
**MASTER DRAINAGE REPORT
FOR**

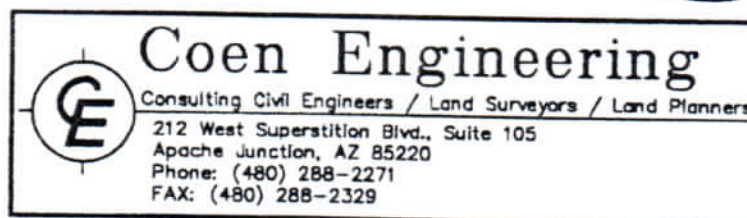
LAS MONTANAS

PINAL COUNTY, ARIZONA

Prepared By:

Robert P. Grow, P.E., R.L.S

February 25, 2001



#200075

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1.00 INTRODUCTION

1.10 Project Description

The Las Montanas, subdivision project will consist of the development of approximately 300 single-family homes on 721 acres lying southerly of the Gila River Indian Reservation, westerly of the Central Arizona College, Signal Peak Campus, between Martin Road on the north and Woodruff Road on the south, and in Pinal County, Arizona. The project will occupy a large portion of the South half of the Southeast Quarter of Section 30 and most of Section 29, with the exception of the area occupied by the college, in Township 5 South, Range 7 East, of the Gila and Salt River Baseline and Meridian, Pinal County, Arizona. (See following Vicinity Map on page 2)

The scope of the project includes the construction of off-site and on-site improvements for the development of a single-family, subdivision. Proposed work includes construction of public residential streets and the associated paving, grading, drainage, water, sewer, and utility off-site improvements.

1.20 Authorization

The owner and developer of the project, Mr. Harlyn Griffiths, President, Tierra Development, Inc. authorized this project.

1.30 Scope of Work

This report covers the general drainage analysis to assist in the design for the infrastructure development and the necessary grading of the proposed single-family subdivision known as Las Montanas in the jurisdiction of Pinal County, Arizona. This project is the first of several phases.

This report, together with the construction improvement plans for the phases of the Las Montanas, Phase I subdivision prepared by the engineer, will constitute the basis of design for the drainage and grading of the site in compliance with Pinal County's development and drainage ordinances.

1.40 Governing Criteria

The Pinal County "Subdivision and Drainage Design Standards" and applicable ordinances are the governing criteria for the design of the subdivision and preparation of this report.

2.00 SITE CONDITIONS

2.10 Existing Conditions

The land is currently undeveloped and vacant and has been fenced and utilized for cattle pasturage. There are no existing water developments or private irrigation ditches on the property. There are several desert washes that cross the property and generally flow southerly and southwesterly. The United States Army Corps of

Engineers has designated four of the washes to be under Corps jurisdiction and subject to their jurisdiction. These washes are indicated on the grading plans by dashed lines.

The offsite drainage originates along the westerly side of the Sacaton Mountains which cross the easterly side of Section 29. The drainage from the westerly side is generally westerly then southerly. The slope varies from in excess of 15 percent in the mountains, to 2 percent in the flats.

Geologically, the site away from the mountains can be described as deep, well drained soils on fan terraces. These soils formed in alluvium derived predominantly from acid and basic igneous rocks. Elevation of the site is from 1490 at Woodruff Road to 2300 at the top of Signal Peak. The average annual precipitation is approximately 9 inches.

2.20 Offsite Drainage

The site is subject to offsite drainage flows from the areas that originate in the Sacaton Mountains shown on the offsite drainage exhibit in the appendix. As previously mentioned, several desert washes run southerly and southwesterly through the development and combine and cross at Woodruff Road. Because of the complexity of the drainage patterns, the runoff was analyzed using the Corps of Engineers HEC-1 program, a standard formula for estimating the runoff for complex drainage areas. The HEC-1 variables were calculated using the Maricopa County Flood Control District

recommendations and are shown in the appendix in the HEC-1 printout. The Maricopa County Desert/Rangeland S-Graph was used for the rainfall distribution and the Kinematic Wave method was used for the routing and the maximum 100-year flows are summarized in the following Table 1. Nearly all of the upstream generated runoff crosses Phase 1 and the flows obtained from the HEC-1 calculations are the ones used. The HEC-1 basins are shown on the master drainage map in the appendix and the designations are enclosed in circles numbered from S1 to S23.

LOS MONTANAS HEC-1
100-YEAR RUNOFF SUMMARY

SUB BASIN	AREA SQ/MI	PEAK FLOW CFS	SUB BASIN	AREA SQ/MI	PEAK FLOW CFS
9	0.09	327	R16	1.24	2466
11	0.06	149	1	0.16	327
C911	0.15	470	2	0.09	207
R911	0.15	434	C12	0.25	530
10	0.10	237	R12	0.25	529
12	0.06	141	3	0.15	331
C1012	0.31	813	4	0.05	107
R1012	0.31	781	C34	0.45	900
13	0.13	261	R34	0.45	892
14	0.20	427	23	0.12	195
C1314	0.64	1470	22	0.11	197
R1314	0.64	1457	C2223	0.68	1240
7	0.07	163	R2223	0.68	1233
8	0.04	92	18	0.02	40
C78	0.11	254	19	0.04	84
R78	0.11	245	20	0.04	89
5	0.26	467	21	0.04	102
6	0.18	296	C2021	0.08	191
C56	0.55	1008	R2021	0.08	182
R56	0.55	944	C1819	0.82	1427
16	0.05	85	R1819	0.82	1423
C16	1.24	2486	17	0.04	79
			15	0.09	207

Table 1

None of the offsite runoff generated on the easterly side of the Sacaton Mountains crosses Phase 1. This area is shown on the map and is divided into basins numbered 24 through 31. These basins were analyzed using the Rational Formula and the results are shown Table 3 following. Table 2, following, shows the time of concentration calculations using the KIRPICH Method. These values are used to determine the intensities from the Maricopa County I-D-F chart in the appendix, for the Rational calculations in Table 3. The flow from these areas should be mainly sheet flow and converge to channelized flow near the bottom of the drainage areas. These areas all flow offsite and will continue to flow as they do presently. No problems are foreseen from this runoff.

LAS MONTANAS TIME OF CONCENTRATION
TC = .04593 L.77/S.385 (KIRPICH)

Sub Basin	Hi El ft	Lo El ft	L ft	S %	LOT TIME	TC min
24	1723	1460	844	31.16	0	2.19
25	1751	1463	995	28.94	0	2.56
26	2282	1461	1227	66.91	0	2.18
27	2150	1510	1129	56.69	0	2.18
28	1943	1460	2311	20.90	0	5.55
29	1846	1460	1333	28.96	0	3.20
30	1770	1448	1378	23.37	0	3.57
31	1740	1480	996	26.10	0	2.66
32	1710	1530	533	33.77	0	1.49

Table 2

LAS MONTANAS OFF-SITE RUNOFF

SUB BASIN	AREA SF	AREA ACRES	Cw	110 INS	Q10 CFS	125 INS	Q25 CFS	1100 INS	Q100 CFS
24	214518	4.92	0.35	4.5	7.8	5.22	9.0	6.6	11.4
25	855991	19.65	0.35	4.5	31.0	5.22	35.9	6.6	45.4
26	2297975	52.75	0.35	4.5	83.1	5.22	96.4	6.6	121.9
27	476298	10.93	0.35	4.5	17.2	5.22	20.0	6.6	25.3
28	1638129	37.61	0.35	4.5	59.2	5.22	68.7	6.6	86.9
29	783100	17.98	0.35	4.5	28.3	5.22	32.8	6.6	41.5
30	1094056	25.12	0.35	4.5	39.6	5.22	45.9	6.6	58.0
31	258359	5.93	0.35	4.5	9.3	5.22	10.8	6.6	13.7
32	81721	1.88	0.35	4.5	3.0	5.22	3.4	6.6	4.3

Table 3

2.30 Floodplain/FIRM Information

FIRM (Flood Insurance Rate Map) Panel No. 0725 of 1525 (Map No. 040077 0725 C), entitled "Pinal County, Arizona Unincorporated Areas" covers the area of Las Montanas, Unit 1 subdivision. This panel is dated August 15, 1983, and has not been updated to our knowledge. The Flood Insurance Rate Map shows that all of the property within the Las Montanas subdivision are located within a "Zone C." Zone "C" is defined as "Areas of minimal flooding. (No shading)" The grading plans must be designed so that all the finished floors of the lots will be elevated a minimum of fourteen (14") inches above the elevation of the outfall of the lot or 1-foot above the adjacent ground. Therefore the residences within the proposed subdivision should not be subject to flooding in an 100-year flood event.

