Flood Control District of Maricopa County

Skunk Creek Floodplain Delineation Study

Technical Data Notebook

Section 3: Hydrologic Analysis

June 1997

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		PAGE
3.0	**INTRODUCTION**	3-1
3.0.1	Purpose of Study	3-1
3.0.2	Description of the Watershed	3-1
3.0.3	Climatic Conditions	3-1
3.0.4	Previous Studies	3-1
3.0.5	Conclusions	3-2
3.1	**METHOD DESCRIPTION**	3-3
3.2	**HYDROLOGIC PARAMETER ESTIMATION**	3-3
3.2.1	Subarea Boundary Delineation	3-3
3.2.2	Physical Parameters	3-3
3.2.2.1	Lag Time	3-3
3.2.2.2	Loss Rates	3-4
3.2.2.3	Hydrograph Routing	3-4
3.2.3	Statistical Parameters	3-5
3.2.4	Precipitation	3-5
3.2.4.1	Time Distribution	3-5
3.2.4.2	Rainfall-Runoff Conversion	3-5
3.3	**MODEL CALIBRATION**	3-5
3.3.1	Flood Frequency Analysis	3-5
3.3.1.1	USGS Gauged Records	3-6
3.3.1.2	Methodology	3-7
3.3.1.3	Results	3-8
3.3.2	Regional Regression Equations - USGS Roeske Method	3-8
3.3.3	Regional Regression Equations - ADWR Method	3-10
3.3.4	Comparison of Methodologies	3-10
3.3.5	Cline Creek and Rodger Creek Calibrations	3-11
3.3.6	Sensitivity Analysis of Hydrologic Model	3-11
3.3.6.1	Depth-Area Reduction Factor Sensitivity	3-11
3.3.6.2	S-Graph Sensitivity	3-11
3.3.6.3	Hydrograph Routing Sensitivity	3-12
3.3.6.4	Infiltration Parameter Sensitivity	3-12
3.3.6.5	Conclusions	3-13
3.4	**HYDROLOGIC MODEL DEVELOPMENT, ASSUMPTIONS, AND SOLUTIONS**	3-13

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3.5 FINAL RESULTS/COMPUTER RUNS 3-14
3.5.1 Results 3-14
3.5.2 Comparison of Results with Previous Studies and Statistical Analyses 3-14
3.5.2.1 Flood Insurance Study (FIS) 3-15
3.5.2.2 Cline/Rodger Creek Floodplain Delineation Study 3-15
3.5.2.3 Gage Records 3-15
3.5.2.4 Regional Regression Equations 3-15

3.6 HYDROLOGIC MODELING RESULTS 3-15

3.7 ADDENDUM 3-15

APPENDIX A - OUTPUT OF DDMS ROUTINE

APPENDIX B - MODIFIED HYDROLOGY FOR CLINE CREEK WATERSHED AND RODGER CREEK WATERSHED

APPENDIX C - MODEL CALIBRATION - USGS GAUGED RECORDS

APPENDIX D - SCHEMATIC DIAGRAM AND HEC-1 OUTPUT

APPENDIX E - ADDENDUM TO HYDROLOGY REPORT

LIST OF TABLES

Table Number	Title	Following Page / Page
1	Subbasin Data	3-3
2	Calculation of Weighted Kn Values	3-4
3	Basic Soils Data	3-4
4	Basic Land Use Data	3-4
5	Calculation of Weighted Percent Vegetation Cover	3-4
6	Hydrograph Routing Data	3-4
7	6-Hour Storm Pattern	3-5
8	Skunk Creek Flood-Frequency Analysis	3-6
9	Comparison of Flood Frequency Analyses	3-11
10	Sensitivity Analysis Results - 100-Year, 24-Hour HEC-1 Simulation	3-11
11	Summary of HEC-1 Discharges - 100-Year, 24-Hour Storm	3-14
12	Subarea Peak and Unit Discharges	3-14
13	Comparison of Results with Other Studies and Methodologies - 100-Year, 24-Hour Storm	3-14

LIST OF FIGURES

Figure Number	Title	Following Page / Page
1	Skunk Creek Floodplain Delineation Study Hydrologic Study Area	3-1
2	Skunk Creek Floodplain Delineation Study Hydrologic Subareas	Back Pocket
3	Soils Map	Back Pocket
4	Existing Landuse Map	Back Pocket
5	Adjusted Frequency Curve for Skunk Creek at I-17.....	3-9

3.0 INTRODUCTION

Montgomery Watson, in association with Hoskin Engineering Consultants, has been retained by the Flood Control District of Maricopa County (District) to prepare a re-delineation of the Skunk Creek floodplain from the Central Arizona Project (CAP) canal upstream a distance of approximately 13.1 river miles. The study effort includes Data Collection, Hydrology, Hydraulic Analysis, and Floodplain Delineation tasks.

3.0.1 Purpose of Study

This Hydrology Report describes the hydrologic analysis performed for the Skunk Creek Floodplain Delineation Study. The report has been prepared to meet the requirements of Task 5.11 of Phase 1 of the contract Scope of Work. The purpose of the hydrologic analyses was to determine peak 100-year discharges using current hydrologic methods adopted by the District for use in the floodplain delineation portion of the study. These discharges were compared to those for the original Skunk Creek Flood Insurance Study (FIS) and to discharges developed by regional methods.

3.0.2 Description of the Watershed

The hydrologic study area includes all of the Skunk Creek watershed tributary to the CAP Aqueduct. The Skunk Creek watershed is located in northern Maricopa County, Arizona, north of the metropolitan Phoenix area. The watershed is bounded by the CAP Aqueduct (south), New River Mountains (north), Daisy Mountain (west), and Apache Peak (east).

Within the watershed, development is light, although development pressures have increased in recent years. There are significant drainage facilities, including bridge crossings at New River Road and Carefree Highway and several dip road crossings. In the upper portions of the watershed, the terrain is mountainous, with steep slopes and sparse vegetation. In the lower portions of the watershed, vegetation is consistent with desert rangeland.

The total drainage area at the CAP Aqueduct is 63.5 square miles. The Skunk Creek watershed includes four subwatersheds: the main Skunk Creek drainage basin, the Cline Creek drainage basin (16.1 square miles at the confluence with Skunk Creek), the Rodger Creek drainage basin (5.1 square miles at the confluence with Skunk Creek), and the Union Hills drainage basin (13.2 square miles at the CAP Aqueduct and confluence with Skunk Creek). These are shown in **Figure 1**.

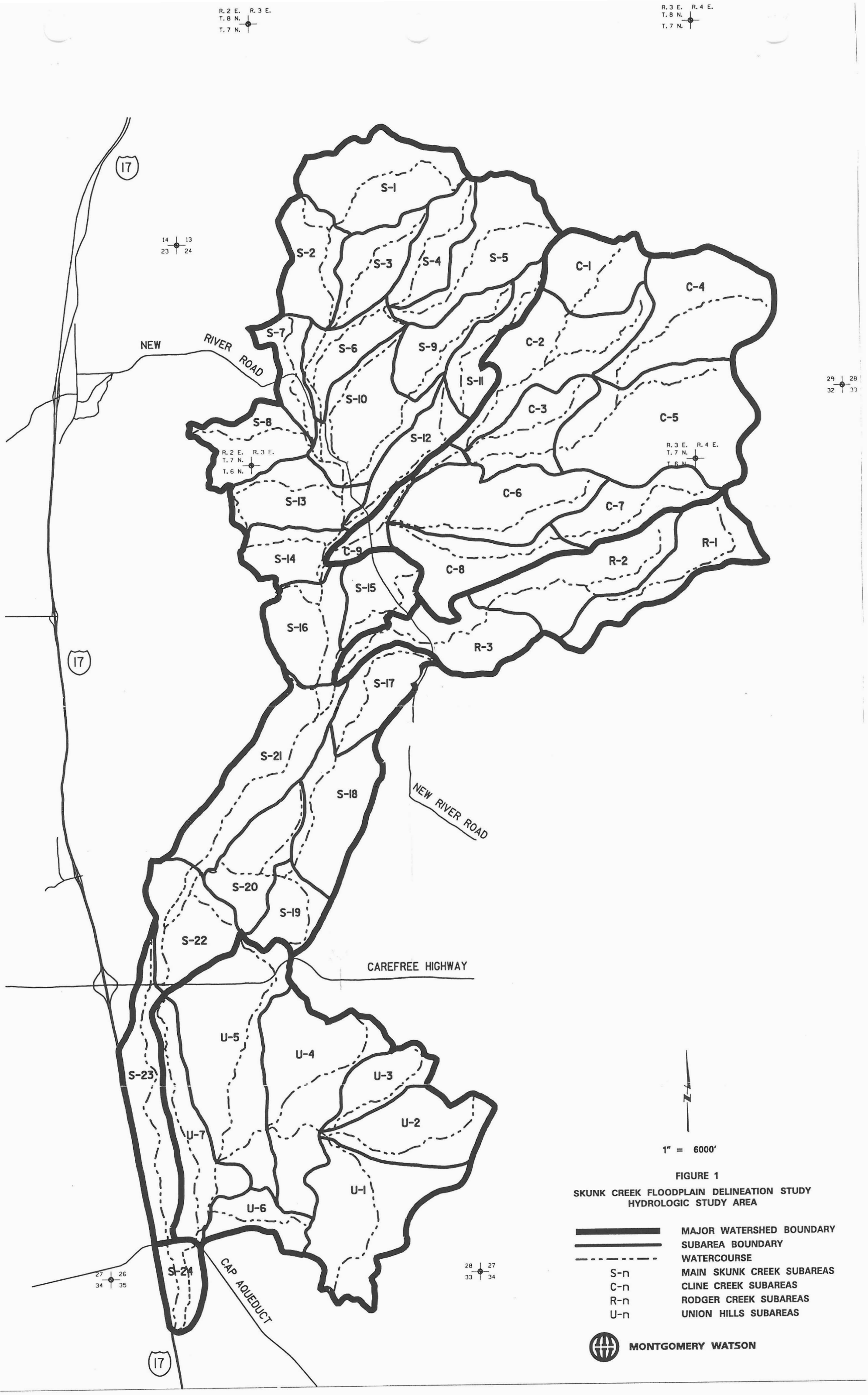
3.0.3 Climatic Conditions

The climate in central Arizona is typical of the arid southwest, producing intense summer storms which can cause flash flooding. Winter storms are typically less intense but of longer duration, resulting in riverine flooding conditions.

3.0.4. Previous Studies

Several previous studies of Skunk Creek flood hydrology have been performed in and near the study area. These are briefly summarized below.

The U.S. Army Corps of Engineers originally developed hydrology and hydraulics for the Skunk Creek watershed as part of its early approximate studies (1975) leading up to the construction of Adobe Dam. The peak 100-year discharge at the CAP Aqueduct from this study was 35,000 cfs.


R. 2 E. R. 3 E.
T. 8 N.
T. 7 N.
R. 3 E. R. 4 E.
T. 8 N.
T. 7 N.
17
14 13
23 24
S-1
S-2
S-3
S-4
S-5
C-1
C-4
S-7
S-6
S-9
C-2
NEW RIVER ROAD
S-11
S-10
C-3
C-5
S-8
S-12
29 28
32 33
R. 2 E. R. 3 E.
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C-6
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S-15
S-16
R-3
17
S-17
S-21
S-18
NEW RIVER ROAD
S-20
S-19
S-22
CAREFREE HIGHWAY
U-5
U-4
S-23
U-3
U-2
U-7
U-1
U-6
27 26
34 35
S-24
CAP AQUEDUCT
28 27
33 34
17
N
1" = 6000'
FIGURE 1
SKUNK CREEK FLOODPLAIN DELINEATION STUDY
HYDROLOGIC STUDY AREA
MAJOR WATERSHED BOUNDARY
SUBAREA BOUNDARY
WATERCOURSE
S-n MAIN SKUNK CREEK SUBAREAS
C-n CLINE CREEK SUBAREAS
R-n RODGER CREEK SUBAREAS
U-n UNION HILLS SUBAREAS
MONTGOMERY WATSON

Floodplain delineations for the original (effective) Skunk Creek FIS was performed by Harris Toups in 1978. Selected 100-year discharges from the FIS are:

At New River Road	7,200 cfs
Below Rodger Creek Confluence	28,100 cfs
At Carefree Highway	31,400 cfs
At CAP Aqueduct	35,000 cfs

Bridges constructed subsequent to the effective FIS at Carefree Highway and New River Road used these discharges for design purposes.

Floodplain delineation studies were performed for Cline Creek and Rodger Creek by Baker Engineers for the District in 1989. Hydrology for these watercourses was developed using HEC-1 simulations. Peak 100-year discharges at the Skunk Creek confluence for these tributaries are 16,700 cfs for Cline Creek and 6,200 cfs for Rodger Creek.

A floodplain delineation study for Skunk Creek downstream of the CAP Aqueduct was prepared by Coe and Van Loo for the District in 1990. This study used the adopted 100-year discharge from the original FIS of 35,000 cfs at the CAP Aqueduct.

3.0.5 Conclusions

Results of the HEC-1 modeling for the Skunk Creek Floodplain Delineation Study project area have yielded 100-year peak discharges as follows:

Upstream Study Limit	4,900 cfs
At New River Road	7,800 cfs
Upstream of Cline Creek	11,800 cfs
Upstream of Rodger Creek	24,400 cfs
Downstream of Rodger Creek	27,300 cfs
At Carefree Highway	27,300 cfs
At CAP Aqueduct	26,700 cfs

Smaller mapped FP?

Between the upstream study limit and the Rodger Creek confluence, these flows agree reasonably well with hydrology currently adopted for this area by the District. In this reach either the new or the old hydrology could be adopted by the District for the Skunk Creek Floodplain Delineation Study with little impact on previous or future planning or design projects.

From Carefree Highway to the downstream study limit at the CAP Aqueduct, the new hydrology generates significantly lower 100-year discharges than the currently adopted hydrology. At the CAP Aqueduct, the modeled flow of 26,700 cfs is 25 percent lower than the FEMA regulatory flow of 35,000 cfs.

District staff and Montgomery Watson considered which hydrologic results to adopt for the floodplain delineation study. Discussions were based on a number of factors, including:

- Use of the new hydrology would result in a smaller mapped floodplain, which could benefit existing residents and future development in the Skunk Creek floodplain.
- Use of the currently adopted hydrology would be consistent with hydrology used for design of flood control structures recently constructed on Skunk Creek.
- The new hydrology is consistent with a regional flood-frequency analysis but underestimates the 100-year discharge computed using records from the stream gauge at Interstate 17.

Table 1
Subbasin Data

Subarea	Area (sq mi)	Precipitation Data Point Precipitation (in) P2,6	P2,24	P100,6	P100,24	Unit Hydrograph Data S-graph	L (mi)	Lca (mi)	High Elev	Low Elev	Slope (ft/mi)	Kn	Lag (hr)	Green-Ampt Loss Parameters XKSAT PSIF DTHETA RTIMP
S-1	2.08	1.6	2.2	3.5	4.9	MTN	2.481	0.928	3640	2312	535	0.040	0.40	See DDMS output
S-2	1.17	1.6	2.2	3.5	4.9	MTN	2.223	1.087	3040	2187	384	0.036	0.39	
S-3	1.03	1.6	2.2	3.5	4.9	MTN	2.273	1.083	2940	2188	331	0.035	0.40	
S-4	0.97	1.6	2.2	3.5	4.9	MTN	2.314	1.098	3640	2280	588	0.040	0.41	
S-5	1.85	1.6	2.2	3.5	4.9	MTN	2.913	1.769	4080	2280	618	0.043	0.56	
S-6	0.94	1.5	2.1	3.5	4.8	D/R	2.383	1.121	2473	2110	152	0.034	0.45	
S-7	0.68	1.5	2.1	3.5	4.8	D/R	2.140	1.250	2380	2088	136	0.031	0.42	
S-8	1.12	1.5	2.1	3.5	4.8	D/R	1.939	1.013	2490	2088	207	0.034	0.39	
S-9	1.02	1.5	2.1	3.5	4.8	MTN	2.311	0.913	2960	2200	329	0.044	0.46	
S-10	1.80	1.5	2.1	3.5	4.8	D/R	2.697	1.239	2473	2050	157	0.032	0.47	
S-11	0.92	1.5	2.1	3.5	4.8	MTN	2.705	1.280	3415	2232	437	0.037	0.44	
S-12	0.91	1.5	2.1	3.5	4.7	D/R	2.761	1.299	2370	2030	123	0.031	0.48	
S-13	1.27	1.5	1.9	3.5	4.7	MTN	2.667	1.163	3160	2025	426	0.035	0.41	
S-14	0.83	1.5	1.9	3.5	4.7	MTN	1.761	1.019	3160	1980	670	0.036	0.31	
S-15	0.99	1.5	1.9	3.5	4.7	D/R	1.973	1.049	2400	1931	238	0.035	0.39	
S-16	1.32	1.5	1.9	3.5	4.6	MTN	1.856	0.890	2520	1900	334	0.033	0.32	
S-17	1.03	1.5	1.9	3.5	4.6	D/R	2.466	1.053	2200	1864	136	0.038	0.51	
S-18	1.71	1.4	1.9	3.3	4.5	D/R	2.417	1.098	1940	1796	60	0.030	0.48	
S-19	0.77	1.4	1.9	3.3	4.4	D/R	1.492	0.674	1900	1786	76	0.031	0.32	
S-20	1.28	1.4	1.9	3.3	4.4	D/R	2.383	0.955	1863	1760	43	0.030	0.48	
S-21	2.22	1.4	1.9	3.3	4.4	D/R	3.708	1.648	1960	1750	57	0.026	0.58	
S-22	1.47	1.4	1.8	3.3	4.4	MTN	2.269	1.140	2300	1670	278	0.032	0.38	
S-23	1.72	1.3	1.7	3.3	4.1	D/R	4.602	2.061	1720	1518	44	0.026	0.70	
S-24	0.64	1.3	1.6	3.3	4.1	D/R	1.367	0.746	1522	1470	38	0.026	0.31	
U-1	2.53	1.4	1.8	3.34	4.19	MTN	2.619	1.667	1800	1610	73	0.030	0.56	
U-2	1.60	1.4	1.8	3.34	4.19	MTN	2.746	1.705	1770	1610	58	0.031	0.62	
U-3	0.84	1.4	1.8	3.34	4.19	MTN	2.083	1.307	1800	1610	91	0.034	0.50	
U-4	2.80	1.4	1.8	3.34	4.19	MTN	2.074	1.193	1850	1570	135	0.036	0.48	
U-5	3.25	1.4	1.8	3.34	4.19	D/R	3.335	1.856	2100	1555	163	0.032	0.59	
U-6	0.70	1.4	1.8	3.34	4.19	MTN	1.413	0.795	1980	1535	315	0.041	0.34	
U-7	1.47	1.4	1.8	3.34	4.19	D/R	3.335	1.818	1680	1515	49	0.025	0.57	

Notes:
1. S-graphs: MTN = Phoenix Mountain; D/R = Desert/Rangeland
2. Pm,n - point precipitation with recurrence interval of m years and duration of n hours
3. Weighted Kn values are calculated in Table 2. DDMS rounds Kn to nearest hundredth.

Table 2
Calculation of Weighted Kn Values

Subarea	Kn	Percent Length	Kn	Percent Length	Kn	Percent Length	Weighted Kn
S-1	0.05	30	0.04	30	0.033	40	0.040
S-2	0.045	25	0.033	75			0.036
S-3	0.045	20	0.033	80			0.035
S-4	0.05	30	0.04	30	0.033	40	0.040
S-5	0.05	40	0.04	40	0.033	20	0.043
S-6	0.04	20	0.033	60	0.03	20	0.034
S-7	0.033	20	0.03	80			0.031
S-8	0.04	20	0.033	80			0.034
S-9	0.045	70	0.04	30			0.044
S-10	0.033	70	0.03	30			0.032
S-11	0.045	30	0.033	70			0.037
S-12	0.033	25	0.03	75			0.031
S-13	0.045	25	0.033	40	0.03	35	0.035
S-14	0.045	30	0.033	40	0.03	30	0.036
S-15	0.045	20	0.033	60	0.03	20	0.035
S-16	0.04	33	0.03	67			0.033
S-17	0.045	25	0.04	25	0.033	50	0.038
S-18	0.03	100					0.030
S-19	0.033	20	0.03	80			0.031
S-20	0.03	100					0.030
S-21	0.03	20	0.025	80			0.026
S-22	0.045	35	0.025	65			0.032
S-23	0.03	10	0.025	90			0.026
S-24	0.03	20	0.025	80			0.026
U-1	0.03	100					0.030
U-2	0.04	10	0.03	90			0.031
U-3	0.045	25	0.03	75			0.034
U-4	0.05	30	0.03	70			0.036
U-5	0.045	25	0.03	45	0.025	30	0.032
U-6	0.05	55	0.03	45			0.041
U-7	0.025	100					0.025

Notes:
1. DDMS rounds Kn to nearest hundredth.

Table 3
Basic Soils Data

Subarea	Soil Type	Area (sq mi)
S-1	8	0.053
	72	1.031
	96	0.021
	40	0.811
	93	0.002
	104	0.027
	41	0.135
Total		2.08
Total F.S. land		0.726
Dist'n of F.S. land:		
Soil	% of Total	Area
40	50	0.363
72	50	0.363

Subarea	Soil Type	Area (sq mi)
S-2	72	0.265
	96	0.046
	40	0.309
	8	0.055
	93	0.014
	66	0.08
	41	0.121
	95	0.076
	26	0.142
	68	0.018
	110	0.026
	10	0.012
	13	0.009
	12	0.001
Total		1.174

Subarea	Soil Type	Area (sq mi)
S-3	41	0.224
	95	0.043
	66	0.62
	72	0.107
	96	0.022
	68	0.007
	12	0.007
Total		1.03
Total F.S. land		0.203
Dist'n of F.S. land:		
Soil	% of Total	Area
41	40	0.081
72	30	0.061
66	30	0.061

Subarea	Soil Type	Area (sq mi)
S-4	66	0.017
	95	0.02
	40	0.933
Total		0.97
Total F.S. land		0.933
Dist'n of F.S. land:		
Soil	% of Total	Area
40	100	0.933

Subarea	Soil Type	Area (sq mi)
S-5	95	0.004
	8	0.005
	41	0.005
	40	1.836
check total		1.85
Total F.S. land		1.836
Dist'n of F.S. land:		
Soil	% of Total	Area
40	100	1.836

Subarea	Soil Type	Area (sq mi)
S-6	110	0.069
	13	0.109
	10	0.111
	12	0.138
	96	0.013
	95	0.052
	8	0.019
	41	0.206
	66	0.17
	98	0.036
	3	0.013
Total		0.936
Total F.S. land		0.012
Dist'n of F.S. land:		
Soil	% of Total	Area
66	100	0.012

Subarea	Soil Type	Area (sq mi)
S-7	26	0.042
	49	0.023
	110	0.175
	52	0.112
	13	0.088
	98	0.099
	22	0.082
	3	0.02
	45	0.04
Total		0.681

Subarea	Soil Type	Area (sq mi)
S-8	52	0.014
	45	0.309
	22	0.027
	109	0.705
	98	0.006
	3	0.06
Total		1.121

Subarea	Soil Type	Area (sq mi)
S-9	95	0.009
	66	0.027
	40	0.985
Total		1.021
Total F.S. land		0.985
Dist'n of F.S. land:		
Soil	% of Total	Area
40	100	0.985

Subarea	Soil Type	Area (sq mi)
S-10	66	0.73
	95	0.278
	41	0.096
	110	0.04
	98	0.024
	13	0.09
	3	0.155
	120	0.093
	93	0.159
	96	0.049
	6	0.033
	109	0.054
Total		1.801
Total F.S. land		0.201
Dist'n of F.S. land:		
Soil	% of Total	Area
66	80	0.161
93	20	0.04

Subarea	Soil Type	Area (sq mi)
S-11	40	0.92
Total F.S. land		0.92
Dist'n of F.S. land:		
Soil	% of Total	Area
40	100	0.92

Subarea	Soil Type	Area (sq mi)
S-12	95	0.425
	66	0.383
	26	0.076
	52	0.002
	68	0.02
	3	0.004
Total		0.91
Total F.S. land		0.522
Dist'n of F.S. land:		
Soil	% of Total	Area
95	50	0.261
66	50	0.261

Table 3 (Continued)
Basic Soils Data

Subarea	Soil Type	Area (sq mi)	Subarea	Soil Type	Area (sq mi)	Subarea	Soil Type	Area (sq mi)	Subarea	Soil Type	Area (sq mi)	Subarea	Soil Type	Area (sq mi)	Subarea	Soil Type	Area (sq mi)
S-13	109	0.66	S-14	109	0.392	S-15	13	0.017	S-16	110	0.1	S-17	110	0.325	S-18	12	0.719
	98	0.06		44	0.232		44	0.089		13	0.16		68	0.024		112	0.338
	44	0.234		68	0.051		68	0.1		52	0.015		72	0.264		110	0.022
	110	0.126		52	0.032		12	0.058		3	0.258		12	0.114		44	0.067
	68	0.075		26	0.02		52	0.252		44	0.168		13	0.02		98	0.116
	3	0.054		13	0.02		72	0.299		109	0.386		98	0.105		113	0.125
	13	0.019		3	0.086		110	0.164		68	0.088		44	0.158		22	0.326
	66	0.033	Total		0.833		98	0.008		12	0.044		112	0.023	Total		1.713
	52	0.009				Total		0.987		98	0.099	Total		1.033			
	96	0.001							Total		1.318						
Total		1.271															

Subarea	Soil Type	Area (sq mi)	Subarea	Soil Type	Area (sq mi)	Subarea	Soil Type	Area (sq mi)	Subarea	Soil Type	Area (sq mi)	Subarea	Soil Type	Area (sq mi)	Subarea	Soil Type	Area (sq mi)
S-20	12	0.293	S-19	112	0.155	S-21	44	0.028	S-22	44	0.12	S-23	12	1.056	S-24	12	0.304
	13	0.243		22	0.199		98	0.107		12	0.183		44	0.026		3	0.14
	113	0.013		13	0.044		3	0.364		110	0.102		100	0.041		55	0.063
	110	0.224		12	0.059		110	0.1		18	0.045		110	0.007		98	0.012
	112	0.063		44	0.186		13	0.079		55	0.004		3	0.326		75	0.061
	22	0.106		75	0.022		50	0.136		52	0.314		55	0.12		112	0.06
	52	0.327		52	0.101		12	1.105		100	0.141		112	0.095	Total		0.64
	100	0.004		68	0.005		112	0.103		123	0.312		50	0.037			
Total		1.273		100	0.001		22	0.068		98	0.04		98	0.012			
			Total		0.772		55	0.028		21	0.004	Total		1.72			
							18	0.028		3	0.202						
							52	0.005	Total		1.467						
							22	0.07									
						Total		2.221									

Table 4
Basic Land Use Data

Subarea	Land Code	Land Type	Area (sq mi)
S-1	31	Vacant	1.398
	41	Forest	0.68
Total			2.078

Subarea	Land Code	Land Type	Area (sq mi)
S-2	1	LDR	0.113
	31	Vacant	1.06
Total			1.173

Subarea	Land Code	Land Type	Area (sq mi)
S-3	1	LDR	0.114
	31	Vacant	0.722
	41	Forest	0.194
Total			1.03

Subarea	Land Code	Land Type	Area (sq mi)
S-4	31	Vacant	0.041
	41	Forest	0.932
Total			0.973

Subarea	Land Code	Land Type	Area (sq mi)
S-5	31	Vacant	0.016
	41	Forest	1.837
Total			1.853

Subarea	Land Code	Land Type	Area (sq mi)
S-6	1	LDR	0.309
	22	Inst/Rel	0.003
	31	Vacant	0.614
	41	Forest	0.01
Total			0.936

Subarea	Land Code	Land Type	Area (sq mi)
S-7	1	LDR	0.189
	31	Vacant	0.495
Total			0.684

Subarea	Land Code	Land Type	Area (sq mi)
S-8	31	Vacant	1.12
Total			1.12

Subarea	Land Code	Land Type	Area (sq mi)
S-9	31	Vacant	0.043
	41	Forest	0.978
Total			1.021

Subarea	Land Code	Land Type	Area (sq mi)
S-10	31	Vacant	1.455
	41	Forest	0.188
	1	LDR	0.154
Total			1.797

Subarea	Land Code	Land Type	Area (sq mi)
S-11	41	Forest	0.92
Total			0.92

Subarea	Land Code	Land Type	Area (sq mi)
S-12	41	Forest	0.506
	31	Vacant	0.214
	1	LDR	0.193
Total			0.913

Subarea	Land Code	Land Type	Area (sq mi)
S-13	1	LDR	0.203
	7	MedCom	0.031
	31	Vacant	1.038
Total			1.272

Subarea	Land Code	Land Type	Area (sq mi)
S-14	1	LDR	0.108
	7	MedCom	0.105
	31	Vacant	0.62
Total			0.833

Subarea	Land Code	Land Type	Area (sq mi)
S-15	1	LDR	0.18
	31	Vacant	0.807
Total			0.987

Subarea	Land Code	Land Type	Area (sq mi)
S-16	1	LDR	0.095
	31	Vacant	1.221
Total			1.316

Table 4 (Continued)
Basic Land Use Data

Subarea	Land Code	Land Type	Area (sq mi)	Subarea	Land Code	Land Type	Area (sq mi)	Subarea	Land Code	Land Type	Area (sq mi)	Subarea	Land Code	Land Type	Area (sq mi)
S-17	1	LDR	0.044	S-18	1	LDR	0.043	S-20	1	LDR	0.194	S-19	1	LDR	0.171
	31	Vacant	0.988		31	Vacant	1.647		31	Vacant	1.082		31	Vacant	0.582
					34	Stkyrd	0.025						34	Stkyrd	0.02
Total			1.032	Total			1.715	Total			1.276	Total			0.773

Subarea	Land Code	Land Type	Area (sq mi)	Subarea	Land Code	Land Type	Area (sq mi)	Subarea	Land Code	Land Type	Area (sq mi)	Subarea	Land Code	Land Type	Area (sq mi)
S-21	1	LDR	0.061	S-22	30	River	0.002	S-23	31	Vacant	1.72	S-24	1	LDR	0.048
	31	Vacant	2.157		31	Vacant	1.466						30	River	0.004
													31	Vacant	0.588
Total			2.218	Total			1.468	Total			1.72	Total			0.64

Subarea	Land Code	Land Type	Area (sq mi)	Subarea	Land Code	Land Type	Area (sq mi)	Subarea	Land Code	Land Type	Area (sq mi)	Subarea	Land Code	Land Type	Area (sq mi)
U-1	31	Vacant	2.53	U-2	31	Vacant	1.596	U-3	31	Vacant	0.843	U-4	31	Vacant	2.8
Total			2.53	Total			1.596	Total			0.843	Total			2.8

Subarea	Land Code	Land Type	Area (sq mi)	Subarea	Land Code	Land Type	Area (sq mi)	Subarea	Land Code	Land Type	Area (sq mi)
U-5	31	Vacant	3.26	U-6	31	Vacant	0.7	U-7	31	Vacant	1.47
Total			3.26	Total			0.7	Total			1.47

Notes:
1. Subarea S-14 land use areas were adjusted from measured values to match total subbasin area.

Table 5
Calculation of Weighted Percent Vegetation Cover

Subarea	Mtn Percent	Hillside Percent	Valley Percent	Weighted Veg Cvr	Ret. Loss IA
S-1	70	30		18	0.22
S-2	30	70		22	0.18
S-3	20	80		23	0.17
S-4	50	50		20	0.20
S-5	80	20		17	0.23
S-6		60	40	31	0.23
S-7		100		25	0.15
S-8	20	80		23	0.17
S-9	50	50		20	0.20
S-10		90	10	27	0.17
S-11	50	50		20	0.20
S-12		100		25	0.15
S-13	30	50	20	25	0.22
S-14	40	40	20	24	0.23
S-15	20	60	20	26	0.21
S-16	20	20	60	32	0.29
S-17	10	90		24	0.16
S-18		100		25	0.15
S-19	20	80		23	0.17
S-20	20	80		23	0.17
S-21		70	30	30	0.21
S-22	40	30	30	26	0.25
S-23			100	40	0.35
S-24			100	40	0.35
U-1	25	30	45	29	0.27
U-2	15	25	60	33	0.29
U-3	30	40	30	27	0.24
U-4	30	45	25	26	0.23
U-5	20	25	55	31	0.28
U-6	55	45		20	0.21
U-7			100	40	0.35

Notes:
1. Weighted vegetation cover used in loss rate calculations.
2. IA value used as check to DDMS-calculated value. Model uses DDMS value.

Vegetation Cover		
Mountain areas have	15%	cover
Hillside areas have	25%	cover
Valley areas have	40%	cover
Based on limited field recon, Nov. 1995		

Surface Retention Losses	IA
Mountain Areas	0.25
Hillside Areas	0.15
Valley Areas	0.35

Table 6
Hydrograph Routing Data

From Subarea	To Subarea	Map Length (ft)	Model Length (1) (ft)	High Elev	Low Elev	Slope (ft/ft)	n value	Velocity (2) (fps)	Vm/V (3)	Celerity Vm (fps)	Travel Time (min)	Muskingum Coefficients K (4) (hr)	X	NSTPS (5)
S-1	S-2	8325	9574	2320	2190	0.014	0.045	6.4	1.33	8.57	19	0.31	0.35	4
S-3	S-6	7244	8331	2190	2113	0.009	0.045	5.3	1.33	7.07	20	0.33	0.30	4
S-5	S-6	11350	13053	2280	2113	0.013	0.045	6.3	1.33	8.32	26	0.44	0.30	5
S-6	S-10	5709	6565	2113	2050	0.010	0.040	6.1	1.67	10.18	11	0.18	0.25	2
S-8	S-10	4108	4724	2090	2050	0.008	0.040	5.7	1.67	9.56	8	0.14	0.25	2
S-9	S-10	8635	9930	2200	2050	0.015	0.040	7.6	1.67	12.77	13	0.22	0.30	3
S-10	S-13	2807	3228	2050	2020	0.009	0.040	6.0	1.67	10.01	5	0.09	0.25	1
S-11	S-12	12303	14148	2280	2020	0.018	0.035	9.6	1.67	16.09	15	0.24	0.30	3
S-13	S-14	4388	5046	2020	1980	0.008	0.040	5.5	1.67	9.25	9	0.15	0.25	2
C-9	S-14	1531	1761	2010	1980	0.017	0.040	8.1	1.67	13.56	2	0.04	0.25	1
S-14	S-16	6790	7809	1980	1940	0.005	0.040	4.5	1.67	7.44	18	0.29	0.25	4
S-15	S-16	2552	2935	1940	1910	0.010	0.040	6.3	1.67	10.50	5	0.08	0.25	1
S-16	S-21	17676	20327	1910	1760	0.007	0.030	7.1	1.67	11.90	28	0.47	0.15	6
S-17	S-18	9622	11065	1865	1795	0.006	0.035	5.7	1.67	9.44	20	0.33	0.25	4
S-18	S-19	1714	1971	1795	1785	0.005	0.035	5.1	1.67	8.46	4	0.06	0.20	1
S-19	S-20	6204	7135	1785	1760	0.004	0.035	4.2	1.67	7.03	17	0.28	0.20	3
S-21	S-22	9785	11253	1760	1680	0.007	0.030	7.0	1.67	11.68	16	0.27	0.20	3
S-22	S-23	20159	23183	1680	1520	0.007	0.030	6.9	1.67	11.51	34	0.56	0.15	7
S-23	S-24	6857	7886	1520	1475	0.006	0.030	6.3	1.67	10.46	13	0.21	0.15	3
U-3	U-4	4800	5520	1610	1575	0.006	0.040	5.0	1.67	8.27	11	0.19	0.20	2
U-4	U-5	4500	5175	1575	1550	0.005	0.040	4.3	1.67	7.22	12	0.20	0.20	2
U-5	U-7	6500	7475	1550	1510	0.005	0.035	5.2	1.67	8.69	14	0.24	0.15	3
U-6	U-7	2500	2875	1525	1510	0.005	0.035	5.1	1.67	8.58	6	0.09	0.15	1
U-7	S-24	8000	9200	1510	1475	0.004	0.030	5.1	1.67	8.54	18	0.30	0.15	4

Notes:
1. Model length = map length x 1.15 to account for simplification in channel alignment due to map scale (based on engineering judgement).
2. Velocity calculated by Mannings equation using a constant typical hydraulic raduis R=1.67 based on section 7.7 in Drainage Design Manual.
3. Vm/V ratios from table on Page 7-7 of Drainage Design Manual.
4. K = travel time through the reach, in hours
5. NSTPS calculated using NSTPS = K/deltaT (midpoint of HEC-1 inequality), assuming a deltaT = 5 minutes.

