .        .         .         .
             .        .       .        .         .         .
313          .        .       .        .         .         .        P5
             .        .       .        .         .         .         .
             .        .       .        .         .         .         .
318          .        .      P11.......................................
             .        .       .
             .        .       .
321          .        .       .      G10
             .        .       .        .
             .        .       .        .
326          .        .       .        .        P2b
             .        .       .        .         .
             .        .       .        .         .
331          .        .       .        .         .        P3b
             .        .       .        .         .         .
             .        .       .        .         .         .
336          .        .     PG10.................................
             .        .       V
             .        .       V
339          .        .      R10
             .        .       .
             .        .       .
345          .        .       .      P8b
             .        .       .        .
             .        .       .        .
350          .        .     CP-5............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

****

FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985

U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95616

****

WESTBROOK VILLAGE, SECTION 27
HYDROLOGY REPORT FILE: WB99.D2
OFFSITE & ONSITE DRAINAGE PATTERN 100 YEAR STORM
MAY 3,1989

7 IO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN	1	MINUTES IN COMPUTATION INTERVAL
IDATE	3MAY89	STARTING DATE
ITIME	1200	STARTING TIME
NQ	300	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	3MAY89	ENDING DATE
NDTIME	1659	ENDING TIME

COMPUTATION INTERVAL .02 HOURS
TOTAL TIME BASE 4.98 HOURS

ENGLISH UNITS

VALUE EXCEEDS TABLE IN LOGLOG	.01667	.01667	2.00000
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VALUE EXCEEDS TABLE IN LOGLOG	.01667	.01667	2.00000
VALUE EXCEEDS TABLE IN LOGLOG	.01667	.01667	2.00000

		CP-1E	42[illegible].	3.00
+	DIVERSION TO	CP-1E2	65.	3.00
+	HYDROGRAPH AT	CP-1E1	373.	3.00
+	HYDROGRAPH AT	CP-1E2	65.	3.00
+	HYDROGRAPH AT	P13	67.	1.17
+	HYDROGRAPH AT	G1	14.	1.20
+	3 COMBINED AT	PG1	82.	1.17
+	ROUTED TO	R1	27.	4.45
+				
+	2 COMBINED AT	PG1	396.	3.00
+	HYDROGRAPH AT	P17	36.	1.15
+	HYDROGRAPH AT	P18a	12.	1.12
+	HYDROGRAPH AT	P23a	18.	1.12
+	HYDROGRAPH AT	GC2	24.	1.25
+	5 COMBINED AT	G2	396.	3.00
+	HYDROGRAPH AT	P15	56.	1.18
+	HYDROGRAPH AT	P16	43.	1.12
+	3 COMBINED AT	G2	396.	3.00
+	ROUTED TO	R2	391.	3.07
+				
+	HYDROGRAPH AT	P23b	26.	1.13
+	HYDROGRAPH AT	P21a	34.	1.12
+	HYDROGRAPH AT	G7	8.	1.18
+	5 COMBINED AT			

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SEC
TIME IN HOURS, AREA IN SQUAR

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MA 6-HOUR	24-HOUR
+	HYDROGRAPH AT	CP-1	877.	3.00	392.	392.
+	DIVERSION TO	CP-1E	439.	3.00	196.	196.
+	HYDROGRAPH AT	CP-1W	438.	3.00	196.	196.
+	HYDROGRAPH AT	P10a	47.	1.37	6.	6.
+	HYDROGRAPH AT	P11	79.	1.13	6.	6.
+	HYDROGRAPH AT	P12	53.	1.25	5.	5.
+	4 COMBINED AT	PG3	439.	3.00	213.	213.
+	ROUTED TO	R3	434.	3.07	197.	197.
+						
+	HYDROGRAPH AT	P19	42.	1.20	4.	4.
+	HYDROGRAPH AT	P18b	27.	1.20	2.	2.
+	HYDROGRAPH AT	GC4-5	21.	1.60	4.	4.
+	4 COMBINED AT	PG4-5	434.	3.05	207.	207.
+	ROUTED TO	R4-5	366.	3.67	100.	100.
+						
+	HYDROGRAPH AT	G6	9.	1.15	1.	1.
+	2 COMBINED AT	PG-6	366.	3.67	101.	101.
+	ROUTED TO	R6	365.	3.72	97.	97.
+						