3.00 RUNOFF COEFFICIENT/RETENTION CALCULATIONS

3.10 Methodology

County's drainage ordinance require that all new developments provide retention for the difference between the runoff generated by the pre and post developments for a 100-year, 1 hour storm. All of the lots are in excess of 1-acre and those that are able to do so will retain 5,000 cubic feet of the runoff on facilities onsite. For Las Montanas, the rainfall from the 100 year, 1 hour duration storm is approximately 2.42 inches (See Figure 2). The pre-development "C" factor will be 0.44 conforming to 100-year "Undeveloped Desert" and the post-development will be 0.44 for 100-year "Suburban) as shown on page 3-5 of the Maricopa County Drainage Manual. A copy is enclosed. This would indicate that no retention is required but in reality, there will be some increase in runoff and it should be retained. The water flows generally from northeast to southwest and then south from the previously mentioned Sacaton Mountains and will be intercepted by the interior street storm drainage system and directed offsite to the development's retention basins located on the lots. The retention basins will be shown on the Drainage and Grading plans and addressed in the drainage reports for each phase of development. Retention volumes are normally determined from the following formula:

$$Q = C \times D \times A$$

Where: Q = Runoff Volume to be retained (cubic feet).

C = Ratio of rainfall to runoff coefficient, Post minus Pre. .

D = Depth of water generated by the 100-yr 1-hour storm (feet).

A = size of the drainage area (acres).

It is apparent from this, that the required retention is exceeded using this method.

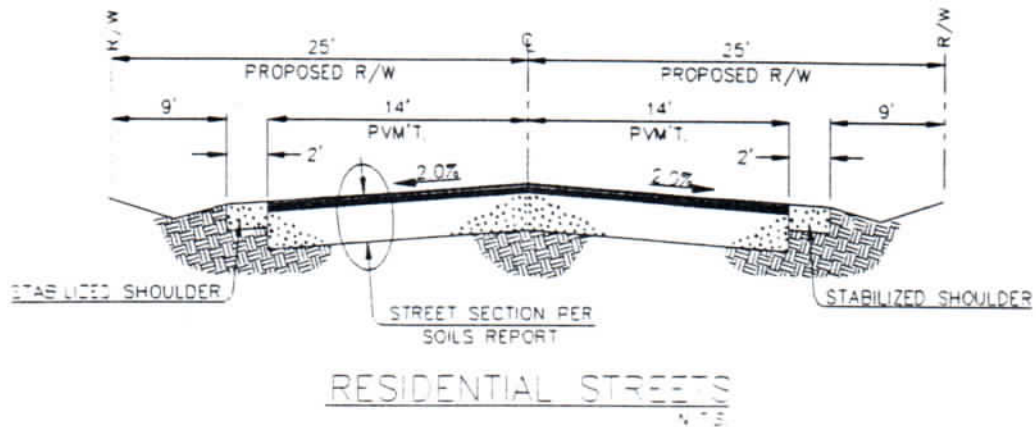
3.20 Runoff Coefficient Calculations

Runoff coefficients used for each sub-area are shown on the previously mentioned page 3-5 of the Maricopa County "Storm Drainage Design Manual" in the appendix.

3.30 Retention Volume Calculations

All developments in Pinal County are required to make provisions to retain the difference in runoff between the pre and post construction 100-year, one-hour duration storm falling within the boundaries of the development, including all rights of way and excluding off-site flows. The retention facilities will be sized for the runoff from a 100-year, one-hour duration storm for onsite drainage only, and the offsite drainage flow will be allowed to flow through the development, uninterrupted.

The rainfall intensity for a 100-year, one-hour duration storm is 2.42 inches per hour, as determined from the PREFRE computer program used by both ADOT and Maricopa County Flood Control District. Explanations of its use are found in Appendix J of the Maricopa County Flood Control District's Drainage Design Manual - Volume 1 "Hydrology".



4.00 REFERENCES

"Drainage Design Manual for Maricopa County, Arizona - Volume 1 Hydrology"
Flood Control District of Maricopa County, Arizona. June, 1992.

"Modern Sewer Design" American Iron and Steel Institute, April, 1981.

"Soil Survey of Eastern Maricopa and Northern Pinal Counties Area, Arizona"
U.S. Department of Agriculture, Soil Conservation Service, in cooperation with
the Arizona Agricultural Experiment Station, November, 1974.

APPENDIX A
PREFRE, C-FACTORS, FIRM & I-D-F

*** OUTPUT DATA ***

REVISED JUNE 1988 TO UPDATE COMPUTATION OF SHORT-DURATION VALUES

PRECIPITATION FREQUENCY VALUES FOR LAS MONTANAS,

PRIMARY ZONE NUMBER= 7

SHORT-DURATION ZONE NUMBER= 8

LATITUDE 32.97N LONGITUDE 111.66W ELEVATION 1800 FEET

POINT VALUES
RETURN PERIOD

DURATION	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR	
5-MIN	.30	.40	.47	.57	.64	.72	.89	5-MIN
10-MIN	.45	.61	.72	.87	.98	1.10	1.37	10-MIN
15-MIN	.54	.76	.90	1.10	1.26	1.41	1.77	15-MIN
30-MIN	.72	1.02	1.22	1.49	1.70	1.91	2.40	30-MIN
1-HR	.87	1.25	1.51	1.86	2.12	2.39	3.01	1-HR
2-HR	1.02	1.45	1.73	2.13	2.43	2.74	3.43	2-HR
3-HR	1.12	1.58	1.89	2.31	2.64	2.97	3.72	3-HR
6-HR	1.30	1.82	2.17	2.66	3.03	3.40	4.26	6-HR
12-HR	1.55	2.16	2.57	3.13	3.57	4.00	5.00	12-HR
24-HR	1.80	2.49	2.96	3.60	4.10	4.60	5.75	24-HR

* IF YOUR SITE IS IN ARIZONA OR NEW MEXICO, PLEASE CONSULT THE FOLLOWING PAPER FOR REVISED DEPTH-AREA VALUES:

DEPTH-AREA RATIOS IN THE SEMI-ARID SOUTHWEST UNITED STATES

NOAA TECHNICAL MEMORANDUM NWS HYDRO-40

ZEHR AND MYERS

AUGUST 1984

INPUT DATA

PROJECT NAME=RANCH 160,

ZONE= 7 SHORT-DURATION ZONE= 8

LATITUDE= 33.30 LONGITUDE= 111.50 ELEVATION= 1800

2-YR, 6-HR PCPN= 1.30 100-YR, 6-HR PCPN= 3.40

2-YR, 24-HR PCPN= 1.80 100-YR, 24-HR PCPN= 4.60

***** END OF RUN *****

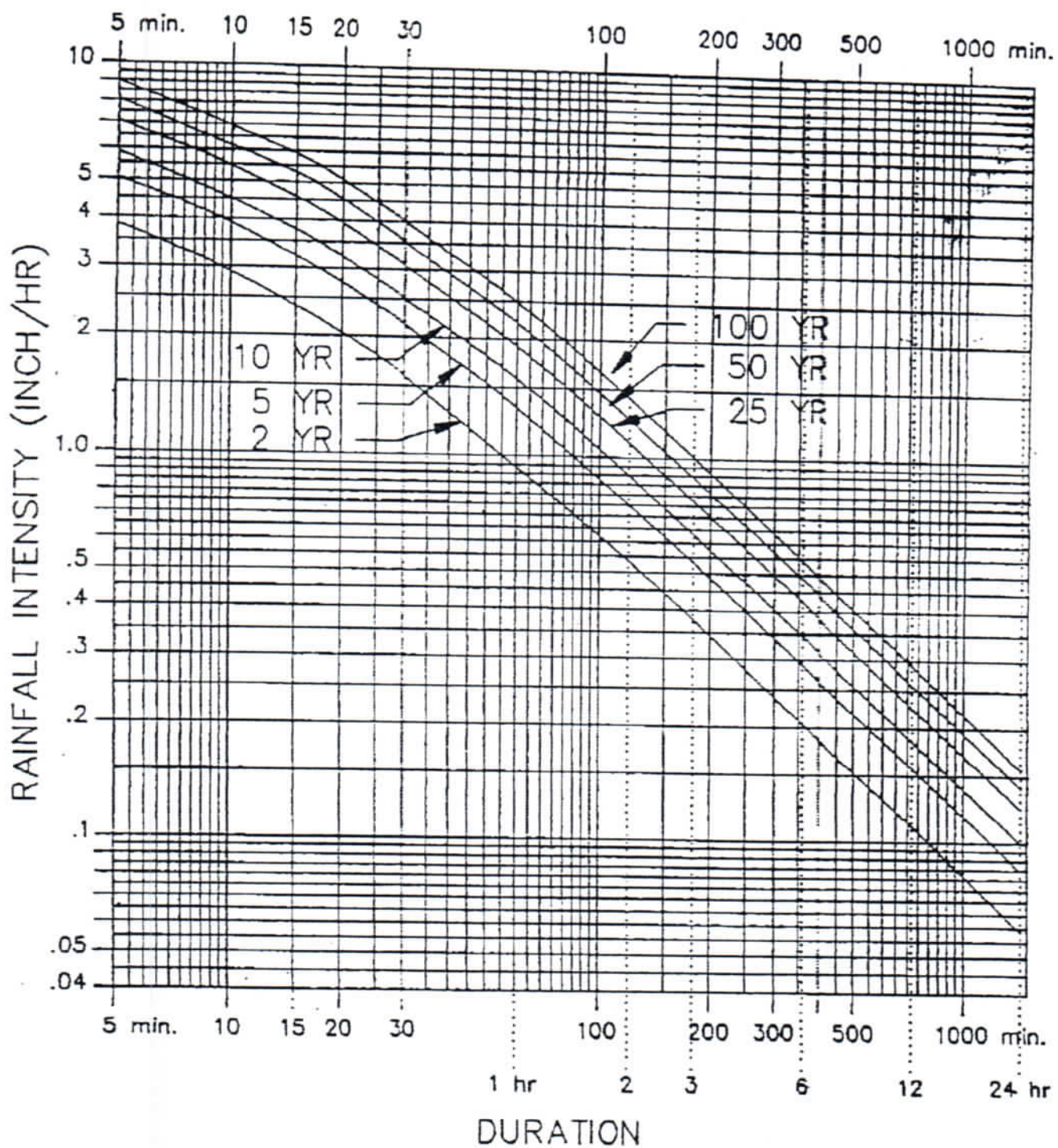


Figure 3.2
Rainfall Intensity-Duration-Frequency Relation
(Phoenix Metro Area)

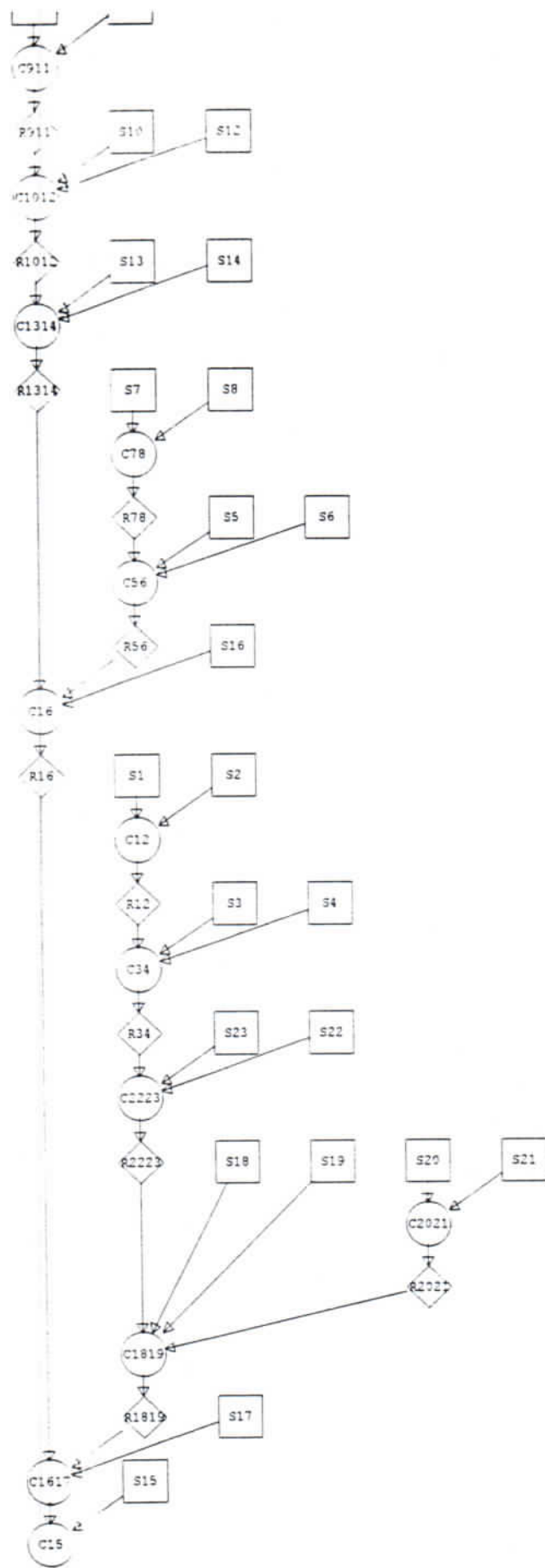
Table 3.2
C Coefficients for Use with the Rational Method

Land Use	Return Period			
	2-10 Year	25 Year	50 Year	100 Year
Streets and Roads				
Paved Roads	0.75 – 0.85	0.83 – 0.94	0.90 – 0.95	0.94 – 0.95
Gravel Roadways & Shoulders	0.60 – 0.70	0.66 – 0.77	0.72 – 0.84	0.75 – 0.88
Industrial Areas				
Heavy	0.70 – 0.80	0.77 – 0.88	0.84 – 0.95	0.88 – 0.95
Light	0.60 – 0.70	0.66 – 0.77	0.72 – 0.84	0.75 – 0.88
Business Areas				
Downtown	0.75 – 0.85	0.83 – 0.94	0.90 – 0.95	0.94 – 0.95
Neighborhood	0.55 – 0.65	0.61 – 0.72	0.66 – 0.78	0.69 – 0.81
Residential Areas				
Lawns – Flat	0.10 – 0.25	0.11 – 0.28	0.12 – 0.30	0.13 – 0.31
– Steep	0.25 – 0.40	0.28 – 0.44	0.30 – 0.48	0.31 – 0.50
Suburban	0.30 – 0.40	0.33 – 0.44	0.36 – 0.48	0.38 – 0.50
Single Family	0.45 – 0.55	0.50 – 0.61	0.54 – 0.66	0.56 – 0.69
Multi-Unit	0.50 – 0.60	0.55 – 0.66	0.60 – 0.72	0.63 – 0.75
Apartment	0.60 – 0.70	0.66 – 0.77	0.72 – 0.84	0.75 – 0.88
Parks/Cemetaries	0.10 – 0.25	0.11 – 0.28	0.12 – 0.30	0.13 – 0.31
Playgrounds	0.40 – 0.50	0.44 – 0.55	0.48 – 0.60	0.50 – 0.63
Agricultural Areas	0.10 – 0.20	0.11 – 0.22	0.12 – 0.24	0.13 – 0.25
Bare Ground	0.20 – 0.30	0.22 – 0.33	0.24 – 0.36	0.25 – 0.38
Undeveloped Desert	0.30 – 0.40	0.33 – 0.44	0.36 – 0.48	0.38 – 0.50
Mountain Terrain (Slopes > 10%)	0.60 – 0.80	0.66 – 0.88	0.72 – 0.95	0.75 – 0.95

Note: Values of C for 25, 50 and 100 Year were derived using frequency adjustment factors of 1.10, 1.20, and 1.25, respectively, with an upper limit of 0.95 for C for the 2-10 Year values.