Table 7
6-Hour Storm Patterns

Time (hrs)	Pattern No. 3.8 (Percent of Total Rainfall Depth)
0:00	0.000
0:15	0.020
0:30	0.032
0:45	0.047
1:00	0.066
1:15	0.082
1:30	0.099
1:45	0.118
2:00	0.135
2:15	0.152
2:30	0.170
2:45	0.191
3:00	0.221
3:15	0.269
3:30	0.352
3:45	0.494
4:00	0.660
4:15	0.778
4:30	0.846
4:45	0.893
5:00	0.931
5:15	0.948
5:30	0.966
5:45	0.983
6:00	1.000

Notes:
1. Pattern No. 3.8 applies to a 64 sq. mi. storm area.

- Use of the currently adopted hydrology would be conservative for planning purposes.

Based on these and other factors, the District and Montgomery Watson concurred that the new discharges (i.e., the discharges from this Hydrology Report) would be used to complete the Skunk Creek Floodplain Delineation Study.

3.1 METHOD DESCRIPTION

Peak discharges were determined using the HEC-1 Flood Hydrograph Package program, version 4.0.1 (May 1991). Analyses were conducted in accordance with the Hydrologic Design Manual for Maricopa County, Arizona (Hydrology Manual) (FCDMC, 1995).

3.2 HYDROLOGIC PARAMETER ESTIMATION

This section describes the procedures used to determine hydrologic modeling parameters for the Skunk Creek Floodplain Delineation Study HEC-1 analysis. Procedures followed the guidelines provided in the Hydrology Manual. Tables, figures, and other portions of the Hydrology Manual are referenced in this document as necessary. Where appropriate, parameters were computed with the use of the District's Drainage Design Menu System (DDMS) software (Version 1.1, August 1995). DDMS output is contained in **Appendix A**.

HEC-1 input files were available from the District for the Cline Creek and Rodger Creek subwatersheds. Original input files were developed by Baker Engineers for the floodplain delineation studies conducted for these watersheds in 1989. Modeling procedures used in these models did not entirely conform with the current District hydrologic criteria. Therefore, District staff updated the models to be consistent with the current criteria. This involved recomputing lag times; using the Maricopa County S-Graph procedure to develop unit hydrographs rather than using the SCS method; and using the Green-Ampt loss rate method instead of the uniform loss rate calculations. Cline Creek and Rodger Creek HEC-1 input data files provided by the District were incorporated directly into the Skunk Creek HEC-1 model for this project.

Hydrologic parameter estimation for the Cline Creek and Rodger Creek subwatersheds is beyond the scope of this study. The revisions to the Cline and Rodger Creek HEC-1 modeling were performed by District staff. Necessary documentation can be found in **Appendix B**.

3.2.1 Subarea Boundary Delineation

Subareas in the main Skunk Creek watershed and Union Hills subwatershed were delineated using USGS 7-1/2 minute quadrangle maps at a scale of 1" = 2000'. The lack of urban development in the watershed makes these maps suitable for subarea delineation throughout the study area. Subareas were digitized and areas were determined by CAD software. Subbasin areas are listed in **Table 1**. The typical subarea size is about 1.0 square mile. Subareas for the Cline Creek and Rodger Creek subwatersheds were taken from the Baker Engineers hydrologic analysis. Subareas on the USGS map base are shown in **Figure 2** *[oversized map accompanying this report]*.

3.2.2 Physical Parameters

3.2.2.1 Lag Time

Basin lag for each subarea was computed using the Corps of Engineers' formula. Basin lengths and slopes were measured from the USGS quadrangles. The slope was computed as the difference between the maximum elevation and minimum elevation along the longest flowpath, divided by the length of the longest flowpath. Basin roughness (Kn) was computed as a weighted average of channel roughness values for segments of the longest flowpath. Kn values were compared to

calibrated values for other watersheds listed in Appendix K in the Hydrology Manual. Table 1 shows the parameters used to compute basin lag for each subarea. **Table 2** shows calculations of weighted average Kn values. Some of the computed Kn values for predominantly desert/rangeland subareas slightly exceed the range of common Kn values given in Table 5-4 of the Hydrology Manual. This is due to the influence of the upper mountainous portions of the subareas, which introduce higher Kn segments to the weighting process.

3.2.2.2 Loss Rates

As stipulated by the Hydrology Manual, the Green-Ampt Method was used to compute watershed losses. The District's DDMS was used to compute Green-Ampt parameters as a function of soil type and vegetation cover.

Soil types for a majority of the Skunk Creek watershed were available in digital form from the County's soils database. The soils map for the Skunk Creek watershed is shown in **Figure 3** *[oversized map accompanying this report]*. The area of each soil type in each subarea was computed in CAD, and is given in **Table 3**. The DDMS contains relationships between soil type and hydrologic loss conditions.

The portion of the Skunk Creek watershed in the Tonto National Forest was not covered by the County's digital soil mapping, and adequate soil maps for this area were not available from other sources. Soil types in this area were estimated by comparison with adjacent mapped areas in the Skunk Creek watershed, making extrapolations based on similar topography and orientation. Table 3 documents these assumptions.

Land use mapping for existing conditions was obtained from the County's HIS for the Skunk Creek watershed. This mapping is shown in **Figure 4** *[oversized map accompanying this report]*. Land use breakdowns in each subarea are given in **Table 4**, as determined from CAD. The DDMS allows for default or input relationships between land use and percent imperviousness. The default values were used.

Antecedent moisture conditions were assumed to be dry, even for residential land uses. Field reconnaissance indicated that residential areas in the study area have predominantly desert landscaping with no significant lawns or irrigated areas.

Vegetation cover was estimated for each subarea by assuming typical vegetation cover conditions for typical topographic conditions (15 percent cover in mountain areas, 25 percent cover in hillside areas, and 40 percent cover in valley areas). Weighted average vegetation cover was computed for each subarea based on the distribution of topographic conditions. This is shown in **Table 5**.

3.2.2.3 Hydrograph Routing

Stream routing was performed using the Muskingum Method. The Muskingum X parameter was estimated based on assumed typical channel conditions using the criteria in Section 7.7 in the Hydrology Manual. The Muskingum K parameter is equal to the travel time through the routing reach. This was computed by calculating the flow velocity using Manning's equation and an assumed simplified channel cross section, then adjusting for wave celerity using the method in the Hydrology Manual. The NSTPS parameter was calculated as K divided by the HEC-1 model computation interval (5 minutes). Muskingum routing parameters for each reach are given in **Table 6**.

Transmission losses due to infiltration in the streambed and floodplain were not considered explicitly in the routing computations.

There are no flood control storage or channelization projects in the watershed which are significant enough from a routing standpoint to include in the HEC-1 model.

3.2.3 Statistical Parameters

Statistical parameters used in the flood frequency analyses and their applicability under WRD Bulletin 17B are discussed in detail in Section 3.3.1.

3.2.4 Precipitation

Point precipitation depths for each subarea for 6-hour and 24-hour durations and 2-year and 100-year return periods were estimated using the isopluvial maps in the Hydrology Manual (Figures 2.2, 2.7, 2.8, 2.13). Point precipitation depths are listed in Table 1. The 6-hour local storm and the 24-hour general storm were each simulated because the total Skunk Creek drainage area (64 square miles) is greater than 10 square miles and less than 100 square miles. Precipitation depths were adjusted for storm areal coverage using the depth-area reduction factors in the Hydrology Manual (Table 2.1a and Table 2.2).

3.2.4.1 Time Distribution

The time distribution of rainfall for the 6-hour local storm was determined using the storm patterns for Maricopa County in the Hydrology Manual (Figure 2.16). The storm pattern number was determined based on the total area of storm coverage using Figure 2.17 in the Hydrology Manual, and dimensionless precipitation values for each time increment were interpolated from the storm pattern data in Table 2.4 in the Hydrology Manual. The 6-hour pattern for a storm covering the entire Skunk Creek watershed is given in **Table 7**. For the 24-hour storm the SCS Type II distribution was used.

3.2.4.2 Rainfall-Runoff Conversion

Conversion of excess rainfall to runoff was accomplished using the S-Graph Method due to the large size of the total Skunk Creek watershed (64 square miles). Either the Mountain S-Graph or the Desert/Rangeland S-Graph, as defined in the Hydrology Manual, was assigned to each subarea based on its dominant topographic conditions. In general, subareas with watershed slopes exceeding 300 ft/mile were assigned the Mountain S-Graph, and subareas with flatter slopes were assigned the Desert/Rangeland S-Graph. S-Graphs for each subarea are listed in Table 1.

3.3 MODEL CALIBRATION

Results from the rainfall-runoff model were compared with peak discharge estimates from several sources as described below.

3.3.1 Flood Frequency Analysis

A flood frequency analysis was performed using U.S. Geological Survey (USGS) gaged data and regional regression equations. These methods and their results are presented in the following paragraphs.

3.3.1.1 USGS Gauged Records

The USGS has maintained a flood record gauging station on Skunk Creek since 1959 (Water Year 1960). The gauge station is located approximately 300 feet upstream of the Interstate 17 frontage road, approximately one mile downstream of the CAP Aqueduct. A full description of the gauge, its

location, and the recorded annual peak discharges for the available period of record are listed in **Table 8**.

Table 8
Skunk Creek at Interstate 17
Historical Peak Discharge Data

Water Year	Date	Annual Peak Discharge (cfs)	Water Year	Date	Annual Peak Discharge (cfs)
1960	12/25/59	9400	1978	3/1/78	3590
1961	n/a	0	1979	1/18/79	600
1962	n/a	175	1980	2/20/80	1210
1963	n/a	480	1981	7/16/81	311
1964	8/1/64	11500	1982	10/2/81	281
1965	2/7/65	400	1983	11/30/82	6170
1966	8/18/66	700	1984	9/26/84	565
1967	9/2/67	950	1985	1/26/85	1320
1968	12/19/67	5900	1986	7/22/86	906
1969	n/a	0	1987	10/10/86	3440
1970	9/5/70	9650	1988	11/1/87	2250
1971	8/21/71	4770	1989	1/4/89	111
1972	7/17/72	2380	1990	8/12/90	8160
1973	10/6/72	4700	1991	8/11/91	1250
1974	7/21/74	300	1992	8/23/92	7020
1975	10/29/74	240	1993	1/8/93	4990
1976	7/28/76	13	1994	n/a	0
1977	1/3/77	70			

Description: Skunk Creek Near Phoenix, AZ - USGS No. 09513860
Gauging Station Records for Period 1960-1994

Location: Lat 33°43'50", Long 112°07'09" in SE 1/4 Sec. 35, T.5 N., R.2E., Maricopa County
Located on the right bank dike of Skunk Creek flood-control channel, 300 ft east of Interstate 17, 3 miles north of Adobe
Prior to December 29, 1984, the gauge was located 300 feet downstream

A 1989 Summary Report published by the USGS was used to obtain the annual peak discharges for the period 1960-1989. This summary report also provides the monthly mean discharges and the results of a flood-frequency analysis for the period of record. The flood records for the period 1990-1994 were obtained from the Annual Water Resources Bulletins.

The results of the discharge-frequency analysis presented in the Summary Report for the period 1960-1989 are as follows:

Discharge in CFS for Indicated Recurrence Interval in Years

2	5	10	25	50	100
967	3,510	6,910	13,700	21,200	31,000

Review of the annual peak discharges for the full period of record indicates that several large flood events occurred during the period of 1990-1994. Inclusion of these most recent events could have an impact on the computed flood-frequency curve. A new flood-frequency analysis was thus performed and is compared to the published analysis in the following sections.

3.3.1.2 Methodology

Procedures presented in the report *"Guidelines For Determining Flood Flow Frequency,"* prepared by the US Water Resources Council (Bulletin #17B, September 1991), were used in the development of an updated flood-frequency analysis using the latest gauged data. In order to ensure that the methodology was applied in a similar manner to the published flood-frequency analysis, the data for the period 1960-1989 was first analyzed. In this way it was possible to check the assumptions made regarding the type of distribution, exclusion of low flow or no record years, and the applied generalized skew coefficient.

Bulletin #17B recommends the use of procedures for the determination of the annual flood series. The partial-duration flood series was therefore not computed in this study. The Pearson Type III distribution with a log transformation of the flood data was used. Procedures are described in greater detail in Bulletin #17B. The following steps were taken to establish the data plotting positions and to develop a "best fit" curve for the periods 1960-1989 and 1960-1994:

1. Data for the period of record were ranked in descending order of magnitude and a plotting position determined using the Weibull Plotting Position formula.

2. The logarithm of the annual peak flow, the standard deviation of logarithms and the skew coefficient of logarithms were computed.

3. Methods described for a conditional probability adjustment were applied since there are years when no flow was recorded or very low flows. Tests were made to determine whether either high or low outliers exist. It was determined that a low flow record of 13 cfs in 1976 should be eliminated from the analysis. The statistics were then recomputed after eliminating the low outlier and the years of zero flow.

4. The computed probability statistics were adjusted and a conditional adjusted probability determined.

5. Using linear interpolation of the logarithms of the flowrates, conditional adjusted flowrates were determined for the 0.01, 0.1 and 0.5 exceedance probabilities.

6. The synthetic mean, standard deviation, and skew coefficient were then computed.

7. The mean square error of the station flowrate was then computed.

8. A weighted skew coefficient was then computed using a generalized skew coefficient for the region. Generalized skew coefficients for the entire United States are provided Bulletin #17B. A generalized skew coefficient of -0.125 was used for the Skunk Creek watershed.

Details of the analysis for each of the flow periods, using the above procedures, are contained in **Appendix C**.

3.3.1.3 Results

The analysis was conducted for the period 1960-1989 as a check of the procedures and assumptions made in computing the flood frequency statistics. Results from the analysis for the period 1960-1989 were compared with those published in the 1989 Summary Report and are summarized as follows:

Discharge in CFS for Indicated Recurrence Interval in Years

Recurrence Interval (years)	2	5	10	25	50	100
USGS Summary Report	967	3,510	6,910	13,700	21,200	31,000
Analysis for Period 1960-1989	926	3,438	6,688	13,397	20,815	30,772

The results are close enough to indicate that the assumptions and procedures used are similar. The procedure was thus repeated using the additional data available for the years 1990-1994 and the same generalized skew coefficient. Results for the period 1960-1994 are as follows:

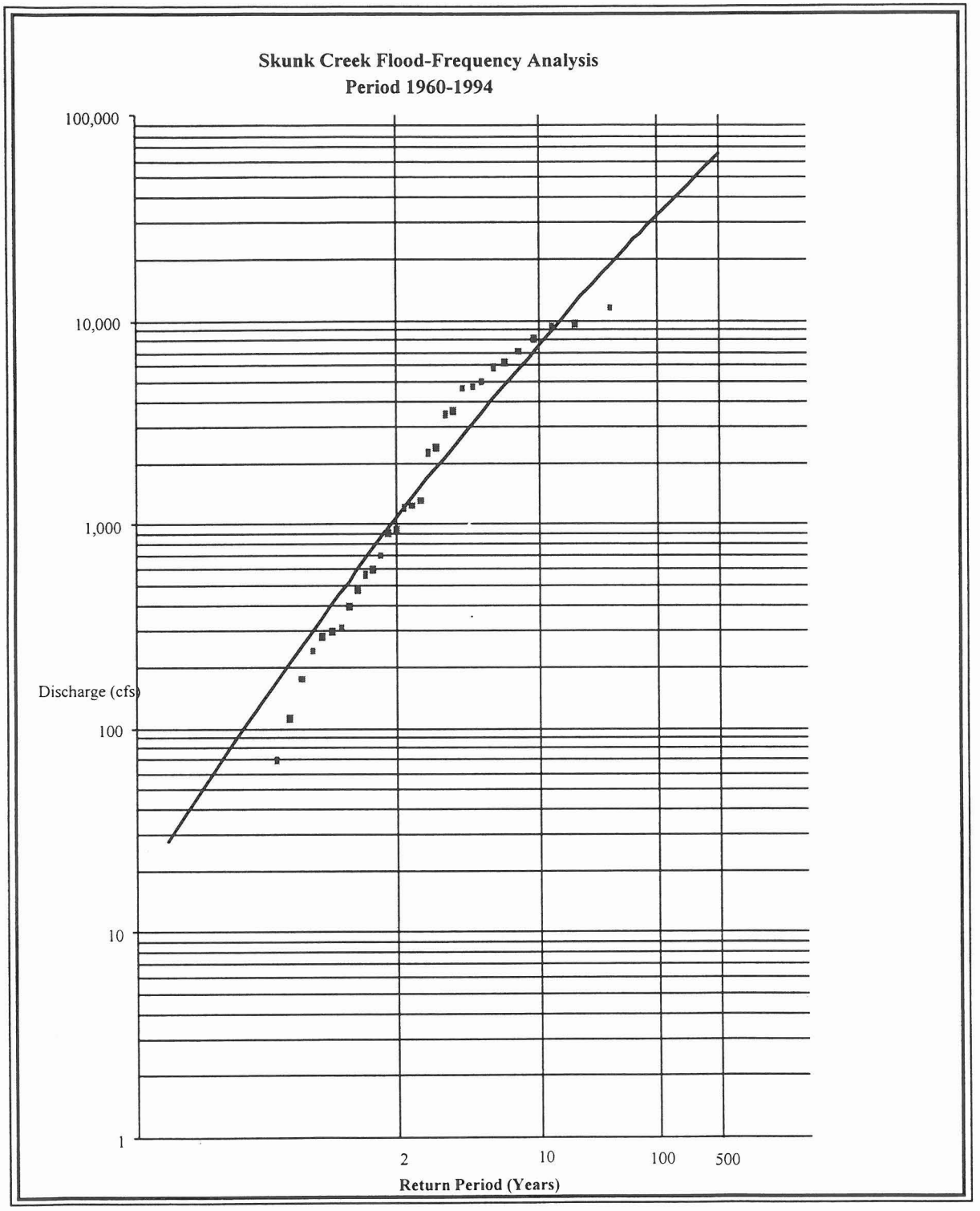
Discharge in CFS for Indicated Recurrence Interval in Years

Recurrence Interval (years)	2	5	10	25	50	100
Analysis for Period 1960-1994	1,090	4,069	7,776	15,050	22,683	32,455
Percent Increase from 1960-1989	18%	18%	16%	12%	9%	6%

As would be expected, the addition of the recent flood events results in an increase in the peak discharge for a given recurrence interval. The resulting flood-frequency curve is illustrated in **Figure 5**.

3.3.2 Regional Regression Equations - USGS Roeske Method

The USGS has developed regional regression equations for estimating the flood magnitudes at ungaged sites. The methodology is described in detail in the report entitled *"Methods for Estimating the Magnitude and Frequency of Floods in Arizona," September, 1978.* The formulae presented therein allow for the estimation of flood magnitudes for recurrence intervals of 2, 5, 10, 25, 50, 100, and 500 years. The equations, which have been developed for six different regions of the state, utilize the variables of drainage area, mean basin elevation, and mean annual precipitation.



Adjusted Frequency Curve for Skunk Creek at I-17
Figure 5

The Skunk Creek watershed lies within what is defined as the Central Mountain Area. Regression equations for that area are as follows:

$$Q_2 = 5.66\,A^{0.673}\,E^{-0.605}\,p^{1.03}$$
$$Q_5 = 31.6\,A^{0.650}\,E^{-0.868}\,p^{0.987}$$
$$Q_{10} = 74.7\,A^{0.638}\,E^{-1.00}\,p^{0.971}$$
$$Q_{25} = 186\,A^{0.626}\,E^{-1.14}\,p^{0.944}$$
$$Q_{50} = 329\,A^{0.617}\,E^{-1.22}\,p^{0.933}$$
$$Q_{100} = 553\,A^{0.610}\,E^{-1.30}\,p^{0.915}$$
$$Q_{500} = 1{,}530\,A^{0.595}\,E^{-1.45}\,p^{0.886}$$

Where: Q = Flood Magnitude in cfs
A = Drainage Area in mi ^{2}
E = Mean Basin Elevation in feet above MSL
p = Mean Annual Precipitation in inches

A subbasin area of 64 mi^2, a mean basin elevation of 2210 feet, and an average annual precipitation of 14 inches were used to develop the flood frequencies.

3.3.3 Regional Regression Equations - ADWR Method

The Arizona Department of Water Resources (ADWR) conducted a literature search of available methodologies for estimating flood frequencies in the report *"A Study to Evaluate Existing Methods for Determining Peak Discharges for Ungaged Watersheds in Arizona - Phase II & III Report,"* draft May, 1995. According to the report, the Skunk Creek watershed lies within Region 12 for which the use of the following regression equations is recommended:

$$Q_2 = 41.1\,A^{0.629}$$
$$Q_5 = 238\,A^{0.687}\,E^{-0.358}$$
$$Q_{10} = 479\,A^{0.661}\,E^{-0.398}$$
$$Q_{25} = 942\,A^{0.630}\,E^{-0.383}$$
$$Q_{50} = 10^{(7.36 - 4.17\,A^{-0.08})}\,E^{-0.440}$$
$$Q_{100} = 10^{(6.55 - 3.17\,A^{-0.11})}\,E^{-0.454}$$

Input variables are the same as defined for the USGS methodology.

3.3.4 Comparison of Methodologies

The results from the flood frequency analysis for the period 1960-1989, the flood frequency analysis for the period 1960-1994, the USGS Regression Equations, and the ADWR Regression Equations are compared in **Table 9**.

Table 9
Comparison of Flood Frequency Analyses

Return Period (years)	Discharge (cfs)					
	2	5	10	25	50	100
Flood Frequency Analysis (1960-1989)	970	3,600	6,900	13,700	21,200	31,000
Flood Frequency Analysis (1960-1994)	1,100	4,100	7,800	15,100	22,700	32,500
USGS Regression Analysis	870	3,200	6,200	12,300	19,100	28,000
ADWR Regression Analysis	560	3,100	5,500	9,600	16,600	24,400

The analyses of gauged records support a 100-year discharge at I-17 of about 32,000 cfs. The regional regression approaches support a somewhat lower value in the 24,000 - 28,000 cfs range. Neither method produces a 100-year peak flow estimate as high as the current adopted value of 35,000 cfs at the CAP Aqueduct.

3.3.5 Cline Creek and Rodger Creek Calibrations

District staff revised HEC-1 modeling parameters from the Baker Engineers models to be consistent with current Hydrology Manual criteria. Certain parameters were then adjusted to obtain better agreement between with the original 100-year discharges computed at the Skunk Creek confluence. This calibration process is described in **Appendix B**.

3.3.6 Sensitivity Analysis of Hydrologic Model

The District feels it is desirable for the Skunk Creek discharges which are developed in this current study to match the adopted FIS discharges as closely as possible. A sensitivity analysis was carried out to assess which parameters of the current analysis might be adjusted or "calibrated" to achieve this goal. All analyses presented in the following sections were carried out on an intermediate version of the 100-year, 24-hour model. Minor model adjustments were made after the sensitivity analyses were performed. Therefore the baseline model results used to assess parameter sensitivity do not exactly match the model results. Nonetheless, the conclusions regarding parameter sensitivity are still valid.

3.3.6.1 Depth-Area Reduction Factor Sensitivity

Previous modeling of Rodger and Cline Creeks by Baker Engineers did not employ the use of depth-area reduction factors (DARFs) to reduce point precipitation depths based on storm area. Updating of the Cline and Rodger Creek models by the District also did not employ DARFs. The Skunk Creek watershed model currently under development does employ DARFs in accordance with the guidelines presented in the Maricopa County Drainage Design Manual. In order to assess the impact of DARFs on peak flows, a model run was made where all DARF values were set equal to 1.0. The results of this model run are presented in **Table 10**. The elimination of DARFs increases the peak Skunk Creek flow at I-17 for this study by approximately 6,500 cfs or 25 percent.

3.3.6.2 S-Graph Sensitivity

Models of the Rodger and Cline Creek watersheds provided by the District utilize the Phoenix Valley S-graph in areas where it might be argued that the Desert/Rangeland S-graph could alternately be used. The Phoenix Valley S-graph peaks somewhat earlier than does the

Desert/Rangeland S-graph. Thus, higher peak discharges can be expected for subareas using the Phoenix Valley S-graph. In order to test the sensitivity of the Skunk Creek model to this parameter, those subareas in the main Skunk Creek and Union Hills basins where Desert/Rangeland S-graphs had been applied were changed to the Phoenix Valley S-graph. This change was made to subareas S6-S8, S10, S12, S15, S17-S21, S23, S24, U5 and U7. The results of this analysis are presented in Table 10 which shows that only a very slight increase (less than 1.0 percent) in peak discharge resulted.

3.3.6.3 Hydrograph Routing Sensitivity

Comparison of Skunk Creek base conditions model flows with adopted FIS flows indicates that the two compare fairly well above the point where Rodger Creek confluences with Skunk Creek. To investigate the impact that Skunk Creek routing below this point is having on peak discharges, model sensitivity to both the Muskingum X and Manning's n parameters was investigated.

Muskingum X values for Skunk Creek main stem routing steps (S16 to S21, S21 to S22, S22 to S23 and S23 to S24) were adjusted upward from values of 0.15 or 0.20 to a new value of 0.25. This is the upper limit recommended by the Maricopa County Drainage Design Manual for wide, shallow channels with overbank flow. The results of this analysis are presented in Table 10. The impact of this change was relatively minor with peak discharge at I-17 increasing approximately 600 cfs over the base conditions model.

Reducing the Manning's n value for a particular routing reach has the effect of speeding up the translation of the storm hydrograph through that reach. In the Skunk Creek watershed, this causes the peaks of hydrographs moving through the main stem to correspond in time more closely with the peaks of tributary hydrographs entering the main stem. The reason for this is the difference in lag times between the smaller tributary basins and the larger combined area contributing to the main stem channel. To investigate the potential impact of increasing the velocity of main stem hydrograph translation, Manning's n values were reduced for main stem routing steps below the Rodger Creek/Skunk Creek confluence point (S16 to S21, S21 to S22, S22 to S23 and S23 to S24) from 0.030 to 0.025. The results of this analysis are presented in Table 10. The described adjustment in Manning n values provided an increase in peak flow at I-17 of approximately 1,250 cfs.

3.3.6.4 Infiltration Parameter Sensitivity

Modeling of the Skunk Creek watershed employed the Green-Ampt Method for modeling of infiltration losses. Input parameters for this method consist of hydraulic conductivity, the soil moisture deficit and the average capillary suction. Model sensitivity to variations in two of these parameters has been investigated.

In order to assess potential impacts to peak discharges, hydraulic conductivity values for all of the main Skunk Creek subareas and the Union Hills subareas were adjusted downward by 25 percent. Table 10 presents the results of this adjustment. It is evident that the impact is relatively small, with the peak discharge at I-17 increasing by approximately 1,100 cfs over the base conditions model.

Model sensitivity to soil moisture deficit values was also investigated. Soil moisture deficit values were reduced by 25 percent for all of the main Skunk Creek and Union Hills subareas. Results are presented in Table 10 which shows a peak flow increase of approximately 800 cfs at the I-17 crossing.

3.3.6.5 Conclusions

Muskingum X values for routing reaches below the confluence of Rodger Creek will be adjusted upward in the base conditions model to 0.25, which is within accepted values for this parameter. No other potential adjustments which have been investigated are recommended for implementation at this time because the magnitude of parameter change required to substantially increase peak discharge at I-17 pushes the parameters out of the feasible range based on the physical characteristics of the watershed.

Sensitivity analysis of the Skunk Creek HEC-1 model currently under development indicates that no adjustment of model parameters within reasonable limits will provide the desired agreement with adopted FIS flows at the I-17 crossing. In addition, most parameter adjustments to improve agreement at I-17 worsen agreement in the upper portion of Skunk Creek (e.g., at New River Road).

3.4 HYDROLOGIC MODEL DEVELOPMENT, ASSUMPTIONS, AND SOLUTIONS

The District's Drainage Design Menu System was utilized to convert hydrologic parameters estimated for the Skunk Creek and Union Hills subbasins into a HEC-1 model input file. The DDMS contains a number of subprograms, each of which are a step in the conversion process. The Subbasin Prep program utilizes soils, land use, vegetative cover, and antecedent moisture data to determine rainfall surface retention and infiltration. Subbasin Prep also uses basin roughness (Kn), flow path, and slope data to determine basin lag. Information developed by Subbasin Prep and user input S-graph types are used by the DDMS subprogram MCUHP2 to develop unit hydrographs for each subbasin. Finally, the DDMS subprogram HEC-1 is utilized to construct a HEC-1 input file which contains all information necessary for each subbasin. Routing and hydrograph combination data must be entered by the user outside of the DDMS. Note that the Land Types subprogram within the DDMS was not utilized in this study. The reason is that parameters such as "percent vegetative cover" were developed as weighted averages for each basin rather than as unique values for each land use type.

Models of the Cline and Rodger Creek watersheds provided by the District were incorporated into the main Skunk Creek watershed model developed through the DDMS. Point precipitation depths and precipitation time distributions in the Cline and Rodger Creek models were changed to match values corresponding to the main Skunk Creek watershed model. The computation time step in the Cline Creek was adjusted downward from 6 minutes to 5 minutes to match the value chosen for the main Skunk Creek watershed model.

A single point precipitation depth was used for the entire Skunk Creek watershed. This value was arrived at by taking an area weighted average of subbasin point precipitation depths. The HEC-1 JD record option was utilized to apply depth-area reduction factors to point precipitation depths. JD records are used to enter precipitation depth and storm area pairs which HEC-1 will use for interpolation at each concentration point. By using JD records, the correct depth-area reduction factor is applied at each HEC-1 concentration point throughout the model. Thus, flow at any given concentration point is computed by HEC-1 using a storm area equal to the drainage area contributing to that point.

Initial simulations of the 6-hour local storm and 24-hour general storm determined that the 24-hour storm generated higher 100-year peak discharges. Therefore the 24-hour storm was adopted as the design storm for all further analyses.

A Schematic Diagram and the HEC-1 output file are included in **Appendix D**.

3.5 FINAL RESULTS/COMPUTER RUNS

This section presents the results of hydrologic modeling carried out for the Skunk Creek watershed. The results presented correspond to existing land use conditions subject to the 24-hour, 100-year storm. Modeling of projected future or ultimate land use conditions has not been carried out for this study. Hydrology for both the 6- and 24-hour events has been investigated. The 24-hour storm produced the highest peak discharges and only those results are presented. Model results at each concentration point correspond to worst-case storm centerings and areal coverage. This was facilitated through the use of JD cards which provide HEC-1 with a curve defining the relationship between storm area and precipitation depth-area reduction factor. Thus, the flow reported at each point of interest is the result of a point rainfall depth reduced by the depth-area reduction factor corresponding to the drainage area contribution to that particular point.

Regarding the CAP Aqueduct, the potential for ponding upstream of the overchutes for the Skunk Creek and the Union Hills drainages has been ignored. It is anticipated that ponding at this location would have little if any mitigating impact on peak discharges due to the large flow volume associated with the 24-hour storm. Breakouts or flow split at the CAP Aqueduct will be analyzed as part of the hydraulic analysis for the floodplain delineation study.

3.5.1 Results

Modeled discharges at key locations in the watershed for the 100-year, 24-hour storm are presented in **Table 11**.

Peak and unit discharges for each subarea are presented in **Table 12**. From Table 12 it is evident that unit discharges tend to be higher for the Cline and Rodger Creek subareas when compared to those in the Skunk Creek and Union Hills drainages. Two factors thought to be contributing to this are the choice of subarea Kn values and S-graphs. The Kn parameter is the estimated mean Manning's n value for all channels in a given subarea and is a component of the lag time calculation. Kn values chosen for Cline and Rodger Creek subareas tend to be lower than those chosen for Skunk Creek and Union Hills subareas. This causes unit hydrographs for Cline and Rodger Creek subareas to have shorter lag times and somewhat higher peak discharges. The second factor affecting unit discharges is the choice of S-graphs. Modeling carried out by the District for the Cline and Rodger Creek basins uses the Phoenix Valley S-graph for non-mountain subareas, while the modeling of Skunk Creek and Union Hills subareas uses the Desert/Rangeland S-graph. The Phoenix Valley S-graph and the unit hydrographs derived from it peak more quickly than does the Desert Rangeland S-graph. The result is that slightly higher peak discharges are developed when the Phoenix Valley S-graph is used, as described in the previous Sensitivity Analysis section.

3.5.2 Comparison of Results with Previous Studies and Statistical Analyses

The hydrologic results were compared with peak runoff estimates from the following sources:

- FIS
- Cline/Rodger Creek Floodplain Delineation Study
- Gage Records
- Regional Regression Equation

The results of this comparison are presented below.

Table 10
Sensitivity Analysis Results
100-Year, 24-Hour HEC-1 Simulation

HEC-1 Concen-tration Point	Location	Adopted FIS Flows (cfs)	Base Conditions Model Flows[a] (cfs)	DARF =1 Flows[b] (cfs)	Adjusted S-Graph Flows[c] (cfs)	Routing Parameters		Infiltration Parameters	
						Adjusted Muskingum X Flows[d] (cfs)	Adjusted Manning's n Flows[e] (cfs)	Adjusted XKSAT Flows[f] (cfs)	Adjusted Soil Moisture Deficit Flows[g] (cfs)
S6C	New River Rd.	7,200	7,840	8,418	7,702	7,840	7,840	8,265	8,133
S16C	D/S of Rodger Cr.	28,100	26,711	32,097	27,040	26,711	26,711	27,572	27,291
S22C	Carefree Highway	31,400	26,220	32,010	26,365	26,570	26,742	27,186	26,903
S24C	I-17	35,000	25,391	31,856	25,576	25,992	26,639	26,470	26,162

Notes:
a. Baseline Conditions Model for sensitivity analysis differs slightly from final HEC-1 model.
b. No depth-area reduction factors applied at any concentration points.
c. Valley S-graph substituted for Desert/Rangeland S-graph in Skunk Creek and Union Hills subareas.
d. Main stem Muskingum X below Rodger Creek set to minimum of 0.25.
e. Main stem Manning n below Rodger Creek set to 0.025 for hydrograph routing.
f. All Skunk Creek and Union Hills subarea XKSAT values reduced by 25 percent compared to DDMS results.
g. All Skunk Creek and Union Hills subarea soil moisture deficit values reduced by 25 percent compared to DDMS results.

Table 11
Summary of HEC-1 Discharges
100-Year, 24-Hour Storm

HEC-1 Combination Point	Location	Drainage Area (sq mi)	Peak Q (cfs)
Skunk Creek			
S3C	Upstream study limit	4.3	4,900
S6C	New River Rd	8.0	7,800
S10C		12.7	9,700
S13C	Upstream of Cline Creek	15.8	11,800
S14C	Downstream of Cline Creek	32.7	24,400
S16C	Downstream of Rodger Creek	40.1	27,300
S21C2	Narrows	47.1	27,700
S22C	Carefree Highway	48.6	27,300
S23C	Main Channel at CAP	50.3	26,500
CAP	Combined Flow at CAP	63.5	26,700
S24C	I-17	64.0	26,500
Cline Creek			
CCO-5	Cline Creek at confluence	16.1	13,700
Rodger Creek			
CO-2	Rodger Creek at confluence	5.1	5,600
Union Hills			
U7C	Union Hills Area at CAP	13.2	12,200

3.5.2.1 Flood Insurance Study (FIS)

Table 13 presents a comparison of current modeling results with those developed in other studies and by other methodologies. It is evident from the table that current hydrologic modeling results correspond well with the adopted Flood Insurance Study (FIS) results in the upper portion of the Skunk Creek watershed above the Rodger Creek confluence. Below this point in the watershed, FIS discharges are substantially higher than the current study indicates. No explanation for this divergence in flows is possible because insufficient documentation supporting the FIS results is available.