	ROUTED TO								
+		R7	697.	3.65	215.	215.	215.	3.76	
+								32.20	3.65
	DIVERSION TO								
+		SF-2	61.	3.65	35.	35.	35.	3.76	
	HYDROGRAPH AT								
+		SF-1	636.	3.65	180.	180.	180.	3.76	
	HYDROGRAPH AT								
+		P25	43.	1.22	4.	4.	4.	.03	
	HYDROGRAPH AT								
+		P24	35.	1.23	4.	4.	4.	.03	
	HYDROGRAPH AT								
+		GC8	10.	1.38	1.	1.	1.	.02	
	HYDROGRAPH AT								
+		P27a	15.	1.12	1.	1.	1.	.01	
	HYDROGRAPH AT								
+		P26a	9.	1.12	1.	1.	1.	.00	
	5 COMBINED AT								
+		PG8	99.	1.22	11.	11.	11.	.08	
	HYDROGRAPH AT								
+		SF-2	61.	3.63	35.	35.	35.	.00	
	2 COMBINED AT								
+		PG8	121.	1.22	45.	45.	45.	.08	
	ROUTED TO								
+		R8	23.	4.98	15.	15.	15.	.08	
+								31.37	4.98
	HYDROGRAPH AT								
+		R/C	15.	1.12	1.	1.	1.	.01	
	HYDROGRAPH AT								
+		P1b	33.	1.12	2.	2.	2.	.02	
	HYDROGRAPH AT								
+		P26b	24.	1.12	2.	2.	2.	.01	
	5 COMBINED AT								
+		ME	657.	3.65	200.	200.	200.	3.88	
	HYDROGRAPH AT								
+		P1a	7.	1.12	1.	1.	1.	.00	
	HYDROGRAPH AT								
+		P20	35.	1.12	2.	2.	2.	.02	
	HYDROGRAPH AT								
+		P21b	25.	1.12	2.	2.	2.	.01	
	HYDROGRAPH AT								
+		G9a	8.	1.18	1.	1.	1.	.01	
	4 COMBINED AT								
+		PG9	74.	1.13	5.	5.	5.	.04	

	HYDROGRAPH AT								
+		P2a	46.	1.20	4.	4.	4.	.03	
	HYDROGRAPH AT								
+		P3a	41.	1.15	3.	3.	3.	.02	
	HYDROGRAPH AT								
+		G9b	9.	1.23	1.	1.	1.	.02	
	4 COMBINED AT								
+		PG9	161.	1.15	14.	14.	14.	.11	
	ROUTED TO								
+		R9	101.	1.30	13.	13.	13.	.11	
+									28.23 1.30
	HYDROGRAPH AT								
+		P8A	21.	1.15	2.	2.	2.	.01	
	HYDROGRAPH AT								
+		P10b	31.	1.15	2.	2.	2.	.02	
	HYDROGRAPH AT								
+		P7	35.	1.15	3.	3.	3.	.02	
	HYDROGRAPH AT								
+		P6	53.	1.20	5.	5.	5.	.04	
	HYDROGRAPH AT								
+		P5	50.	1.22	5.	5.	5.	.04	
	5 COMBINED AT								
+		P11	182.	1.18	16.	16.	16.	.12	
	HYDROGRAPH AT								
+		G10	13.	1.25	1.	1.	1.	.02	
	HYDROGRAPH AT								
+		P2b	12.	1.12	1.	1.	1.	.01	
	HYDROGRAPH AT								
+		P3b	42.	1.12	3.	3.	3.	.02	
	4 COMBINED AT								
+		PG10	240.	1.17	22.	22.	22.	.17	
	ROUTED TO								
+		R10	19.	2.07	13.	13.	13.	.17	
+									30.64 2.08
	HYDROGRAPH AT								
+		P8b	21.	1.12	1.	1.	1.	.01	
	2 COMBINED AT								
+		CP-5	29.	1.15	15.	15.	15.	.18	

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

APPENDIX D

Hydraulic Calculation for Culverts and Channels

CARTER ASSOCIATES, INC.
5030 N. 40TH STREET, SUITE 300, PHOENIX AZ 85018

PROJECT: WESTBROOK SECTION 27

DESIGNER: R. MURPHY

DATE: 5-10-89

HYDROLOGIC AND CHANNEL INFORMATION

10-YEAR FLOW = ½ TOTAL FLOW TO NORTH PROPERTY LINE

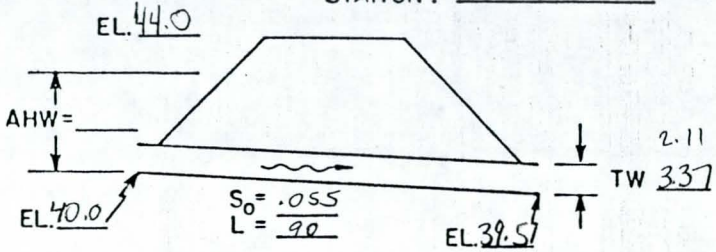
Q_{10} = 174 TW_1 = 2.11

Q_2 = 438 TW_2 = 3.37

(Q_1 = DESIGN DISCHARGE, SAY ~~Q_{25}~~ Q_{10}
Q_2 = CHECK DISCHARGE, SAY ~~Q_{50}~~ OR Q_{100})

SKETCH

STATION: BC-1



10 yr, 100 yr } CHANNEL C-5

MEAN STREAM VELOCITY = ____

MAX. STREAM VELOCITY = ____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
BOX W/WING WALLS	174	1 8'-3'	1.36	4.08	.5	1.75	2.4	2.7	2.11	2.7	.5	3.95	4.08	8.1		
"	216		1.67	5.00	.5	2.65	2.9	2.95	3.37	3.37	.5					
100-YR THRU BOX →	192		1.50	4.50		2.15	2.65	2.32	3.37	3.37	.5	5.02	5.08			
REMAINDER OVER ROAD																