APPENDIX B

HEC-1



```

*****
*   FLOOD HYDROGRAPH PACKAGE (HEC-1)   *
*   MAY 1991                           *
*   VERSION 4.0.1E                     *
*   RUN DATE 03/11/2001 TIME 19:48:03 *
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*****
*   U.S. ARMY CORPS OF ENGINEERS      *
*   HYDROLOGIC ENGINEERING CENTER     *
*   609 SECOND STREET                 *
*   DAVIS, CALIFORNIA 95618          *
*   (916) 756-1104                   *
*****
    
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X   X   XXXXXXXX   XXXXX   X
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XXXXXXX   XXXX   X   XXXXX   X
X   X   X   X   X   X
X   X   X   X   X   X
X   X   XXXXXXXX   XXXXX   XXX
    
```

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*****
*   Full Microcomputer Implementation *
*   by                                *
*   Haestad Methods, Inc.             *
*****
    
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37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

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

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

HEC-1 INPUT

PAGE 1

LINE	ID	1	2	3	4	5	6	7	8	9	10
1	ID	100-YEAR RUNOFF FROM MARICOPA COUNTY DRAINAGE DESIGN									
2	IT	5			300			2000			
3	IO	5	0								
4	KK	S9									
5	KM	DESERT/RANGELAND S-CURVE WAS USED FOR THE BASIN									
6	KO				22						
7	BA	.09									
8	PB	3.139									
9	IN	15									
10	PC	.000	.008	.016	.025	.033	.041	.050	.058	.066	.075
11	PC	.087	.099	.113	.148	.230	.407	.778	.881	.919	.945
12	PC	.957	.968	.980	.990	1.000					
13	LG	.35	.35	4.80	.29	9.00					
14	UI	128.	418.	374.	172.	76.	33.	12.	0.	0.	0.
15	UI	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	KK	S11									
17	KM	DESERT/RANGELAND S-CURVE WAS USED FOR THE BASIN									
18	KO				22						

19	BA	.06									
20	PB	3.139									
21	LG	.35	.35	7.00	.12	.00					
22	UI	243.	169.	25.	0.	0.	0.	0.	0.	0.	0.
23	UI	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
24	KK	C911									
25	KM	COMBINE BASINS S9 AND S11									
26	KO					22					
27	HC	2									
28	KK	R911									
29	KM	ROUTE S11 AND S9									
30	KO					22					
31	RK	1560	.013	.035		TRAP	30	4			
32	KK	S10									
33	KM	DESERT/RANGELAND S-GGRAPH WAS USED FOR THE BASIN									
34	KO					22					
35	BA	.10									
36	PB	3.139									
37	LG	.35	.37	5.20	.24	.00					
38	UI	302.	356.	80.	17.	0.	0.	0.	0.	0.	0.
39	UI	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
40	KK	S12									
41	KM	DESERT/RANGELAND S-GGRAPH WAS USED FOR THE BASIN									
42	KO					22					
43	BA	.06									
44	PB	3.139									
45	LG	.35	.39	5.80	.19	.00					
46	UI	157.	219.	56.	12.	0.	0.	0.	0.	0.	0.
47	UI	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

HEC-1 INPUT

PAGE 2

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
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48	KK	C1012									
49	KM	COMBINE S10 S12 AND C911									
50	KO					22					
51	HC	3									
52	KK	R1012									
53	KM	ROUTE C1012									
54	KO					22					
55	RK	3570	.0095	.035		TRAP	30	4			
56	KK	S13									
57	KM	DESERT/RANGELAND S-GGRAPH WAS USED FOR THE BASIN									
58	KO					22					
59	BA	.13									
60	PB	3.139									
61	LG	.35	.36	5.00	.27	3.00					
62	UI	80.	284.	317.	171.	82.	39.	18.	9.	0.	0.
63	UI	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
64	KK	S14									
65	KM	DESERT/RANGELAND S-GGRAPH WAS USED FOR THE BASIN									
66	KO					22					
67	BA	.20									
68	PB	3.139									
69	LG	.35	.39	5.80	.19	.00					
70	UI	155.	517.	490.	233.	104.	49.	15.	15.	0.	0.
71	UI	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
72	KK	C1314									
73	KM	COMBINE S13 S14 C1012									
74	KO					22					
75	HC	3									
76	KK	R1314									
77	KM	ROUTE S13 S14 R1012									
78	KO					22					
79	RK	348	.003	.035		TRAP	30	4			
80	KK	S7									

81	KM	DESEPT/RANGELAND S-GRAPH WAS USED FOR THE BASIN								
82	KO									
83	BA	.07								
84	PB	3.133								
85	LG	.35	.39	5.80	.19	.00				
86	UI	204.	240.	54.	11.	0.	0.	0.	0.	0.
87	UI	1.	0.	0.	0.	0.	0.	0.	0.	0.
88	KK	S6								
89	KM	DESEPT/RANGELAND S-GRAPH WAS USED FOR THE BASIN								
90	KO									
91	BA	.04								
92	PB	3.133								
93	LG	.35	.35	4.90	.28	.00				
94	UI	136.	128.	24.	0.	0.	0.	0.	0.	0.

HEC-1 INPUT

PAGE 3

LINE	ID	1	2	3	4	5	6	7	8	9	10
95	UI	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
96	KK	C78									
97	KM	COMBINE S7 AND S8									
98	KO					22					
99	HC	1									
100	KK	R78									
101	KM	ROUTE S7 AND S8									
102	KO					22					
103	RK	4871	.0121	.035		TRAP	30	4			
104	KK	S5									
105	KM	DESEPT/RANGELAND S-GRAPH WAS USED FOR THE BASIN									
106	KO					22					
107	BA	.15									
108	PB	3.133									
109	LG	.35	.35	4.35	.38	3.00					
110	UI	108.	406.	576.	437.	240.	130.	71.	39.	15.	15.
111	UI	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
112	UI	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
113	KK	S6									
114	KM	DESEPT/RANGELAND S-GRAPH WAS USED FOR THE BASIN									
115	KO					22					
116	BA	.15									
117	PB	3.133									
118	LG	.35	.35	3.70	.55	2.00					
119	UI	83.	310.	410.	273.	143.	75.	38.	18.	11.	0.
120	UI	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
121	UI	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
122	KK	C56									
123	KM	COMBINE C56 S5 S6									
124	KO					22					
125	HC	3									
126	KK	R56									
127	KM	ROUTE S5 AND S6									
128	KO					22					
129	RK	3217	.090	.035		TRAP	30	4			
130	KK	S16									
131	KM	DESEPT/RANGELAND S-GRAPH WAS USED FOR THE BASIN									
132	KO					22					
133	BA	.15									
134	PB	3.133									
135	LG	.35	.35	3.81	.51	15.00					
136	UI	21.	77.	107.	78.	42.	22.	12.	6.	3.	3.
137	UI	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
138	UI	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.