3.5.2.2 Cline/Rodger Creek Floodplain Delineation Study

Current modeling yields flows for Cline and Rodger Creeks that agree well with those developed in the earlier floodplain delineation study by Baker Engineers, as long as no depth-area reduction factors are applied. Application of DARFs in the overall Skunk Creek model generates discharges which are significantly lower for these major tributaries.

3.5.2.3 Gage Records

The 100-year peak flow derived from flood-frequency analysis of gaging data at I-17 is substantially higher than that from the current hydrologic model. Table 13 shows a flood-frequency result of 32,500 cfs versus a model result of 26,500 cfs.

3.5.2.4 Regional Regression Equations

100-year peak discharges computed using the USGS and ADWR equations are presented in Table 13. These results compare favorably with the results of the current hydrologic modeling. The model gives a 100-year peak flow of 26,500 cfs at I-17 as compared to the range of regional regression results of 24,400 to 28,000 cfs.

3.6 HYDROLOGIC MODELING RESULTS

As previously stated, results of the HEC-1 modeling for the Skunk Creek Floodplain Delineation Study project area have yielded 100-year peak discharges as follows:

Upstream Study Limit	4,900 cfs
At New River Road	7,800 cfs
Upstream of Cline Creek	11,800 cfs
Upstream of Rodger Creek	24,400 cfs
Downstream of Rodger Creek	27,300 cfs
At Carefree Highway	27,300 cfs
At CAP Aqueduct	26,700 cfs

Electronic input and output data files are submitted separately in conjunction with this report.

3.7 HYDROLOGY ADDENDUM

An addendum to the Hydrologic Report was prepared which addresses modifications in the hydrology since the report was completed. Flow changes presented in the addendum are the result of the detailed hydraulic analysis which determined that a flow diversion can occur within the study area upstream of Carefree Highway. The addendum is included as **Appendix E** in the back of this report.

Table 12
Subarea Peak and Unit Discharges

Subarea	Area (sq mi)	Q (cfs)	Unit Q (cfs/sq mi)
Upper Main Skunk Creek			
S1	2.08	2911	1400
S2	1.17	1738	1485
S3	1.03	1415	1374
S4	0.97	1295	1335
S5	1.85	2007	1085
S6	0.94	1339	1424
S7	0.68	1061	1560
S8	1.12	1650	1473
S9	1.02	1254	1229
S10	1.80	2350	1306
S11	0.92	1161	1262
S12	0.91	1307	1436
S13	1.27	1734	1365
		Average =	**1364**
Lower Main Skunk Creek			
S14	0.83	1336	1610
S15	0.99	1564	1580
S16	1.32	1930	1462
S17	1.03	1422	1381
S18	1.71	2537	1484
S19	0.77	1368	1777
S20	1.27	1900	1496
S21	2.22	2946	1327
S22	1.47	1987	1352
S23	1.72	2027	1178
S24	0.64	1113	1739
		Average =	**1490**
Cline Creek			
X1SUB	0.61	1291	2116
X2SUB	0.43	876	2037
X3SUB	0.56	1121	2002
X4SUB	0.28	650	2321
X5SUB	0.38	776	2042
SUBC1	1.26	2552	2025
SUBC2	2.19	3321	1516
SUBC3	1.24	2149	1733
SUBC4	2.54	4326	1703
SUBC5	3.39	5968	1760
SUBC7	1.20	2462	2052
SUBC8	1.42	2713	1911
SUBC9	0.58	979	1688
		Average =	**1916**

Table 12 (Continued)
Subarea Peak and Unit Discharges

Subarea	Area (sq mi)	Q (cfs)	Unit Q (cfs/sq mi)
Rodger Creek			
SUBR1	1.56	2796	1792
SUBR2	1.98	3330	1682
SUBR3	1.59	2213	1392
		Average =	**1622**
Union Hills			
U1	2.53	3481	1376
U2	1.6	2119	1324
U3	0.84	1138	1355
U4	2.8	3846	1374
U5	3.25	3759	1157
U6	0.7	1121	1601
U7	1.47	1991	1354
		Average =	**1363**

Table 13

Comparison of Results With Other Studies and Methodologies
100-Year, 24-Hour Storm

Location	Skunk Creek Floodplain Delineation Study (cfs)	Flood Insurance Study[a] (cfs)	Cline/Rodger Creek Floodplain Study[b] (cfs)	I-17 Gage Regression Analysis[c] (cfs)	USGS Regional Regression Equations[d] (cfs)	ADWR Regional Regression Equations[e] (cfs)
Skunk Creek						
New River Road	7,800	7,200				
Below Rodger Cr. Confluence	27,300	28,100				
Carefree Highway	27,300	31,400				
CAP Aqueduct	26,700	35,000				
I-17	26,500	35,000		32,500	28,000	24,400
Cline Creek						
Skunk Cr. Confluence	13,700 (16,600)[f]		16,700			
Rodger Creek						
Skunk Cr. Confluence	5,600 (6,200)		6,200			

Notes:
a. Flows at Carefree Highway and upstream from Skunk Creek FIS by Harris Toups, 1978. Flow at I-17 from USCOE Adobe Dam studies, 1974.
b. Cline Creek Floodplain Delineation Study and Rodger Creek Floodplain Delineation Study, both by Baker Engineers, 1989.
c. Skunk Creek Floodplain Delineation Study Criteria Committee Meeting, March 8, 1996.
d. "*Methods for Estimating the Magnitude and Frequency of Floods in Arizona*", by R.H. Roeske, USGS.
e. "*State Standard for Estimating Peak Discharges on Ungaged Rural Watersheds*", ADWR draft publication.
f. Flows in parentheses are from FCDMC update of Cline and Rodger Creek modeling by Baker Engineers using a depth-area reduction factor of 1.0.

Appendix A

MONTGOMERY WATSON

LOSS PARAMETERS FOR SUBBASIN: S1

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
8	0.053	2.5	0.96	0
72	1.031	49.6	0.09	30
96	0.021	1.0	0.07	0
40	0.811	39.0	0.17	0
93	0.002	0.1	0.33	0
104	0.027	1.3	0.14	60
41	0.135	6.5	0.17	0

TOTAL = 2.080 Sq.Miles XKSAT = 0.13 %Rock = 16

DTHETA

Dry = 0.38 PSIF = 6.40
Normal = 0.21
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
1.398	VACANT	67.3	DRY	18	0	0.22	0.04	Low	0.04
0.680	FOREST	32.7	DRY	18	0	0.22	0.04	Low	0.04
2.078 = Total Area			Avg. =	18	0%	0.220			

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.38

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.14

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 16
% EFFECTIVE IMP. = 6

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S1	2.080	2.48	0.93	0.04	535.5	0.22	0.38	6.40	0.14	6	24

LOSS PARAMETERS FOR SUBBASIN: S2

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
72	0.265	22.6	0.09	30
96	0.046	3.9	0.07	0
40	0.309	26.3	0.17	0
8	0.055	4.7	0.96	0
93	0.014	1.2	0.33	0
66	0.080	6.8	0.23	0
41	0.121	10.3	0.17	0
95	0.076	6.5	0.04	0
26	0.142	12.1	0.01	0
68	0.018	1.5	0.63	0
110	0.026	2.2	0.13	0
10	0.012	1.0	0.94	0
13	0.009	0.8	0.01	0
12	0.001	0.1	0.01	0

TOTAL = 1.174 Sq.Miles XKSAT = 0.10 %Rock = 7

DTHETA

Dry = 0.35 PSIF = 7.00
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.115	LDR	9.8	DRY	22	5	0.18	0.04	Low	0.05
1.059	VACANT	90.2	DRY	22	0	0.18	0.04	Low	0.04

1.174 = Total Area Avg. = 22 0% 0.180

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.11

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 7
% EFFECTIVE IMP. = 7

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S2	1.174	2.22	1.09	0.04	384.2	0.18	0.35	7.00	0.11	7	23

LOSS PARAMETERS FOR SUBBASIN: S3

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
41	0.224	21.7	0.17	0
95	0.043	4.2	0.04	0
66	0.620	60.2	0.23	0
72	0.107	10.4	0.09	30
96	0.022	2.1	0.07	0
68	0.007	0.7	0.63	0
12	0.007	0.7	0.01	0

TOTAL = 1.030 Sq.Miles XKSAT = 0.17 %Rock = 3

DTHETA

Dry = 0.39 PSIF = 5.70
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.114	LDR	11.1	DRY	23	5	0.17	0.04	Low	0.05
0.722	VACANT	70.1	DRY	23	0	0.17	0.04	Low	0.04
0.194	FOREST	18.8	DRY	23	0	0.17	0.04	Low	0.05
1.030 = Total Area				Avg. =	23	1%	0.170		

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.39

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.19

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 100 % effective = 3
% EFFECTIVE IMP. = 4

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S3	1.030	2.27	1.08	0.04	331.3	0.17	0.39	5.70	0.19	4	24

LOSS PARAMETERS FOR SUBBASIN: S4

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
66	0.017	1.8	0.23	0
95	0.020	2.1	0.04	0
40	0.933	96.2	0.17	0
TOTAL =	0.970 Sq.Miles	XKSAT = 0.17	%Rock =	0

DTHETA

Dry = 0.39 PSIF = 5.70
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.040	VACANT	4.1	DRY	20	0	0.20	0.04	Low	0.06
0.930	FOREST	95.9	DRY	20	0	0.20	0.04	Low	0.04
0.970 = Total Area			Avg. =	20	0%	0.200			

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.39

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.19

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S4	0.970	2.31	1.10	0.04	588.7	0.20	0.39	5.70	0.19	0	24

LOSS PARAMETERS FOR SUBBASIN: S5

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
95	0.004	0.2	0.04	0
8	0.005	0.3	0.96	0
41	0.005	0.3	0.17	0
40	1.836	99.2	0.17	0

TOTAL = 1.850 Sq.Miles XKSAT = 0.17 %Rock = 0

DTHETA

Dry = 0.39 PSIF = 5.70
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.016	VACANT	0.9	DRY	17	0	0.23	0.04	Low	0.07
1.837	FOREST	99.1	DRY	17	0	0.23	0.04	Low	0.04

1.853 = Total Area Avg. = 17 0% 0.230

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.39

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.18

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S5	1.850	2.91	1.77	0.04	618.6	0.23	0.39	5.70	0.18	0	34

LOSS PARAMETERS FOR SUBBASIN: S6

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
110	0.069	7.4	0.13	0
13	0.109	11.6	0.01	0
10	0.111	11.9	0.94	0
12	0.138	14.7	0.01	0
96	0.013	1.4	0.07	0
95	0.052	5.6	0.04	0
8	0.019	2.0	0.96	0
41	0.206	22.0	0.17	0
66	0.170	18.2	0.23	0
98	0.036	3.8	0.37	0
3	0.013	1.4	0.58	0

TOTAL = 0.936 Sq.Miles XKSAT = 0.10 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 7.00
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.309	LDR	33.0	DRY	31	5	0.23	0.03	Low	0.05
0.003	INST/REL	0.3	DRY	31	0	0.23	0.03	Low	0.08
0.614	VACANT	65.6	DRY	31	0	0.23	0.03	Low	0.04
0.010	FOREST	1.1	DRY	31	0	0.23	0.03	Low	0.07

0.936 = Total Area Avg. = 31 2% 0.230

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.12

IMPERVIOUS AREA: URBAN @ 100 % effective = 2
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 2

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S6	0.936	2.38	1.12	0.03	152.5	0.23	0.35	7.00	0.12	2	27

LOSS PARAMETERS FOR SUBBASIN: S7

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
26	0.042	6.1	0.01	0
49	0.023	3.4	0.06	0
110	0.175	25.6	0.13	0
52	0.112	16.4	0.16	20
13	0.088	12.9	0.01	0
98	0.099	14.5	0.37	0
22	0.082	12.0	0.04	0
3	0.020	2.9	0.58	0
45	0.042	6.1	0.03	0

TOTAL = 0.683 Sq.Miles XKSAT = 0.08 %Rock = 3

DTHETA

Dry = 0.32 PSIF = 7.60
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.189	LDR	27.7	DRY	25	5	0.15	0.03	Low	0.05
0.494	VACANT	72.3	DRY	25	0	0.15	0.03	Low	0.05

0.683 = Total Area Avg. = 25 1% 0.150

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.32

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.09

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 100 % effective = 3

% EFFECTIVE IMP. = 4

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S7	0.683	2.14	1.25	0.03	136.4	0.15	0.32	7.60	0.09	4	26

LOSS PARAMETERS FOR SUBBASIN: S8

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
52	0.014	1.2	0.16	20
45	0.309	27.6	0.03	0
22	0.027	2.4	0.04	0
109	0.705	62.9	0.35	35
98	0.006	0.5	0.37	0
3	0.060	5.4	0.58	0

TOTAL = 1.121 Sq.Miles XKSAT = 0.17 %Rock = 22

DTHETA

Dry = 0.39 PSIF = 5.70
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
1.121	VACANT	100.	DRY	23	0	0.17	0.03	Low	0.04

1.121 = Total Area Avg. = 23 0% 0.170

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.39

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.19

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 22
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S8	1.121	1.94	1.01	0.03	207.2	0.17	0.39	5.70	0.19	0	23

LOSS PARAMETERS FOR SUBBASIN: S9

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
95	0.009	0.9	0.04	0
66	0.027	2.6	0.23	0
40	0.985	96.5	0.17	0

TOTAL = 1.021 Sq.Miles XKSAT = 0.17 %Rock = 0

DTHETA

Dry = 0.39 PSIF = 5.70
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.043	VACANT	4.2	DRY	20	0	0.20	0.04	Low	0.06
0.978	FOREST	95.8	DRY	20	0	0.20	0.04	Low	0.04
1.021 = Total Area			Avg. =	20	0%	0.200			

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.39

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.19

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S9	1.021	2.31	0.91	0.04	329.0	0.20	0.39	5.70	0.19	0	28

LOSS PARAMETERS FOR SUBBASIN: S10

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
66	0.730	40.5	0.23	0
95	0.278	15.4	0.04	0
41	0.096	5.3	0.17	0
110	0.040	2.2	0.13	0
98	0.024	1.3	0.37	0
13	0.090	5.0	0.01	0
3	0.155	8.6	0.58	0
120	0.093	5.2	0.06	0
93	0.159	8.8	0.33	0
96	0.049	2.7	0.07	0
6	0.033	1.8	0.62	0
109	0.054	3.0	0.35	35

TOTAL = 1.801 Sq.Miles XKSAT = 0.15 %Rock = 1

DTHETA

Dry = 0.40 PSIF = 6.00
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
1.455	VACANT	80.8	DRY	27	0	0.17	0.03	Low	0.04
0.188	FOREST	10.4	DRY	27	0	0.17	0.03	Low	0.05
0.158	LDR	8.8	DRY	27	5	0.17	0.03	Low	0.05

1.801 = Total Area Avg. = 27 0% 0.170

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.40

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.18

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 1
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S10	1.801	2.70	1.24	0.03	156.7	0.17	0.40	6.00	0.18	0	28

LOSS PARAMETERS FOR SUBBASIN: S11

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
40	0.920	100.	0.17	0
TOTAL =	0.920 Sq.Miles	XKSAT = 0.17	%Rock = 0	

DTHETA

Dry = 0.39 PSIF = 5.70
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.920	FOREST	100.	DRY	20	0	0.20	0.04	Low	0.04
0.920 = Total Area			Avg. =	20	0%	0.200			

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.39

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.19

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S11	0.920	2.70	1.28	0.04	438.1	0.20	0.39	5.70	0.19	0	27

LOSS PARAMETERS FOR SUBBASIN: S12

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
95	0.425	46.7	0.04	0
66	0.383	42.1	0.23	0
26	0.076	8.4	0.01	0
52	0.002	0.2	0.16	20
68	0.020	2.2	0.63	0
3	0.004	0.4	0.58	0

TOTAL = 0.910 Sq.Miles XKSAT = 0.08 %Rock = 0

DTHETA

Dry = 0.32 PSIF = 7.60
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.506	FOREST	55.4	DRY	25	0	0.15	0.03	Low	0.05
0.214	VACANT	23.4	DRY	25	0	0.15	0.03	Low	0.05
0.193	LDR	21.1	DRY	25	5	0.15	0.03	Low	0.05

0.913 = Total Area Avg. = 25 1% 0.150

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.32

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.09

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 100 % effective = 0
% EFFECTIVE IMP. = 1

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S12	0.910	2.76	1.30	0.03	123.2	0.15	0.32	7.60	0.09	1	29

LOSS PARAMETERS FOR SUBBASIN: S13

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
109	0.660	51.9	0.35	35
98	0.060	4.7	0.37	0
44	0.234	18.4	0.03	0
110	0.126	9.9	0.13	0
68	0.075	5.9	0.63	0
3	0.054	4.2	0.58	0
13	0.019	1.5	0.01	0
66	0.033	2.6	0.23	0
52	0.009	0.7	0.16	20
96	0.002	0.2	0.07	0

TOTAL = 1.272 Sq.Miles XKSAT = 0.20 %Rock = 18

DTHETA

Dry = 0.37 PSIF = 5.30
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.203	LDR	16.0	DRY	25	5	0.22	0.04	Low	0.05
0.031	MEDCOM	2.4	DRY	25	60	0.22	0.04	Low	0.06
1.038	VACANT	81.6	DRY	25	0	0.22	0.04	Low	0.04

1.272 = Total Area Avg. = 25 2% 0.220

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.37

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.23

IMPERVIOUS AREA: URBAN @ 100 % effective = 2
ROCK OUTCROP @ 100 % effective = 18
% EFFECTIVE IMP. = 20

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S13	1.272	2.67	1.16	0.04	425.1	0.22	0.37	5.30	0.23	20	25

LOSS PARAMETERS FOR SUBBASIN: S14

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
109	0.392	47.1	0.35	35
44	0.232	27.9	0.03	0
68	0.051	6.1	0.63	0
52	0.032	3.8	0.16	20
26	0.020	2.4	0.01	0
13	0.020	2.4	0.01	0
3	0.086	10.3	0.58	0

TOTAL = 0.833 Sq.Miles XKSAT = 0.16 %Rock = 17

DTHETA

Dry = 0.39 PSIF = 5.80
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.108	LDR	13.0	DRY	24	5	0.23	0.04	Low	0.05
0.105	MEDCOM	12.6	DRY	24	60	0.23	0.04	Low	0.05
0.620	VACANT	74.4	DRY	24	0	0.23	0.04	Low	0.04

0.833 = Total Area Avg. = 24 8% 0.230

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.39

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.18

IMPERVIOUS AREA: URBAN @ 100 % effective = 8
ROCK OUTCROP @ 100 % effective = 17

% EFFECTIVE IMP. = 25

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S14	0.833	1.76	1.02	0.04	670.5	0.23	0.39	5.80	0.18	25	19

LOSS PARAMETERS FOR SUBBASIN: S15

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
13	0.017	1.7	0.01	0
44	0.089	9.0	0.03	0
68	0.100	10.1	0.63	0
12	0.058	5.9	0.01	0
52	0.252	25.5	0.16	20
72	0.299	30.3	0.09	30
110	0.164	16.6	0.13	0
98	0.008	0.8	0.37	0

TOTAL = 0.987 Sq.Miles XKSAT = 0.10 %Rock = 14

DTHETA

Dry = 0.35 PSIF = 7.00
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.180	LDR	18.2	DRY	26	5	0.21	0.04	Low	0.05
0.807	VACANT	81.8	DRY	26	0	0.21	0.04	Low	0.04
0.987 = Total Area			Avg. =	26	1%	0.210			

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.12

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 100 % effective = 14
% EFFECTIVE IMP. = 15

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S15	0.987	1.97	1.05	0.04	238.1	0.21	0.35	7.00	0.12	15	24

LOSS PARAMETERS FOR SUBBASIN: S16

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
110	0.100	7.6	0.13	0
13	0.160	12.1	0.01	0
52	0.015	1.1	0.16	20
3	0.258	19.6	0.58	0
44	0.168	12.7	0.03	0
109	0.386	29.3	0.35	35
68	0.088	6.7	0.63	0
12	0.044	3.3	0.01	0
98	0.099	7.5	0.37	0

TOTAL = 1.318 Sq.Miles XKSAT = 0.16 %Rock = 10

DTHETA

Dry = 0.39 PSIF = 5.00
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.095	LDR	7.2	DRY	32	5	0.29	0.03	Low	0.06
1.223	VACANT	92.8	DRY	32	0	0.29	0.03	Low	0.04
1.318 = Total Area			Avg. =	32	0%	0.290			

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.39

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.20

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 10
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S16	1.318	1.86	0.89	0.03	333.3	0.29	0.39	5.80	0.20	0	19

LOSS PARAMETERS FOR SUBBASIN: S17

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
110	0.325	31.5	0.13	0
68	0.024	2.3	0.63	0
72	0.264	25.6	0.09	30
12	0.114	11.0	0.01	0
13	0.020	1.9	0.00	0
98	0.105	10.2	0.37	0
44	0.158	15.3	0.03	0
112	0.023	2.2	0.39	0

TOTAL = 1.033 Sq.Miles XKSAT = 0.09 %Rock = 8

DTHETA

Dry = 0.33 PSIF = 7.30
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.044	LDR	4.3	DRY	24	5	0.16	0.04	Low	0.06
0.989	VACANT	95.7	DRY	24	0	0.16	0.04	Low	0.04

1.033 = Total Area Avg. = 24 0% 0.160

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.33

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.10

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 8
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S17	1.033	2.47	1.05	0.04	136.0	0.16	0.33	7.30	0.10	0	31

LOSS PARAMETERS FOR SUBBASIN: S18

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
12	0.719	42.0	0.01	0
112	0.338	19.7	0.39	0
110	0.022	1.3	0.13	0
44	0.067	3.9	0.03	0
98	0.116	6.8	0.37	0
113	0.125	7.3	0.39	0
22	0.326	19.0	0.04	0

TOTAL = 1.713 Sq.Miles XKSAT = 0.05 %Rock = 0

DTHETA

Dry = 0.27 PSIF = 8.80
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.043	LDR	2.5	DRY	25	5	0.15	0.03	Low	0.06
1.647	VACANT	96.1	DRY	25	0	0.15	0.03	Low	0.04
0.023	STKYRD	1.3	DRY	25	0	0.15	0.03	Low	0.06

1.713 = Total Area Avg. = 25 0% 0.150

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.27

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.06

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S18	1.713	2.42	1.10	0.03	59.5	0.15	0.27	8.80	0.06	0	29

LOSS PARAMETERS FOR SUBBASIN: S20

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
12	0.293	23.0	0.01	0
13	0.243	19.1	0.01	0
113	0.013	1.0	0.39	0
110	0.224	17.6	0.13	0
112	0.063	4.9	0.39	0
22	0.106	8.3	0.04	0
52	0.327	25.7	0.16	20
100	0.004	0.3	0.40	20

TOTAL = 1.273 Sq.Miles XKSAT = 0.05 %Rock = 5

DTHETA

Dry = 0.27 PSIF = 8.80
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.194	LDR	15.2	DRY	23	5	0.17	0.03	Low	0.05
1.079	VACANT	84.8	DRY	23	0	0.17	0.03	Low	0.04
1.273 = Total Area			Avg. =	23	1%	0.170			

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.27

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.06

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 100 % effective = 5
% EFFECTIVE IMP. = 6

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S20	1.273	2.38	0.96	0.03	43.3	0.17	0.27	8.80	0.06	6	29

LOSS PARAMETERS FOR SUBBASIN: S19

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
112	0.155	20.1	0.39	0
22	0.199	25.8	0.04	0
13	0.044	5.7	0.01	0
12	0.059	7.6	0.01	0
44	0.186	24.1	0.03	0
75	0.022	2.8	0.23	0
52	0.101	13.1	0.16	20
68	0.005	0.6	0.63	0
100	0.001	0.1	0.40	20

TOTAL = 0.772 Sq.Miles XKSAT = 0.06 %Rock = 3

DTHETA

Dry = 0.29 PSIF = 8.40
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.171	LDR	22.2	DRY	23	5	0.17	0.03	Low	0.05
0.582	VACANT	75.4	DRY	23	0	0.17	0.03	Low	0.04
0.019	STKYRD	2.5	DRY	23	0	0.17	0.03	Low	0.07

0.772 = Total Area Avg. = 23 1% 0.170

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.29

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.07

IMPERVIOUS AREA: URBAN @ 100 % effective = 1
ROCK OUTCROP @ 100 % effective = 3
% EFFECTIVE IMP. = 4

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S19	0.772	1.49	0.67	0.03	76.5	0.17	0.29	8.40	0.07	4	20

LOSS PARAMETERS FOR SUBBASIN: S21

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
44	0.028	1.3	0.03	0
98	0.107	4.8	0.37	0
3	0.364	16.4	0.58	0
110	0.100	4.5	0.13	0
13	0.079	3.6	0.01	0
50	0.136	6.1	0.26	0
12	1.105	49.8	0.01	0
112	0.103	4.6	0.39	0
22	0.068	3.1	0.04	0
55	0.028	1.3	0.27	0
18	0.028	1.3	0.33	15
52	0.005	0.2	0.16	20
22	0.070	3.2	0.04	0

TOTAL = 2.221 Sq.Miles XKSAT = 0.05 %Rock = 0

DTHETA

Dry = 0.27 PSIF = 8.80
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.061	LDR	2.7	DRY	30	5	0.21	0.03	Low	0.06
2.160	VACANT	97.3	DRY	30	0	0.21	0.03	Low	0.04

2.221 = Total Area Avg. = 30 0% 0.210

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.27

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.06

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S21	2.221	3.71	1.65	0.03	56.6	0.21	0.27	8.80	0.06	0	35

LOSS PARAMETERS FOR SUBBASIN: S22

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
44	0.120	8.2	0.03	0
12	0.183	12.5	0.01	0
110	0.102	7.0	0.13	0
18	0.045	3.1	0.33	15
55	0.004	0.3	0.27	0
52	0.314	21.4	0.16	20
100	0.141	9.6	0.40	20
123	0.312	21.3	0.37	0
98	0.040	2.7	0.37	0
21	0.004	0.3	0.38	0
3	0.202	13.8	0.58	0

TOTAL = 1.467 Sq.Miles XKSAT = 0.16 %Rock = 7

DTHETA

Dry = 0.39 PSIF = 5.80
Normal = 0.25
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.002	RIVER	0.1	DRY	26	0	0.25	0.03	Low	0.08
1.465	VACANT	99.9	DRY	26	0	0.25	0.03	Low	0.04

1.467 = Total Area Avg. = 26 0% 0.250

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.39

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.19

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 7
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S22	1.467	2.27	1.14	0.03	277.5	0.25	0.39	5.80	0.19	0	23

LOSS PARAMETERS FOR SUBBASIN: S23

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
12	1.056	61.4	0.01	0
44	0.026	1.5	0.03	0
100	0.041	2.4	0.40	20
110	0.007	0.4	0.13	0
3	0.326	19.0	0.58	0
55	0.120	7.0	0.27	0
112	0.095	5.5	0.39	0
50	0.037	2.2	0.26	0
98	0.012	0.7	0.37	0
TOTAL =	1.720 Sq.Miles	XKSAT =	0.04	%Rock = 0

DTHETA

Dry = 0.25 PSIF = 9.70
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
1.720	VACANT	100.	DRY	40	0	0.35	0.03	Low	0.04
1.720 = Total Area			Avg. =	40	0%	0.350			

PERCENT OF SUBBASIN
DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.05

IMPERVIOUS AREA:
URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S23	1.720	4.60	2.06	0.03	43.9	0.35	0.25	9.70	0.05	0	43

LOSS PARAMETERS FOR SUBBASIN: S24

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
12	0.304	47.5	0.01	0
3	0.140	21.9	0.58	0
55	0.063	9.8	0.27	0
98	0.012	1.9	0.37	0
75	0.061	9.5	0.23	0
112	0.060	9.4	0.39	0

TOTAL = 0.640 Sq.Miles XKSAT = 0.07 %Rock = 0

DTHETA

Dry = 0.30 PSIF = 8.00
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
0.048	LDR	7.5	DRY	40	5	0.35	0.03	Low	0.06
0.004	RIVER	0.6	DRY	40	0	0.35	0.03	Low	0.07
0.588	VACANT	91.9	DRY	40	0	0.35	0.03	Low	0.04

0.640 = Total Area Avg. = 40 0% 0.350

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.30

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.09

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
S24	0.640	1.37	0.75	0.03	38.0	0.35	0.30	8.00	0.09	0	19

LOSS PARAMETERS FOR SUBBASIN: X1SUB

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
26	81.000	20.9	0.01	0
66	74.000	19.1	0.23	0
72	202.000	52.2	0.09	30
93	20.000	5.2	0.33	0
95	10.000	2.6	0.04	0

TOTAL = 387.000 Acres XKSAT = 0.07 %Rock = 16

DTHETA

Dry = 0.30 PSIF = 8.00
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Desert		DRY	25	0	0.40	0.02	Low	
387.000	OPEN	100.	DRY	15	0	0.20	0.02	Min	0.02
	V.L.D.R		NORMAL	30	5	0.30	0.03	Low	
	L.D.R.		NORMAL	50	15	0.30	0.03	Low	
	M.D.R.		NORMAL	50	30	0.25	0.03	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	L.D.R.		NORMAL	75	80	0.10	0.02	Min	
	M.D.R.		NORMAL	90	0	0.20	0.10	Hi	
	M.F.R.		NORMAL	85	0	0.50	0.10	Hi	
387.00 = Total Area			Avg. =	15	0%	0.200			

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.30

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.07

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 16
% EFFECTIVE IMP. = 16

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
X1SUB	0.605	1.75	0.81	0.02	320.0	0.20	0.30	8.00	0.07	16	11

LOSS PARAMETERS FOR SUBBASIN: X2SUB

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
26	53.000	19.1	0.01	0
66	135.000	48.7	0.23	0
72	54.000	19.5	0.09	30
95	35.000	12.6	0.04	0

TOTAL = 277.000 Acres XKSAT = 0.08 %Rock = 6

DTHETA

Dry = 0.32 PSIF = 7.60
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Desert		DRY	25	0	0.40	0.02	Low	
277.000	OPEN	100.	DRY	15	0	0.20	0.02	Min	0.02
	V.L.D.R		NORMAL	30	5	0.30	0.03	Low	
	L.D.R.		NORMAL	50	15	0.30	0.03	Low	
	M.D.R.		NORMAL	50	30	0.25	0.03	Low	
	M.F.R		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	L.D.R.		NORMAL	75	80	0.10	0.02	Min	
	M.D.R.		NORMAL	90	0	0.20	0.10	Hi	
	M.F.R.		NORMAL	85	0	0.50	0.10	Hi	

277.00 = Total Area Avg. = 15 0% 0.200

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.32

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.08

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 6
% EFFECTIVE IMP. = 6

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
X2SUB	0.433	1.99	0.99	0.02	311.6	0.20	0.32	7.60	0.08	6	13

LOSS PARAMETERS FOR SUBBASIN: X3SUB

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	9.000	2.5	0.62	0
26	26.000	7.3	0.01	0
28	11.000	3.1	0.02	0
66	148.000	41.6	0.23	0
72	9.000	2.5	0.09	30
93	10.000	2.8	0.33	0
95	143.000	40.2	0.04	0

TOTAL = 356.000 Acres XKSAT = 0.08 %Rock = 1

DTHETA

Dry = 0.32 PSIF = 7.60
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Desert		DRY	25	0	0.40	0.02	Low	
356.000	OPEN	100.	DRY	15	0	0.20	0.02	Min	0.02
	V.L.D.R		NORMAL	30	5	0.30	0.03	Low	
	L.D.R.		NORMAL	50	15	0.30	0.03	Low	
	M.D.R.		NORMAL	50	30	0.25	0.03	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	L.D.R.		NORMAL	75	80	0.10	0.02	Min	
	M.D.R.		NORMAL	90	0	0.20	0.10	Hi	
	M.F.R.		NORMAL	85	0	0.50	0.10	Hi	

356.00 = Total Area Avg. = 15 0% 0.200

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.32

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.08

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 1
% EFFECTIVE IMP. = 1

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
X3SUB	0.556	2.27	1.23	0.02	196.0	0.20	0.32	7.60	0.08	1	16

LOSS PARAMETERS FOR SUBBASIN: X4SUB

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
28	76.000	42.0	0.02	0
66	48.000	26.5	0.23	0
95	57.000	31.5	0.04	0

TOTAL = 181.000 Acres XKSAT = 0.05 %Rock = 0

DTHETA

Dry = 0.27 PSIF = 8.80
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Desert		DRY	25	0	0.40	0.02	Low	
181.000	OPEN	100.	DRY	15	0	0.20	0.02	Min	0.03
	V.L.D.R		NORMAL	30	5	0.30	0.03	Low	
	L.D.R.		NORMAL	50	15	0.30	0.03	Low	
	M.D.R.		NORMAL	50	30	0.25	0.03	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	L.D.R.		NORMAL	75	80	0.10	0.02	Min	
	M.D.R.		NORMAL	90	0	0.20	0.10	Hi	
	M.F.R.		NORMAL	85	0	0.50	0.10	Hi	

181.00 = Total Area Avg. = 15 0% 0.200

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.27

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.05

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 0

% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
X4SUB	0.283	1.14	0.62	0.02	250.0	0.20	0.27	8.80	0.05	0	9

LOSS PARAMETERS FOR SUBBASIN: X5SUB

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	80.000	33.2	0.62	0
26	12.000	5.0	0.01	0
28	13.000	5.4	0.02	0
66	44.000	18.3	0.23	0
95	92.000	38.2	0.04	0

TOTAL = 241.000 Acres XKSAT = 0.12 %Rock = 0

DTHETA

Dry = 0.37 PSIF = 6.60
Normal = 0.19
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Desert		DRY	25	0	0.40	0.02	Low	
241.000	OPEN	100.	DRY	15	0	0.20	0.02	Min	0.03
	V.L.D.R		NORMAL	30	5	0.30	0.03	Low	
	L.D.R.		NORMAL	50	15	0.30	0.03	Low	
	M.D.R.		NORMAL	50	30	0.25	0.03	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	L.D.R.		NORMAL	75	80	0.10	0.02	Min	
	M.D.R.		NORMAL	90	0	0.20	0.10	Hi	
	M.F.R.		NORMAL	85	0	0.50	0.10	Hi	

241.00 = Total Area Avg. = 15 0% 0.200

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.37

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.13

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
X5SUB	0.377	1.51	0.85	0.02	198.7	0.20	0.37	6.60	0.13	0	12

LOSS PARAMETERS FOR SUBBASIN: SUBC1

Soil Survey Used Other

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
126F	280.000	34.7	0.25	0
103F	526.000	65.3	0.25	0

TOTAL = 806.000 Acres XKSAT = 0.25 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 4.80
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Desert		DRY	25	0	0.40	0.02	Low	
806.000	OPEN	100.	DRY	15	0	0.20	0.02	Min	0.02
	V.L.D.R		NORMAL	30	5	0.30	0.03	Low	
	L.D.R.		NORMAL	50	15	0.30	0.03	Low	
	M.D.R.		NORMAL	50	30	0.25	0.03	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	L.D.R.		NORMAL	75	80	0.10	0.02	Min	
	M.D.R.		NORMAL	90	0	0.20	0.10	Hi	
	M.F.R.		NORMAL	85	0	0.50	0.10	Hi	

806.00 = Total Area Avg. = 15 0% 0.200

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.26

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
SUBC1	1.259	1.33	0.81	0.02	1143.	0.20	0.35	4.80	0.26	0	8

LOSS PARAMETERS FOR SUBBASIN: SUBC2

Soil Survey Used Other

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
126F	100.000	7.1	0.25	0
103F	1302.000	92.9	0.25	0

TOTAL = 1402.000 Acres XKSAT = 0.25 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 4.80
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Desert		DRY	25	0	0.40	0.02	Low	
1402.00	OPEN	100.	DRY	15	0	0.20	0.02	Min	0.02
	V.L.D.R		NORMAL	30	5	0.30	0.03	Low	
	L.D.R.		NORMAL	50	15	0.30	0.03	Low	
	M.D.R.		NORMAL	50	30	0.25	0.03	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	L.D.R.		NORMAL	75	80	0.10	0.02	Min	
	M.D.R.		NORMAL	90	0	0.20	0.10	Hi	
	M.F.R.		NORMAL	[illegible]	0	0.50	0.10	Hi	