SUMMARY & RECOMMENDATIONS: DIP IN ROAD MUST CARRY 438 − 192 = 246 cfs @ 1' MAX

$L = \frac{Q}{CH^{3/2}} = \frac{246}{2.9(1)^{3/2}} = 92.1$ WEIR CREST EL 44.0

CARTER ASSOCIATES, INC.
5030 E. 40TH STREET, SUITE 300, PHOENIX AZ 85018

PROJECT: WESTBROOK SECTION 27

DESIGNER: R. MURPHY

DATE: 5-10-89

HYDROLOGIC AND CHANNEL INFORMATION

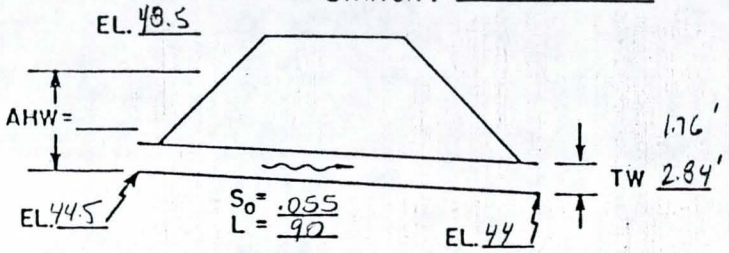
Q_1 = 174 TW_1 = 1.76

Q_2 = 438 TW_2 = 2.84

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: BC-2



10-YR } CHANNEL
100-YR } C-C

MEAN STREAM VELOCITY = ____
MAX. STREAM VELOCITY = ____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	HW	OUTLET CONTROL HW=H + h_o − LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
BOX W/WING WALLS	174	1 8'x3'	1.36	4.08	.5	1.75	2.4	2.7	1.76	2.7	0.5	3.95	408			
100-YR THRU BOX REMAINDER OVER ROAD	192	"	1.50	4.50	.5	2.15	2.65	2.82	3.37	3.37	0.5	5.02	5.08			

SUMMARY & RECOMMENDATIONS: DIP IN ROAD MUST CARRY 438-192 = 246 CFS @ 1 MAX

$L = \frac{Q}{CH^{3/2}} = \frac{246}{2.67(1)^{3/2}}$ = 92.1 FT SAY 100 FT CREST OF WEIR EL 49.0

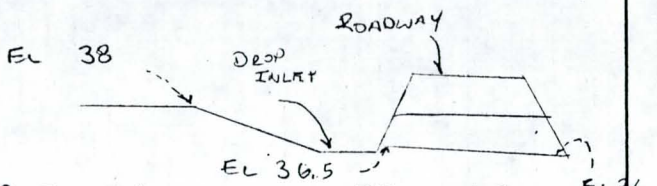
CARTER ASSOCIATES, INC.
5050 N. 40TH STREET, SUITE 300, PHOENIX AZ 85018

PROJECT: WESTBROOK SECTION 27

DESIGNER: R. MURPHY

DATE: 5-10-89

HYDROLOGIC AND CHANNEL INFORMATION



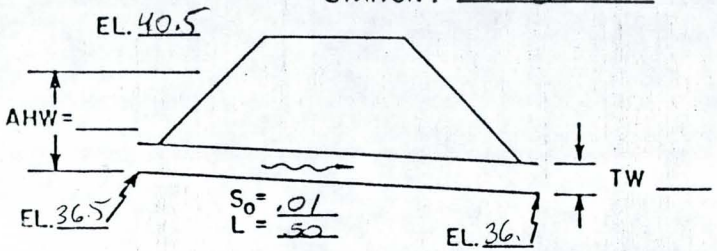
Q_{10} = 174 TW_1 = 1.5

Q_2 = 438 TW_2 = 2.0

(Q_1 = DESIGN DISCHARGE, SAY ~~Q_{25}~~ Q_{10}
Q_2 = CHECK DISCHARGE, SAY ~~Q_{50}~~ OR Q_{100})

SKETCH

STATION: BC-3



MEAN STREAM VELOCITY = ____

MAX. STREAM VELOCITY = ____

	CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H+h_o−LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
10 YEAR THRU BOX	BOX W/DROP INLET & WINGS	174	3'x3'	1.36	4.08	.5	1.75	2.4	2.7	1.5	2.7	0.5	3.95	4.08			
100 YR THRU BOX REMAINDER OVER ROAD MAX DEPTH 1'		216		1.67	5.0	.5	2.0	2.8	2.9	2.0	2.9	.5	4.40	5.0			

SUMMARY & RECOMMENDATIONS:

$L = \frac{Q}{CH^{3/2}} = \frac{(438-216)}{2.67(1)^{3/2}} = 83.1$ FT

544.85 FT

CARTER ASSOCIATES, INC.
5030 N. 40TH STREET, SUITE 300, PHOENIX AZ 85018

PROJECT: WESTBROOK SECTION 27

DESIGNER: R. MURPHY

DATE: 5-10-89

HYDROLOGIC AND CHANNEL INFORMATION

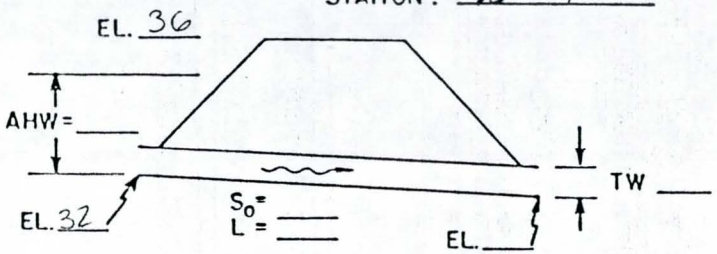
Q_1 = 165 TW_1 = 1.5

Q_2 = 434 TW_2 = 2.0

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: BC-4



MEAN STREAM VELOCITY =

MAX. STREAM VELOCITY =

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. $\frac{HW}{D}$	HW	OUTLET CONTROL $HW = H + h_o - LS_o$: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
Box w/wing walls	165	8'x3'	1.38	4.14	.5	1.8	2.45	2.73	1.5	2.73	.5	4.03	4.14			
100-yr Think Box →	216		1.67	5.0	.5	2.0	2.8	2.9	2.0	2.9	.5	4.4	5.0			

REMAINDER OVER ROAD

SUMMARY & RECOMMENDATIONS:

$L = \frac{Q}{CH^{3/2}} = \frac{(434-216)}{2.67(1)^{3/2}} = 81.6$ FT

SAY 85 FT

CARTER ASSOCIATES, INC.
5030 N. 40TH STREET, SUITE 300, PHOENIX, AZ 85018

PROJECT: WESTBROOK SECTION 27

DESIGNER: R. MURPHY

DATE: 5-10-89

HYDROLOGIC AND CHANNEL INFORMATION

Q_1 = 42

Q_2 = _____

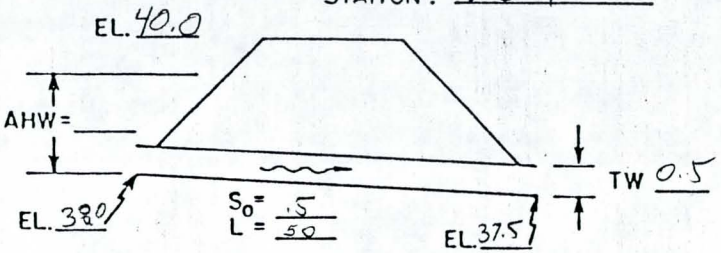
TW_1 = .5 (CON 1) / 3.0 (CON 2)

TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: PC-1



MEAN STREAM VELOCITY = _____

MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL HW=H + h_o - LS_o: K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW	CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
PIPE CULVERTS w/ WING WALL	42 PER	2-36"	1.17	3.5	.5	1.01	2.1	2.55	0.5	2.55	.5	3.06	3.5			
"	42		1.17	3.5	.5	1.01	2.1	2.5	3.0	2.55	.5	3.51	3.5			

CONDITION 1
R-1 EMPTY
TW = .5

CONDITION 2
R-1 TW = 3.0

SUMMARY & RECOMMENDATIONS: MAX FLOW 84 cfs, AS R-1 FILLS FLOW DIMINISHES

CARTER ASSOCIATES, INC.
5030 N. 40TH STREET, SUITE 300, PHOENIX AZ 85018

PROJECT: WESTBROOK

DESIGNER: R.M

DATE: 5-5-89

HYDROLOGIC AND CHANNEL INFORMATION

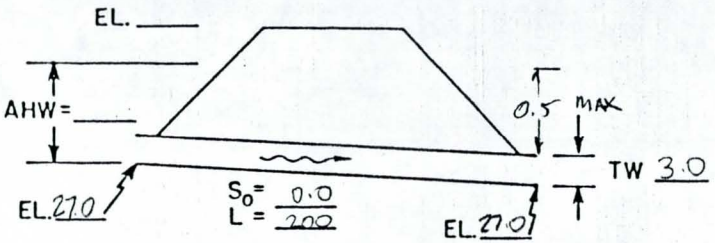
BC-5 ESTIMATE FLOW
THROUGH BOX WITH MAX H = 0.5
THIS SHOULD BE CONSERVATIVE

Q_1 = _____ TW_1 = _____
Q_2 = _____ TW_2 = _____

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY Q_{50} OR Q_{100})

SKETCH

STATION: _____



MEAN STREAM VELOCITY = _____
MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT.		OUTLET CONTROL $HW=H+h_o-LS_o$								CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
			$\frac{HW}{D}$	HW	K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW				
WING WALLS	115	10'-3'	.83	2.49	.5	0.5	–		3.0		0	3.0	3.0			USE CHART 8 *
		"														

SUMMARY & RECOMMENDATIONS:

*. BUREAU PUBLIC ROADS 1963

CARTER ASSOCIATES, INC.
5030 N. 40TH STREET, SUITE 300, PHOENIX AZ 85018

BC-6

PROJECT: WESTBROOK SECTION 27

DESIGNER: R. MURPHY

DATE: 5-10-89

HYDROLOGIC AND CHANNEL INFORMATION

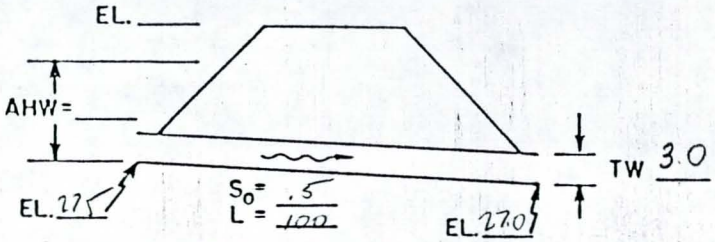
ESTIMATE MAX CAPACITY AT
HW = 3.7 & TW = 3.0