HEC-1 INPUT

PAGE 4

LINE	ID	1	2	3	4	5	6	7	8	9	10
139	KK	C16									
140	KM	COMBINE S16									
141	KO					22					

Page 3

142 HC 3

143 KY R16

144 KM ROUTE C16

145 KC 22

146 RK 348 .014 .035 TRAP 30 4

147 KY S1

148 KM DESERT/RANGELAND S-GRAH WAS USED FOR THE BASIN

149 KC 22

150 BA .16

151 PB 3.139

152 LG .35 .35 4.8 .29 9.00

153 UT 128. 418. 374. 172. 76. 33. 12. 0. 0. 0.

154 UT 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

155 KY S2

156 KM DESERT/RANGELAND S-GRAH WAS USED FOR THE BASIN

157 KC 22

158 BA .09

159 PB 3.139

160 LG .35 .39 6.20 .16 3.00

161 UT 91. 279. 211. 88. 36. 14. 8. 0. 0. 0.

162 UT 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

163 KY C12

164 KM COMBINE HYDROGRAPHS 1 AND 2

165 KC 22

166 HC 2

167 KY R12

168 KM ROUTE THE HYDROGRAPH FROM C12 TO C34

169 KC 22

170 RK 2609 .0150 .035 TRAP 30 4

171 KY S3

172 KM DESERT/RANGELAND S-GRAH WAS USED FOR THE BASIN

173 KC 22

174 BA .15

175 PB 3.139

176 LG .35 .35 4.50 .35 11.00

177 UT 212. 537. 267. 93. 29. 15. 0. 0. 0. 0.

178 UT 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

179 KY S4

180 KM DESERT/RANGELAND S-GRAH WAS USED FOR THE BASIN

181 KC 22

182 BA .05

183 PB 3.139

184 LG .35 .35 3.91 .48 7.00

185 UT 130. 181. 47. 10. 0. 0. 0. 0. 0. 0.

HEC-1 INPUT

PAGE 5

LINE	ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
186	UT 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.
187	KY C34
188	KM COMBINE HYDROGRAPHS FROM S3 AND S4
189	KC 22
190	HC 3
191	KY R34
192	KM ROUTE HYDROGRAPHS 3 AND 4 THRU 23
193	KC 22
194	RK 5652 .0097 .035 TRAP 30 4
195	KY S23
196	KM DESERT/RANGELAND S-GRAH WAS USED FOR THE BASIN
197	KC 22
198	BA .12
199	PB 3.139
200	LG .35 .35 3.81 .51 15.00
201	UT 41. 156. 235. 199. 115. 64. 37. 20. 10. 6.
202	UT 6. 0. 0. 0. 0. 0. 0. 0. 0. 0.
203	UT 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

204 KK S22
 205 KM DESERT/RANGELAND S-GGRAPH WAS USED FOR THE BASIN
 206 KO 22
 207 BA .11
 208 PB 3.139
 209 LG .35 .35 3.91 .48 14.00
 210 UI 51. 189. 250. 166. 87. 46. 23. 11. 7. 1.
 211 UI 0. 0. 0. 0. 0. 0. 0. 0. 0. 1.
 212 UI 0. 0. 0. 0. 0. 0. 0. 0. 0. 1.

 213 KK C2223
 214 KM COMBINE S22 AND S23
 215 KO 22
 216 HC 3

 217 KK R2223
 218 KM ROUTE S22 AND S23 THRU S18
 219 KO 22
 220 RK 1040 .0096 .035 TRAP 30 4

 221 KK S20
 222 KM DESERT/RANGELAND S-GGRAPH WAS USED FOR THE BASIN
 223 KO 22
 224 BA .04
 225 PB 3.139
 226 LG .35 .35 4.65 .31 10.00
 227 UI 76. 146. 52. 15. 4. 0. 0. 0. 0. 1.
 228 UI 0. 0. 0. 0. 0. 0. 0. 0. 0. 1.

HEC-1 INFILT

PAGE 6

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

229 KK S21
 230 KM DESERT/RANGELAND S-GGRAPH WAS USED FOR THE BASIN
 231 KO 22
 232 BA .04
 233 PB 3.139
 234 LG .35 .35 4.35 .38 12.00
 235 UI 93. 170. 57. 15. 5. 0. 0. 0. 0. 1.
 236 UI 0. 0. 0. 0. 0. 0. 0. 0. 0. 1.

 237 KK C2021
 238 KM COMBINE S20 AND S21
 239 KO 22
 240 HC 2

 241 KK R2021
 242 KM ROUTE S20 AND S21
 243 KO 22
 244 RK 2090 .0081 .035 TRAP 30 4

 245 KK S18
 246 KM DESERT/RANGELAND S-GGRAPH WAS USED FOR THE BASIN
 247 KO 22
 248 BA .02
 249 PB 3.139
 250 LG .35 .35 3.81 .51 15.00
 251 UI 36. 69. 25. 7. 2. 0. 0. 0. 0. 1.
 252 UI 0. 0. 0. 0. 0. 0. 0. 0. 0. 1.

 253 KK S19
 254 KM DESERT/RANGELAND S-GGRAPH WAS USED FOR THE BASIN
 255 KO 22
 256 BA .04
 257 PB 3.139
 258 LG .35 .35 3.81 .51 15.00
 259 UI 53. 140. 75. 27. 9. 4. 0. 0. 0. 1.
 260 UI 0. 0. 0. 0. 0. 0. 0. 0. 0. 1.

 261 KK C1819
 262 KM COMBINE S18 AND S19
 263 KO 22
 264 HC 4

 265 KK R1819

266 KM ROUTE S18 AND S19 S20 AND S21
 267 KO
 268 RK 1043 .0087 .035 22 TRAP 30 4

269 KK S17
 270 KM DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 271 KO 22
 272 BA .04
 273 PB 3.139
 274 LG .35 .35 3.81 .51 15.00
 275 UI 70. 138. 50. 15. 4. 0. 0. 0. 0. 0.

HEC-1 INPUT

PAGE 7

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

276 UI 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

277 KK C1617
 278 KM COMBINE S16 S17 AND US FROM R1819
 279 KO 22
 280 HC 3

281 KK S15
 282 KM DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 283 KO 22
 284 BA .09
 285 PB 3.139
 286 LG .35 .38 6.40 .15 .00
 287 UI 160. 325. 122. 37. 10. 0. 0. 0. 0. 0.
 288 UI 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

289 KK C15
 290 KM COMBINE C1617 WITH S15 FOR TOTAL RUNOFF
 291 KO 22
 292 HC 2
 293 ZZ

GHEC1 S/N: 1143001909

HMVersion: 6.33

Data File:

C:\windows\TEMP\~vbh3111.TMP

```

*****
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAY 1991 *
* VERSION 4.0.1E *
* RUN DATE 03/11/2001 TIME 19:48:03 *
*****

```

```

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

```

100-YEAR RUNOFF FROM MARICOPA COUNTY DRAINAGE DESIGN

3 IO

OUTPUT CONTROL VARIABLES

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

IT

HYDROGRAPH TIME DATA

NMIN 5 MINUTES IN COMPUTATION INTERVAL
 IDATE 1 STARTING DATE
 ITIME 0000 STARTING TIME
 NQ 300 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 2 0 ENDING DATE
 NDTIME 0055 ENDING TIME
 ICENT 20 CENTURY MARK

COMPUTATION INTERVAL 0.08 HOURS
 TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS

DRAINAGE AREA SQUARE MILES
 PRECIPITATION DEPTH INCHES
 LENGTH, ELEVATION FEET
 FLOW CUBIC FEET PER SECOND

STORAGE VOLUME
SURFACE AREA
TEMPERATURE

ACRE-FEET
ACRES
DEGREES FAHRENHEIT

4 KK

S9

6 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

16 KK

S11

18 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

24 KK

C911

26 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

28 KK

R911

30 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
ICUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