1402.0 = Total Area Avg. = 15 0% 0.200

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.26

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
SUBC2	2.191	3.79	2.08	0.02	369.4	0.20	0.35	4.80	0.26	0	21

LOSS PARAMETERS FOR SUBBASIN: SUBC3

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	5.000	0.6	0.62	0
66	85.000	10.7	0.23	0
72	17.000	2.1	0.09	30
95	10.000	1.3	0.04	0
126F	100.000	12.6	0.25	0
103F	577.000	72.7	0.25	0

TOTAL = 794.000 Acres XKSAT = 0.24 %Rock = 1

DTHETA

Dry = 0.35 PSIF = 4.90
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
140.000	Desert	17.6	DRY	25	0	0.40	0.02	Low	0.05
654.000	OPEN	82.4	DRY	15	0	0.20	0.02	Min	0.02
	V.L.D.R		NORMAL	30	5	0.30	0.03	Low	
	L.D.R.		NORMAL	50	15	0.30	0.03	Low	
	M.D.R.		NORMAL	50	30	0.25	0.03	Low	
	M.F.R.		NORMAL	50	45	0.25	0.[illegible]	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	L.D.R.		NORMAL	75	80	0.10	0.02	Min	
	M.D.R.		NORMAL	90	0	0.20	0.10	Hi	
	M.F.R.		NORMAL	85	0	0.50	0.10	Hi	

794.00 = Total Area Avg. = 17 0% 0.230

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.26

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 1
% EFFECTIVE IMP. = 1

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
SUBC3	1.241	2.18	1.61	0.02	403.7	0.23	0.35	4.90	0.26	1	15

LOSS PARAMETERS FOR SUBBASIN: SUBC4

Soil Survey Used Other

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
126F	467.000	28.7	0.25	0
103F	1158.000	71.3	0.25	0

TOTAL = 1625.000 Acres XKSAT = 0.25 %Rock = 0

DTHETA

Dry = 0.35 PSIF = 4.80
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Desert		DRY	25	0	0.40	0.02	Low	
1625.00	OPEN	100.	DRY	15	0	0.20	0.02	Min	0.02
	V.L.D.R		NORMAL	30	5	0.30	0.03	Low	
	L.D.R.		NORMAL	50	15	0.30	0.03	Low	
	M.D.R.		NORMAL	50	30	0.25	0.03	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	L.D.R.		NORMAL	75	80	0.10	0.02	Min	
	M.D.R.		NORMAL	90	0	0.20	0.10	Hi	
	M.F.R.		NORMAL	85	0	0.50	0.10	Hi	

1625.0 = Total Area Avg. = 15 0% 0.200

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.26

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 0
% EFFECTIVE IMP. = 0

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
SUBC4	2.539	2.94	1.85	0.02	688.4	0.20	0.35	4.80	0.26	0	16

LOSS PARAMETERS FOR SUBBASIN: SUBC5

Soil Survey Used Other

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
126F	128.000	5.9	0.25	0
103F	1638.000	75.5	0.25	0
72	404.000	18.6	0.09	30

TOTAL = 2170.000 Acres XKSAT = 0.21 %Rock = 6

DTHETA

Dry = 0.37 PSIF = 5.20
Normal = 0.25
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
437.000	Desert	20.1	DRY	25	0	0.40	0.02	Low	0.04
1733.00	OPEN	79.9	DRY	15	0	0.20	0.02	Min	0.02
	V.L.D.R		NORMAL	30	5	0.30	0.03	Low	
	L.D.R.		NORMAL	50	15	0.30	0.03	Low	
	M.D.R.		NORMAL	50	30	0.25	0.03	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	L.D.R.		NORMAL	75	30	0.10	0.02	Min	
	M.D.R.		NORMAL	90	0	0.20	0.10	Hi	
	M.F.R.		NORMAL	85	0	0.50	0.10	Hi	
2170.0 = Total Area			Avg. =	17	0%	0.240			

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.37

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.23

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 6
% EFFECTIVE IMP. = 6

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
SUBC5	3.391	2.94	1.42	0.02	540.8	0.24	0.37	5.20	0.23	6	15

LOSS PARAMETERS FOR SUBBASIN: SUBC7

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
26	202.000	26.3	0.01	0
66	72.000	9.4	0.23	0
72	469.000	61.2	0.09	30
95	24.000	3.1	0.04	0

TOTAL = 767.000 Acres XKSAT = 0.05 %Rock = 18

DTHETA

Dry = 0.27 PSIF = 8.80
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
767.000	Desert	100.	DRY	25	0	0.40	0.02	Low	0.04
	OPEN		DRY	15	0	0.20	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.03	Low	
	L.D.R.		NORMAL	50	15	0.30	0.03	Low	
	M.D.R.		NORMAL	50	30	0.25	0.03	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	L.D.R.		NORMAL	75	60	0.10	0.02	Min	
	M.D.R.		NORMAL	90	0	0.20	0.10	Hi	
	M.F.R.		NORMAL	85	0	0.50	0.10	Hi	

767.00 = Total Area Avg. = 25 0% 0.400

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.27

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.06

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 18

% EFFECTIVE IMP. = 18

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
SUBC7	1.198	2.46	1.09	0.02	561.0	0.40	0.27	8.80	0.06	18	13

LOSS PARAMETERS FOR SUBBASIN: SUBC8

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
6	2.000	0.2	0.62	0
26	437.000	48.0	0.01	0
66	61.000	6.7	0.23	0
72	258.000	28.4	0.09	30
95	152.000	16.7	0.04	0

TOTAL = 910.000 Acres XKSAT = 0.03 %Rock = 9

DTHETA

Dry = 0.22 PSIF = 10.10
Normal = 0.13
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
639.000	Desert	70.2	DRY	25	0	0.40	0.02	Low	0.04
	OPEN		DRY	15	0	0.20	0.02	Min	
	V.L.D.R		NORMAL	30	5	0.30	0.03	Low	
271.000	L.D.R.	29.8	NORMAL	50	15	0.30	0.03	Low	0.05
	M.D.R.		NORMAL	50	30	0.25	0.03	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	L.D.R.		NORMAL	75	80	0.10	0.02	Min	
	M.D.R.		NORMAL	90	0	0.20	0.10	Hi	
	M.F.R.		NORMAL	85	0	0.50	0.10	Hi	

910.00 = Total Area Avg. = 32 4% 0.370

PERCENT OF SUBBASIN DRY = 70.0 %
NORMAL = 30.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.19

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.04

IMPERVIOUS AREA: URBAN @ 100 % effective = 4
ROCK OUTCROP @ 100 % effective = 9

% EFFECTIVE IMP. = 13

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
SUBC8	1.422	2.56	1.23	0.02	101.6	0.37	0.19	10.10	0.04	13	20

LOSS PARAMETERS FOR SUBBASIN: SUBC9

Soil Survey Used Aguila/Carefre

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
3	1.000	0.3	0.58	0
6	107.000	28.9	0.62	0
13	10.000	2.7	0.01	0
26	77.000	20.8	0.01	0
44	22.000	5.9	0.03	0
66	8.000	2.2	0.23	0
72	41.000	11.1	0.09	30
93	10.000	2.7	0.33	0
96	30.000	8.1	0.07	0
110	11.000	3.0	0.13	0
103F	53.000	14.3	0.25	0

TOTAL = 370.000 Acres XKSAT = 0.11 %Rock = 3

DTHETA

Dry = 0.36 PSIF = 6.80
Normal = 0.17
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
219.000	Desert	59.2	DRY	25	0	0.40	0.02	Low	0.05
42.000	OPEN	11.4	DRY	15	0	0.20	0.02	Min	0.03
	V.L.D.R		NORMAL	30	5	0.30	0.03	Low	
109.000	L.D.R.	29.5	NORMAL	50	15	0.30	0.03	Low	0.05
	M.D.R.		NORMAL	50	30	0.25	0.03	Low	
	M.F.R.		NORMAL	50	45	0.25	0.05	Low	
	Ind		NORMAL	60	55	0.15	0.03	Min	
	L.D.R.		NORMAL	75	80	0.10	0.02	Min	
	M.D.R.		NORMAL	90	0	0.20	0.10	Hi	
	M.F.R.		NORMAL	85	0	0.50	0.10	Hi	

370.00 = Total Area Avg. = 31 4% 0.350

PERCENT OF SUBBASIN DRY = 71.0 %
NORMAL = 30.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.31

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.14

IMPERVIOUS AREA: URBAN @ 100 % effective = 4
ROCK OUTCROP @ 100 % effective = 3
% EFFECTIVE IMP. = 7

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
SUBC9	0.578	2.46	1.37	0.02	81.3	0.35	0.31	6.80	0.14	7	22

LOSS PARAMETERS FOR SUBBASIN: R1

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
26	365.000	36.5	0.01	0
66	8.000	0.8	0.23	0
72	566.000	56.7	0.09	30
95	55.000	5.5	0.04	0
96	5.000	0.5	0.07	0

TOTAL = 999.000 Acres XKSAT = 0.04 %Rock = 17

DTHETA

Dry = 0.25 PSIF = 9.70
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
999.000	Vacant	100.	DRY	26	0	0.15	0.03	Low	0.04
	L.D.R.		DRY	34	5	0.10	0.03	Low	
999.00 = Total Area			Avg. =	26	0%	0.150			

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.05

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 17
% EFFECTIVE IMP. = 17

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
R1	1.561	2.94	1.14	0.03	112.2	0.15	0.25	9.70	0.05	17	23

LOSS PARAMETERS FOR SUBBASIN: R2

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
26	275.000	21.6	0.01	0
66	248.000	19.5	0.23	0
72	583.000	45.9	0.09	30
93	10.000	0.8	0.33	0
95	138.000	10.9	0.04	0
96	16.000	1.3	0.07	0

TOTAL = 1270.000 Acres XKSAT = 0.06 %Rock = 14

DTHETA

Dry = 0.29 PSIF = 8.40
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
1270.00	Vacant	100.	DRY	26	0	0.15	0.03	Low	0.04
	L.D R.		DRY	34	5	0.10	0.03	Low	-
1270.0 - Total Area			Avg. =	26	0%	0.150			

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.29

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.07

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 14
% EFFECTIVE IMP. = 14

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
R2	1.984	3.36	1.47	0.03	327.4	0.15	0.29	8.40	0.07	14	22

LOSS PARAMETERS FOR SUBBASIN: R3

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Acres	% Area	XKSAT	% Rock Outcrop
12	8.000	0.8	0.01	0
26	40.000	3.9	0.01	0
44	33.000	3.2	0.03	0
52	43.000	4.2	0.16	20
66	7.000	0.7	0.23	0
68	6.000	0.6	0.63	7
72	649.000	63.8	0.09	30
96	53.000	5.2	0.07	0
98	99.000	9.7	0.37	0
110	79.000	7.8	0.13	0

TOTAL = 1017.000 Acres XKSAT = 0.10 %Rock = 20

DTHETA

Dry = 0.35 PSIF = 7.00
Normal = 0.15
Wet = 0.00

LAND USE

AREA Acres	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
82.000	Vacant	8.1	DRY	26	0	0.15	0.03	Low	0.05
935.000	L.D.R.	91.9	DRY	34	[illegible]	0.10	0.03	Low	0.04

1017.0 = Total Area Avg. = 33 5% 0.100

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.13

IMPERVIOUS AREA: URBAN @ 100 % effective = 5
ROCK OUTCROP @ 100 % effective = 20
% EFFECTIVE IMP. = 25

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
R3	1.589	3.50	2.08	0.03	365.7	0.10	0.35	7.00	0.13	25	30

LOSS PARAMETERS FOR SUBBASIN: U1

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
12	0.608	24.0	0.01	0
13	0.133	5.3	0.01	0
23	0.420	16.6	0.01	0
52	0.980	38.7	0.16	20
44	0.334	13.2	0.03	0
21	0.055	2.2	0.38	0
1	0.000	0.0	0.41	0

TOTAL = 2.530 Sq.Miles XKSAT = 0.04 %Rock = 8

DTHETA

Dry = 0.25 PSIF = 9.70
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
2.530	Desert 1	100.	DRY	29	0	0.27	0.03	Hi	0.07
	Desert 2		DRY	33	0	0.29	0.03	Hi	
	Desert 3		DRY	27	0	0.24	0.03	Hi	
	Desert 4		DRY	26	0	0.23	0.04	Hi	
	Desert 5		DRY	31	0	0.28	0.03	Hi	
	Desert 6		DRY	20	0	0.21	0.04	Hi	
	Desert 7		DRY	40	0	0.35	0.03	Hi	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	
2.530 = Total Area			Avg. =	29	0%	0.270			

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.05

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 8
% EFFECTIVE IMP. = 8

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
U1	2.530	2.62	1.67	0.03	72.5	0.27	0.25	9.70	0.05	8	34

LOSS PARAMETERS FOR SUBBASIN: U2

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
52	0.466	29.2	0.16	20
44	0.202	12.7	0.03	0
98	0.105	6.6	0.37	0
23	0.069	4.3	0.01	0
12	0.500	31.3	0.01	0
13	0.244	15.3	0.01	0
3	0.010	0.6	0.58	0

TOTAL = 1.596 Sq.Miles XKSAT = 0.03 %Rock = 6

DTHETA

Dry = 0.22 PSIF = 10.10
Normal = 0.13
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Desert 1		DRY	29	0	0.27	0.03	Hi	
1.596	Desert 2	100.	DRY	33	0	0.29	0.03	Hi	0.07
	Desert 3		DRY	27	0	0.24	0.03	Hi	
	Desert 4		DRY	26	0	0.23	0.04	Hi	
	Desert 5		DRY	31	0	0.28	0.03	Hi	
	Desert 6		DRY	20	0	0.21	0.04	Hi	
	Desert 7		DRY	40	0	0.35	0.03	Hi	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	
1.596 = Total Area			Avg. =	33	0%	0.290			

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.22

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.04

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 6
% EFFECTIVE IMP. = 6

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
U2	1.595	2.75	1.71	0.03	58.2	0.29	0.22	10.10	0.04	6	37

LOSS PARAMETERS FOR SUBBASIN: U3

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
44	0.231	27.4	0.03	0
52	0.338	40.1	0.16	20
68	0.146	17.3	0.63	0
12	0.071	8.4	0.01	0
3	0.050	5.9	0.58	0
110	0.007	0.8	0.13	0

TOTAL = 0.843 Sq.Miles XKSAT = 0.11 %Rock = 8

DTHETA

Dry = 0.36 PSIF = 6.80
Normal = 0.17
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Desert 1		DRY	29	0	0.27	0.03	Hi	
	Desert 2		DRY	33	0	0.29	0.03	Hi	
0.843	Desert 3	100.	DRY	27	0	0.24	0.03	Hi	0.08
	Desert 4		DRY	26	0	0.23	0.04	Hi	
	Desert 5		DRY	31	0	0.28	0.03	Hi	
	Desert 6		DRY	20	0	0.21	0.04	Hi	
	Desert 7		DRY	40	0	0.35	0.03	Hi	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	
0.843 = Total Area			Avg. =	27	0%	0.240			

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.36

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.13

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 8
% EFFECTIVE IMP. = 8

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
U3	0.843	2.08	1.31	0.03	91.3	0.24	0.36	6.80	0.13	8	30

LOSS PARAMETERS FOR SUBBASIN: U4

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
52	0.797	28.5	0.16	20
68	0.428	15.3	0.63	0
100	0.333	11.9	0.40	20
44	0.879	31.5	0.03	0
98	0.013	0.5	0.37	0
12	0.226	8.1	0.01	0
110	0.060	2.1	0.13	0
3	0.040	1.4	0.58	0
23	0.019	0.7	0.01	0

TOTAL = 2.795 Sq.Miles XKSAT = 0.10 %Rock = 8

DTHETA

Dry = 0.35 PSIF = 7.00
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Desert 1		DRY	29	0	0.27	0.03	Hi	
	Desert 2		DRY	33	0	0.29	0.03	Hi	
	Desert 3		DRY	27	0	0.24	0.03	Hi	
2.795	Desert 4	100.	DRY	26	0	0.23	0.04	Hi	0.07
	Desert 5		DRY	31	0	0.28	0.03	Hi	
	Desert 6		DRY	20	0	0.21	0.04	Hi	
	Desert 7		DRY	40	0	0.35	0.03	Hi	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

2.795 = Total Area Avg. = 26 0% 0.230

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.35

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.12

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 8
% EFFECTIVE IMP. = 8

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
U4	2.795	2.07	1.19	0.04	135.3	0.23	0.35	7.00	0.12	8	29

LOSS PARAMETERS FOR SUBBASIN: U5

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
44	1.114	34.3	0.03	0
52	0.197	6.1	0.16	20
100	0.236	7.3	0.40	20
68	0.328	10.1	0.63	0
123	0.416	12.8	0.37	0
21	0.012	0.4	0.38	0
118	0.013	0.4	0.42	0
110	0.008	0.2	0.13	0
98	0.572	17.6	0.37	0
12	0.285	8.8	0.01	0
112	0.021	0.6	0.39	0
3	0.048	1.5	0.58	0
124	0.001	0.0	0.39	0

TOTAL = 3.251 Sq.Miles XKSAT = 0.12 %Rock = 3

DTHETA

Dry = 0.37 PSIF = 6.60
Normal = 0.19
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Desert 1		DRY	29	0	0.27	0.03	Hi	
	Desert 2		DRY	33	0	0.29	0.03	Hi	
	Desert 3		DRY	27	0	0.24	0.03	Hi	
	Desert 4		DRY	26	0	0.23	0.04	Hi	
3.251	Desert 5	100.	DRY	31	0	0.28	0.03	Hi	0.07
	Desert 6		DRY	20	0	0.21	0.04	Hi	
	Desert 7		DRY	40	0	0.35	0.03	Hi	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

3.251 = Total Area Avg. = 31 0% 0.280

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.37

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.15

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 3

% EFFECTIVE IMP. = 3

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
U5	3.252	3.34	1.86	0.03	163.2	0.28	0.37	6.60	0.15	3	35

LOSS PARAMETERS FOR SUBBASIN: U6

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
100	0.007	1.0	0.40	20
98	0.028	4.0	0.37	0
44	0.274	38.9	0.03	0
110	0.023	3.3	0.13	0
52	0.364	51.7	0.16	20
3	0.008	1.1	0.58	0

TOTAL = 0.704 Sq.Miles XKSAT = 0.09 %Rock = 11

DTHETA

Dry = 0.33 PSIF = 7.30
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Desert 1		DRY	29	0	0.27	0.03	Hi	
	Desert 2		DRY	33	0	0.29	0.03	Hi	
	Desert 3		DRY	27	0	0.24	0.03	Hi	
	Desert 4		DRY	26	0	0.23	0.04	Hi	
	Desert 5		DRY	31	0	0.28	0.03	Hi	
0.704	Desert 6	100.	DRY	20	0	0.21	0.04	Hi	0.08
	Desert 7		DRY	40	0	0.35	0.03	Hi	
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

0.704 = Total Area Avg. = 20 0% 0.210

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.33

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.10

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 11
% EFFECTIVE IMP. = 11

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
U6	0.704	1.41	0.80	0.04	315.6	0.21	0.33	7.30	0.10	11	21

LOSS PARAMETERS FOR SUBBASIN: U7

Soil Survey Used Aguila/Carefree

XKSAT

Map Unit	AREA Sq.Miles	% Area	XKSAT	% Rock Outcrop
100	0.073	5.0	0.40	20
110	0.144	9.8	0.13	0
44	0.146	10.0	0.03	0
12	0.745	50.8	0.01	0
52	0.022	1.5	0.16	20
98	0.241	16.4	0.37	0
3	0.070	4.8	0.58	0
123	0.011	0.7	0.37	0
124	0.015	1.0	0.39	0

TOTAL = 1.467 Sq.Miles XKSAT = 0.04 %Rock = 1

DTHETA

Dry = 0.25 PSIF = 9.70
Normal = 0.15
Wet = 0.00

LAND USE

AREA Sq.Miles	LAND USE Type	% Area	DTHETA condition	%Veg. cover	RTIMP%	IA in.	Kn	Kb Type	Kb
	Desert 1		DRY	29	0	0.27	0.03	Hi	
	Desert 2		DRY	33	0	0.29	0.03	Hi	
	Desert 3		DRY	27	0	0.24	0.03	Hi	
	Desert 4		DRY	26	0	0.23	0.04	Hi	
	Desert 5		DRY	31	0	0.28	0.03	Hi	
	Desert 6		DRY	20	0	0.21	0.04	Hi	
1.467	Desert 7	100.	DRY	40	0	0.35	0.03	Hi	0.08
	Comm		NORMAL	75	80	0.10	0.02	Min	
	Park		NORMAL	90	0	0.20	0.10	Hi	
	RowCrop		NORMAL	85	0	0.50	0.10	Hi	

1.467 = Total Area Avg. = 40 0% 0.350

PERCENT OF SUBBASIN DRY = 100. %
NORMAL = 0.0 %
WET = 0.0 %

SUBBASIN DTHETA WEIGHTED BY LAND USE = 0.25

SUBBASIN XKSAT ADJUSTED FOR VEG. = 0.05

IMPERVIOUS AREA: URBAN @ 100 % effective = 0
ROCK OUTCROP @ 100 % effective = 1
% EFFECTIVE IMP. = 1

INPUT VALUES FOR MCUHP2 PROGRAM

SUBBASIN	Area sq. mi.	Length mi.	Lca	Kn	Slope ft/mi	IA in.	DTHETA	PSIF	XKSAT adj.	RTIMP %	Lag min.
U7	1.467	3.34	1.82	0.03	49.4	0.35	0.25	9.70	0.05	1	34

Summary of MCUHP2 Lag Time Calculation Parameters

SUBBASIN	S-Graph Type	Kn	L miles	Lca miles	Slope ft/mile	Lag mins
S1	Mountain	0.0400	2.48	0.93	535.50	24.0
S2	Mountain	0.0400	2.22	1.09	384.20	23.4
S3	Mountain	0.0400	2.27	1.08	331.30	23.5
S4	Mountain	0.0400	2.31	1.10	588.70	24.4
S5	Mountain	0.0400	2.91	1.77	618.60	34.0
S6	Desert/Rangeland	0.0300	2.38	1.12	152.50	27.3
S7	Desert/Rangeland	0.0300	2.14	1.25	136.40	25.5
S8	Desert/Rangeland	0.0300	1.94	1.01	207.20	22.9
S9	Mountain	0.0400	2.31	0.91	329.00	27.9
S10	Desert/Rangeland	0.0300	2.70	1.24	156.70	27.9
S11	Mountain	0.0400	2.70	1.28	438.10	26.9
S12	Desert/Rangeland	0.0300	2.76	1.30	123.20	29.1
S13	Mountain	0.0400	2.67	1.16	425.10	24.5
S14	Mountain	0.0400	1.76	1.02	670.50	18.8
S15	Desert/Rangeland	0.0400	1.97	1.05	238.10	23.5
S16	Mountain	0.0300	1.86	0.89	333.30	19.1
S17	Desert/Rangeland	0.0400	2.47	1.05	136.00	30.9
S18	Desert/Rangeland	0.0300	2.42	1.10	59.50	28.8
S20	Desert/Rangeland	0.0300	2.38	0.96	43.30	28.9
S19	Desert/Rangeland	0.0300	1.49	0.67	76.50	19.6
S21	Desert/Rangeland	0.0300	3.71	1.65	56.60	34.6
S22	Mountain	0.0300	2.27	1.14	277.50	22.7
S23	Desert/Rangeland	0.0300	4.60	2.06	43.90	42.9
S24	Desert/Rangeland	0.0300	1.37	0.75	38.00	19.0
X1SUB	Valley	0.0250	1.75	0.81	320.00	13.7
X2SUB	Valley	0.0250	1.99	0.99	311.60	15.6
X3SUB	Valley	0.0250	2.27	1.23	196.00	19.5
X4SUB	Valley	0.0250	1.14	0.62	250.00	11.1
X5SUB	Valley	0.0250	1.51	0.85	198.70	14.5
SUBC1	Mountain	0.0250	1.33	0.81	1143.00	9.7
SUBC2	Mountain	0.0250	3.79	2.08	369.40	25.7
SUBC3	Mountain	0.0270	2.18	1.61	403.70	20.0
SUBC4	Mountain	0.0250	2.94	1.85	688.40	19.8
SUBC5	Mountain	0.0270	2.94	1.42	540.80	20.2
SUBC7	Mountain	0.0350	2.46	1.09	561.00	22.0
SUBC8	Valley	0.0390	2.56	1.23	101.60	36.1
SUBC9	Valley	0.0380	2.46	1.37	81.30	37.6
R1	Valley	0.0300	2.94	1.14	112.20	27.9
R2	Valley	0.0300	3.36	1.47	327.40	26.4
R3	Valley	0.0300	3.50	2.08	365.70	29.9
U1	Mountain	0.0300	2.62	1.67	72.50	33.5
U2	Mountain	0.0300	2.75	1.71	58.20	37.1
U3	Mountain	0.0300	2.08	1.31	91.30	26.8
U4	Mountain	0.0400	2.07	1.19	135.30	28.7
U5	Desert/Rangeland	0.0300	3.34	1.86	163.20	35.0
U6	Mountain	0.0400	1.41	0.80	315.60	20.7
U7	Desert/Rangeland	0.0300	3.34	1.82	49.40	34.1

Summary of MCUHP2 Lag Time Calculation Parameters

SUBBASIN	S-Graph Type	Kn	L miles	Lca miles	Slope ft/mile	Lag mins
S1	Mountain	0.0400	2.48	0.93	535.50	24.0
S2	Mountain	0.0400	2.22	1.09	384.20	23.4
S3	Mountain	0.0400	2.27	1.08	331.30	23.5
S4	Mountain	0.0400	2.31	1.10	588.70	24.4
S5	Mountain	0.0400	2.91	1.77	618.60	34.0
S6	Desert/Rangeland	0.0300	2.38	1.12	152.50	27.3
S7	Desert/Rangeland	0.0300	2.14	1.25	136.40	25.5
S8	Desert/Rangeland	0.0300	1.94	1.01	207.20	22.9
S9	Mountain	0.0400	2.31	0.91	329.00	27.9
S10	Desert/Rangeland	0.0300	2.70	1.24	156.70	27.9
S11	Mountain	0.0400	2.70	1.28	438.10	26.9
S12	Desert/Rangeland	0.0300	2.76	1.30	123.20	29.1
S13	Mountain	0.0400	2.67	1.16	425.10	24.5
S14	Mountain	0.0400	1.76	1.02	670.50	18.8
S15	Desert/Rangeland	0.0400	1.97	1.05	238.10	23.5
S16	Mountain	0.0300	1.86	0.89	333.30	19.1
S17	Desert/Rangeland	0.0400	2.47	1.05	136.00	30.9
S18	Desert/Rangeland	0.0300	2.42	1.10	59.50	28.8
S20	Desert/Rangeland	0.0300	2.38	0.96	43.30	28.9
S19	Desert/Rangeland	0.0300	1.49	0.67	76.50	19.6
S21	Desert/Rangeland	0.0300	3.71	1.65	56.60	34.6
S22	Mountain	0.0300	2.27	1.14	277.50	22.7
S23	Desert/Rangeland	0.0260	4.60	2.06	43.90	42.9
S24	Desert/Rangeland	0.0300	1.37	0.75	38.00	19.0
X1SUB	Valley	0.0250	1.75	0.81	320.00	13.7
X2SUB	Valley	0.0250	1.99	0.99	311.60	15.6
X3SUB	Valley	0.0250	2.27	1.23	196.00	19.5
X4SUB	Valley	0.0250	1.14	0.62	250.00	11.1
X5SUB	Valley	0.0250	1.51	0.85	198.70	14.5
SUBC1	Mountain	0.0250	1.33	0.81	1143.00	9.7
SUBC2	Mountain	0.0250	3.79	2.08	369.40	25.7
SUBC3	Mountain	0.0270	2.18	1.61	403.70	20.0
SUBC4	Mountain	0.0250	2.94	1.85	688.40	19.8
SUBC5	Mountain	0.0270	2.94	1.42	540.80	20.2
SUBC7	Mountain	0.0350	2.46	1.09	561.00	22.0
SUBC8	Valley	0.0390	2.56	1.23	101.60	36.1
SUBC9	Valley	0.0380	2.46	1.37	81.30	37.6
R1	Valley	0.0300	2.94	1.14	112.20	27.9
R2	Valley	0.0300	3.36	1.47	327.40	26.4
R3	Valley	0.0300	3.50	2.08	365.70	29.9
U1	Mountain	0.0300	2.62	1.67	72.50	33.5
U2	Mountain	0.0300	2.75	1.71	58.20	37.1
U3	Mountain	0.0340	2.08	1.31	91.30	30.4
U4	Mountain	0.0400	2.07	1.19	135.30	28.7
U5	Desert/Rangeland	0.0300	3.34	1.86	163.20	35.0
U6	Mountain	0.0400	1.41	0.80	315.60	20.7
U7	Desert/Rangeland	0.0300	3.34	1.82	49.40	34.1

Summary of MCUHP2 Subbasin Input Parameters

SUBBASIN	AREA sq.miles	IA ins.	DTHETA	PSIF	XKSAT adj.	RTIMP %	LAG mins.
S1	2.080	0.220	0.380	6.40	0.140	6	24.0
S2	1.174	0.180	0.350	7.00	0.110	7	23.4
S3	1.030	0.170	0.390	5.70	0.190	4	23.5
S4	0.970	0.200	0.390	5.70	0.190	0	24.4
S5	1.850	0.230	0.390	5.70	0.180	0	34.0
S6	0.936	0.230	0.350	7.00	0.120	2	27.3
S7	0.683	0.150	0.320	7.60	0.090	4	25.5
S8	1.121	0.170	0.390	5.70	0.190	0	22.9
S9	1.021	0.200	0.390	5.70	0.190	0	27.9
S10	1.801	0.170	0.400	6.00	0.180	0	27.9
S11	0.920	0.200	0.390	5.70	0.190	0	26.9
S12	0.910	0.150	0.320	7.60	0.090	1	29.1
S13	1.272	0.220	0.370	5.30	0.230	20	24.5
S14	0.833	0.230	0.390	5.80	0.180	25	18.8
S15	0.987	0.210	0.350	7.00	0.120	15	23.5
S16	1.318	0.290	0.390	5.80	0.200	0	19.1
S17	1.033	0.160	0.330	7.30	0.100	0	30.9
S18	1.713	0.150	0.270	8.80	0.060	0	28.8
S20	1.273	0.170	0.270	8.80	0.060	6	28.9
S19	0.772	0.170	0.290	8.40	0.070	4	19.6
S21	2.221	0.210	0.270	8.80	0.060	0	34.6
S22	1.467	0.250	0.390	5.80	0.190	0	22.7
S23	1.720	0.350	0.250	9.70	0.050	0	42.9
S24	0.640	0.350	0.300	8.00	0.090	0	19.0
X1SUB	0.605	0.200	0.300	8.00	0.070	16	11.0
X2SUB	0.433	0.200	0.320	7.60	0.080	6	12.5
X3SUB	0.556	0.200	0.320	7.60	0.080	1	15.6
X4SUB	0.283	0.200	0.270	8.80	0.050	0	8.8
X5SUB	0.377	0.200	0.370	6.60	0.130	0	11.6
SUBC1	1.259	0.200	0.350	4.80	0.260	0	7.8
SUBC2	2.191	0.200	0.350	4.80	0.260	0	20.5
SUBC3	1.241	0.230	0.350	4.90	0.260	1	14.8
SUBC4	2.539	0.200	0.350	4.80	0.260	0	15.8
SUBC5	3.391	0.240	0.370	5.20	0.230	6	15.0
SUBC7	1.198	0.400	0.270	8.80	0.060	18	12.6
SUBC8	1.422	0.370	0.190	10.10	0.040	13	20.4
SUBC9	0.578	0.350	0.310	6.80	0.140	7	21.8
R1	1.561	0.150	0.250	9.70	0.050	17	23.3
R2	1.984	0.150	0.290	8.40	0.070	14	22.0
R3	1.589	0.100	0.350	7.00	0.130	25	29.9
U1	2.530	0.270	0.250	9.70	0.050	8	33.5
U2	1.596	0.290	0.220	10.10	0.040	6	37.1
U3	0.843	0.240	0.360	6.80	0.130	8	30.4
U4	2.795	0.230	0.350	7.00	0.120	8	28.7
U5	3.251	0.280	0.370	6.60	0.150	3	35.0
U6	0.704	0.210	0.330	7.30	0.100	11	20.7
U7	1.467	0.350	0.250	9.70	0.050	1	34.1

Summary of MCUHP2 Lag Time Calculation Parameters

SUBBASIN	S-Graph Type	Kn	L miles	Lca miles	Slope ft/mile	Lag mins
S1	Mountain	0.0400	2.48	0.93	535.50	24.0
S2	Mountain	0.0360	2.22	1.09	384.20	23.4
S3	Mountain	0.0350	2.27	1.08	331.30	23.5
S4	Mountain	0.0400	2.31	1.10	588.70	24.4
S5	Mountain	0.0430	2.91	1.77	618.60	34.0
S6	Desert/Rangeland	0.0340	2.38	1.12	152.50	27.3
S7	Desert/Rangeland	0.0310	2.14	1.25	136.40	25.5
S8	Desert/Rangeland	0.0340	1.94	1.01	207.20	22.9
S9	Mountain	0.0440	2.31	0.91	329.00	27.9
S10	Desert/Rangeland	0.0320	2.70	1.24	156.70	27.9
S11	Mountain	0.0370	2.70	1.28	438.10	26.9
S12	Desert/Rangeland	0.0310	2.76	1.30	123.20	29.1
S13	Mountain	0.0350	2.67	1.16	425.10	24.5
S14	Mountain	0.0360	1.76	1.02	670.50	18.8
S15	Desert/Rangeland	0.0350	1.97	1.05	238.10	23.5
S16	Mountain	0.0330	1.86	0.89	333.30	19.1
S17	Desert/Rangeland	0.0380	2.47	1.05	136.00	30.9
S18	Desert/Rangeland	0.0300	2.42	1.10	59.50	28.8
S20	Desert/Rangeland	0.0300	2.38	0.96	43.30	28.9
S19	Desert/Rangeland	0.0310	1.49	0.67	76.50	19.6
S21	Desert/Rangeland	0.0260	3.71	1.65	56.60	34.6
S22	Mountain	0.0320	2.27	1.14	277.50	22.7
S23	Desert/Rangeland	0.0260	4.60	2.06	43.90	42.9
S24	Desert/Rangeland	0.0260	1.37	0.75	38.00	19.0
X1SUB	Mountain	0.0200	1.75	0.81	320.00	11.0
X2SUB	Mountain	0.0200	1.99	0.99	311.60	12.5
X3SUB	Desert/Rangeland	0.0200	2.27	1.23	196.00	15.6
X4SUB	Desert/Rangeland	0.0200	1.14	0.62	250.00	8.8
X5SUB	Desert/Rangeland	0.0200	1.51	0.85	198.70	11.6
SUBC1	Mountain	0.0200	1.33	0.81	1143.00	7.8
SUBC2	Mountain	0.0200	3.79	2.08	369.40	20.5
SUBC3	Mountain	0.0200	2.18	1.61	403.70	14.8
SUBC4	Mountain	0.0200	2.94	1.85	688.40	15.8
SUBC5	Mountain	0.0200	2.94	1.42	540.80	15.0
SUBC7	Mountain	0.0200	2.46	1.09	561.00	12.6
SUBC8	Desert/Rangeland	0.0220	2.56	1.23	101.60	20.4
SUBC9	Desert/Rangeland	0.0220	2.46	1.37	81.30	21.8
R1	Desert/Rangeland	0.0250	2.94	1.14	112.20	23.3
R2	Mountain	0.0250	3.36	1.47	327.40	22.0
R3	Mountain	0.0300	3.50	2.08	365.70	29.9
U1	Desert/Rangeland	0.0300	2.62	1.67	72.50	33.5
U2	Desert/Rangeland	0.0310	2.75	1.71	58.20	37.1
U3	Desert/Rangeland	0.0340	2.08	1.31	91.30	30.4
U4	Desert/Rangeland	0.0360	2.07	1.19	135.30	28.7
U5	Desert/Rangeland	0.0320	3.34	1.86	163.20	35.0
U6	Mountain	0.0410	1.41	0.80	315.60	20.7
U7	Desert/Rangeland	0.0250	3.34	1.82	49.40	34.1

Appendix B

MONTGOMERY WATSON

Modified Hydrology for

Cline Creek Watershed and Rodger Creek Watershed

Prepared by the

Flood Control District of Maricopa County
Engineering Division

May 1996

Introduction :

The Flood Control District of Maricopa County has retained Montgomery Watson, as consultants, for the Skunk Creek Topographic Mapping and Floodplain Delineation study. The study limits are from the CAP canal to the south to the New River Mountains to the North. The floodplain delineation study covers approximately 64.0 square miles of watershed.