Q_1 = _____ TW_1 = _____
Q_2 = 160 cfs TW_2 = 3.0

(Q_1 = DESIGN DISCHARGE, SAY Q_{25}
Q_2 = CHECK DISCHARGE, SAY ~~Q_{50}~~ OR Q_{100})

SKETCH

STATION: BC-6



MEAN STREAM VELOCITY = _____
MAX. STREAM VELOCITY = _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION: INLET CONT.		OUTLET CONTROL HW=H + h_o − LS_o								CONTROLLING HW	OUTLET VELOCITY	COST	COMMENTS
			$\frac{HW}{D}$	HW	K_e	H	d_c	$\frac{d_c+D}{2}$	TW	h_o	LS_o	HW				
BOX W/WING WALLS	160	8'x3'	1.23	3.70	.5	1.3	2.35	2.68	3.0	3.0	.5	3.8	3.8			

SUMMARY & RECOMMENDATIONS:

CARTER ASSOCIATES, INC.
ENGINEERING
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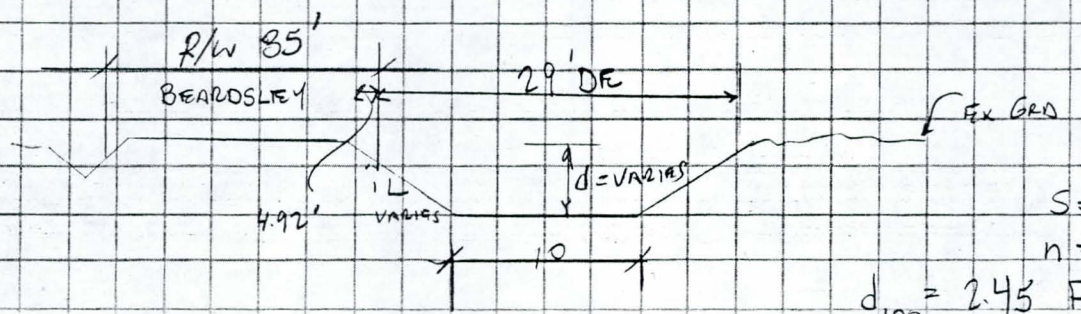
PLANNING

Project No. _____
Project Name _____
Sheet No. _____ of _____
Calculated by _____ Date _____
Checked by _____ Date _____

CHANNEL C-4

Q_{100} for C-4 = 280 cfs
Q_{10} for C-4 108 cfs



S = .005
n = .025

d_{100} = 2.45 FT

d_{10} = 1.52 FT

CHANNEL CAPACITY WEST LEG, WEST END
d = 2.5' Q = 291 cfs

CHANNEL C-3

(SECTION SAME AS C-4)

Q_{100} = 158 cfs

Q_{10} = 63 cfs

S = .0050
n = .025

d_{100} = 1.85 FT

d_{10} = 1.15 FT

CHANNEL CAPACITY EAST LEG, EAST END

d = 1.5, Q = 106 cfs

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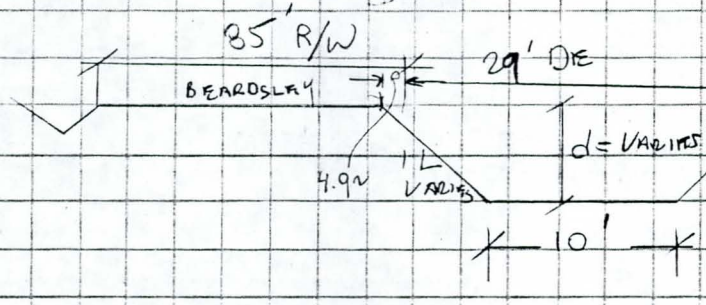
Project No. _____
Project Name _____
Sheet No. _____ of _____
Calculated by _____ Date _____
Checked by _____ Date _____

39.2

CHANNEL SIZING FOR NORTH SIDE OF BEARDSLEY ROAD, CHANNELS C-1, C-2, C-3 & C-4

CHANNEL 1 (C-1) THE Q_{100} FOR C-1 = $\frac{1}{4}$ Q_{100} FROM NORTH = 219 cfs
THE Q_{10} FOR C-1 = $\frac{1}{4}$ Q_{10} FROM NORTH = 87 cfs



MANNING "n" = .025

WEST LEG AT BOX CULVERT
S = .005
d_{100} = 2.17 FT Q_{100} = 219 cfs
d_{10} = 1.36 FT Q_{10} = 87 cfs

CHANNEL CAPACITY
WEST LEG
AT 91ST & BEARDSLEY
d = 2.5' Q = 291 cfs

CHANNEL C-2 (SECTION SAME AS C-1)