32 KK

S10

34 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
ICUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

40 KK

S12

42 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
ICUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

48 KK

C1012

50 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH

C:\HAESTAD\GHEC1\TIERRA.WMF
 IOUT 22 SAVE HYDROGRAPH ON THIS UNIT
 ISAVE 1 FIRST ORDINATE PUNCHED OR SAVED
 ISAVE 300 LAST ORDINATE PUNCHED OR SAVED
 TIMINT 0.083 TIME INTERVAL IN HOURS

52 KK

R1012

54 KO

OUTPUT CONTROL VARIABLES

IPRNT 5 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE
 IPNCH 0 PUNCH COMPUTED HYDROGRAPH
 IOUT 22 SAVE HYDROGRAPH ON THIS UNIT
 ISAVE 1 FIRST ORDINATE PUNCHED OR SAVED
 ISAVE 300 LAST ORDINATE PUNCHED OR SAVED
 TIMINT 0.083 TIME INTERVAL IN HOURS

56 KK

S13

58 KO

OUTPUT CONTROL VARIABLES

IPRNT 5 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE
 IPNCH 0 PUNCH COMPUTED HYDROGRAPH
 IOUT 22 SAVE HYDROGRAPH ON THIS UNIT
 ISAVE 1 FIRST ORDINATE PUNCHED OR SAVED
 ISAVE 300 LAST ORDINATE PUNCHED OR SAVED
 TIMINT 0.083 TIME INTERVAL IN HOURS

64 KK

S14

66 KO

OUTPUT CONTROL VARIABLES

IPRNT 5 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE
 IPNCH 0 PUNCH COMPUTED HYDROGRAPH
 IOUT 22 SAVE HYDROGRAPH ON THIS UNIT
 ISAVE 1 FIRST ORDINATE PUNCHED OR SAVED
 ISAVE 300 LAST ORDINATE PUNCHED OR SAVED
 TIMINT 0.083 TIME INTERVAL IN HOURS

72 KK

C1314

74 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

76 KK

R1314

78 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

80 KK

S

82 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

88 KK

S2

90 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL

QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

96 KK

C78

98 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

100 KK

R78

102 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

104 KK

S5

106 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

113 KN

S6

115 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

122 KK

C56

124 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

126 KK

R56

128 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

130 KK

S16

132 KO

OUTPUT CONTROL VARIABLES

```

IPRNT      5  PRINT CONTROL
IPLOT      0  PLOT CONTROL
QSCAL     0.  HYDROGRAPH PLOT SCALE
IPNCH      0  PUNCH COMPUTED HYDROGRAPH
IOUT      22  SAVE HYDROGRAPH ON THIS UNIT
ISAV1      1  FIRST ORDINATE PUNCHED OR SAVED
ISAV2     300 LAST ORDINATE PUNCHED OR SAVED
TIMINT     0.183 TIME INTERVAL IN HOURS

```

139 KK

C16

141 KO

OUTPUT CONTROL VARIABLES

```

IPRNT      5  PRINT CONTROL
IPLOT      0  PLOT CONTROL
QSCAL     0.  HYDROGRAPH PLOT SCALE
IPNCH      0  PUNCH COMPUTED HYDROGRAPH
IOUT      22  SAVE HYDROGRAPH ON THIS UNIT
ISAV1      1  FIRST ORDINATE PUNCHED OR SAVED
ISAV2     300 LAST ORDINATE PUNCHED OR SAVED
TIMINT     0.183 TIME INTERVAL IN HOURS

```

143 KK

R16

145 KO

OUTPUT CONTROL VARIABLES

```

IPRNT      5  PRINT CONTROL
IPLOT      0  PLOT CONTROL
QSCAL     0.  HYDROGRAPH PLOT SCALE
IPNCH      0  PUNCH COMPUTED HYDROGRAPH
IOUT      22  SAVE HYDROGRAPH ON THIS UNIT
ISAV1      1  FIRST ORDINATE PUNCHED OR SAVED
ISAV2     300 LAST ORDINATE PUNCHED OR SAVED
TIMINT     0.183 TIME INTERVAL IN HOURS

```

147 KK

S1

149 KO

OUTPUT CONTROL VARIABLES

```

IPRNT      5  PRINT CONTROL
IPLOT      0  PLOT CONTROL
QSCAL     0.  HYDROGRAPH PLOT SCALE
IPNCH      0  PUNCH COMPUTED HYDROGRAPH
IOUT      22  SAVE HYDROGRAPH ON THIS UNIT
ISAV1      1  FIRST ORDINATE PUNCHED OR SAVED
ISAV2     300 LAST ORDINATE PUNCHED OR SAVED
TIMINT     0.183 TIME INTERVAL IN HOURS

```

157 KO

 OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNTH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAVE	1	FIRST ORDINATE PUNCHED OR SAVED
ISAVE	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

163 KK

 * C12 *

165 KO

 OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNTH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAVE	1	FIRST ORDINATE PUNCHED OR SAVED
ISAVE	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

167 KK

 * R12 *

169 KO

 OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNTH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAVE	1	FIRST ORDINATE PUNCHED OR SAVED
ISAVE	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

171 KK

 * S3 *

.....

.....

10

10

10

10

10

10

10

10

10

10

10

10

173 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

179 KK

S4

181 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

187 KK

C34

189 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

191 KK

R34

193 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

135 KK

S23

137 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

114 KK

S22

116 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

113 KK

C2223

115 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

117 KK

R2223

```

219 KO      OUTPUT CONTROL VARIABLES
            IPRNT      5  PRINT CONTROL
            IPLOT      0  PLOT CONTROL
            QSCAL      0.  HYDROGRAPH PLOT SCALE
            IPNCH      0  PUNCH COMPUTED HYDROGRAPH
            IOUT       22  SAVE HYDROGRAPH ON THIS UNIT
            ISAV1      1  FIRST ORDINATE PUNCHED OR SAVED
            ISAV2     300  LAST ORDINATE PUNCHED OR SAVED
            TIMINT     1.083 TIME INTERVAL IN HOURS

```

```

221 KK      S20

```

```

223 KO      OUTPUT CONTROL VARIABLES
            IPRNT      5  PRINT CONTROL
            IPLOT      0  PLOT CONTROL
            QSCAL      0.  HYDROGRAPH PLOT SCALE
            IPNCH      0  PUNCH COMPUTED HYDROGRAPH
            IOUT       22  SAVE HYDROGRAPH ON THIS UNIT
            ISAV1      1  FIRST ORDINATE PUNCHED OR SAVED
            ISAV2     300  LAST ORDINATE PUNCHED OR SAVED
            TIMINT     1.083 TIME INTERVAL IN HOURS

```

```

229 KK      S21

```

```

231 KO      OUTPUT CONTROL VARIABLES
            IPRNT      5  PRINT CONTROL
            IPLOT      0  PLOT CONTROL
            QSCAL      0.  HYDROGRAPH PLOT SCALE
            IPNCH      0  PUNCH COMPUTED HYDROGRAPH
            IOUT       22  SAVE HYDROGRAPH ON THIS UNIT
            ISAV1      1  FIRST ORDINATE PUNCHED OR SAVED
            ISAV2     300  LAST ORDINATE PUNCHED OR SAVED
            TIMINT     1.083 TIME INTERVAL IN HOURS

```

```

237 KK      C2021

```

```

239 KO      OUTPUT CONTROL VARIABLES
            IPRNT      5  PRINT CONTROL
            IPLOT      0  PLOT CONTROL
            QSCAL      0.  HYDROGRAPH PLOT SCALE
            IPNCH      0  PUNCH COMPUTED HYDROGRAPH
            IOUT       22  SAVE HYDROGRAPH ON THIS UNIT
            ISAV1      1  FIRST ORDINATE PUNCHED OR SAVED