There are two major tributaries that contribute to the hydrology of the Skunk Creek Watershed. These are : (1) Cline Creek Watershed, and (2) Rodger Creek Watershed, which comprise of approximately 21.0 square miles of watershed area. Figure 1 shows the boundaries of the Skunk Creek, Cline Creek and Rodger Creek watersheds.

Purpose :

Cline Creek and Rodger Creek watersheds have been delineated previously by the Michael Baker, Jr., Inc., for the Flood Control District of Maricopa County in 1989-1990 (Ref. 1 and Ref. 2). Since then, several changes have been adopted by the District for the Drainage Design Manual (Ref. 3). The current hydrologic study (Skunk Creek Watershed) incorporates the existing Drainage Design Manual, Volume I, Hydrology, procedures.

It is intended that the two contributing watersheds (Cline Creek and Rodger Creek) will be a part of the comprehensive modeling effort in the current study. In order to apply the Drainage Design Manual, Volume I, Hydrology, methods and procedures uniformly, the two previously completed watershed hydrology models had to be modified. The modifications of the hydrologic analyses of the Cline Creek and Rodger Creek watersheds

are discussed in detail in the following sections.

Soil Types :

Cline Creek Watershed : The Aguila-Carefree Soil Survey (Ref. 4) was used to determine the soil characteristics and infiltration properties. Table 1 lists the different soil types within the watershed; while Figure 2 is a graphical representation of the same information. A portion of the project area lies within the Tonto National Forest. No detailed soil survey is available for the area within the National Forest. Based on the information collected from the Tonto National Forest soils experts, it was determined that a loam soil would best describe the hydrologic properties of the soil. This information is shown in Appendix A.

Rodger Creek Watershed : The Aguila-Carefree Soil Survey (Ref. 4) was used to determine the soil characteristics and infiltration properties. All areas are covered by the Aguila-Carefree Soil Survey. Table 2 lists the different soil types within the watershed; while Figure 3 is a graphical representation of the same information.

Land Use Types :

Cline Creek Watershed : The Land Use Type information was collected from the Flood Control District's GIS database. Once again, no information was available on the portion of the watershed within the Tonto National Forest. However, since all of the forest area is undeveloped, it was characterized as vacant land for the purposes of Land Use Types. Table 3 lists the different land use types; while Figure 4 shows the information graphically.

Rodger Creek Watershed : The Land Use Type information was collected from the

Flood Control District's GIS database. The majority of the area in the watershed is characterized as vacant land. Table 4 lists the different land use types; while Figure 5 shows the information graphically.

K_n Values :

This roughness value is necessary for the lag time calculation. In the foothills areas K_n values varied from 0.020 to 0.030. The K_n values are also dependent on the land use types of the subbasins.

Rainfall Losses :

The previous studies used a uniform soil loss procedure to describe the rainfall losses. However, the current study utilizes the Green-Ampt infiltration model to determine the losses. Therefore, Green-Ampt infiltration method was used in both of the revised hydrologic models. The parameters necessary to define the infiltration process are based on the Soil types and the Land use types. Other necessary parameters to calculate the lag time were measured from the available topographic mapping information. These measurements are listed in Tables 5 and 6.

Unit Hydrograph :

In the previous studies, the SCS dimensionless unit hydrograph procedure was used to generate the rainfall excess. A more realistic and recommended procedure of generating the rainfall excess is to use the S-graphs. Some subbasins were assigned Phoenix Mountain

S-graph, while others were assigned Desert/Rangeland S-graph depending on the general terrain characteristics of the watersheds. Subbasins with an average watercourse slope of 300 ft./mi. or higher utilized the Phoenix Mountain S-graph method while others subbasins having slopes less than 300 ft./mi. used the Desert/Rangeland S-graph. Table 7 lists the assignments of the S-graphs in the two watersheds.

Rainfall-Runoff Modeling :

The revised hydrologic models were created using the Corps' of Enginners' HEC-1 (Ref. 5) computer program to determine the excess runoff generated by the watersheds. However, the Drainage Design Menu System (DDMS) (Ref. 6) was also utilized to prepare the necessary information, compile, and run the program using HEC-1.

Model Results :

The revised hydrology of the watershed produced reasonable excess runoff. The total discharges at the outlet of the watersheds are very similar. A comparison of the HEC-1 outputs are available in Appendix B.

List of Reference

1. Michael Baker, Jr., Inc., Cline Creek Floodplain Delineation Study, Contract no. FCD 89-15, January 1990.
2. Michael Baker, Jr., Inc., Rodger Creek Floodplain Delineation Study, Contract no. FCD 89-15, December 1989.
3. Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, January 1995.
4. U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of Aguila-Carefree area, Parts of Maricopa and Pinal Counties, Arizona, April 1986.
5. U.S. Army Corps' of Engineers, HEC-1 Flood Hydrograph Package, User's Manual, September 1990.
6. Flood Control District of Maricopa County, Drainage Design Menu System (DDMS), Computer program, 1995.

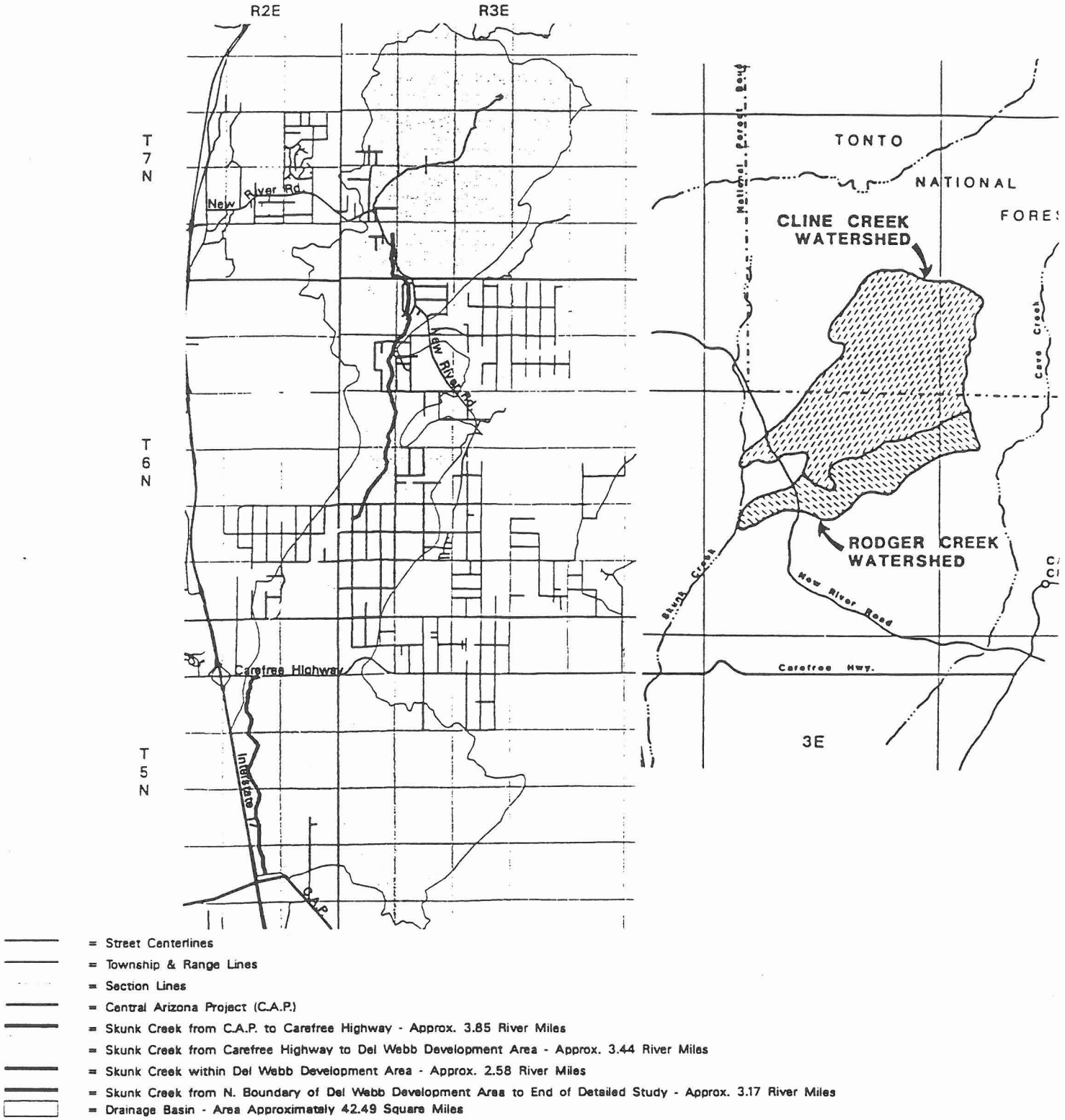
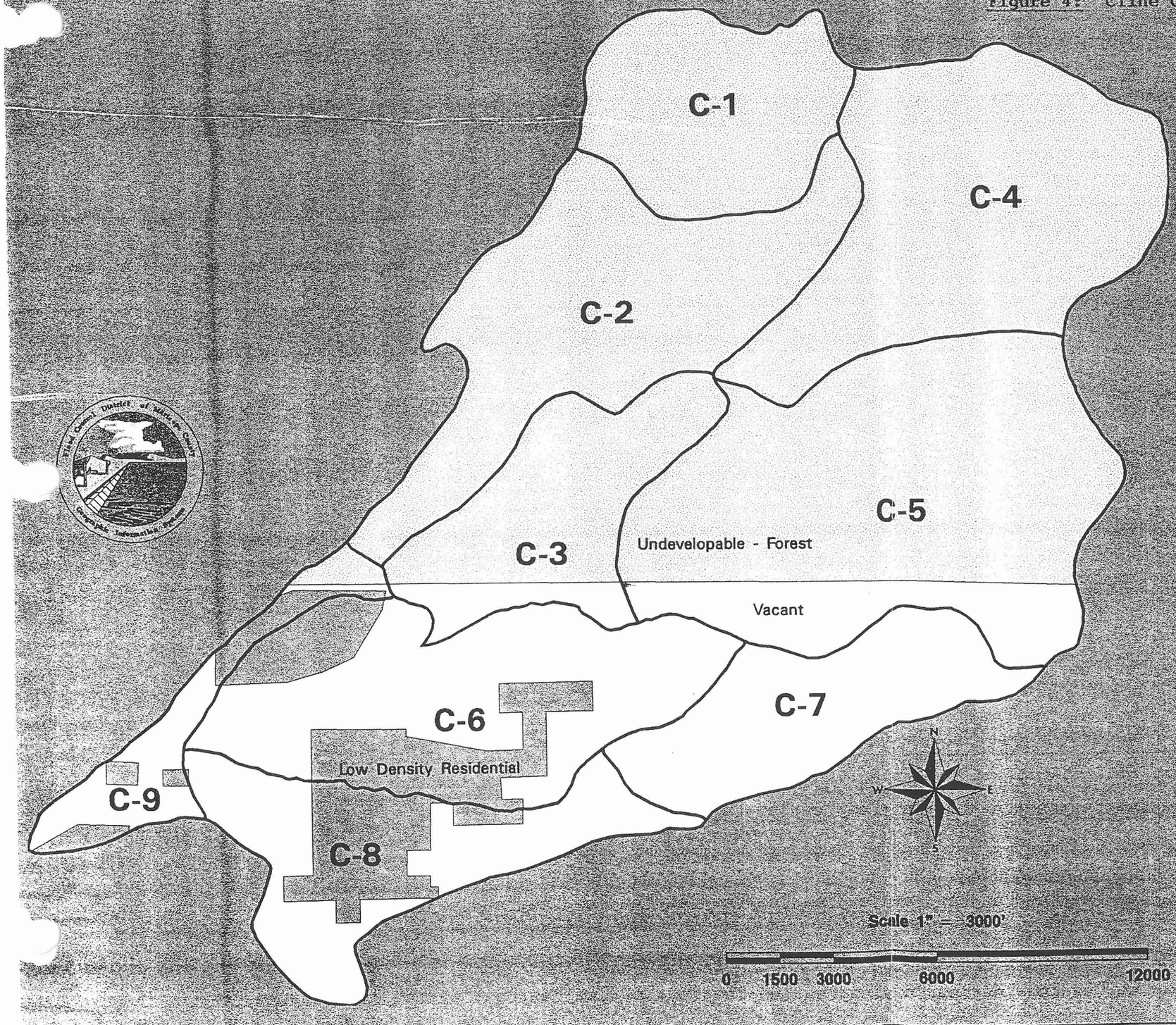


Figure 1 : Watershed boundaries.

Landuse Types for the Cline Creek Watershed

Figure 4: Cline Creek Land Use Types.



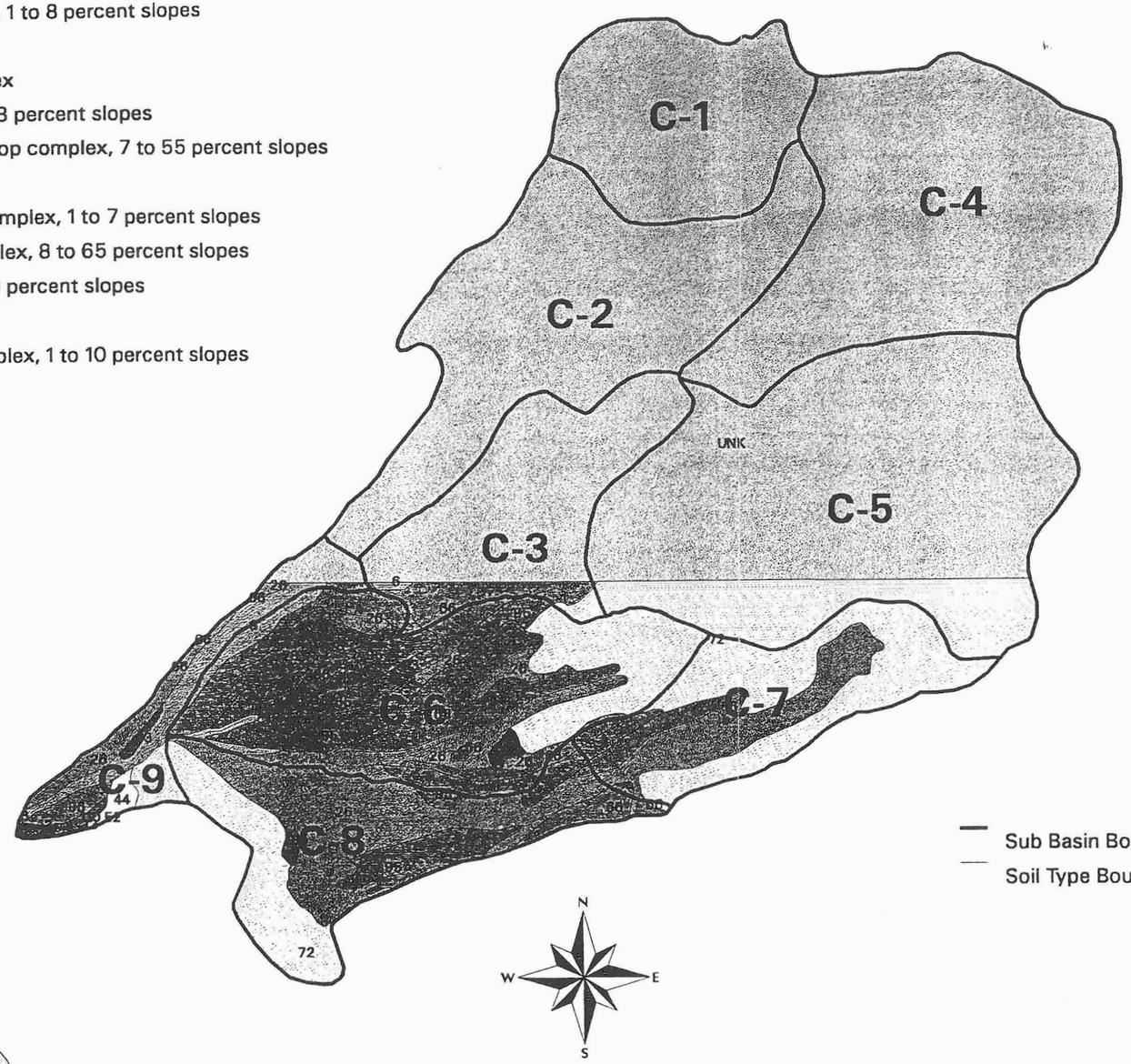
PERCENTAGES OF LAND USE TYPES PER SUB BASIN

SUB BASIN	LANDUSE TYPE	AREA IN SQ MI	PERCENT OF BASIN AREA
C 1	Undevelopable - Forest	1.268	100.000
C 1		1.268	100.000
C 2	Undevelopable - Forest	2.160	100.000
C 2		2.160	100.000
C 3	Undevelopable - Forest	1.021	82.403
C 3	Vacant	0.218	17.597
C 3		1.238	100.000
C 4	Undevelopable - Forest	2.538	100.000
C 4		2.538	100.000
C 5	Undevelopable - Forest	2.708	79.846
C 5	Vacant	0.684	20.154
C 5		3.392	100.000
C 6	Low Density Residential	0.685	30.143
C 6	Vacant	1.542	69.857
C 6		2.284	100.000
C 7	Vacant	1.198	100.000
C 7		1.198	100.000
C 8	Low Density Residential	0.424	29.751
C 8	Vacant	0.998	70.249
C 8		1.422	100.000
C 9	Low Density Residential	0.171	29.465
C 9	Undevelopable - Forest	0.066	11.305
C 9	Vacant	0.343	59.230
C 9		0.580	100.000
TOTAL		16.025	100.000

Soil Types for the Cline Creek Watershed

- Suncity-Cipriano complex, 1 to 7 percent slopes
- Carefree-Beardsley complex
- Continental cobbly clay loam, 1 to 8 percent slopes
- Continental-Ohaco complex
- Antho-Carrizo-Maripo complex
- Ebon very gravelly loam, 1 to 8 percent slopes
- Gachado-Lomitas-Rock outcrop complex, 7 to 55 percent slopes
- Anthony-Arizo complex
- Greyeagle-Suncity Variant complex, 1 to 7 percent slopes
- Lehmans-Rock outcrop complex, 8 to 65 percent slopes
- Nickel-Cave complex, 8 to 30 percent slopes
- Ohaco gravelly loam
- Pinaleno-Tres Hermanos complex, 1 to 10 percent slopes
- Unknown

Figure 2: Cline Creek Watershed Soil Type.



Sub Basin Boundaries

Soil Type Boundary

Scale 1" = 4000'

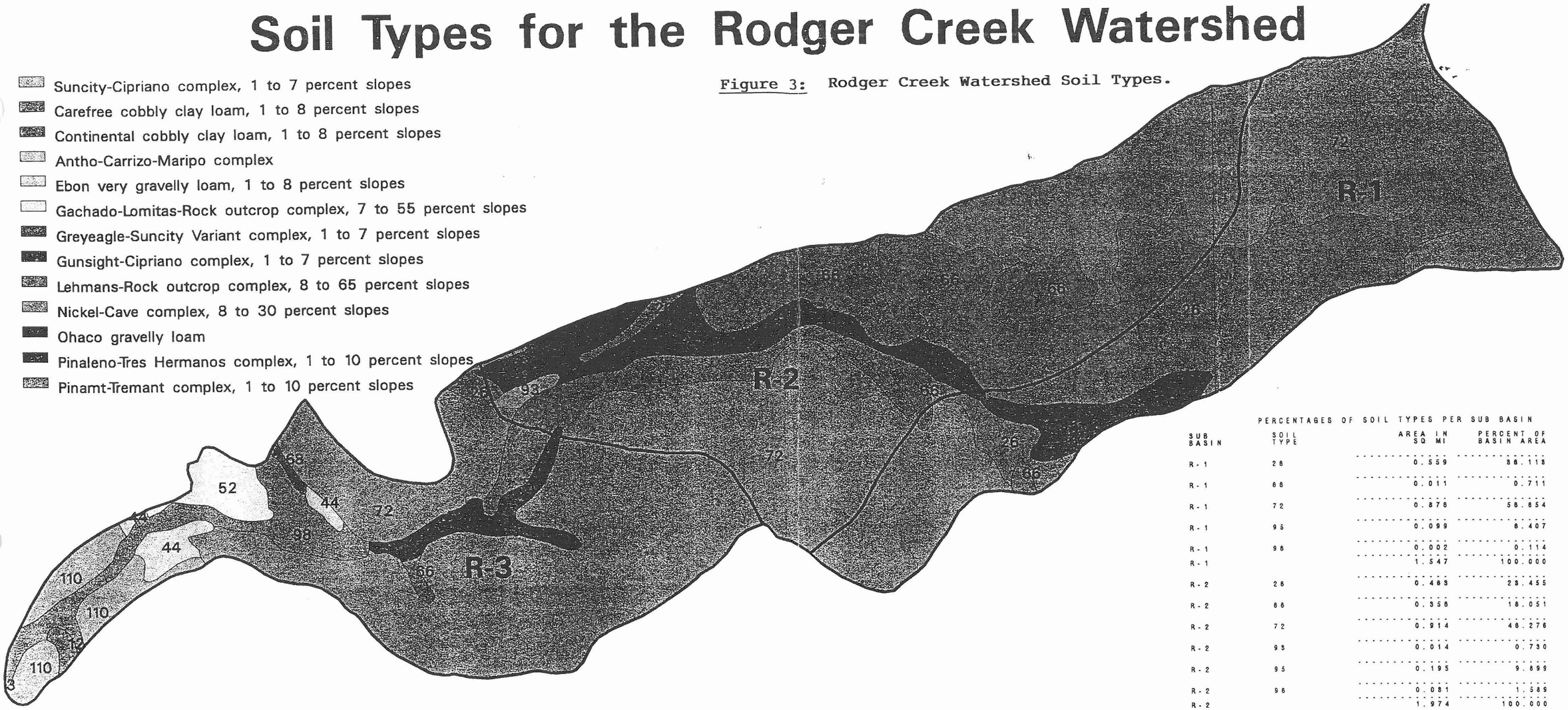
0 2000 4000 8000 16000

PERCENTAGES OF SOIL TYPES PER SUB BASIN

SUB BASIN	SOIL TYPE	AREA IN SQ MILES	PERCENT OF BASIN AREA
C-1	UNK	1.259	100
C-1		1.259	100
C-2	UNK	2.190	100
C-2		2.190	100
C-3	6	0.006	1
C-3	66	0.132	11
C-3	72	0.026	2
C-3	95	0.015	1
C-3	UNK	1.057	85
C-3		1.239	100
C-4	UNK	2.536	100
C-4		2.536	100
C-5	66	0.000	0
C-5	72	0.531	19
C-5	UNK	2.761	81
C-5		3.392	100
C-6	26	0.301	14
C-6	26	0.146	7
C-6	6	0.096	4
C-6	66	0.697	32
C-6	72	0.420	19
C-6	93	0.036	2
C-6	95	0.510	23
C-6		2.206	100
C-7	26	0.317	26
C-7	66	0.112	9
C-7	72	0.734	61
C-7	95	0.037	3
C-7		1.199	100
C-8	26	0.684	48
C-8	6	0.002	0
C-8	66	0.095	7
C-8	72	0.403	28
C-8	95	0.238	17
C-8		1.422	100
C-9	110	0.017	3
C-9	13	0.016	3
C-9	26	0.121	21
C-9	3	0.001	0
C-9	44	0.035	6
C-9	52	0.000	0
C-9	6	0.167	29
C-9	66	0.013	2
C-9	72	0.064	11
C-9	93	0.015	3
C-9	95	0.000	0
C-9	96	0.047	8
C-9	UNK	0.063	14
C-9		0.580	100
		16.025	900

Soil Types for the Rodger Creek Watershed

Figure 3: Rodger Creek Watershed Soil Types.

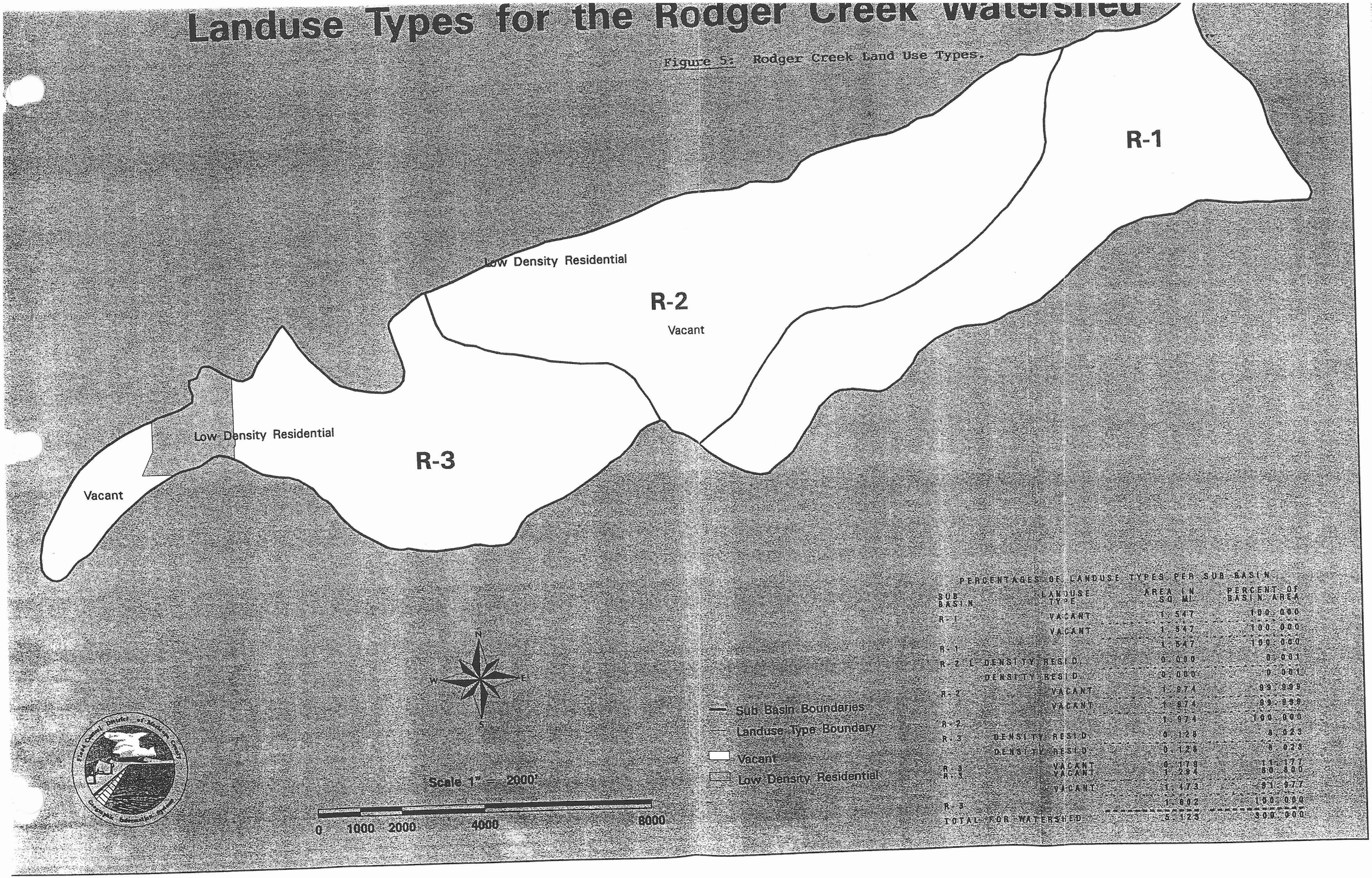


PERCENTAGES OF SOIL TYPES PER SUB BASIN

SUB BASIN	SOIL TYPE	AREA IN SQ MI	PERCENT OF BASIN AREA
R-1	26	0.559	36.113
R-1	66	0.011	0.711
R-1	72	0.876	56.654
R-1	95	0.099	6.407
R-1	96	0.002	0.114
R-1		1.547	100.000
R-2	26	0.463	23.455
R-2	66	0.356	18.051
R-2	72	0.914	46.276
R-2	93	0.014	0.730
R-2	95	0.195	9.899
R-2	96	0.031	1.589
R-2		1.974	100.000
R-3	110	0.123	7.874
R-3	12	0.011	0.665
R-3	26	0.053	3.261
R-3	3	0.000	0.009
R-3	44	0.046	2.866
R-3	52	0.061	3.828
R-3	66	0.009	0.536
R-3	68	0.006	0.404
R-3	72	1.362	86.335
R-3	93	0.000	0.015
R-3	95	0.001	0.041
R-3	96	0.078	4.882
R-3	98	0.151	9.441
R-3		1.602	100.000
		5.123	800.000

Landuse Types for the Rodger Creek Watershed

Figure 5: Rodger Creek Land Use Types.



PERCENTAGES OF LANDUSE TYPES PER SUB BASIN

SUB BASIN	LANDUSE TYPE	AREA IN SQ MI	PERCENT OF BASIN AREA
R-1	VACANT	1.547	100.000
	VACANT	1.547	100.000
R-1		1.547	100.000
R-2	L DENSITY RESID.	0.000	0.001
	DENSITY RESID.	0.000	0.001
R-2	VACANT	1.974	99.999
	VACANT	1.974	99.999
R-2		1.974	100.000
R-3	DENSITY RESID.	0.128	0.023
	DENSITY RESID.	0.128	0.023
R-3	VACANT	0.176	11.177
R-3	VACANT	1.294	82.800
	VACANT	1.473	93.977
R-3		1.602	100.000
TOTAL FOR WATERSHED		5.123	300.000

Table 1: Soil Type information on Cline Creek Watershed.

PERCENTAGES OF SOIL TYPES PER SUB BASIN

SUB BASIN	SOIL TYPE	AREA IN SQ MILES	PERCENT OF BASIN AREA
C-1	UNK	1.259	100
	UNK	1.259	100
C-1		1.259	100
C-2	UNK	2.190	100
	UNK	2.190	100
C-2		2.190	100
C-3	6	0.008	1
	6	0.008	1
C-3	66	0.001	0
C-3	66	0.130	11
	66	0.132	11
C-3	72	0.026	2
	72	0.026	2
C-3	95	0.006	0
C-3	95	0.009	1
	95	0.015	1
C-3	UNK	1.057	85
	UNK	1.057	85
C-3		1.239	100
C-4	UNK	2.538	100
	UNK	2.538	100
C-4		2.538	100
C-5	66	0.000	0
	66	0.000	0
C-5	72	0.631	19
	72	0.631	19

PERCENTAGES OF SOIL TYPES PER SUB BASIN

SUB BASIN	SOIL TYPE	AREA IN SQ MILES	PERCENT OF BASIN AREA
C-5	UNK	2.761	81
	UNK	2.761	81
C-5		3.392	100
C-6	26	0.000	0
C-6	26	0.005	0
C-6	26	0.008	0
C-6	26	0.016	1
C-6	26	0.020	1
C-6	26	0.038	2
C-6	26	0.053	2
C-6	26	0.160	7
	26	0.301	14
C-6	28	0.148	7
	28	0.148	7
C-6	6	0.000	0
C-6	6	0.030	1
C-6	6	0.065	3
	6	0.096	4
C-6	66	0.008	0
C-6	66	0.052	2
C-6	66	0.058	3
C-6	66	0.074	3
C-6	66	0.075	3
C-6	66	0.100	5
C-6	66	0.330	15
	66	0.697	32
C-6	72	0.420	19
	72	0.420	19
C-6	93	0.012	1
C-6	93	0.023	1
	93	0.036	2
C-6	95	0.001	0
C-6	95	0.056	3
C-6	95	0.068	3
C-6	95	0.110	5

PERCENTAGES OF SOIL TYPES PER SUB BASIN

SUB BASIN	SOIL TYPE	AREA IN SQ MILES	PERCENT OF BASIN AREA
C-6	95	0.275	12
	95	0.510	23
C-6		2.208	100
C-7	26	0.317	26
	26	0.317	26
C-7	66	0.001	0
C-7	66	0.006	1
C-7	66	0.017	1
C-7	66	0.088	7
	66	0.112	9
C-7	72	0.734	61
	72	0.734	61
C-7	95	0.037	3
	95	0.037	3
C-7		1.199	100
C-8	26	0.003	0
C-8	26	0.680	48
	26	0.684	48
C-8	6	0.000	0
C-8	6	0.002	0
	6	0.002	0
C-8	66	0.005	0
C-8	66	0.009	1
C-8	66	0.011	1
C-8	66	0.070	5
	66	0.095	7
C-8	72	0.004	0
C-8	72	0.398	28
	72	0.403	28
C-8	95	0.015	1

PERCENTAGES OF SOIL TYPES PER SUB BASIN

SUB BASIN	SOIL TYPE	AREA IN SQ MILES	PERCENT OF BASIN AREA
C-8	95	0.020	1
C-8	95	0.041	3
C-8	95	0.163	11
	95	0.238	17
C-8		1.422	100
C-9	110	0.017	3
	110	0.017	3
C-9	13	0.001	0
C-9	13	0.015	3
	13	0.016	3
C-9	26	0.009	1
C-9	26	0.112	19
	26	0.121	21
C-9	3	0.001	0
	3	0.001	0
C-9	44	0.035	6
	44	0.035	6
C-9	52	0.000	0
	52	0.000	0
C-9	6	0.167	29
	6	0.167	29
C-9	66	0.000	0
C-9	66	0.000	0
C-9	66	0.003	0
C-9	66	0.010	2
	66	0.013	2
C-9	72	0.064	11
	72	0.064	11
C-9	93	0.015	3
	93	0.015	3

PERCENTAGES OF SOIL TYPES PER SUB BASIN

SUB BASIN	SOIL TYPE	AREA IN SQ MILES	PERCENT OF BASIN AREA
C-9	95	0.000	0
C-9	95	0.000	0
	95	0.000	0
C-9	96	0.047	8
	96	0.047	8
C-9	UNK	0.083	14
	UNK	0.083	14
C-9		0.580	100
		16.025	900

Table 2 : Soil Type information on Rodger Creek Watershed.

PERCENTAGES OF SOIL TYPES PER SUB BASIN

SUB BASIN	SOIL TYPE	AREA IN SQ MI	PERCENT OF BASIN AREA
R-1	26	0.060	3.908
R-1	26	0.498	32.205
	26	0.559	36.113
R-1	66	0.003	0.225
R-1	66	0.008	0.486
	66	0.011	0.711
R-1	72	0.236	15.262
R-1	72	0.640	41.392
	72	0.876	56.654
R-1	95	0.099	6.407
	95	0.099	6.407
R-1	96	0.002	0.114
	96	0.002	0.114
R-1		1.547	100.000
R-2	26	0.003	0.155
R-2	26	0.003	0.157
R-2	26	0.017	0.884
R-2	26	0.164	8.313
R-2	26	0.275	13.946
	26	0.463	23.455
R-2	66	0.013	0.636
R-2	66	0.066	3.339
R-2	66	0.095	4.793
R-2	66	0.183	9.283
	66	0.356	18.051
R-2	72	0.001	0.029
R-2	72	0.003	0.142
R-2	72	0.415	20.999
R-2	72	0.496	25.106
	72	0.914	46.276
R-2	93	0.014	0.730
	93	0.014	0.730

PERCENTAGES OF SOIL TYPES PER SUB BASIN

SUB BASIN	SOIL TYPE	AREA IN SQ MI	PERCENT OF BASIN AREA
R-2	95	0.195	9.899
	95	0.195	9.899
R-2	96	0.001	0.047
R-2	96	0.030	1.542
	96	0.031	1.589
R-2		1.974	100.000
R-3	110	0.030	1.904
R-3	110	0.046	2.856
R-3	110	0.047	2.915
	110	0.123	7.674
R-3	12	0.011	0.665
	12	0.011	0.665
R-3	26	0.014	0.887
R-3	26	0.038	2.394
	26	0.053	3.281
R-3	3	0.000	0.009
	3	0.000	0.009
R-3	44	0.003	0.217
R-3	44	0.009	0.558
R-3	44	0.034	2.114
	44	0.046	2.888
R-3	52	0.061	3.828
	52	0.061	3.828
R-3	66	0.009	0.536
	66	0.009	0.536
R-3	68	0.006	0.404
	68	0.006	0.404
R-3	72	0.223	13.917
R-3	72	0.839	52.418
	72	1.062	66.335

PERCENTAGES OF SOIL TYPES PER SUB BASIN

SUB BASIN	SOIL TYPE	AREA IN SQ MI	PERCENT OF BASIN AREA
R-3	93	0.000	0.015
	93	0.000	0.015
R-3	95	0.001	0.041
	95	0.001	0.041
R-3	96	0.078	4.882
	96	0.078	4.882
R-3	98	0.151	9.441
	98	0.151	9.441
R-3		1.602	100.000
		5.123	300.000

Table 3 : Land Use Type information on Cline Creek Watershed.