Q_{10} & Q_{100} SAME AS FOR C-1
S = .006923 n = .025
d_{100} = 2.0 FT
d_{10} = 1.25 FT

CHANNEL CAPACITY
EAST LEG AT EAST END
d = 1.5' Q = 124 cfs

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SURVEYING
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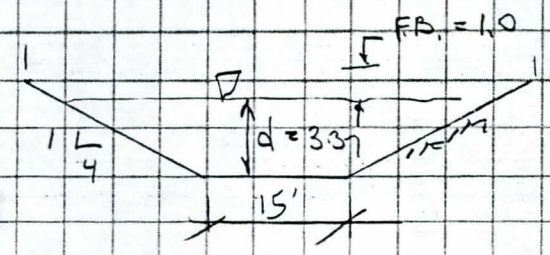
Project No. _____
Project Name WESTBROOK SECTION 27
Sheet No. _____ of _____
Calculated by R. MURPHY Date 5-12-89
Checked by _____ Date _____

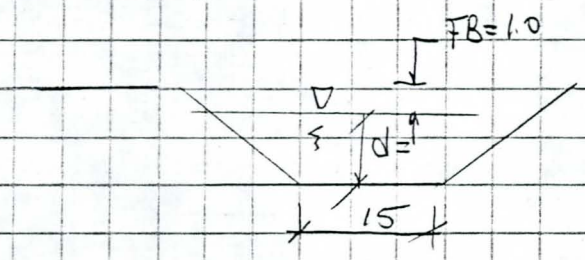
CHANNEL SIZING FOR C-5 (SECTION C-C ON FIG 2)



$Q_{100} = 438$ cfs
$S = .002$
$n = .025$
$z = 4$
$b = 10'$
$d = 3.37$ FT
F.B. = 1.0

$Q_{10} = 174$ cfs
$d = 2.11$

CHANNEL SIZING FOR C-6 (SECTION C-C ON FIG 2)



$Q_{100} = 438$
$S = .004$
$n = .025$
$z = 4$
$b = 10'$
$d = 2.84$ FT
FB = 1.0

Q_{10} 174 cfs
$d = 1.76$ FT

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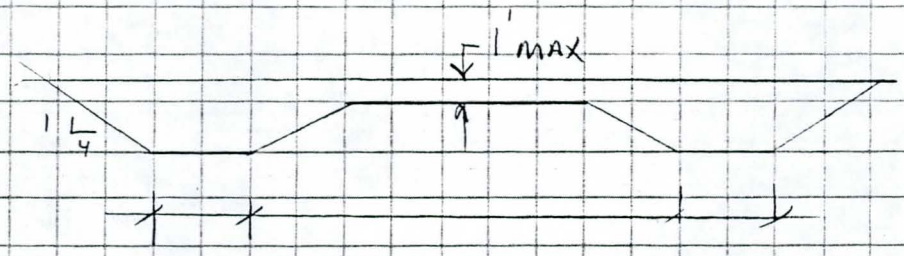
Project No. _____
Project Name _____
Sheet No. _____ of _____
Calculated by _____ Date _____
Checked by _____ Date _____

SIZING OF ENTRANCE TO CONVEY 100-YEAR FLOW TO UNION HILLS



(SECTION B-B ON PLAN)

5/2

P = 127.98
A = 187.0
n = .020 (STREET AND D.E.)
S = .0025

$$Q = \frac{1.486}{n} \frac{A^{5/3}}{P^{2/3}} S^{1/2}$$

= 894 cfs > 657 cfs PEAK FLOW (ME ON COMPUTER PRINT OUT

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ENGINEERING
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Project No. _____
Project Name _____
Sheet No. _____ of _____
Calculated by _____ Date _____
Checked by _____ Date _____

BLEED CALCULATIONS

PIPE TO NEW RIVER

ASSUME 100-AC FT IN 36 HRS

$$\text{AVE FLOW} = \frac{100\ \text{AC-FT} \times \frac{43560\ \text{FT}^3}{\text{AC-FT}}}{36\text{-HR} \times 3600\ \frac{\text{SEC}}{\text{HR}} \times 1} = 33.61\ \text{cfs}$$