```

241 KK

R2021

243 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

245 KK

S18

247 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

253 KK

S19

255 KO

OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	300	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

261 KK

```

      .
      . C1819 .
      .
      .....

```

263 KO

OUTPUT CONTROL VARIABLES

```

      IPRNT      5  PRINT CONTROL
      IPLOT      0  PLOT CONTROL
      QSCAL      0.  HYDROGRAPH PLOT SCALE
      IPNCH      0  PUNCH COMPUTED HYDROGRAPH
      IOUT       22  SAVE HYDROGRAPH ON THIS UNIT
      ISAV1      1  FIRST ORDINATE PUNCHED OR SAVED
      ISAV2     300  LAST ORDINATE PUNCHED OR SAVED
      TIMINT     0.083  TIME INTERVAL IN HOURS

```

265 KK

```

      .....
      .
      . R1819 .
      .
      .....

```

267 KO

OUTPUT CONTROL VARIABLES

```

      IPRNT      5  PRINT CONTROL
      IPLOT      0  PLOT CONTROL
      QSCAL      0.  HYDROGRAPH PLOT SCALE
      IPNCH      0  PUNCH COMPUTED HYDROGRAPH
      IOUT       22  SAVE HYDROGRAPH ON THIS UNIT
      ISAV1      1  FIRST ORDINATE PUNCHED OR SAVED
      ISAV2     300  LAST ORDINATE PUNCHED OR SAVED
      TIMINT     0.083  TIME INTERVAL IN HOURS

```

269 KK

```

      .....
      .
      . S17 .
      .
      .....

```

271 KO

OUTPUT CONTROL VARIABLES

```

      IPRNT      5  PRINT CONTROL
      IPLOT      0  PLOT CONTROL
      QSCAL      0.  HYDROGRAPH PLOT SCALE
      IPNCH      0  PUNCH COMPUTED HYDROGRAPH
      IOUT       22  SAVE HYDROGRAPH ON THIS UNIT
      ISAV1      1  FIRST ORDINATE PUNCHED OR SAVED
      ISAV2     300  LAST ORDINATE PUNCHED OR SAVED
      TIMINT     0.083  TIME INTERVAL IN HOURS

```

277 KK

```

      .....
      .
      . T1817 .
      .
      .....

```

279 KO

OUTPUT CONTROL VARIABLES

```

      IPRNT      5  PRINT CONTROL
      IPLOT      0  PLOT CONTROL
      QSCAL      0.  HYDROGRAPH PLOT SCALE
      IPNCH      0  PUNCH COMPUTED HYDROGRAPH

```

C:\HAESTAD\GHEC1\TIERRA.WMF
 IOUT 22 SAVE HYDROGRAPH ON THIS UNIT
 ISAV1 1 FIRST ORDINATE PUNCHED OR SAVED
 ISAV2 300 LAST ORDINATE PUNCHED OR SAVED
 TIMINT 0.083 TIME INTERVAL IN HOURS

281 KK

S15

283 KO

OUTPUT CONTROL VARIABLES

IPRNT 5 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE
 IPNCH 0 PUNCH COMPUTED HYDROGRAPH
 IOUT 22 SAVE HYDROGRAPH ON THIS UNIT
 ISAV1 1 FIRST ORDINATE PUNCHED OR SAVED
 ISAV2 300 LAST ORDINATE PUNCHED OR SAVED
 TIMINT 0.083 TIME INTERVAL IN HOURS

289 KK

C15

291 KO

OUTPUT CONTROL VARIABLES

IPRNT 5 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE
 IPNCH 0 PUNCH COMPUTED HYDROGRAPH
 IOUT 22 SAVE HYDROGRAPH ON THIS UNIT
 ISAV1 1 FIRST ORDINATE PUNCHED OR SAVED
 ISAV2 300 LAST ORDINATE PUNCHED OR SAVED
 TIMINT 0.083 TIME INTERVAL IN HOURS

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		BASIN AREA	MAXIMUM STAGE	TIME C
				6-HOUR				MAX STA
24-HOUR								
12-HOUR								
HYDROGRAPH AT	S9	327.	4.08	25.	6.	6.	0.09	
HYDROGRAPH AT	S11	149.	4.00	10.	2.	2.	0.06	
1 COMBINED AT	C911	470.	4.00	35.	9.	8.	0.15	
ROUTED TO	R911	434.	4.00	35.	9.	8.	0.15	
HYDROGRAPH AT	S10	237.	4.00	14.	4.	3.	0.10	
HYDROGRAPH AT	S12	141.	4.00	9.	2.	2.	0.06	
1 COMBINED AT	C1012	813.	4.00	58.	14.	14.	0.31	
ROUTED TO	R1012	781.	4.08	58.	15.	14.	0.31	
HYDROGRAPH AT	S13	261.	4.08	19.	5.	5.	0.13	
HYDROGRAPH AT	S14	427.	4.08	31.	8.	8.	0.20	

3 COMBINED AT	C1314	1470.	4.09	108.	27.	26.	0.64
ROUTED TO	R1314	1457.	4.09	109.	27.	26.	0.64
HYDROGRAPH AT	S7	163.	4.00	10.	3.	2.	0.07
HYDROGRAPH AT	S8	92.	4.00	5.	1.	1.	0.04
2 COMBINED AT	C78	254.	4.00	15.	4.	4.	0.11
ROUTED TO	R78	245.	4.08	16.	4.	4.	0.11
HYDROGRAPH AT	S5	467.	4.08	35.	9.	9.	0.26
HYDROGRAPH AT	S6	296.	4.08	20.	5.	5.	0.18
3 COMBINED AT	C56	1008.	4.08	71.	18.	17.	0.55
ROUTED TO	R56	944.	4.08	71.	18.	17.	0.55
HYDROGRAPH AT	S16	85.	4.08	7.	2.	2.	0.03
3 COMBINED AT	C16	2486.	4.08	187.	47.	45.	1.24
ROUTED TO	R16	2465.	4.08	187.	47.	45.	1.24
HYDROGRAPH AT	S1	327.	4.08	25.	6.	6.	0.16
HYDROGRAPH AT	S2	207.	4.00	15.	4.	4.	0.09
2 COMBINED AT	C12	530.	4.08	40.	10.	10.	0.25
ROUTED TO	R12	529.	4.08	40.	10.	10.	0.25
HYDROGRAPH AT	S3	331.	4.00	23.	6.	6.	0.15
HYDROGRAPH AT	S4	107.	4.00	6.	2.	2.	0.05
3 COMBINED AT	C34	900.	4.08	70.	17.	17.	0.45
ROUTED TO	R34	892.	4.07	70.	18.	17.	0.45
HYDROGRAPH AT	S23	195.	4.08	17.	4.	4.	0.02
HYDROGRAPH AT	S22	197.	4.08	16.	4.	4.	0.01
3 COMBINED AT	C2223	1240.	4.17	103.	26.	25.	0.68
ROUTED TO	R2223	1233.	4.17	103.	26.	25.	0.68
HYDROGRAPH AT	S20	89.	4.00	6.	2.	1.	0.04
HYDROGRAPH AT	S21	102.	4.00	7.	2.	2.	0.04
2 COMBINED AT	C2021	191.	4.00	13.	3.	3.	0.08
ROUTED TO	R2021	182.	4.08	13.	3.	3.	0.08
HYDROGRAPH AT	S18	40.	4.00	3.	1.	1.	0.02

4 COMBINED AT	C1819	1427.	4.17	124.	31.	30.	0.82
ROUTED TO	R1819	1423.	4.17	125.	31.	30.	0.82
HYDROGRAPH AT	S17	79.	4.00	5.	1.	1.	0.04
3 COMBINED AT	C1617	3851.	4.08	317.	80.	77.	2.10
HYDROGRAPH AT	S15	207.	4.00	14.	3.	3.	0.09
2 COMBINED AT	C15	4023.	4.08	331.	83.	80.	