SUB BASIN	LANDUSE TYPE	AREA IN SQ MI	PERCENT OF BASIN AREA
C-1	Undevelopable - Forest	1.259	100.000
	Undevelopable - Forest	1.259	100.000
C-1		1.259	100.000
C-2	Undevelopable - Forest	2.190	100.000
	Undevelopable - Forest	2.190	100.000
C-2		2.190	100.000
C-3	Undevelopable - Forest	1.021	82.403
	Undevelopable - Forest	1.021	82.403
C-3	Vacant	0.218	17.597
	Vacant	0.218	17.597
C-3		1.239	100.000
C-4	Undevelopable - Forest	2.538	100.000
	Undevelopable - Forest	2.538	100.000
C-4		2.538	100.000
C-5	Undevelopable - Forest	2.708	79.846
	Undevelopable - Forest	2.708	79.846
C-5	Vacant	0.684	20.154
	Vacant	0.684	20.154
C-5		3.392	100.000
C-6	Low Density Residential	0.215	9.756
C-6	Low Density Residential	0.450	20.387
	Low Density Residential	0.665	30.143
C-6	Vacant	0.000	0.003
C-6	Vacant	1.542	69.854
	Vacant	1.542	69.857
C-6		2.208	100.000

PERCENTAGES OF LAND USE TYPES PER SUB BASIN

SUB BASIN	LANDUSE TYPE	AREA IN SQ MI	PERCENT OF BASIN AREA
C-7	Vacant	1.199	100.000
	Vacant	1.199	100.000
C-7		1.199	100.000
C-8	Low Density Residential	0.001	0.058
C-8	Low Density Residential	0.035	2.435
C-8	Low Density Residential	0.388	27.258
	Low Density Residential	0.423	29.751
C-8	Vacant	0.428	30.091
C-8	Vacant	0.571	40.158
	Vacant	0.999	70.249
C-8		1.422	100.000
C-9	Low Density Residential	0.011	1.915
C-9	Low Density Residential	0.021	3.548
C-9	Low Density Residential	0.044	7.556
C-9	Low Density Residential	0.095	16.445
	Low Density Residential	0.171	29.465
C-9	Undevelopable - Forest	0.066	11.305
	Undevelopable - Forest	0.066	11.305
C-9	Vacant	0.020	3.510
C-9	Vacant	0.323	55.720
	Vacant	0.344	59.230
C-9		0.580	100.000
		16.025	900.000

Table 4 : Land Use Type information on Rodger Creek Watershed.

LANDUSE TYPES IN THE ROGER CREEK WATERSHED

SUB BASIN	LANDUSE TYPE	AREA IN SQ MI	PERCENT OF BASIN AREA
R-1	Vacant	1.547	100.000
	Vacant	1.547	100.000
R-1		1.547	100.000
R-2	Low Density Residential	0.000	0.001
	Low Density Residential	0.000	0.001
R-2	Vacant	1.974	99.999
	Vacant	1.974	99.999
R-2		1.974	100.000
R-3	Low Density Residential	0.128	8.023
	Low Density Residential	0.128	8.023
R-3	Vacant	0.179	11.177
R-3	Vacant	1.294	80.800
	Vacant	1.473	91.977
R-3		1.602	100.000
		5.123	300.000

Table 5 : Subbasin parameters on Cline Creek Watershed.

Subbasin	Length, L (mile)	Length, L_{ca} (mile)	High elev. (ft.)	Low elev. (ft.)
X1	1.75	0.81	2780	2220
X2	1.99	0.99	2780	2160
X3	2.27	1.23	2540	2095
X4	1.14	0.62	2380	2095
X5	1.51	0.85	2380	2080
C1	1.33	0.81	4160	2640
C2	3.79	2.08	3600	2200
C3	2.18	1.61	3080	2200
C4	2.94	1.85	4600	2576
C5	2.94	1.42	3920	2330
C7	2.46	1.09	3720	2340
C8	2.56	1.23	2340	2080
C9	2.46	1.37	2200	2000

Table 6 : Subbasin parameters on Rodger Creek Watershed.

Subbasin	Length, L (mile)	Length, L_{ca} (mile)	High elev. (ft.)	Low elev. (ft.)
R1	2.90	1.10	2640	2310
R2	3.40	1.50	3220	2120
R3	3.50	2.10	3200	1920

Table 7 : S-graph assignments for different subbasins.

Cline Creek

Subbasin	S-graph	Subbasin	S-graph
X1	Mountain	C3	Mountain
X2	Mountain	C4	Mountain
X3	Desert/Rangeland	C5	Mountain
X4	Desert/Rangeland	C7	Mountain
X5	Desert/Rangeland	C8	Desert/Rangeland
C1	Mountain	C9	Desert/Rangeland
C2	Mountain		

Rodger Creek

Subbasin	S-graph
R1	Desert/Rangeland
R2	Mountain
R3	Mountain

APPENDIX A

Table 1. Mapping Legend For General Ecosystem Survey. USDA-FS, R-3 Date 03/14/89 Page 1

Map Unit No.	Comp	Soil Name or Miscellaneous Area	Phase	Clim. Class	Veg. Symb.	Slope/Composition Climax/Kind of MU	Water
82	0.2	Typic Hapaquoils	deep	HSM	---	5-15 %	---
		,	---	5	---	--- %	
		,frigid	---	---	---	Topo-edaphic	
		---	---		---	Association	
101	0.1	Aridic Haplustalfs	deep	LSM	Prve	0-15 %	---
		,	gravelly	3	---	90 %	
		, thermic	loam	---	---	Edaphic/zootic	
		---	compacted		---	Consociation	
101	0.5	Aridic Ustochrepts	---	LSM	Prve	0-15 %	---
		,	gravelly	3	---	10 %	
		, thermic	loam	---	---	Edaphic/zootic	
		---	compacted		---	--- Velvet Mesquite Scrub	
* 103	0.1	Vertic Haplustalfs	deep	LSM	Prve	0-15 %	---
		, Fine, mont.	---	3	---	50 % ≤	
		, thermic	clay loam SURFACE	---	---	Edaphic/zootic	
		---	---		---	Association	
* 103	0.2	Aridic Haplustalfs	deep	LSM	Prve	15-40 %	---
		, Fine, mont or Clayey-Skeletal	very cobbly	3	---	40 %	
		, thermic	loam	---	---	Edaphic	
		---	---		---	Association	
103	0.5	Aridic Haplustalfs	deep	LSM	Prve	0-15 %	---
		,	---	3	---	10 %	
		, thermic	loam	---	---	Edaphic/zootic	
		---	compacted		---	---	
110	0.1	Aridic Haplustalfs	deep	LSM	Prve	0-15 %	---
		,	gravelly	3	---	40 %	
		, thermic	sandy loam	---	---	Edaphic/zootic	
		---	compacted		---	Association	
110	0.2	Typic Haplustalfs	deep	LSM	Qutu2	15-40 %	---
		,	cobbly	4	---	20 %	
		, mesic	sandy loam	---	---	Edaphic/fire	
		---	---		---	Association	
110	0.3	Aridic Haplustalfs	deep	LSM	Prve	15-40 %	---
		,	cobbly	3	---	20 %	
		, thermic	sandy loam	---	---	Edaphic	
		---	---		---	Association	
110	0.5	Aridic Ustochrepts	deep	LSM	Prve	15-40 %	---
		,	cobbly	3	---	10 %	
		, thermic	sandy loam	---	---	Edaphic	
		---	---		---	---	

Map Unit No.	Comp	Soil Name or Miscellaneous Area	Phase	Clim. Class	Veg. Symb.	Slope/Composition Climax/Kind of MU	Water
122	0.5	---	---	LSC	---	0-2 %	---
		,	---	4	---	10 %	
		, ---	---	---	---	---	
		Riverwash	---		---	---	
122	0.6	Typic Ustifluvents	deep	LSC	Juos	0-2 %	---
		,	cobbly	4	---	10 %	
		nonacid, mesic	sandy loam	---	---	Topo-edaphic	
		---	---		---	---	
124	0.1	Typic Haplustalfs	moderately deep	LSC	Juos	40-80 %	---
		,	extremely cobbly	4	---	30 %	
		, mesic	loam	---	---	Edaphic	
		---	---		---	Complex	
124	0.2	Typic Ustochrepts	moderately deep	LSC	Juos	40-80 %	---
		,	extremely cobbly	4	---	30 %	
		, mesic	loam	---	---	Edaphic	
		---	---		---	Complex	
124	0.3	---	---	LSC	---	80-120 %	---
		,	---	4	---	20 %	
		, ---	---	---	---	---	
		Basalt rock outcrop	---		---	Association	
124	0.5	Lithic Haplustalfs	shallow	LSC	Juos	40-80 %	---
		,	very stony	4	---	10 %	
		, mesic	loam	---	---	Edaphic	
		---	---		---	---	
124	0.6	Typic Haplustalfs	deep	LSC	Juos	15-40 %	---
		,	cobbly	4	---	10 %	
		, mesic	loam	---	---	---	
		---	---		---	--- mesquite	
126	0.1	Aridic Haplustalfs	deep	LSM	Prve	40-80 %	---
		,	extremely stony	3	---	30 %	
		, thermic	loam	---	---	Edaphic	
		---	---		---	Association	
						Turbinella Oak	
126	0.2	Typic Haplustalfs	deep	LSM	Qutu2	40-80 %	---
		,	extremely cobbly	4	---	30 %	
		, mesic	loam	---	---	Edaphic/fire	
		---	---		---	Association	
126	0.3	---	---	LSM	---	80-120 %	---
		,	---	4	---	15 %	
		, ---	---	---	---	---	
		Basalt rock outcrop	---		---	Association	

Map Unit No.	Comp	Soil Name or Miscellaneous Area	Phase	Clim. Class	Veg. Symb.	Slope/Composition Climax/Kind of MU	Water
126	0.4	---	---	LSM	---	80-120 %	---
		,	---	4	---	15 %	
		, ---	---	---	---	---	
		Basalt rock outcrop	---		---	Association	
126	0.5	Lithic Haplustalfs	shallow	LSM	Fosp2	40-80 %	---
		,	extremely stony	3	---	10 %	
		, thermic	loam	---	---	Edaphic/fire	
		---	---		---	---	
127	0.1	Typic Ustochrepts	deep	HSM	Qutu2	15-40 %	---
		,	very cobbly	4	---	60 %	
		, mesic	sandy loam	---	---	Edaphic/fire/zootic	
		---	gullied		---	Association	
127	0.2	Typic Haplustalfs	deep	HSM	Qutu2	0-15 %	---
		,	gravelly	4	---	30 %	
		, mesic	sandy loam	---	---	Edaphic/fire/zootic	
		---	compacted		---	Association	
127	0.5	Typic Haplustalfs	deep	HSM	Qutu2	15-40 %	---
		,	very cobbly	4	---	10 %	
		, mesic	loam	---	---	Edaphic/fire	
		---	---		---	---	
128	0.1	Typic Haplustalfs	deep	LSM	Qutu2	0-15 %	---
		,	gravelly	4	---	30 %	
		, mesic	sandy loam	---	---	Edaphic/fire/zootic	
		---	compacted		---	Association	
128	0.2	Typic Ustochrepts	deep	LSM	Qutu2	15-40 %	---
		,	very cobbly	4	---	60 %	
		, mesic	sandy loam	---	---	Edaphic/fire	
		---	---		---	Association	
128	0.5	Typic Haplustalfs	deep	LSM	Qutu2	15-40 %	---
		,	very cobbly	4	---	10 %	
		, mesic	sandy loam	---	---	Edaphic/fire	
		---	---		---	---	
129	0.1	Typic Haplustalfs	deep	HSC	Jumo	0-15 %	---
		,	---	4	---	60 %	
		, mesic	loam	---	---	Edaphic/zootic	
		---	compacted		---	Association	
129	0.2	Typic Ustochrepts	deep	HSC	Jumo	15-40 %	---
		,	very gravelly	4	---	20 %	
		calcareous, mesic	sandy loam	---	---	Edaphic	
		---	---		---	Association	

Table 4a. Interpretations For General Ecosystem Survey. USDA-FS, R-3 Date 02/02/89 Page 1

Rio Arriba County

Map Unit No.	Comp	Soil Loss For Pot.	Nat.	Cur.	Tol.	Soil Cond.	Eros. Hazard	Potentials Re-veg.	Re-for.	Pipos	Psmeg	Pien	Production Potentials For Hb/Wd	Forg.	ForgM	Fu.Wd
		t/ac/yr								Site Index			lb/ac/yr			cs/ac
101	0.1	3.5	0.4	1.3	6.6	Unsat	Slight	Mod	NA	---	---	---	500	400	450	---
103	0.1	4.7	0.6	1.7	6.6	Unsat	Slight	Mod	NA	---	---	---	350	300	350	---
103	0.2	31.4	4.6	11.3	6.6	Unsat-	Severe	Mod	NA	---	---	---	500	400	450	---
110	0.1	1.9	0.3	0.8	6.6	Unsat	Slight	Mod	NA	---	---	---	500	400	450	---
110	0.2	24.5	3.4	4.3	6.6	Sat	Severe	Mod	NA	---	---	---	800	50	1200	4
110	0.3	20.7	4.1	10.0	6.6	Unsat	Severe	Mod	NA	---	---	---	500	400	450	---
120	0.1	4.0	0.5	1.8	6.6	Unsat	Slight	Mod	NA	---	---	---	600	600	600	---
120	0.2	15.4	2.2	6.9	6.6	Unsat	Mod	Mod	NA	---	---	---	450	350	575	---
121	0.1	1.8	0.2	0.6	6.6	Unsat	Slight	Mod	NA	---	---	---	700	50	800	6
121	0.2	24.3	3.6	4.3	6.6	Sat	Severe	Mod	NA	---	---	---	700	100	1200	8
122	0.1	5.4	0.5	0.8	6.6	Unsat	Slight	Mod	NA	---	---	---	700	200	1200	8
122	0.2	4.2	0.2	0.5	6.6	Unsat	Slight	Mod	NA	---	---	---	700	200	1200	6
124	0.1	18.4	3.3	3.3	6.6	Sat	Severe	Low	NA	---	---	---	650	175	1100	6
124	0.2	18.4	3.3	3.3	6.6	Sat	Severe	Low	NA	---	---	---	650	175	1100	6
124	0.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
126	0.1	18.4	9.2	9.2	6.6	Unsuit	Severe	Low	NA	---	---	---	400	300	350	---
126	0.2	21.5	3.5	4.7	6.6	Sat	Severe	Low	NA	---	---	---	700	25	800	2
126	0.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
126	0.4	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
127	0.1	15.7	1.9	3.3	6.6	Unsat	Mod	Mod	NA	---	---	---	800	50	1200	4
127	0.2	2.1	0.2	0.4	6.6	Unsat	Slight	Mod	NA	---	---	---	700	100	1200	2
128	0.1	2.1	0.1	0.3	6.6	Unsat	Slight	Mod	NA	---	---	---	800	50	1200	4
128	0.2	15.7	2.2	3.1	6.6	Sat	Mod	Mod	NA	---	---	---	800	100	1200	2
129	0.1	5.4	0.3	0.6	6.6	Unsat	Slight	Mod	NA	---	---	---	700	275	1200	8
129	0.2	13.2	2.4	3.5	6.6	Sat	Mod	Mod	NA	---	---	---	575	150	850	6
130	0.1	5.4	0.4	0.8	6.6	Unsat	Slight	Mod	NA	---	---	---	700	275	1200	8
131	0.1	20.4	2.1	3.7	6.6	Sat	Severe	Mod	NA	---	---	---	700	275	1200	8
132	0.1	18.4	4.1	4.1	6.6	Sat	Severe	Low	NA	---	---	---	650	150	1100	6
132	0.2	27.4	0.0	0.0	9.0	Sat	Severe	Low	Low	60	65	---	300	50	3300	---
132	0.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
132	0.4	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
134	0.1	2.4	0.3	0.8	6.6	Unsat	Slight	Mod	NA	---	---	---	650	225	1100	---
134	0.2	2.4	0.4	1.2	6.6	Unsat	Slight	Mod	NA	---	---	---	650	225	1100	---
134	0.3	17.7	1.8	3.2	6.6	Sat	Severe	Mod	NA	---	---	---	700	275	1200	8
135	0.1	3.5	0.2	0.4	6.6	Unsat	Slight	Mod	NA	---	---	---	700	200	1200	8
136	0.1	31.9	3.2	4.7	6.6	Sat	Severe	Mod	NA	---	---	---	700	200	1200	8
137	0.1	18.4	3.3	3.3	6.6	Sat	Severe	Low	NA	---	---	---	650	175	1100	6
137	0.2	27.4	0.0	0.0	9.0	Sat	Severe	Low	Low	60	65	---	300	50	3300	---
137	0.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
137	0.4	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
139	0.1	3.5	0.2	0.4	6.6	Unsat	Slight	Mod	NA	---	---	---	700	200	1200	8
139	0.2	37.8	0.8	1.1	9.0	Sat	Severe	Mod	Mod	70	---	---	500	250	2500	---
139	0.3	31.9	3.2	4.7	6.6	Sat	Severe	Mod	NA	---	---	---	---	---	---	---
140	0.1	3.3	0.2	0.6	6.6	Unsat	Slight	Mod	NA	---	---	---	750	200	1200	8
140	0.2	15.7	1.2	2.8	6.6	Unsat	Mod	Mod	NA	---	---	---	750	200	1200	8
140	0.3	13.2	3.7	6.4	6.6	Sat	Mod	Mod	NA	---	---	---	550	450	500	---
143	0.1	2.4	0.4	1.7	6.6	Unsat	Slight	Mod	NA	---	---	---	350	300	350	---
143	0.2	20.4	5.8	9.8	6.6	Unsat	Severe	Mod	NA	---	---	---	550	450	500	---

Map Unit No.	Comp	Landscape Features		Climax Plant Community (canopy cover) Tree	%	Shrub	%	Forb	%	Graminoid	%
101	0.1	Landform:	Elevated plains	Edaphic							
		Elevation:	900-1000 m	---	---	Beha	3.0	ERIOG	1.0	Anba	1.0
		Slope:		---	---	Cegr	1.0	---	---	Bocu	10.0
		Gradient:	4 % Length: 15 m	---	---	Dawh2	2.0	---	---	Boer4	20.0
		Aspect:	Noninfl. Class: Simple	---	---	Open2	1.0	---	---	Hibe	5.0
		Shape, Plan:	Linear	---	---	Prve	5.0	---	---	Mupo2	4.0
		Shape, Section:	Linear	Edaphic/zootic							
		Precipitation:	24-36 cm Bedrock: ---	---	---	Beha	3.0	Erwr	1.0	Anba	1.0
		Parent Material:	Alluvium, ss, sts	---	---	Cegr	1.0	---	---	Bocu	5.0
		Condition	Canopy Height / Surface Components OvStr, RkFrg, Littr, VegBA, BSoil	---	---	Dawh2	2.0	---	---	Boer4	5.0
				---	---	Open2	1.0	---	---	Hibe	4.0
		Tolerance:	0.5m 15% 25% 5% ---% ---%	---	---	Prve	15.0	---	---	Mupo2	1.0
		Natural:	0.5m 15% 25% 5% 40% 30%	Fluvial: ---							
		Current:	0.5m 20% 25% 5% 10% 60%	Lacustrine: ---							

Map Unit No.	Comp	Landscape Features		Climax Plant Community (canopy cover) Tree	%	Shrub	%	Forb	%	Graminoid	%
102	0.1	Landform:	Elevated plains	Edaphic							
		Elevation:	900-1000 m	---	---	Prve	10.0	Hean3	1.0	Bocu	10.0
		Slope:		---	---	---	---	---	---	Boer4	15.0
		Gradient:	4 % Length: 15 m	---	---	---	---	---	---	Himu2	25.0
		Aspect:	Noninfl. Class: Simple	---	---	---	---	---	---	Hibe	5.0
		Shape, Plan:	Linear	---	---	---	---	---	---	---	---
		Shape, Section:	Linear	Edaphic/zootic							
		Precipitation:	36-46 cm Bedrock: Basalt	---	---	Prve	10.0	Hean3	25.0	Bocu	1.0
		Parent Material:	Residuum, cl	---	---	---	---	---	---	Boer4	1.0
		Condition	Canopy Height / Surface Components OvStr, RkFrg, Littr, VegBA, BSoil	---	---	---	---	---	---	Himu2	10.0
				---	---	---	---	---	---	Hibe	5.0
		Tolerance:	0.5m 15% 10% 5% ---% ---%	---	---	---	---	---	---	---	---
		Natural:	0.5m 15% 10% 5% 45% 40%	Fluvial: ---							
		Current:	0.5m 15% 10% 5% 5% 70%	Lacustrine: ---							

Map Unit No.	Comp	Landscape Features		Climax Plant Community (canopy cover) Tree	%	Shrub	%	Forb	%	Graminoid	%
102	0.2	Landform:	Hills	Edaphic							
		Elevation:	900-1000 m	---	---	Beha	3.0	ERIOG	1.0	Anba	1.0
		Slope:		---	---	Cegr	1.0	---	---	Bocu	10.0
		Gradient:	25 % Length: 10 m	---	---	Dawh2	2.0	---	---	Boer4	10.0
		Aspect:	All Class: Simple	---	---	Open2	1.0	---	---	Himu2	5.0
		Shape, Plan:	Linear	---	---	Prve	5.0	---	---	Mupo2	4.0
		Shape, Section:	Convex	---							
		Precipitation:	24-36 cm Bedrock: Basalt	---	---	---	---	---	---	---	---
		Parent Material:	Residuum, cl	---	---	---	---	---	---	---	---
		Condition	Canopy Height / Surface Components OvStr, RkFrg, Littr, VegBA, BSoil	---	---	---	---	---	---	---	---
				---	---	---	---	---	---	---	---
		Tolerance:	0.5m 15% 40% 5% ---% ---%	---	---	---	---	---	---	---	---
		Natural:	0.5m 15% 40% 5% 35% 20%	Fluvial: ---							
		Current:	0.5m 15% 40% 5% 5% 55%	Lacustrine: ---							

Map Unit No. Comp	Landscape Features						Climax Plant Community (canopy cover)							
							Tree	%	Shrub	%	Forb	%	Graminoid	%
126 0.1	Landform:	Hills, mountains					Edaphic							
	Elevation:	900-1200 m					---	---	Bena	1.0	ERIOS	1.0	Anpa	0.1
	Slope:						---	---	Cegr	1.0	Ercis	0.1	Bocu	1.0
	Gradient:	60 %	Length:	5 m			---	---	Dawn2	1.0	---	---	Boer4	10.0
	Aspect:	South	Class:	Simple			---	---	Open2	2.0	---	---	Himu2	0.1
	Shape, Plan:	Linear					---	---	Prve	2.0	---	---	Muco2	1.0
	Shape, Section:	Convex					---							
	Precipitation:	24-36 cm	Bedrock:	Basalt			---	---	---	---	---	---	---	---
	Parent Material:	Residuum, ci					---	---	---	---	---	---	---	---
	Condit-	Canopy	Surface Components				---	---	---	---	---	---	---	---
	ion	Height	OvStr	RkFrg	Littr	VegBA	---	---	---	---	---	---	---	---
	Tolerance:	0.5m	10%	75%	5%	---%	---	---	---	---	---	---	---	---
	Natural:	0.5m	10%	75%	5%	10%	Fluvial: ---							
	Current:	0.5m	10%	75%	5%	10%	Lacustrine: ---							

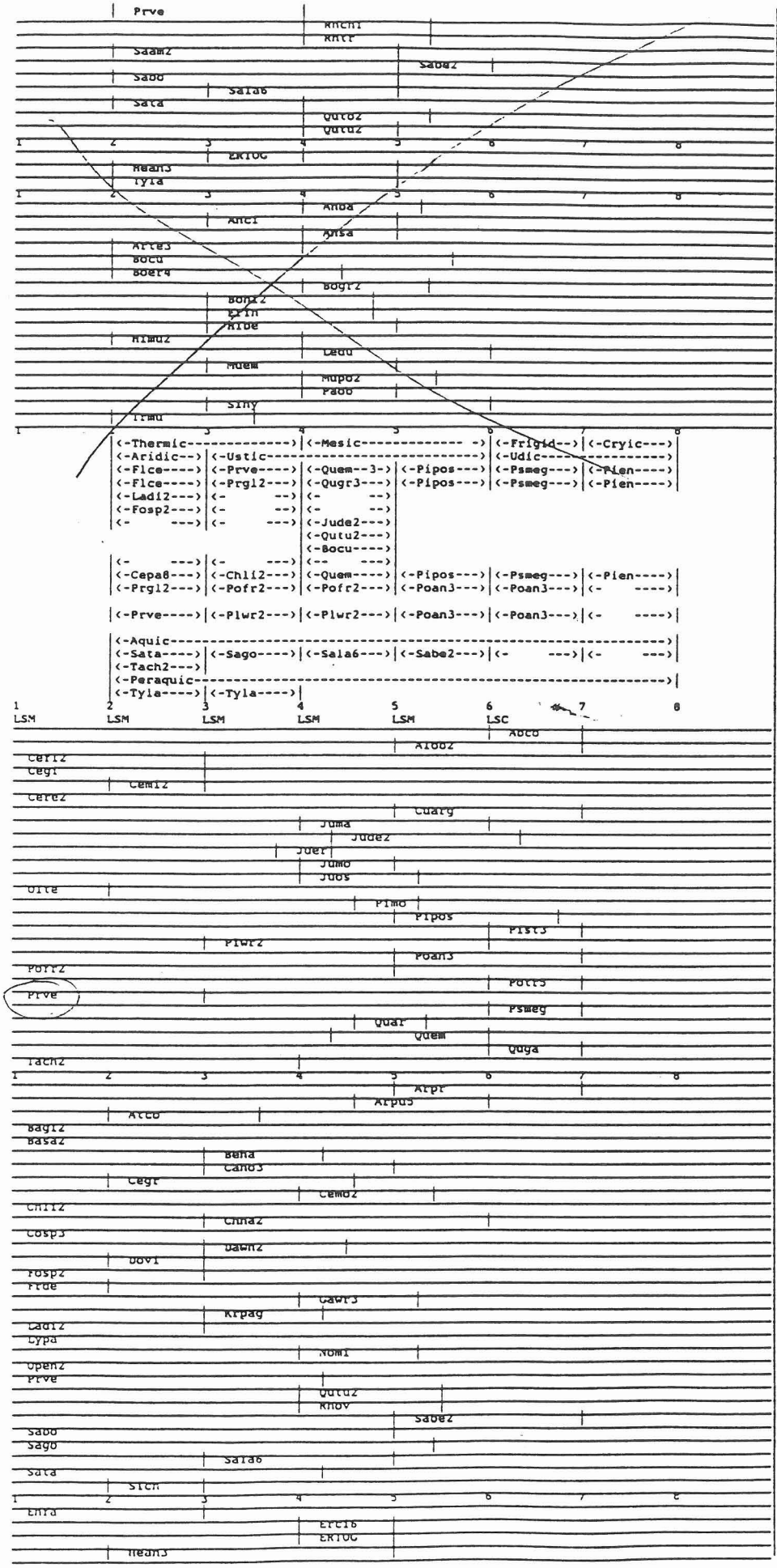
Map Unit No. Comp	Landscape Features						Climax Plant Community (canopy cover)							
							Tree	%	Shrub	%	Forb	%	Graminoid	%
126 0.2	Landform:	Hills, mountains					Edaphic/fire							
	Elevation:	1000-1700 m					Jude2	0.0	Arpu5	10.0	ERIOG	1.0	Anse	0.1
	Slope:						Juos	0.0	Ceco2	5.0	Ercis	0.1	Bocu	1.0
	Gradient:	60 %	Length:	5 m			Piao	0.0	Gawr3	1.0	---	---	Boer4	0.1
	Aspect:	North	Class:	Simple			Quar	0.1	Nomi	2.0	---	---	Bogr2	5.0
	Shape, Plan:	Linear					Quem	0.1	Qutu2	20.0	---	---	Bohi2	1.0
	Shape, Section:	Convex					---							
	Precipitation:	46-56 cm	Bedrock:	Basalt			---	---	---	---	---	---	---	---
	Parent Material:	Residuum, ci					---	---	---	---	---	---	---	---
	Condit-	Canopy	Surface Components				---	---	---	---	---	---	---	---
	ion	Height	OvStr	RkFrg	Littr	VegBA	---	---	---	---	---	---	---	---
	Tolerance:	1.m	35%	65%	30%	---%	---	---	---	---	---	---	---	---
	Natural:	1.m	35%	65%	30%	10%	Fluvial: ---							
	Current:	1.m	35%	65%	30%	5%	Lacustrine: ---							

Map Unit No. Comp	Landscape Features						Climax Plant Community (canopy cover)							
							Tree	%	Shrub	%	Forb	%	Graminoid	%
126 0.3	Landform:	Escarpments					---							
	Elevation:	900-1200 m					---	---	---	---	---	---	---	---
	Slope:						---	---	---	---	---	---	---	---
	Gradient:	100 %	Length:	5 m			---	---	---	---	---	---	---	---
	Aspect:	South	Class:	Simple			---	---	---	---	---	---	---	---
	Shape, Plan:	Linear					---	---	---	---	---	---	---	---
	Shape, Section:	Linear					---							
	Precipitation:	24-36 cm	Bedrock:	---			---	---	---	---	---	---	---	---
	Parent Material:	.					---	---	---	---	---	---	---	---
	Condit-	Canopy	Surface Components				---	---	---	---	---	---	---	---
	ion	Height	OvStr	RkFrg	Littr	VegBA	---	---	---	---	---	---	---	---
	Tolerance:	--- m	---%	---%	---%	---%	---	---	---	---	---	---	---	---
	Natural:	--- m	---%	---%	---%	---%	Fluvial: ---							
	Current:	--- m	---%	---%	---%	---%	Lacustrine: ---							

Map Unit No.	Comp	Landscape Features		Climax Plant Community (canopy cover) Tree	%	Shrub	%	Forb	%	Graminoid	%
126	0.4	Landform:	Escarpments	---							
		Elevation:	1000-1700 m	---	---	---	---	---	---	---	---
		Slope:		---	---	---	---	---	---	---	---
		Gradient:	100 % Length: 5 m	---	---	---	---	---	---	---	---
		Aspect:	North Class: Simple	---	---	---	---	---	---	---	---
		Shape, Plan:	Linear	---	---	---	---	---	---	---	---
		Shape, Section:	Linear	---							
		Precipitation:	46-56 cm Bedrock: ---	---	---	---	---	---	---	---	---
		Parent Material:	.	---	---	---	---	---	---	---	---
		Condit-	«= Canopy =» «= Surface Components =»	---	---	---	---	---	---	---	---
		ion	Height OvStr RkFrg Littr VegBA BSoil	---	---	---	---	---	---	---	---
		Tolerance:	--- m ---% ---% ---% ---% ---%	---	---	---	---	---	---	---	---
		Natural:	--- m ---% ---% ---% ---% ---%	Fluvial: ---							
		Current:	--- m ---% ---% ---% ---% ---%	Lacustrine: ---							

Map Unit No.	Comp	Landscape Features		Climax Plant Community (canopy cover) Tree	%	Shrub	%	Forb	%	Graminoid	%
127	0.1	Landform:	Hills	Edaphic/fire/zootic							
		Elevation:	1700-2100 m	Juoe2	0.0	Arpu5	10.0	ERIOG	1.0	Ansa	0.1
		Slope:		Jumo	0.0	Gawr3	1.0	Erci6	0.1	Bocu	1.0
		Gradient:	25 % Length: 10 m	Pidi	0.0	Nomi	5.0	---	---	Boer4	0.5
		Aspect:	All Class: Simple	Qugr3	0.1	Qutu2	30.0	---	---	Bogr2	5.0
		Shape, Plan:	Linear	---	---	Rhtr	1.0	---	---	Bohi2	1.0
		Shape, Section:	Convex	---							
		Precipitation:	46-56 cm Bedrock: ---	---	---	---	---	---	---	---	---
		Parent Material:	Alluvium, ss, sts, di, gr	---	---	---	---	---	---	---	---
		Condit-	«= Canopy =» «= Surface Components =»	---	---	---	---	---	---	---	---
		ion	Height OvStr RkFrg Littr VegBA BSoil	---	---	---	---	---	---	---	---
		Tolerance:	1.m 40% 45% 30% ---% ---%	---	---	---	---	---	---	---	---
		Natural:	1.m 40% 45% 30% 20% 10%	Fluvial: ---							
		Current:	1.m 40% 45% 30% 5% 25%	Lacustrine: ---							

Map Unit No.	Comp	Landscape Features		Climax Plant Community (canopy cover) Tree	%	Shrub	%	Forb	%	Graminoid	%
127	0.2	Landform:	Elevated plains	Edaphic/fire							
		Elevation:	1700-2300 m	Juoe2	0.0	Arpu5	10.0	ERIOG	1.0	Ansa	0.1
		Slope:		Jumo	0.0	Gawr3	1.0	Erci6	0.1	Bocu	1.0
		Gradient:	4 % Length: 15 m	Pidi	0.0	Nomi	2.0	---	---	Boer4	5.0
		Aspect:	Noninfl. Class: Simple	Qugr3	0.1	Qutu2	40.0	---	---	Bogr2	15.0
		Shape, Plan:	Linear	---	---	Rhtr	0.1	---	---	Bohi2	1.0
		Shape, Section:	Linear	Edaphic/fire/zootic							
		Precipitation:	46-56 cm Bedrock: ---	Juoe2	0.0	Arpu5	10.0	ERIOG	1.0	Ansa	0.1
		Parent Material:	Alluvium, ss, sts	Jumo	0.0	Gawr3	1.0	Erci6	0.1	Bocu	1.0
		Condit-	«= Canopy =» «= Surface Components =»	Pidi	0.0	Nomi	2.0	---	---	Boer4	0.1
		ion	Height OvStr RkFrg Littr VegBA BSoil	Qugr3	0.1	Qutu2	40.0	---	---	Bogr2	5.0
		Tolerance:	1.m 40% 25% 30% ---% ---%	---	---	Rhtr	0.1	---	---	Bohi2	1.0
		Natural:	1.m 40% 25% 30% 20% 5%	Fluvial: ---							
		Current:	1.m 40% 25% 30% 5% 30%	Lacustrine: ---							