FOR PIPE FLOWING FULL

SLOPE = .002

1-36" DIAMETER PIPE

BLEED FROM R-8 SAME

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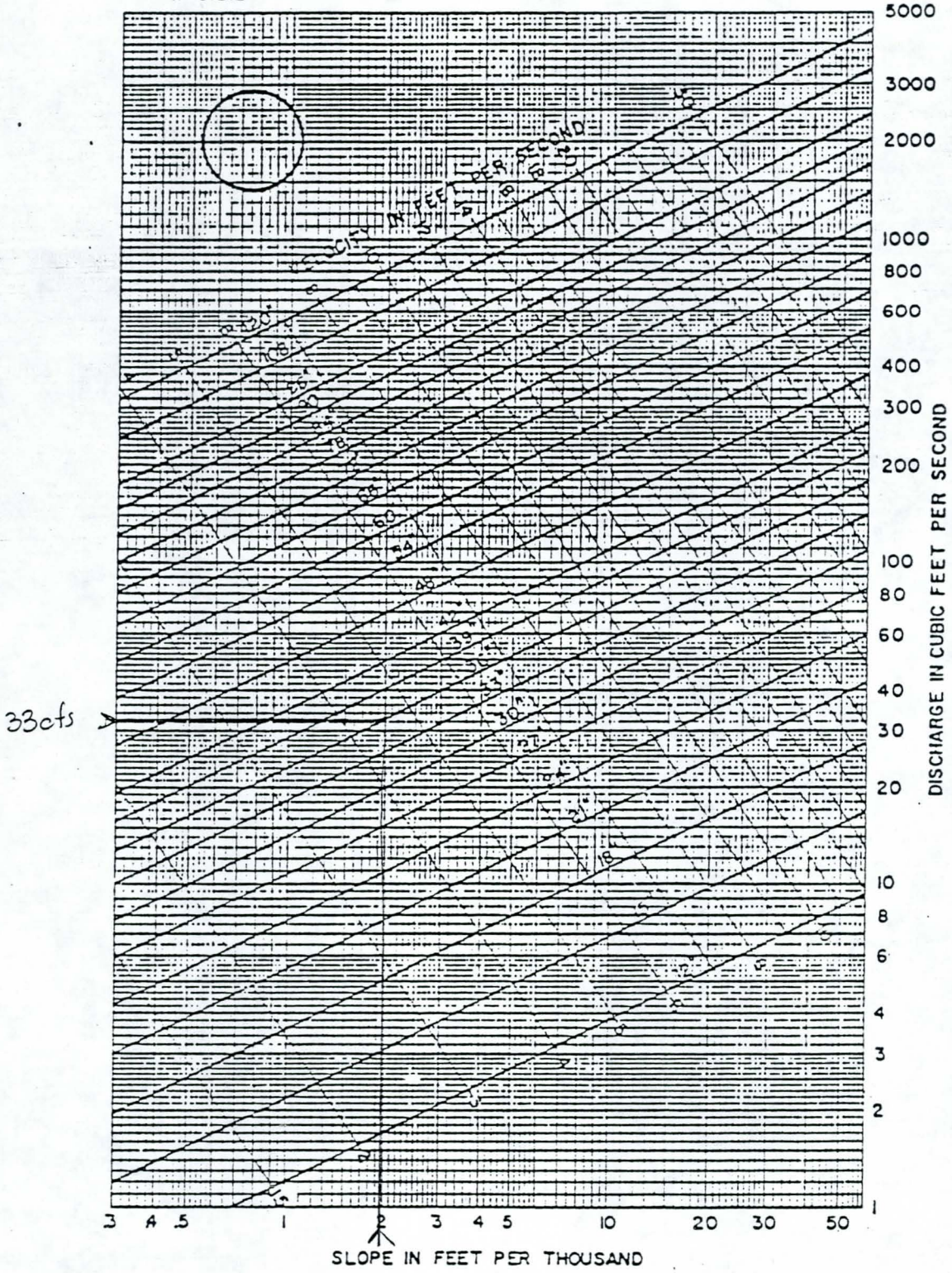
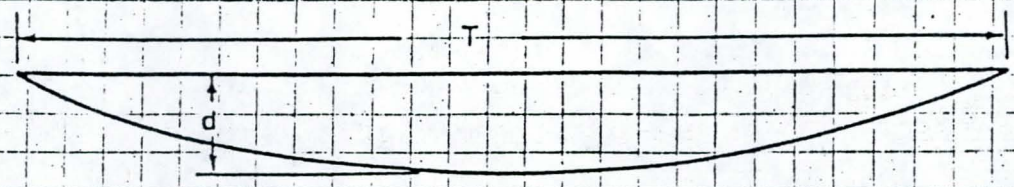
COMPUTED FROM MANNING'S FORMULA
n = 0.012



PIPE CAPACITIES FLOWING FULL

DIP SECTION CALC. @ R7 / INTERSECTION



$$A = \frac{2}{3} Td$$

$$P = \frac{1}{2}\sqrt{16d^2 + T^2} + \left(\frac{T^2}{8d}\right) \ln_e \left(\frac{4d + \sqrt{16d^2 + T^2}}{T}\right)$$

$$T = 1.5 \frac{A}{d}$$

PARABOLIC

* DISCHARGE @ CRITICAL DEPTH

Q DESIGN CFS	T FT	A FT^2	P FT	S %	N	Q* CAPACITY CFS	ELE
N/A	150 @ 0.5'	50	150	N/A	N/A	163	31.0
	240 @ 1.0'	160	240			741	31.5
	270 @ 1.5'	270	270			1532	32.0

$$Q = \left(\frac{A^3}{32.24\,T}\right)^{0.5}$$

Form 209

APPENDIX E

Calculation of Off-Site Lag Time

CARTER ASSOCIATES, INC.
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Project No. _____
Project Name _____
Sheet No. _____ of _____
Calculated by _____ Date _____
Checked by _____ Date _____