2.19

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
Page 21

ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	INTERPOLATED TO COMPUTATION INTERVAL		VOLUME
							PEAK	TIME TO PEAK	
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
R911	MANE	0.97	468.49	241.92	2.15	5.00	434.33	240.00	2.15
CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1716E+02 EXCESS=0.0000E+00 OUTFLOW=0.1722E+02 BASIN STORAGE=0.9084E-05 PERCENT ERROR=									
R1012	MANE	2.09	792.68	243.53	1.74	5.00	780.85	245.00	1.74
CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2865E+02 EXCESS=0.0000E+00 OUTFLOW=0.2883E+02 BASIN STORAGE=0.2174E-03 PERCENT ERROR=									
R1314	MANE	0.37	1460.37	245.47	1.58	5.00	1456.62	245.00	1.58
CONTINUITY SUMMARY (AC-FT) - INFLOW=0.5379E+02 EXCESS=0.0000E+00 OUTFLOW=0.5380E+02 BASIN STORAGE=0.4728E-04 PERCENT ERROR=									
R78	MANE	3.75	250.44	246.29	1.34	5.00	245.21	245.00	1.34
CONTINUITY SUMMARY (AC-FT) - INFLOW=0.7635E+01 EXCESS=0.0000E+00 OUTFLOW=0.7866E+01 BASIN STORAGE=0.2721E-03 PERCENT ERROR=									
R56	MANE	0.91	996.20	246.60	1.20	5.00	944.22	245.00	1.20
CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3523E+02 EXCESS=0.0000E+00 OUTFLOW=0.3528E+02 BASIN STORAGE=0.1644E-03 PERCENT ERROR=									
R16	MANE	0.14	2481.00	245.32	1.40	5.00	2465.49	245.00	1.41
CONTINUITY SUMMARY (AC-FT) - INFLOW=0.9274E+02 EXCESS=0.0000E+00 OUTFLOW=0.9275E+02 BASIN STORAGE=0.5671E-04 PERCENT ERROR=									
R12	MANE	1.49	529.59	246.56	1.51	5.00	529.05	245.00	1.50
CONTINUITY SUMMARY (AC-FT) - INFLOW=0.2000E+02 EXCESS=0.0000E+00 OUTFLOW=0.2011E+02 BASIN STORAGE=0.4214E-04 PERCENT ERROR=									
R34	MANE	3.16	892.62	250.55	1.46	5.00	892.02	250.00	1.46
CONTINUITY SUMMARY (AC-FT) - INFLOW=0.3457E+02 EXCESS=0.0000E+00 OUTFLOW=0.3496E+02 BASIN STORAGE=0.7041E-03 PERCENT ERROR=									
R2223	MANE	0.53	1236.83	250.68	1.41	5.00	1232.82	250.00	1.42
CONTINUITY SUMMARY (AC-FT) - INFLOW=0.5118E+02 EXCESS=0.0000E+00 OUTFLOW=0.5124E+02 BASIN STORAGE=0.2331E-03 PERCENT ERROR=									
R2021	MANE	2.08	185.59	243.21	1.50	5.00	181.90	245.00	1.50
CONTINUITY SUMMARY (AC-FT) - INFLOW=0.6323E+01 EXCESS=0.0000E+00 OUTFLOW=0.6383E+01 BASIN STORAGE=0.3179E-04 PERCENT ERROR=									
R1819	MANE	0.61	1423.50	250.44	1.42	5.00	1422.62	250.00	1.42
CONTINUITY SUMMARY (AC-FT) - INFLOW=0.6196E+02 EXCESS=0.0000E+00 OUTFLOW=0.6201E+02 BASIN STORAGE=0.2972E-03 PERCENT ERROR=									

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

RUMOFF 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			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	S9	327.	4.08	25.	6.	6.	0.09		
HYDROGRAPH AT	S11	149.	4.00	10.	2.	2.	0.06		
2 COMBINED AT	C911	470.	4.00	35.	9.	8.	0.15		
ROUTED TO	R911	434.	4.00	35.	9.	8.	0.15		
HYDROGRAPH AT	S10	237.	4.00	14.	4.	3.	0.10		
HYDROGRAPH AT	S12	141.	4.00	9.	2.	2.	0.06		
3 COMBINED AT	C1012	813.	4.00	58.	14.	14.	0.31		
ROUTED TO	R1012	781.	4.08	58.	15.	14.	0.31		
HYDROGRAPH AT	S13	261.	4.08	19.	5.	5.	0.13		
HYDROGRAPH AT	S14	427.	4.08	31.	8.	8.	0.20		
3 COMBINED AT	C1314	1470.	4.08	108.	27.	26.	0.64		
ROUTED TO	R1314	1457.	4.08	109.	27.	26.	0.64		
HYDROGRAPH AT	S7	163.	4.00	10.	3.	2.	0.07		
HYDROGRAPH AT	S8	92.	4.00	5.	1.	1.	0.04		
2 COMBINED AT	C78	254.	4.00	15.	4.	4.	0.11		
ROUTED TO	R78	245.	4.08	16.	4.	4.	0.11		
HYDROGRAPH AT	S5	467.	4.08	35.	9.	9.	0.26		
HYDROGRAPH AT	S6	296.	4.08	20.	5.	5.	0.18		
3 COMBINED AT	C56	1008.	4.08	71.	18.	17.	0.55		
ROUTED TO	R56	944.	4.08	71.	18.	17.	0.55		
HYDROGRAPH AT	S16	85.	4.08	7.	2.	2.	0.05		
3 COMBINED AT	C16	2486.	4.08	187.	47.	45.	1.24		
ROUTED TO	R16	2466.	4.08	187.	47.	45.	1.24		
HYDROGRAPH AT	S1	327.	4.08	25.	6.	6.	0.16		
HYDROGRAPH AT	S2	207.	4.00	15.	4.	4.	0.09		
2 COMBINED AT	C12	530.	4.08	40.	10.	10.	0.25		

ROUTED TO	R12	529.	4.08	40.	10.	10.	0.25
HYDROGRAPH AT	S3	331.	4.00	23.	6.	6.	0.15
HYDROGRAPH AT	S4	107.	4.00	6.	2.	2.	0.05
3 COMBINED AT	C34	900.	4.08	70.	17.	17.	0.45
ROUTED TO	R34	892.	4.17	70.	18.	17.	0.45
HYDROGRAPH AT	S23	195.	4.08	17.	4.	4.	0.12
HYDROGRAPH AT	S22	197.	4.08	16.	4.	4.	0.11
3 COMBINED AT	C2223	1240.	4.17	103.	26.	25.	0.68
ROUTED TO	R2223	1233.	4.17	103.	26.	25.	0.68
HYDROGRAPH AT	S18	40.	4.00	3.	1.	1.	0.02
HYDROGRAPH AT	S19	84.	4.00	6.	1.	1.	0.04
HYDROGRAPH AT	S20	89.	4.00	6.	2.	1.	0.04
HYDROGRAPH AT	S21	102.	4.00	7.	2.	2.	0.04
2 COMBINED AT	C2021	191.	4.00	13.	3.	3.	0.08
ROUTED TO	R2021	182.	4.08	13.	3.	3.	0.08
4 COMBINED AT	C1819	1427.	4.17	124.	31.	30.	0.82
ROUTED TO	R1819	1423.	4.17	125.	31.	30.	0.82
HYDROGRAPH AT	S17	79.	4.00	5.	1.	1.	0.04
3 COMBINED AT	C1617	3851.	4.08	317.	80.	77.	2.10
HYDROGRAPH AT	S15	207.	4.00	14.	3.	3.	0.09
2 COMBINED AT	C15	4023.	4.08	331.	83.	80.	2.19