Prosopis velutina
Rhus choriophylla
Rhus trilobata
Salix amydaloides
Salix bebbiana
Salix bonplandiana
Salix lasiolepis
Salix taxifolia
Quercus toumeyi
Quercus turbinella
Column number **FORBS**
Erigerion
Helianthus annuus
Typha latifolia
Column number **GRAMMINOIDS**
Andropogon barbompodes
Andropogon cirratus
Andropogon saccharides
Aristida ternipes
Bouteloua curtipendula
Bouteloua eriopoda
Bouteloua gracilis
Bouteloua hirsuta
Eragrostis intermedia
Hilaria belangeri
Hilaria mutica
Leptochloa dubia
Muhlenbergia emersleyi
Muhlenbergia porteri
Panicum obtusum
Sitanion hystrix
Tridens mutica
Column number **CLIMAX CLASS**
STR
SMR
Edaphic (western section)
Edaphic (eastern section)
Edaphic ($CaCO_3$)
Edaphic (shallow)
Edaphic (clayey/elev plain)
Topo/fire
Topographic (wind)
Topo-edap (excess drained)
Topo-edaphic (H_2O >150 cm)
Topo-edaphic (H_2O 50-150 cm)-(eastern section)
Topo-edaphic (H_2O 50-150 cm)-(western section)
SMR
Topo-edaphic (H_2O <50 cm)
Topo-edap/zoo (H_2O <50 cm)
SMR
Topo-edaphic (H_2O <50 cm)
Column number
Climatic class **TREES**
Abies concolorts
Alnus oblongifolia
Cercidium flordum
Cereus giganteus
Cercidum microphyllum
Celtis reticulata
Cupressus arizonica glabra
Juglans majors
Juniperous deppeana
Juniperous erythrocapa
Juniperous monosperma
Juniperous ostesperma
Olney tesota
Pinus monophylla
Pinus ponderosa scupulorum
Pinus strobiformis
Platanus wrightii
Populus angustifolia
Populus fremontii
Populus tremuloides
Prosopis velutina
Pseudotsuga menziesii glauca
Quercus arizonica
Quercus emoryi
Quercus gambelii
Tamarix chinensis
Column number **SHRUBS**
Arctostaphylos pringlei
Arctostaphylos punguns
Atriplex conterfolia
Baccaris glutinosa
Baccaris sarothides
Berberis haematocarpa
Canotia holacantha
Ceanothus greggii
Cerococarpus montanus
Chilopsis linearis
Chrysothnamnus nauseosus
Condalia spatulata
Dasylirion wheeleri
Dodonaea viscosa
Fouquieria splendens
Franseria deltoidea
Garrya wrightii
Krameria paravifolia glandul.
Larrea divaricata
Lycium pallidum
Nolina microcarpa
Opuntia engelmannii
Prosopis velutina
Quercus turbinella
Rhus ovata
Salix bebbiana
Salix bonplandiana
Salix goodingii
Salix lasiolepis
Salix taxifolia
Simmondsia chinensis
Column number **FORBS**
Encelia farinosa
Erodium cirutarium
Erigerion
Helianthus annuus

November 1988

```
                                        |Pste3|
Tyla
1         2         3         4         5         6         7         8
                    |Anba|
                                        |Ansa|
          |Bocu|
                    |Boer4|
                                        |Bogr2|
                                  |Bonl2|
Brru2
          |Erin|
                    |Nibe|
          |Himu2|
                    |Kopy (Kocr)|
                                        |Muio|
          |Mupo2|
                                        |Paob|
                                        |Pore|
                    |Siny|
                    |Stspj|
                                        |Trum|
1         2         3         4         5         6         7         8
Hyperther.->|<-Thermic------------->|<--Mesic-------------->|<-Frigid-->|
Aridic----------------->|<-Ustic--------------------------->|<-Udic---->|
<-Frde----->|<-Cemi2--->|<-Prve---->|<-Quar---->|<-Pipos--->|<-Psmeg--->|

                                        |<-Qutu2--->|
                                                    |<-Cuarg--->|
<-Ladi2---->|<-Ladi2--->|<-Caho3--->|<-       --->|<-      --->|
<-Fosp2---->|<-Fosp2--->|<-       -->|<-       --->|
            |<-Dovi---->|
                                        |<--Jude2-->|
|<-    ---->|<-       -->|<-       -->|
|<-Olte---->|<-Cefl2--->|<-Chl12--->|<-Quem---->|<-Pipos--->|<-Psmeg--->|
|<-Prve---->|<-Prve---->|<-Plwr2--->|<-Plwr2--->|<-Poan3--->|<-Poan3--->|
            |<-Atco---->|
|<-Aquic-------------------------------------------------------------->|
|<-Sabo---->|<-Sata---->|<-Sago---->|<-Sala6--->|<-Sabe2--->|<-      -->|
|<-Tach2--->|<-Tach2--->|<-Tach2--->|
|<-Peraquic------------------------------------------------------------>|
|<-Tyla---->|<-Tyla----->|
```

1	2	3	4	5	6	7	8
	LSC	LSC	LSC	LSC	LSC	LSC	
	Farmington			Jacob Lk.2NE			
				T39NR2ES8			
	BSkf			Dcbf			
	12(11)	10	8	5(7)	4	1	
	(2/16/22/5)			(-1/10/16/3)			
	(19/4)			(13/1)			
	(23/0)			(16/-2)			
	13(12)	11[12]	9[9]	6[5](8)	5[5]	2	
				12[11]	9[10]	6	
			5	2[0]	1[-1]	-1	
				7	6	-2	
				12	10	4	
	170(166)	150	130	100(120)	90	60	
	20(21)	30	40	56(48)	66	76	
	(19/16/36/29			(24/18/32/27			
	(52/48)			(50/50)			
	(49/27)			(40/32)			
	70	80	90	120	150	180	
	10P	15P	20P	35C	70C	120C	
	12/1-4/1	12/1-4/1	12/1-4/1	11/1-4/15	10/15-4/15	10/15/15	
	(71)			(53)			
	-60(-50)	-50	-30	10(-6)	40	70	
	60(48)	60	60	55(50)	50	50	
	3.0	3.0	3.6	4.0	4.6	5.0	
	1700(1675)	1800	2100	2400	2700	3000	
	Mesic	Mesic	Mesic	Frigid	Frigid	Cryic	
	Aridic	Ustic	Ustic	Ustic	Udic	Udic	

1	2	3	4	5	6	7	8
	HSC	HSC	HSC	HSC	LSC	LSC	LSC
	Vaughn	Mtn. Air	Flagstaff	Cloudcroft			
		T26NR7ES16	T13NR13ES8				
	BSkf	BSkf	Dcbf	Dcbf			
	12(12)	9(11)	5(7)	4(4)	1	-3	
	(3/16/21/7)	(3/15/28/6)	(0/10/17/3)	( )			
	(18/5)	(17/4)	(14/1)	( )			
	(22/2)	(21/1)	(17/-1)	( )			
	13(13)	10[10](12)	6[7](8)	5[5]	2[3]	-2[-1]	
		[ ]	12[9]	9[9]	6[6]	4[4]	
		5[ ]	2[2]	1[1]	-1[-1]	-6[-6]	
			7	6	3[ ]		
			12	10	7[ ]	4	
	165(167)	150(147)	120(120)	90( )	60	30	
	30(31)	40(34)	56(52)	66(66)	76	86	
	(11/26/50/15	(15/14/53/19	(28/13/32/27				
	(75/25)	(67/33)	(45/55)				
	(57/15)	(62/19)	(40/35)				
	60	80	110	140	170	210	
	10P	10P	20P	50C	120C	15P	
	12/1-4/1	12/1-4/1	11/1-3/15	11/1-4/15	10/15-5/15	10/15-6/1	
	(69)	(65)	(51)	(44)			
	-60(-38)	-40(-32)	10(-3)	40(22)	90	150	
	40(25)	40(33)	50(55)	50	50	50	
	3.0	3.6	4.0	4.6	5.0	5.0	
	1800(1820)	2100(1987)	2400(2135)	2700	3200	3800	
	Mesic	Mesic	Frigid	Frigid	Cryic	Pergelic	
	Ustic	Ustic	Ustic	Udic	Udic	Udic	

1	2	3	4	5	6	7	8
	HSM	HSM	HSM	HSM	LSC	LSC	
	Douglas	Apache 6WNW					
				T29SR30ES20			
	BShw	Caf					
	18(16)	15(14)	12	9	6	3	
	(9/20/25/12)	(8/17/22/10)					
	(22/11)	(20/9)					
	(25/8)	(23/6)					
	19(17)	16(15)	13[ ]	10	7	4	
				12	9	6	
	230(201)	200(178)	170	140	110	80	
	39(32)	40(46)	50	60	70	76	

Psoralea tenuiflora
Typha latifolia
Column number GRAMMINOIDS
Andropogon barbinodes
Andropogon saccharoides
Bouteloua curtipendula
Bouteloua eriopoda
Bouteloua gracilis
Bouteloua hirsuta
Bromus rubens
Eragrostis intermedia
Hilaria belangeri
Hilaria mutica
Koeleria pyramidata
Muhenbergia longiligala
Muhenbergia porteri
Panicum obtusum
Pao fendleriana
Sitanion hystrix
Stipa speciosa
Tridens mutica
Column number CLIMAX CLASS
STR
SMR
Edaphic
Edaphic/zootic
Edaphic/fire
Topo/fire
Edaphic (CaCO3)
Edaphic (shallow)
Edaphic (shallow/tuff)
Edaphic (clayey/elev plain)
Topo-edaphic (excess drain)
Topo-edaphic (H20 >150 cm)
Topo-edapnic (H20 50-150 cm)
Topo-edap (H20 >150cm sal/alk)
SMR
Topo-edaphic (H20 <50 cm)
Topo-edap/zoo (H20 <50 cm)
SMR
Topo-edaphic (H20 <50 cm)
Column number CLIMATE
Climatic Class
NOAA ( )
Soil temp./moist. study [ ]
Climatic Type (Trewartha)
MAAT deg. C
AT deg. C by 4 seasons
AT deg. C by 2 seasons
AT deg. C by soil season
MAST deg. C @ 50 cm
MSST deg. C @ 50 cm
MWST deg. C @ 50 cm
MAST deg. C @ 50 cm Disc
MSST deg. C @ 50 cm Disc
MWST deg. C @ 50 cm Disc.
FFP no. days
MAP cm
AP % of ann. by 4 seasons
AP % of ann. by 2 seasons
AP % of ann. by soil seasons
MAS cm
MASA cm
SP mo.(s)
aPET cm
Water balance cm
MLSP % of An.
2 yr 6hr st. cm
ME m
STR
SMR
Column number
Climatic Class
NOAA ( )
Soil temp./moist. study [ ]
Climatic Type (Trewartha)
MAAT deg. C
AT deg. C by 4 seasons
AT deg. C by 2 seasons
AT deg. C by soil season
MAST deg. C @ 50 cm
MSST deg. C @ 50 cm
MWST deg. C @ 50 cm
MAST deg. C @ 50 cm Disc
MSST deg. C @ 50 cm Disc
MWST deg. C @ 50 cm Disc.
FFP no. days
MAP cm
AP % of ann. by 4 seasons
AP % of ann. by 2 seasons
AP % of ann. by soil season
MAS cm
MASA cm
SP mo.(s)
aPET cm
Water balance cm
MLSP % of An.
2 yr 6hr st. cm
ME m
STR
SMR
Column number
Climatic Class
NOAA ( )
Soil temp./moist. study [ ]
Climatic Type (Trewartha)
MAAT deg. C
AT deg. C by 4 seasons
AT deg. C by 2 seasons
AT deg. C by soil seasons
MAST deg. C @ 50 cm
MSST deg. C @ 50 cm
MWST deg. C @ 50 cm
MAST deg. C @ 50 cm Disc
MSST deg. C @ 50 cm Disc
MWST deg. C @ 50 cm Disc.
FFP no. days
MAP cm

APPENDIX B

```
1****************************************
****************************************
 *                                      *
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *                                      *
 *              MAY   1991              *
 *                                      *
 *           VERSION 4.0.1E             *
 *                                      *
 *     Lahey F77L-EM/32 version 5.01    *
 *                                      *
 *       Dodson & Associates, Inc.      *
 *                                      *
 *  RUN DATE  05/01/96  TIME  14:29:22  *
 *                                      *
 ****************************************
****************************************
```

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

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

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

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

```
1                                          HFC-1 INPUT                                                    PAGE  1

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

            1           ID                    FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
            2           ID
            3           ID                                 FILE: CC-24
            4           ID
            5           ID        HYDROLOGY FOR:    100 YEAR 24 HOUR EVENT
            6           ID
            7           ID        PURPOSE OF STUDY: DELINEATION OF THE 100-YEAR FLOODPLAIN OF
            8           ID                          CLINE CREEK
            9           ID
           10           ID
           11           ID        METHODS OF STUDY: HEC-1   DIMENSIONLESS SCS HYDROGRAPH 6 MIN. INTERVALS
           12           ID                          PRECIPITATION- SCS TYPE II STORM BY 15 MIN. INCREMENTS
           13           ID                                     -AREAL REDUCTION BY "JD" DEPTH-AREA OPTION
           14           ID                          EXCESS PRECIPITATION-  LOSS RATES
           15           ID                                   &  PERCENT IMPERVIOUS
           16           ID                          STREAM ROUTING- MUSKINGUM METHOD
           17           ID
           18           ID        WATERSHED NAME:   CLINE CREEK   ( BASIN X IS SUBBASIN C-6 )
           19           ID
           20           ID        CONTRACT NUMBER:  FCD 89-15
           21           ID
           22           ID        COMPUTED BY:      BAKER ENGINEERS          DATE:12/11/89
           23           ID                          COMP: _______________    CKD: _______________
           24           ID
           25           ID        Revised by :    Hasan Mushtaq, FCDMC
           26           ID                        February 23, 1996.
           27           ID
           28           ID        (1)     A reduction factor of 1.00 was used to be consistent with
           29           ID                the previous study.
           30           ID        (2)     Green-Ampt infiltration method was used for soil loss.
           31           ID        (3)     Phoenix Valley S-graph and Mountain S-graphs were
           32           ID                used to generate the excess rainfall.
           33           ID        (4)     L, Lca, S, were measured from the work maps.
           34           ID        (5)     Roughness values for the subbasins are assumed to vary
           35           ID                between 0.025 and 0.030.  These may be changed as necessary.
           36           ID
           37           ID   DDM MCUHP2 CLINE CREEK WATERSHED
           38           IT       5 01JAN89       0     280
                        *DIAGRAM
           39           IO       5
           40           IN      15
                        * DDM   ***** Preserved *****

           41           KK   X1SUB
           42           KM   BASIN X1SUB
           43           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
           44           KM    L=      1.8  Lca=       .8   S=  320.0  Kn= .020  LAG=  11.0
           45           KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
           46           BA     .61
           47           IN      15
           48           KM   RAINFALL DEPTH OF 4.80 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
           49           KM   AN AREAL REDUCTION COEFFICIENT OF 1.000 WAS USED
           50           PB   4.800
           51           KM   THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL
           52           PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
1                                          HEC-1 INPUT                                                    PAGE  2

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

           53           PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
           54           PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
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 55          PC    .110    .115    .120    .126    .135    .142    .150    .158    .166    .175
 56          PC    .184    .195    .208    .224    .243    .266    .318    .479    .678    .716
 57          PC    .743    .764    .781    .795    .808    .818    .828    .837    .844    .851
 58          PC    .858    .865    .871    .877    .883    .889    .895    .900    .905    .910
 59          PC    .915    .919    .923    .927    .931    .935    .939    .943    .947    .951
 60          PC    .954    .957    .960    .963    .966    .969    .972    .975    .978    .981
 61          PC    .984    .987    .990    .993    .996    .999   1.000
 62          LG     .20     .30    8.00     .07   16.00
 63          UI    456.   1602.   1122.    665.    379.    205.    116.     64.     35.     35.
 64          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 65          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM    ***** Preserved *****

 66          KK   XROX2
 67          KM        ROUTE X1 THROUGH SUBBASIN X2
 68          RM       2    0.15    0.30
             * DDM    ***** Preserved *****

 69          KK   X2SUB
 70          KM   BASIN X2SUB
 71          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 72          KM    L=      2.0  Lca=      1.0   S=  311.6  Kn= .020  LAG=  12.5
 73          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 74          BA     .43
 75          LG     .20     .32    7.60     .08    6.00
 76          UI    241.    860.    931.    528.    317.    193.    115.     69.     41.     22.
 77          UI     22.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 78          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM    ***** Preserved *****

 79          KK   XCO-1
 80          KM        COMBINE RUNOFF FROM SUBBASINS X1 AND X2
 81          HC       2
             * DDM    ***** Preserved *****

 82          KK   XROX3
 83          KM        ROUTE X1 & X2 THROUGH SUBBASINS X3 & X5
 84          RM       2    0.23    0.30
             * DDM    ***** Preserved *****

 85          KK   X3SUB
 86          KM   BASIN X3SUB
 87          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 88          KM    L=      2.3  Lca=      1.2   S=  196.0  Kn= .020  LAG=  15.6
 89          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 90          BA     .56
 91          LG     .20     .32    7.60     .08    1.00
 92          UI    188.    723.   1108.    970.    572.    326.    187.    104.     57.     29.
 93          UI     29.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 94          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM    ***** Preserved *****
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 95          KK   XCO-2
 96          KM        COMBINE RUNOFF FROM SUBBASINS X1,X2, AND X3
 97          HC       2
             * DDM    ***** Preserved *****

 98          KK   X4SUB
 99          KM   BASIN X4SUB
100          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
101          KM    L=      1.1  Lca=       .6   S=  250.0  Kn= .020  LAG=   8.8
102          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
103          BA     .28
104          LG     .20     .27    8.80     .05     .00
105          UI    356.    968.    551.    203.     74.     26.      0.      0.      0.      0.
106          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM    ***** Preserved *****

107          KK   XCO-3
108          KM        COMBINE RUNOFF FROM SUBBASINS X1,X2,X3,AND X4
109          HC       2
             * DDM    ***** Preserved *****

110          KK   X5SUB
111          KM   BASIN X5SUB
112          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
113          KM    L=      1.5  Lca=       .9   S=  198.7  Kn= .020  LAG=  11.6
114          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
115          BA     .38
116          LG     .20     .37    6.60     .13     .00
117          UI    253.    874.    917.    470.    221.    101.     43.     27.      0.      0.
118          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM    ***** Preserved *****

119          KK   XCO-4
120          KM        COMBINE RUNOFF FROM SUBBASINS X1,X2,X3,X4,AND X5
121          KM        BASIN X OUTFLOW HYDROGRAPH = SUB C-6 RUNOFF HYDROGRAPH
122          HC       2
             * DDM    ***** Preserved *****

123          KK   SUBC1
124          KM   BASIN SUBC1
125          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
126          KM    L=      1.3  Lca=       .8   S= 1143.0  Kn= .020  LAG=   7.8
127          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
128          BA    1.26
129          LG     .20     .35    4.80     .26     .00
130          UI   2015.   4263.   1937.    870.    381.    158.    104.      0.      0.      0.
131          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM    ***** Preserved *****
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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132          KK    RO-1
133          KM        ROUTE C-1       THROUGH      C-2
134          RM       6      .58       .3
             * DDM   ***** Preserved *****

135          KK   SUBC2
136          KM   BASIN SUBC2
137          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
138          KM    L=      3.8  Lca=      2.1   S=  369.4  Kn= .020  LAG=  20.5
139          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
140          BA    2.19
141          LG     .20      .35    4.80     .26     .00
142          UI    398.   1547.   2645.   3635.   2218.   1726.   1306.    918.    721.    495.
143          UI    378.    276.    186.    176.     71.     69.     69.     69.      0.      0.
144          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM   ***** Preserved *****

145          KK   SUBC3
146          KM   BASIN SUBC3
147          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
148          KM    L=      2.2  Lca=      1.6   S=  403.7  Kn= .020  LAG=  14.8
149          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
150          BA    1.24
151          LG     .23      .35    4.90     .26    1.00
152          UI    474.   1738.   2670.   1591.   1112.    710.    467.    306.    195.    138.
153          UI     64.     54.     54.      0.      0.      0.      0.      0.      0.      0.
154          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM   ***** Preserved *****

155          KK   SUBC4
156          KM   BASIN SUBC4
157          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
158          KM    L=      2.9  Lca=      1.9   S=  688.4  Kn= .020  LAG=  15.8
159          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
160          BA    2.54
161          LG     .20      .35    4.80     .26     .00
162          UI    829.   3129.   5236.   3326.   2386.   1563.   1101.    691.    481.    313.
163          UI    234.    104.    104.    104.      0.      0.      0.      0.      0.      0.
164          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM   ***** Preserved *****

165          KK    RO-2
166          KM        ROUTE C-4 THROUGH C-5
167          RM       3      .27       .3
             * DDM   ***** Preserved *****

168          KK   SUBC5
169          KM   BASIN SUBC5
170          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
171          KM    L=      2.9  Lca=      1.4   S=  540.8  Kn= .020  LAG=  15.0
172          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
173          BA    3.39
174          LG     .24      .37    5.20     .23    6.00
175          UI   1255.   4625.   7250.   4358.   3077.   1965.   1317.    866.    552.    372.
```



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

176          UI    205.    146.    146.      0.      0.      0.      0.      0.      0.      0.
177          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM   ***** Preserved *****

178          KK    CO-1
179          KM        COMBINE RUNOFF FROM SUBBASINS C-4 AND C-5
180          HC       2
             * DDM   ***** Preserved *****

181          KK    RO-3
182          KM        ROUTE C-4&5 THROUGH C-3
183          RM       3      .24       .3
             * DDM   ***** Preserved *****

184          KK    CO-2
185          KM        COMBINE RUNOFF FROM SUBBASINS 4&5 WITH C-1,2&3
186          HC       4
             * DDM   ***** Preserved *****

187          KK    RO-4
188          KM        ROUTE C-1,2,3,4,5 THROUGH C-9 UPST
189          RM       3      .25       .3
             * DDM   ***** Preserved *****

190          KK   SUBC7
191          KM   BASIN SUBC7
192          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
193          KM    L=      2.5  Lca=      1.1   S=  561.0  Kn= .020  LAG=  12.6
194          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
195          BA    1.20
196          LG     .40      .27    8.80     .06   18.00
197          UI    656.   2336.   2590.   1467.    882.    544.    325.    195.    120.     61.
198          UI     61.      0.      0.      0.      0.      0.      0.      0.      0.      0.
199          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM   ***** Preserved *****

200          KK    RO-5
201          KM        ROUTE C-7 THROUGH C-8
202          RM       8      .77       .3
             * DDM   ***** Preserved *****

203          KK   SUBC8
204          KM   BASIN SUBC8
205          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
206          KM    L=      2.6  Lca=      1.2   S=  101.6  Kn= .022  LAG=  20.4
207          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
208          BA    1.42
209          LG     .37      .19   10.10     .04   13.00
210          UI    262.   1020.   1830.   2221.   1951.   1316.    858.    550.    371.    229.
```

```
 211          UI    161.     72.     57.     57.     57.      0.      0.      0.      0.      0.
 212          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              * DDM   ***** Preserved *****
1                                          HEC-1 INPUT                                                    PAGE  6

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

 213          KK    CO-3
 214          KM        COMBINE RUNOFF FROM SUBBASINS C-7 AND C-8
 215          HC       2
              * DDM   ***** Preserved *****

 216          KK    CO-4
 217          KM        COMBINE RUNOFF FROM SUBBASINS C-1 THROUGH 5; C-6 AND C-7&8
 218          HC       3
              * DDM   ***** Preserved *****

 219          KK    RO-6
 220          KM        ROUTE C-1 THROUGH 8 THROUGH C-9 DWN
 221          RM       2     .21      .3
              * DDM   ***** Preserved *****

 222          KK   SUBC9
 223          KM   BASIN SUBC9
 224          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 225          KM    L=      2.5  Lca=      1.4   S=   81.3  Kn= .022  LAG=  21.8
 226          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 227          BA     .58
 228          LG     .35     .31    6.80     .14    7.00
 229          UI     89.    358.    655.    832.    804.    579.    389.    260.    173.    116.
 230          UI     76.     58.     22.     22.     22.     22.      0.      0.      0.      0.
 231          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              * DDM   ***** Preserved *****

 232          KK    CO-5
 233          KM        COMBINE RUNOFF FROM SUBBASINS C-1 THROUGH 8 AND C-9
 234          KO       1
 235          HC       2
 236          ZZ
1
              SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE     (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

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

   41      X1SUB
               V
               V
   66      XROX2
               .
               .
   69          .       X2SUB
               .           .
               .           .
   79      XCO-1............
               V
               V
   82      XROX3
               .
               .
   85          .       X3SUB
               .           .
               .           .
   95      XCO-2............
               .
               .
   98          .       X4SUB
               .           .
               .           .
  107      XCO-3............
               .
               .
  110          .       X5SUB
               .           .
               .           .
  119      XCO-4............
               .
               .
  123          .       SUBC1
               .           V
               .           V
  132          .        RO-1
               .           .
               .           .
  135          .           .       SUBC2
               .           .           .
               .           .           .
  145          .           .           .       SUBC3
               .           .           .           .
               .           .           .           .
  155          .           .           .           .       SUBC4
               .           .           .           .           V
               .           .           .           .           V
  165          .           .           .           .        RO-2
               .           .           .           .           .
               .           .           .           .           .
  168          .           .           .           .           .       SUBC5
               .           .           .           .           .           .
               .           .           .           .           .           .
  178          .           .           .           .        CO-1............
               .           .           .           .           V
               .           .           .           .           V
  181          .           .           .           .        RO-3
               .           .           .           .           .
               .           .           .           .           .
  184          .        CO-2.......................................
```

```
                .          V
                .          V
   187          .       RO-4
                .          .
                .          .
   190          .          .      SUBC7
                .          .          V
                .          .          V
   200          .          .       RO-5
                .          .          .
                .          .          .
   203          .          .          .      SUBC8
                .          .          .        .
                .          .          .        .
   213          .          .       CO-3............
                .          .          .
                .          .          .
   216       CO-4........................
                V
                V
   219       RO-6
                .
                .
   222          .       SUBC9
                .          .
                .          .
   232       CO-5............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1****************************************
****************************************
 *                                      *                                          *
 *                                      *                                          *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                          *    U.S. ARMY CORPS OF ENGINEERS
 *                                      *                                          *
 *              MAY   1991              *                                          *    HYDROLOGIC ENGINEERING CENTER
 *                                      *                                          *
 *           VERSION 4.0.1E             *                                          *          609 SECOND STREET
 *                                      *                                          *
 *     Lahey F77L-EM/32 version 5.01    *                                          *       DAVIS, CALIFORNIA 95616
 *                                      *                                          *
 *       Dodson & Associates, Inc.      *                                          *           (916) 551-1748
 *                                      *                                          *
 *  RUN DATE  05/01/96  TIME  14:29:22  *                                          *
 *                                      *
 ****************************************
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FILE: CC-24

HYDROLOGY FOR: 100 YEAR 24 HOUR EVENT

PURPOSE OF STUDY: DELINEATION OF THE 100-YEAR FLOODPLAIN OF CLINE CREEK

METHODS OF STUDY: HEC-1 DIMENSIONLESS SCS HYDROGRAPH 6 MIN. INTERVALS
PRECIPITATION- SCS TYPE II STORM BY 15 MIN. INCREMENTS
-AREAL REDUCTION BY "JD" DEPTH-AREA OPTION
EXCESS PRECIPITATION- LOSS RATES
& PERCENT IMPERVIOUS
STREAM ROUTING- MUSKINGUM METHOD

WATERSHED NAME: CLINE CREEK (BASIN X IS SUBBASIN C-6)

CONTRACT NUMBER: FCD 89-15

COMPUTED BY: BAKER ENGINEERS DATE:12/11/89
COMP: _____ CKD: _____

Revised by : Hasan Mushtaq, FCDMC
February 23, 1996.

(1) A reduction factor of 1.00 was used to be consistent with the previous study.
(2) Green-Ampt infiltration method was used for soil loss.
(3) Phoenix Valley S-graph and Mountain S-graphs were used to generate the excess rainfall.
(4) L, Lca, S, were measured from the work maps.
(5) Roughness values for the subbasins are assumed to vary between 0.025 and 0.030. These may be changed as necessary.

DDM MCUHP2 CLINE CREEK WATERSHED

```
 39 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     1JAN89  STARTING DATE
                   ITIME       0000  STARTING TIME
                      NQ        280  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE     1JAN89  ENDING DATE
                  NDTIME       2315  ENDING TIME
                   ICENT         19  CENTURY MARK

              COMPUTATION INTERVAL    0.08 HOURS
                   TOTAL TIME BASE   23.25 HOURS

        ENGLISH UNITS
```

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

*** ***

```
              **************
              *            *
232 KK        *     CO-5   *
              *            *
              **************

234 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          1  PRINT CONTROL
                     IPLOT          0  PLOT CONTROL
                     QSCAL         0.  HYDROGRAPH PLOT SCALE

235 HC          HYDROGRAPH COMBINATION
                     ICOMP          2  NUMBER OF HYDROGRAPHS TO COMBINE
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*

HYDROGRAPH AT STATION CO-5
SUM OF 2 HYDROGRAPHS

****
*

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
1 JAN 0000	1	0.	1 JAN 0550	71	39.	1 JAN 1140	141	1169.	1 JAN 1730	211	54.
1 JAN 0005	2	0.	1 JAN 0555	72	39.	1 JAN 1145	142	1760.	1 JAN 1735	212	53.
1 JAN 0010	3	0.	1 JAN 0600	73	39.	1 JAN 1150	143	2706.	1 JAN 1740	213	52.
1 JAN 0015	4	0.	1 JAN 0605	74	39.	1 JAN 1155	144	3967.	1 JAN 1745	214	52.
1 JAN 0020	5	1.	1 JAN 0610	75	39.	1 JAN 1200	145	5510.	1 JAN 1750	215	51.
1 JAN 0025	6	2.	1 JAN 0615	76	39.	1 JAN 1205	146	7358.	1 JAN 1755	216	50.
1 JAN 0030	7	3.	1 JAN 0620	77	40.	1 JAN 1210	147	9403.	1 JAN 1800	217	49.
1 JAN 0035	8	5.	1 JAN 0625	78	40.	1 JAN 1215	148	11389.	1 JAN 1805	218	48.
1 JAN 0040	9	6.	1 JAN 0630	79	41.	1 JAN 1220	149	13065.	1 JAN 1810	219	47.
1 JAN 0045	10	9.	1 JAN 0635	80	41.	1 JAN 1225	150	14454.	1 JAN 1815	220	46.
1 JAN 0050	11	11.	1 JAN 0640	81	42.	1 JAN 1230	151	15581.	1 JAN 1820	221	45.
1 JAN 0055	12	13.	1 JAN 0645	82	43.	1 JAN 1235	152	16329.	1 JAN 1825	222	44.
1 JAN 0100	13	16.	1 JAN 0650	83	43.	1 JAN 1240	153	16613.	1 JAN 1830	223	43.
1 JAN 0105	14	18.	1 JAN 0655	84	44.	1 JAN 1245	154	16404.	1 JAN 1835	224	42.
1 JAN 0110	15	20.	1 JAN 0700	85	45.	1 JAN 1250	155	15705.	1 JAN 1840	225	41.
1 JAN 0115	16	22.	1 JAN 0705	86	46.	1 JAN 1255	156	14537.	1 JAN 1845	226	41.
1 JAN 0120	17	24.	1 JAN 0710	87	47.	1 JAN 1300	157	12961.	1 JAN 1850	227	40.
1 JAN 0125	18	26.	1 JAN 0715	88	47.	1 JAN 1305	158	11091.	1 JAN 1855	228	40.
1 JAN 0130	19	27.	1 JAN 0720	89	48.	1 JAN 1310	159	9099.	1 JAN 1900	229	40.
1 JAN 0135	20	28.	1 JAN 0725	90	48.	1 JAN 1315	160	7177.	1 JAN 1905	230	39.
1 JAN 0140	21	28.	1 JAN 0730	91	48.	1 JAN 1320	161	5474.	1 JAN 1910	231	39.
1 JAN 0145	22	29.	1 JAN 0735	92	49.	1 JAN 1325	162	4076.	1 JAN 1915	232	39.
1 JAN 0150	23	29.	1 JAN 0740	93	49.	1 JAN 1330	163	2992.	1 JAN 1920	233	39.
1 JAN 0155	24	29.	1 JAN 0745	94	49.	1 JAN 1335	164	2189.	1 JAN 1925	234	39.
1 JAN 0200	25	29.	1 JAN 0750	95	49.	1 JAN 1340	165	1611.	1 JAN 1930	235	39.
1 JAN 0205	26	29.	1 JAN 0755	96	49.	1 JAN 1345	166	1201.	1 JAN 1935	236	39.
1 JAN 0210	27	29.	1 JAN 0800	97	49.	1 JAN 1350	167	911.	1 JAN 1940	237	39.
1 JAN 0215	28	29.	1 JAN 0805	98	49.	1 JAN 1355	168	704.	1 JAN 1945	238	39.
1 JAN 0220	29	29.	1 JAN 0810	99	49.	1 JAN 1400	169	559.	1 JAN 1950	239	39.
1 JAN 0225	30	29.	1 JAN 0815	100	49.	1 JAN 1405	170	456.	1 JAN 1955	240	39.
1 JAN 0230	31	29.	1 JAN 0820	101	49.	1 JAN 1410	171	384.	1 JAN 2000	241	39.
1 JAN 0235	32	29.	1 JAN 0825	102	50.	1 JAN 1415	172	333.	1 JAN 2005	242	39.
1 JAN 0240	33	29.	1 JAN 0830	103	51.	1 JAN 1420	173	295.	1 JAN 2010	243	38.
1 JAN 0245	34	29.	1 JAN 0835	104	52.	1 JAN 1425	174	266.	1 JAN 2015	244	38.
1 JAN 0250	35	29.	1 JAN 0840	105	54.	1 JAN 1430	175	241.	1 JAN 2020	245	37.
1 JAN 0255	36	29.	1 JAN 0845	106	56.	1 JAN 1435	176	218.	1 JAN 2025	246	36.
1 JAN 0300	37	29.	1 JAN 0850	107	59.	1 JAN 1440	177	195.	1 JAN 2030	247	36.
1 JAN 0305	38	29.	1 JAN 0855	108	61.	1 JAN 1445	178	176.	1 JAN 2035	248	35.
1 JAN 0310	39	29.	1 JAN 0900	109	63.	1 JAN 1450	179	159.	1 JAN 2040	249	34.
1 JAN 0315	40	29.	1 JAN 0905	110	65.	1 JAN 1455	180	145.	1 JAN 2045	250	33.
1 JAN 0320	41	29.	1 JAN 0910	111	67.	1 JAN 1500	181	134.	1 JAN 2050	251	32.
1 JAN 0325	42	29.	1 JAN 0915	112	69.	1 JAN 1505	182	126.	1 JAN 2055	252	32.
1 JAN 0330	43	29.	1 JAN 0920	113	71.	1 JAN 1510	183	119.	1 JAN 2100	253	31.
1 JAN 0335	44	29.	1 JAN 0925	114	73.	1 JAN 1515	184	113.	1 JAN 2105	254	30.
1 JAN 0340	45	29.	1 JAN 0930	115	74.	1 JAN 1520	185	109.	1 JAN 2110	255	30.
1 JAN 0345	46	29.	1 JAN 0935	116	75.	1 JAN 1525	186	104.	1 JAN 2115	256	30.
1 JAN 0350	47	29.	1 JAN 0940	117	76.	1 JAN 1530	187	101.	1 JAN 2120	257	30.
1 JAN 0355	48	29.	1 JAN 0945	118	76.	1 JAN 1535	188	97.	1 JAN 2125	258	29.
1 JAN 0400	49	29.	1 JAN 0950	119	77.	1 JAN 1540	189	93.	1 JAN 2130	259	29.
1 JAN 0405	50	30.	1 JAN 0955	120	78.	1 JAN 1545	190	88.	1 JAN 2135	260	29.
1 JAN 0410	51	30.	1 JAN 1000	121	79.	1 JAN 1550	191	84.	1 JAN 2140	261	29.
1 JAN 0415	52	31.	1 JAN 1005	122	80.	1 JAN 1555	192	81.	1 JAN 2145	262	29.
1 JAN 0420	53	31.	1 JAN 1010	123	81.	1 JAN 1600	193	79.	1 JAN 2150	263	29.
1 JAN 0425	54	32.	1 JAN 1015	124	82.	1 JAN 1605	194	77.	1 JAN 2155	264	29.
1 JAN 0430	55	33.	1 JAN 1020	125	85.	1 JAN 1610	195	76.	1 JAN 2200	265	29.
1 JAN 0435	56	34.	1 JAN 1025	126	91.	1 JAN 1615	196	75.	1 JAN 2205	266	29.
1 JAN 0440	57	34.	1 JAN 1030	127	99.	1 JAN 1620	197	74.	1 JAN 2210	267	29.
1 JAN 0445	58	35.	1 JAN 1035	128	111.	1 JAN 1625	198	73.	1 JAN 2215	268	29.
1 JAN 0450	59	36.	1 JAN 1040	129	126.	1 JAN 1630	199	73.	1 JAN 2220	269	29.
1 JAN 0455	60	37.	1 JAN 1045	130	143.	1 JAN 1635	200	73.	1 JAN 2225	270	29.
1 JAN 0500	61	37.	1 JAN 1050	131	163.	1 JAN 1640	201	72.	1 JAN 2230	271	29.
1 JAN 0505	62	38.	1 JAN 1055	132	186.	1 JAN 1645	202	72.	1 JAN 2235	272	29.
1 JAN 0510	63	38.	1 JAN 1100	133	212.	1 JAN 1650	203	71.	1 JAN 2240	273	29.
1 JAN 0515	64	39.	1 JAN 1105	134	242.	1 JAN 1655	204	69.	1 JAN 2245	274	29.
1 JAN 0520	65	39.	1 JAN 1110	135	278.	1 JAN 1700	205	66.	1 JAN 2250	275	29.

1 JAN 0525	66	39.	*	1 JAN 1115	136	318.	*	1 JAN 1705	206	63.	*	1 JAN 2255	276	29.
1 JAN 0530	67	39.	*	1 JAN 1120	137	371.	*	1 JAN 1710	207	60.	*	1 JAN 2300	277	29.
1 JAN 0535	68	39.	*	1 JAN 1125	138	447.	*	1 JAN 1715	208	58.	*	1 JAN 2305	278	29.
1 JAN 0540	69	39.	*	1 JAN 1130	139	576.	*	1 JAN 1720	209	56.	*	1 JAN 2310	279	29.
1 JAN 0545	70	39.	*	1 JAN 1135	140	805.	*	1 JAN 1725	210	55.	*	1 JAN 2315	280	29.
			*				*				*			

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*

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	23.25-HR
+		(CFS)				
+ 16613.	12.67		3260.	871.	871.	871.
		(INCHES)	1.885	1.951	1.951	1.951
		(AC-FT)	1616.	1673.	1673.	1673.

CUMULATIVE AREA = 16.08 SQ MI

1

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	X1SUB	1291.	12.00	158.	45.	45.	0.61		
+	ROUTED TO	XROX2	1237.	12.17	158.	44.	44.	0.61		
+	HYDROGRAPH AT	X2SUB	876.	12.00	104.	28.	28.	0.43		
+	2 COMBINED AT	XCO-1	2056.	12.08	262.	72.	72.	1.04		
+	ROUTED TO	XROX3	1886.	12.33	262.	72.	72.	1.04		
+	HYDROGRAPH AT	X3SUB	1121.	12.08	130.	34.	34.	0.56		
+	2 COMBINED AT	XCO-2	2684.	12.17	392.	106.	106.	1.60		
+	HYDROGRAPH AT	X4SUB	650.	12.00	74.	19.	19.	0.28		
+	2 COMBINED AT	XCO-3	3110.	12.08	466.	125.	125.	1.88		
+	HYDROGRAPH AT	X5SUB	776.	12.00	75.	19.	19.	0.38		
+	2 COMBINED AT	XCO-4	3858.	12.08	541.	144.	144.	2.26		
+	HYDROGRAPH AT	SUBC1	2552.	12.00	216.	56.	56.	1.26		
+	ROUTED TO	RO-1	2074.	12.50	216.	56.	56.	1.26		
+	HYDROGRAPH AT	SUBC2	3321.	12.08	375.	97.	97.	2.19		
+	HYDROGRAPH AT	SUBC3	2149.	12.08	213.	55.	55.	1.24		
+	HYDROGRAPH AT	SUBC4	4326.	12.08	435.	112.	112.	2.54		
+	ROUTED TO	RO-2	3953.	12.33	435.	112.	112.	2.54		
+	HYDROGRAPH AT	SUBC5	5968.	12.08	626.	169.	169.	3.39		
+	2 COMBINED AT	CO-1	8603.	12.08	1061.	282.	282.	5.93		
+	ROUTED TO	RO-3	8117.	12.33	1061.	281.	281.	5.93		
+	4 COMBINED AT	CO-2	12849.	12.25	1865.	489.	489.	10.62		
+	ROUTED TO	RO-4	12431.	12.50	1865.	489.	489.	10.62		
+	HYDROGRAPH AT	SUBC7	2462.	12.00	318.	90.	90.	1.20		
+	ROUTED TO	RO-5	2028.	12.75	318.	90.	90.	1.20		
+	HYDROGRAPH AT	SUBC8	2713.	12.08	415.	115.	115.	1.42		
+	2 COMBINED AT	CO-3	3055.	12.17	733.	205.	205.	2.62		
	3 COMBINED AT									

+		CO-4	16716.	12.50	3139.	838.	838.	15.50
	ROUTED TO							
+		RO-6	16401.	12.67	3139.	838.	838.	15.50
	HYDROGRAPH AT							
+		SUBC9	979.	12.17	121.	33.	33.	0.58
	2 COMBINED AT							
+		CO-5	16613.	12.67	3260.	871.	871.	16.08

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

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1****************************************
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 *                                      *
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *                                      *
 *              MAY   1991              *
 *                                      *
 *           VERSION 4.0.1E             *
 *                                      *
 *     Lahey F77L-EM/32 version 5.01    *
 *                                      *
 *       Dodson & Associates, Inc.      *
 *                                      *
 *  RUN DATE  05/01/96  TIME  13:40:45  *
 *                                      *
 ****************************************
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U.S. ARMY CORPS OF ENGINEERS
HYDROLOGIC ENGINEERING CENTER
609 SECOND STREET
DAVIS, CALIFORNIA 95616
(916) 551-1748


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

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

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