TIME OF CONCENTRATION & LAG TIME

WSD TYPE	LENGTH "L" (FT)	Δ ELE. (FT)	SLOPE "S" (%)	VELOCITY "V" (FPS)	V * L / L^Δ OR L'	
MOUNTAIN	1200	266	22.17	9.1	0.55	
MOUNTAIN	750	50	6.67	5.2	0.20	
FOOTHILLS	900	30	3.33	3.7	0.17	
FOOTHILLS	1100	20	1.82	2.7	0.15	
FOOTHILLS	8000	55	0.69	1.7	0.68	
FARMLAND	2750	15	0.55	0.37	0.05	
FARMLAND*	5280	25	0.47	0.35	0.09	TOTAL = 1.89 FPS
FARMLAND**	5280	25	0.47	0.35	0.09	TOTAL = 1.98 FPS

$\frac{FT}{hR} = 1.89 \frac{FT}{SEC} * 3600 \frac{SEC}{hR} = 6804 \frac{FT}{hR}$; $T_c^* = \frac{19980\ FT}{6804 \frac{FT}{hR}} = 2.94$

$T_L = T_c * 0.6 = 1.76$

* CONCENTRATION ALONG NORTH ℞ OF PROJECT
$L^\Delta = 19980$ FT

** CONCENTRATION ALONG SOUTH ℞ OF PROJECT
$L' = 25260$

$\frac{FT}{hR} = 1.98 * 3600 = 7120 \frac{FT}{hR}$; $T_c = \frac{25260}{7120} = 3.54\ hR$; $T_L = 2.13$

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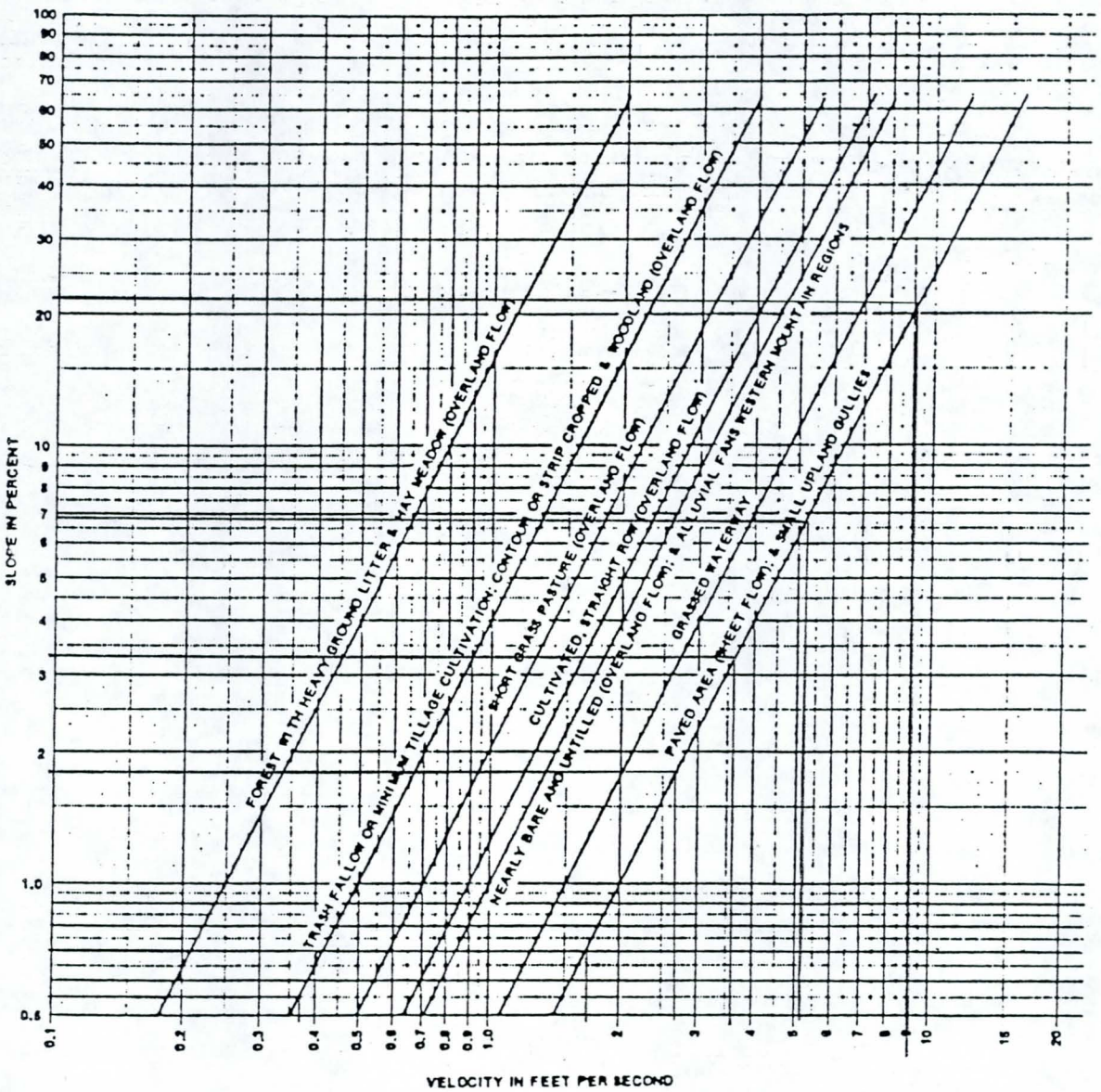

Velocities for upland method of estimating Tc