```
1                                          HEC-1 INPUT                                                    PAGE  1

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

  1           ID                    FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  2           ID
  3           ID                                 FILE:    RC-24
  4           ID
  5           ID        HYDROLOGY FOR:    100-YEAR 24 HOUR EVENT
  6           ID
  7           ID        PURPOSE OF STUDY: DELINEATION OF THE 100-YEAR FLOODPLAIN OF
  8           ID                          RODGER CREEK ABOVE CONFLUENCE WITH SKUNK CREEK
  9           ID
 10           ID        METHODS OF STUDY: HEC-1   DIMENSIONLESS SCS HYDROGRAPH 5 MIN. INTERVALS
 11           ID                          PRECIPITATION- SCS TYPE II STORM BY 15 MIN. INCREMENTS
 12           ID                                     -AREAL REDUCTION NOT USED  < 10 SQ. MI.
 13           ID                          EXCESS PRECIPITATION- INITIAL AND UNIFORM LOSS RATES
 14           ID                                   &  PERCENT IMPERVIOUS
 15           ID                          STREAM ROUTING- MUSKINGUM METHOD
 16           ID
 17           ID        WATERSHED NAME: RODGER CREEK
 18           ID
 19           ID        CONTRACT NUMBER:  FCD 89-15
 20           ID
 21           ID        COMPUTED BY:      BAKER ENGINEERS          DATE:12/09/89
 22           ID                          COMP: _________________  CKD: _________________
 23           ID
 24           ID        Revision by:      Hasan Mushtaq, Flood Control District
 25           ID                          January 24, 1996.
 26           ID
 27           ID        (1)     A reduction factor of 1.00 was used to be consistent with
 28           ID                the previous study.
 29           ID        (2)     Green-Ampt infiltration method was used for soil loss.
 30           ID        (3)     Valley S-graph was used to derive the unit hydrograph.
 31           ID        (4)     L, Lca, S, were measured from the work map.
 32           ID        (5)     Roughness value for the subbasins are assumed constant
 33           ID                at 0.030.  These may be changed as needed.
 34           ID
 35           ID   DDM MCUHP2
 36           IT       5                    300
 37           IO       3
              * DDM   ***** Updated *****

 38           KK      R1
 39           KM   BASIN R1
 40           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 41           KM    L=      2.9  Lca=      1.1   S=  112.2  Kn= .025  LAG=  23.3
 42           KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 43           BA    1.56
 44           IN      15
 45           KM   RAINFALL DEPTH OF 4.80 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
 46           KM   AN AREAL REDUCTION COEFFICIENT OF 1.000 WAS USED
 47           PB   4.800
 48           KM   THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL
 49           PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
 50           PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
 51           PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
 52           PC    .110    .115    .120    .126    .135    .142    .150    .158    .166    .175
 53           PC    .184    .195    .208    .224    .243    .266    .318    .479    .678    .716
1                                          HEC-1 INPUT                                                    PAGE  2

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

 54           PC    .743    .764    .781    .795    .808    .818    .828    .837    .844    .851
 55           PC    .858    .865    .871    .877    .883    .889    .895    .900    .905    .910
```

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 56          PC    .915    .919    .923    .927    .931    .935    .939    .943    .947    .951
 57          PC    .954    .957    .960    .963    .966    .969    .972    .975    .978    .981
 58          PC    .984    .987    .990    .993    .996    .999   1.000
 59          LG     .15     .25    9.70     .05   17.00
 60          UI    226.    812.   1543.   2048.   2113.   1686.   1158.    801.    542.    382.
 61          UI    256.    168.    128.     55.     55.     55.     55.      0.      0.      0.
 62          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM   ***** Preserved *****

 63          KK    RO-1
 64          KM        ROUTE R-1 THROUGH R-2
 65          RM       4      .3      .3
             * DDM   ***** Updated *****

 66          KK      R2
 67          KM   BASIN R2
 68          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 69          KM    L=      3.4  Lca=      1.5   S=  327.4  Kn= .025  LAG=  22.0
 70          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 71          BA    1.98
 72          LG     .15     .29    8.40     .07   14.00
 73          UI    304.   1191.   2106.   3147.   2080.   1599.   1264.    916.    706.    537.
 74          UI    373.    299.    231.    149.    149.     63.     58.     58.     58.     58.
 75          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 76          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM   ***** Preserved *****

 77          KK    CO-1
 78          KM        COMBINE RUNOFF FROM SUBBASINS R-1 AND R-2
 79          HC       2    3.54
             *
             * DDM   ***** Preserved *****

 80          KK    RO-2
 81          KM        ROUTE R-1 AND R-2 THROUGH R-3
 82          RM       5      .4      .3
             * DDM   ***** Updated *****

 83          KK      R3
 84          KM   BASIN R3
 85          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 86          KM    L=      3.5  Lca=      2.1   S=  365.7  Kn= .030  LAG=  29.9
 87          KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 88          BA    1.59
 89          LG     .10     .35    7.00     .13   25.00
 90          UI    179.    414.    909.   1272.   1709.   1694.   1105.    936.    789.    649.
 91          UI    496.    423.    349.    262.    215.    187.    137.    119.     88.     88.
 92          UI     58.     34.     34.     34.     34.     34.     34.      0.      0.      0.
 93          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM   ***** Preserved *****
1                                    HEC-1 INPUT                                          PAGE  3

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

 94          KK    CO-2
 95          KM        COMBINE RUNOFF FROM R-1, R-2, AND R-3
 96          KO       1
 97          HC       2    5.13
 98          ZZ
1****************************************
****************************************
 *                                      *                                                    *
 *                                      *                                                    *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *   U.S. ARMY CORPS OF ENGINEERS
 *                                      *                                                    *
 *              MAY   1991              *                                                    *   HYDROLOGIC ENGINEERING CENTER
 *                                      *                                                    *
 *           VERSION 4.0.1E             *                                                    *          609 SECOND STREET
 *                                      *                                                    *
 *     Lahey F77L-EM/32 version 5.01    *                                                    *       DAVIS, CALIFORNIA 95616
 *                                      *                                                    *
 *       Dodson & Associates, Inc.      *                                                    *          (916) 551-1748
 *                                      *                                                    *
 *  RUN DATE  05/01/96  TIME  13:40:45  *                                                    *
 *                                      *
 ****************************************
****************************************
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FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FILE: RC-24

HYDROLOGY FOR: 100-YEAR 24 HOUR EVENT

PURPOSE OF STUDY: DELINEATION OF THE 100-YEAR FLOODPLAIN OF RODGER CREEK ABOVE CONFLUENCE WITH SKUNK CREEK

METHODS OF STUDY: HEC-1 DIMENSIONLESS SCS HYDROGRAPH 5 MIN. INTERVALS
PRECIPITATION- SCS TYPE II STORM BY 15 MIN. INCREMENTS
-AREAL REDUCTION NOT USED < 10 SQ. MI.
EXCESS PRECIPITATION- INITIAL AND UNIFORM LOSS RATES
& PERCENT IMPERVIOUS
STREAM ROUTING- MUSKINGUM METHOD

WATERSHED NAME: RODGER CREEK

CONTRACT NUMBER: FCD 89-15

COMPUTED BY: BAKER ENGINEERS DATE:12/09/89
COMP: _____ CKD: _____

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                                Revision by:      Hasan Mushtaq, Flood Control District
                                                  January 24, 1996.

                                (1)     A reduction factor of 1.00 was used to be consistent with
                                        the previous study.
                                (2)     Green-Ampt infiltration method was used for soil loss.
                                (3)     Valley S-graph was used to derive the unit hydrograph.
                                (4)     L, Lca, S, were measured from the work map.
                                (5)     Roughness value for the subbasins are assumed constant
                                        at 0.030.  These may be changed as needed.

                            DDM MCUHP2

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

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

                  COMPUTATION INTERVAL    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         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT


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

              **************
              *            *
 38 KK        *        R1  *
              *            *
              **************
                            BASIN R1
                             THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                             L=      2.9  Lca=      1.1   S=  112.2  Kn= .025  LAG=  23.3
                             DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
                            RAINFALL DEPTH OF 4.80 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
                            AN AREAL REDUCTION COEFFICIENT OF 1.000 WAS USED
                            THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL

 44 IN          TIME DATA FOR INPUT TIME SERIES
                      JXMIN          15  TIME INTERVAL IN MINUTES
                     JXDATE       1    0  STARTING DATE
                     JXTIME           0  STARTING TIME

              SUBBASIN RUNOFF DATA

 43 BA          SUBBASIN CHARACTERISTICS
                      TAREA        1.56  SUBBASIN AREA

                PRECIPITATION DATA

 48 PB                STORM        4.80  BASIN TOTAL PRECIPITATION

 48 PI            INCREMENTAL PRECIPITATION PATTERN
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.05      0.05
                    0.05      0.07      0.07      0.07      0.01      0.01      0.01      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

 59 LG          GREEN AND AMPT LOSS RATE
                      STRTL        0.15  STARTING LOSS
                        DTH        0.25  MOISTURE DEFICIT
                       PSIF        9.70  WETTING FRONT SUCTION
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                    XKSAT        0.05  HYDRAULIC CONDUCTIVITY
                    RTIMP       17.00  PERCENT IMPERVIOUS AREA

 59 UI          INPUT UNITGRAPH,  17 ORDINATES,  VOLUME = 1.00
                   226.0     812.0    1543.0    2048.0    2113.0    1686.0    1158.0     801.0     542.0     382.0
                   256.0     168.0     128.0      55.0      55.0      55.0      55.0
                                                                   ***

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

                      HYDROGRAPH AT STATION       R1

   TOTAL RAINFALL =    4.80, TOTAL LOSS =    1.96, TOTAL EXCESS =    2.84

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                          (CFS)
+    2796.     12.17                437.        119.        115.         115.
                        (INCHES)    2.605       2.843       2.844        2.844
                         (AC-FT)    217.        237.        237.         237.

                       CUMULATIVE AREA =    1.56 SQ MI


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


            **************
            *            *
 63 KK      *      RO-1  *
            *            *
            **************
                                ROUTE R-1 THROUGH R-2

               HYDROGRAPH ROUTING DATA

 65 RM          MUSKINGUM ROUTING
                      NSTPS          4 NUMBER OF SUBREACHES
                      AMSKK       0.30 MUSKINGUM K
                          X       0.30 MUSKINGUM X
                                                                   ***

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

                      HYDROGRAPH AT STATION     RO-1

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                          (CFS)
+    2639.     12.42                437.        119.        115.         115.
                        (INCHES)    2.605       2.843       2.844        2.844
                         (AC-FT)    217.        237.        237.         237.

                       CUMULATIVE AREA =    1.56 SQ MI


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


            **************
            *            *
 66 KK      *        R2  *
            *            *
            **************
                         BASIN R2
                          THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                          L=     3.4  Lca=      1.5   S=  327.4  Kn= .025  LAG=  22.0
                          PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN

               SUBBASIN RUNOFF DATA

 71 BA          SUBBASIN CHARACTERISTICS
                      TAREA        1.98  SUBBASIN AREA

                PRECIPITATION DATA

 48 PB                STORM        4.80  BASIN TOTAL PRECIPITATION

 48 PI            INCREMENTAL PRECIPITATION PATTERN
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.05      0.05
                    0.05      0.07      0.07      0.07      0.01      0.01      0.01      0.01      0.01      0.01
                    0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
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                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                    0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
  72 LG          GREEN AND AMPT LOSS RATE
                      STRTL        0.15  STARTING LOSS
                        DTH        0.29  MOISTURE DEFICIT
                       PSIF        8.40  WETTING FRONT SUCTION
                      XKSAT        0.07  HYDRAULIC CONDUCTIVITY
                      RTIMP       14.00  PERCENT IMPERVIOUS AREA

  67 UI          INPUT UNITGRAPH,  20 ORDINATES,  VOLUME = 1.00
                    304.0     1191.0     2106.0     3147.0     2080.0     1599.0     1264.0      916.0      706.0      537.0
                    373.0      299.0      231.0      149.0      149.0       63.0       58.0       58.0       58.0       58.0
                                                                                  ***

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

                        HYDROGRAPH AT STATION       R2

    TOTAL RAINFALL =    4.80, TOTAL LOSS =    2.20, TOTAL EXCESS =    2.60

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                              (CFS)
+    3330.     12.17             511.        138.        133.         133.
                          (INCHES)     2.401       2.596       2.597        2.597
                           (AC-FT)      254.        274.        274.         274.

                         CUMULATIVE AREA =    1.98 SQ MI


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

              **************
              *            *
  77 KK       *      CO-1  *
              *            *
              **************
                                COMBINE RUNOFF FROM SUBBASINS R-1 AND R-2

  79 HC          HYDROGRAPH COMBINATION
                      ICOMP           2  NUMBER OF HYDROGRAPHS TO COMBINE
                                                                  ***

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

                        HYDROGRAPH AT STATION     CO-1

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                              (CFS)
-    5174.     12.25             948.        257.        248.         248.
                          (INCHES)     2.490       2.705       2.706        2.706
                           (AC-FT)      470.        511.        511.         511.

                         CUMULATIVE AREA =    3.54 SQ MI


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

              **************
              *            *
  80 KK       *      RO-2  *
              *            *
              **************
                                ROUTE R-1 AND R-2 THROUGH R-3

                HYDROGRAPH ROUTING DATA

  82 RM          MUSKINGUM ROUTING
                      NSTPS           5 NUMBER OF SUBREACHES
                      AMSKK        0.40 MUSKINGUM K
                          X        0.30 MUSKINGUM X
                                                                  ***

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

                        HYDROGRAPH AT STATION     RO-2

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                              (CFS)
+    4892.     12.67             948.        257.        248.         248.
                          (INCHES)     2.490       2.705       2.705        2.705
                           (AC-FT)      470.        511.        511.         511.
```

```
                    CUMULATIVE AREA =    3.54 SQ MI

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

            **************
            *            *
 83 KK      *     R3     *
            *            *
            **************
                    BASIN R3
                     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                     L=      3.5  Lca=      2.1   S=  365.7  Kn= .030  LAG=  29.9
                     PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN

          SUBBASIN RUNOFF DATA

 88 BA        SUBBASIN CHARACTERISTICS
                  TAREA        1.59  SUBBASIN AREA

              PRECIPITATION DATA

 48 PB            STORM        4.80  BASIN TOTAL PRECIPITATION

 48 PI          INCREMENTAL PRECIPITATION PATTERN
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.01      0.01      0.01      0.01
                  0.01      0.01      0.01      0.01      0.01      0.02      0.02      0.02      0.05      0.05
                  0.05      0.07      0.07      0.07      0.01      0.01      0.01      0.01      0.01      0.01
                  0.01      0.01      0.01      0.01      0.01      0.01      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
                  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00

 89 LG        GREEN AND AMPT LOSS RATE
                  STRTL        0.10  STARTING LOSS
                    DTH        0.35  MOISTURE DEFICIT
                   PSIF        7.00  WETTING FRONT SUCTION
                  XKSAT        0.13  HYDRAULIC CONDUCTIVITY
                  RTIMP       25.00  PERCENT IMPERVIOUS AREA

 84 UI        INPUT UNITGRAPH,  27 ORDINATES,  VOLUME = 1.00
                 179.0     414.0     909.0    1272.0    1709.0    1694.0    1105.0     936.0     789.0     649.0
                 496.0     423.0     349.0     262.0     215.0     187.0     137.0     119.0      88.0      88.0
                  58.0      34.0      34.0      34.0      34.0      34.0      34.0
                                                                   ***

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

                    HYDROGRAPH AT STATION       R3

   TOTAL RAINFALL =    4.80, TOTAL LOSS =    2.20, TOTAL EXCESS =    2.60

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                              (CFS)
+    2213.     12.25            384.        111.        107.         107.
                         (INCHES)      2.247       2.594       2.596       2.596
                          (AC-FT)       191.        220.        220.        220.

                    CUMULATIVE AREA =    1.59 SQ MI

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

            **************
            *            *
 94 KK      *    CO-2    *
            *            *
            **************
                    COMBINE RUNOFF FROM R-1, R-2, AND R-3

 96 KO        OUTPUT CONTROL VARIABLES
                  IPRNT          1  PRINT CONTROL
                  IPLOT          0  PLOT CONTROL
                  QSCAL         0.  HYDROGRAPH PLOT SCALE
```

97 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

***

HYDROGRAPH AT STATION CO-2
SUM OF 2 HYDROGRAPHS

DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW	DA	MON	HRMN	ORD	FLOW
1		0000	1	0.	1		0615	76	47.	1		1230	151	6020.	1		1845	226	48.
1		0005	2	0.	1		0620	77	48.	1		1235	152	6128.	1		1850	227	48.
1		0010	3	0.	1		0625	78	48.	1		1240	153	5986.	1		1855	228	47.
1		0015	4	1.	1		0630	79	49.	1		1245	154	5655.	1		1900	229	47.
1		0020	5	2.	1		0635	80	50.	1		1250	155	5220.	1		1905	230	47.
1		0025	6	4.	1		0640	81	51.	1		1255	156	4695.	1		1910	231	47.
1		0030	7	6.	1		0645	82	52.	1		1300	157	4094.	1		1915	232	47.
1		0035	8	8.	1		0650	83	53.	1		1305	158	3473.	1		1920	233	47.
1		0040	9	11.	1		0655	84	54.	1		1310	159	2890.	1		1925	234	47.
1		0045	10	13.	1		0700	85	54.	1		1315	160	2374.	1		1930	235	47.
1		0050	11	16.	1		0705	86	55.	1		1320	161	1941.	1		1935	236	47.
1		0055	12	19.	1		0710	87	56.	1		1325	162	1600.	1		1940	237	47.
1		0100	13	21.	1		0715	88	57.	1		1330	163	1327.	1		1945	238	47.
1		0105	14	24.	1		0720	89	57.	1		1335	164	1113.	1		1950	239	46.
1		0110	15	26.	1		0725	90	57.	1		1340	165	940.	1		1955	240	46.
1		0115	16	28.	1		0730	91	58.	1		1345	166	806.	1		2000	241	46.
1		0120	17	30.	1		0735	92	58.	1		1350	167	696.	1		2005	242	45.
1		0125	18	31.	1		0740	93	58.	1		1355	168	601.	1		2010	243	45.
1		0130	19	32.	1		0745	94	58.	1		1400	169	518.	1		2015	244	44.
1		0135	20	33.	1		0750	95	58.	1		1405	170	447.	1		2020	245	43.
1		0140	21	33.	1		0755	96	58.	1		1410	171	386.	1		2025	246	42.
1		0145	22	34.	1		0800	97	58.	1		1415	172	336.	1		2030	247	41.
1		0150	23	34.	1		0805	98	58.	1		1420	173	301.	1		2035	248	40.
1		0155	24	34.	1		0810	99	58.	1		1425	174	272.	1		2040	249	39.
1		0200	25	35.	1		0815	100	59.	1		1430	175	247.	1		2045	250	39.
1		0205	26	35.	1		0820	101	60.	1		1435	176	225.	1		2050	251	38.
1		0210	27	35.	1		0825	102	61.	1		1440	177	205.	1		2055	252	37.
1		0215	28	35.	1		0830	103	63.	1		1445	178	187.	1		2100	253	37.
1		0220	29	35.	1		0835	104	65.	1		1450	179	173.	1		2105	254	36.
1		0225	30	35.	1		0840	105	68.	1		1455	180	161.	1		2110	255	36.
1		0230	31	35.	1		0845	106	70.	1		1500	181	149.	1		2115	256	36.
1		0235	32	35.	1		0850	107	73.	1		1505	182	139.	1		2120	257	35.
1		0240	33	35.	1		0855	108	75.	1		1510	183	129.	1		2125	258	35.
1		0245	34	35.	1		0900	109	77.	1		1515	184	120.	1		2130	259	35.
1		0250	35	35.	1		0905	110	80.	1		1520	185	111.	1		2135	260	35.
1		0255	36	35.	1		0910	111	82.	1		1525	186	103.	1		2140	261	35.
1		0300	37	35.	1		0915	112	84.	1		1530	187	97.	1		2145	262	35.
1		0305	38	35.	1		0920	113	86.	1		1535	188	92.	1		2150	263	35.
1		0310	39	35.	1		0925	114	87.	1		1540	189	89.	1		2155	264	35.
1		0315	40	35.	1		0930	115	89.	1		1545	190	86.	1		2200	265	35.
1		0320	41	35.	1		0935	116	89.	1		1550	191	84.	1		2205	266	35.
1		0325	42	35.	1		0940	117	90.	1		1555	192	82.	1		2210	267	35.
1		0330	43	35.	1		0945	118	91.	1		1600	193	81.	1		2215	268	35.
1		0335	44	35.	1		0950	119	92.	1		1605	194	79.	1		2220	269	35.
1		0340	45	35.	1		0955	120	93.	1		1610	195	78.	1		2225	270	35.
1		0345	46	35.	1		1000	121	95.	1		1615	196	77.	1		2230	271	35.
1		0350	47	35.	1		1005	122	96.	1		1620	197	75.	1		2235	272	35.
1		0355	48	35.	1		1010	123	97.	1		1625	198	74.	1		2240	273	35.
1		0400	49	36.	1		1015	124	99.	1		1630	199	73.	1		2245	274	35.
1		0405	50	36.	1		1020	125	101.	1		1635	200	72.	1		2250	275	35.
1		0410	51	37.	1		1025	126	104.	1		1640	201	71.	1		2255	276	35.
1		0415	52	38.	1		1030	127	108.	1		1645	202	70.	1		2300	277	35.
1		0420	53	38.	1		1035	128	111.	1		1650	203	69.	1		2305	278	35.
1		0425	54	39.	1		1040	129	116.	1		1655	204	68.	1		2310	279	35.
1		0430	55	40.	1		1045	130	121.	1		1700	205	67.	1		2315	280	35.
1		0435	56	41.	1		1050	131	127.	1		1705	206	67.	1		2320	281	35.
1		0440	57	42.	1		1055	132	135.	1		1710	207	66.	1		2325	282	35.
1		0445	58	43.	1		1100	133	147.	1		1715	208	65.	1		2330	283	35.
1		0450	59	44.	1		1105	134	163.	1		1720	209	64.	1		2335	284	35.
1		0455	60	44.	1		1110	135	185.	1		1725	210	63.	1		2340	285	35.
1		0500	61	45.	1		1115	136	214.	1		1730	211	62.	1		2345	286	35.
1		0505	62	45.	1		1120	137	258.	1		1735	212	61.	1		2350	287	35.
1		0510	63	46.	1		1125	138	319.	1		1740	213	60.	1		2355	288	34.
1		0515	64	46.	1		1130	139	410.	1		1745	214	59.	2		0000	289	34.
1		0520	65	46.	1		1135	140	555.	1		1750	215	58.	2		0005	290	33.
1		0525	66	46.	1		1140	141	773.	1		1755	216	57.	2		0010	291	31.
1		0530	67	46.	1		1145	142	1102.	1		1800	217	56.	2		0015	292	29.
1		0535	68	46.	1		1150	143	1519.	1		1805	218	55.	2		0020	293	27.
1		0540	69	46.	1		1155	144	2086.	1		1810	219	54.	2		0025	294	24.
1		0545	70	46.	1		1200	145	2774.	1		1815	220	53.	2		0030	295	22.
1		0550	71	47.	1		1205	146	3456.	1		1820	221	52.	2		0035	296	19.
1		0555	72	47.	1		1210	147	4201.	1		1825	222	51.	2		0040	297	16.
1		0600	73	47.	1		1215	148	4883.	1		1830	223	50.	2		0045	298	14.
1		0605	74	47.	1		1220	149	5437.	1		1835	224	49.	2		0050	299	11.
1		0610	75	47.	1		1225	150	5806.	1		1840	225	49.	2		0055	300	9.

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
6128.	12.58	(CFS)	1332.	368.	355.	355.
		(INCHES)	2.415	2.670	2.671	2.671
		(AC-FT)	661.	730.	731.	731.

CUMULATIVE AREA = 5.13 SQ MI

1

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	R1	2796.	12.17	437.	119.	115.	1.56		
+	ROUTED TO	RO-1	2639.	12.42	437.	119.	115.	1.56		
+	HYDROGRAPH AT	R2	3330.	12.17	511.	138.	133.	1.98		
+	2 COMBINED AT	CO-1	5174.	12.25	948.	257.	248.	3.54		
+	ROUTED TO	RO-2	4892.	12.67	948.	257.	248.	3.54		
+	HYDROGRAPH AT	R3	2213.	12.25	384.	111.	107.	1.59		
+	2 COMBINED AT	CO-2	6128.	12.58	1332.	368.	355.	5.13		

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

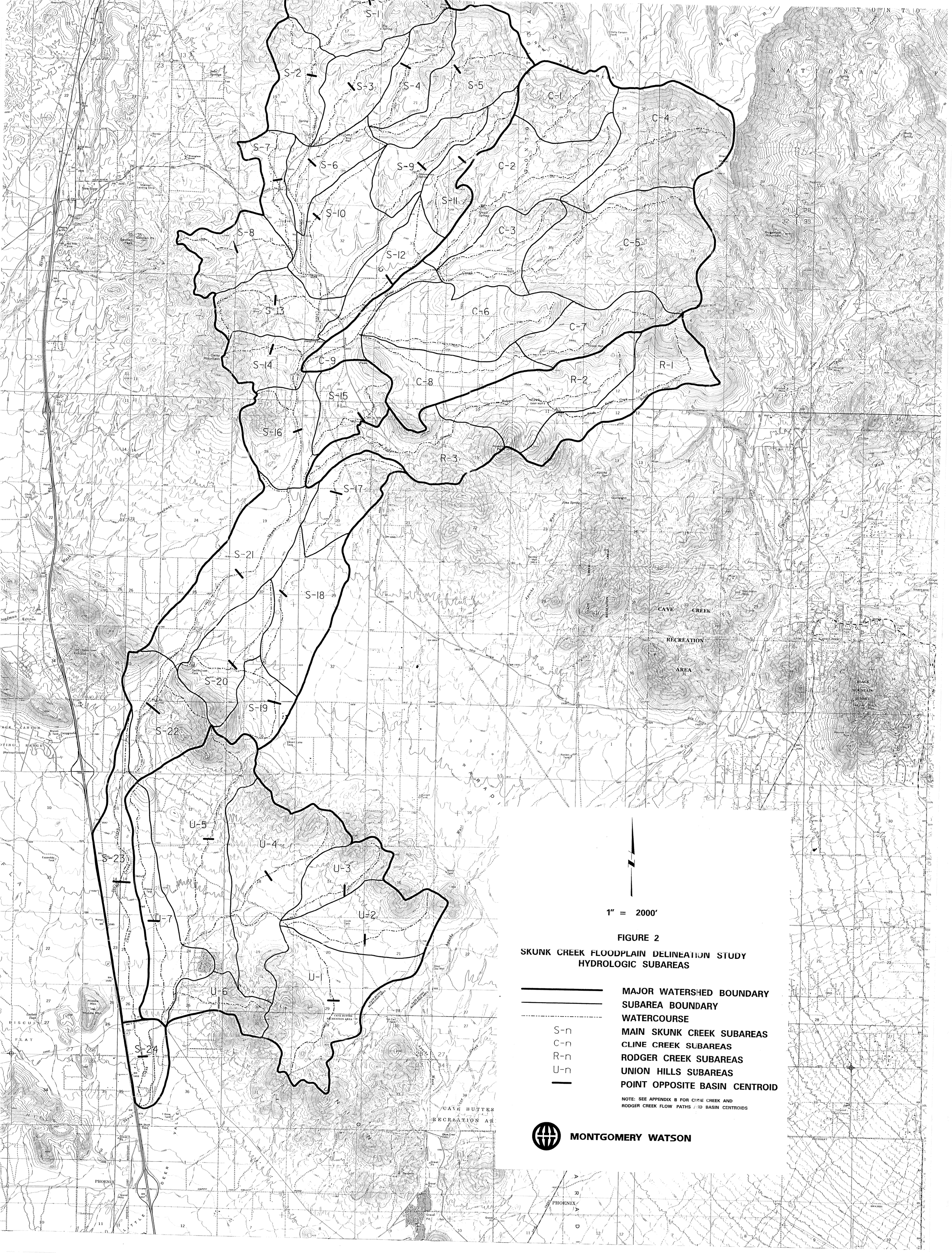


FIGURE 2

SKUNK CREEK FLOODPLAIN DELINEATION STUDY
HYDROLOGIC SUBAREAS

Appendix C

MONTGOMERY WATSON

SKUNK CREEK FLOOD-FREQUENCY ANALYSIS

Description Skunk Creek Near Phoenix, AZ - USGS No. 09513860
Gauging Station Records for period 1960-1994

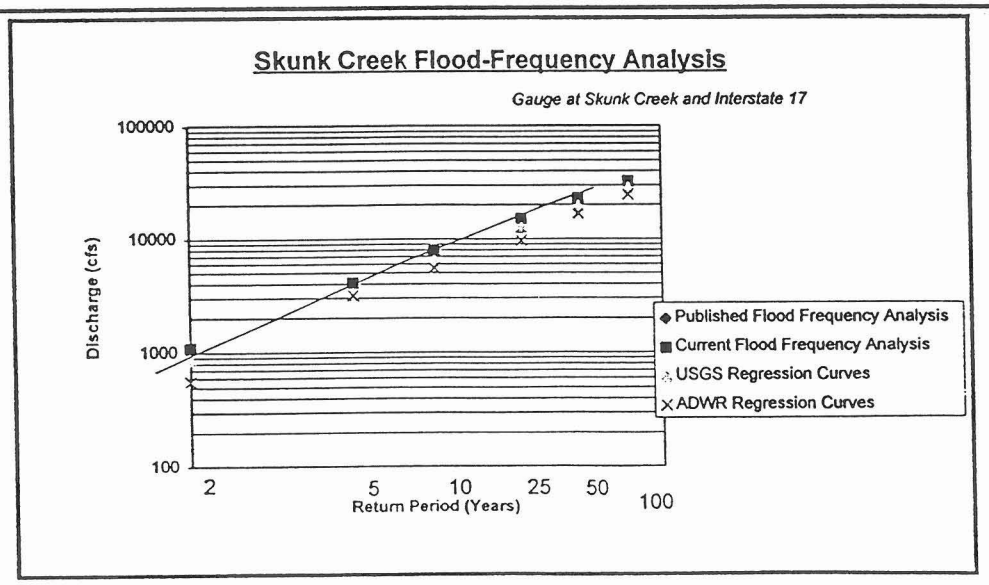
Location: Lat 33^43'50", Long 112^07'09" in SE 1/4 Sec.35, T.5 N.,R.2E., Maricopa County
Located on the right bank dike of Skunk Creek flood-control channel, 300 ft east of Interstate 17, 3 miles north of Adobe
Prior to December 29, 1984, the gauge was located 300 feet downstream.

Water Year	*Date*	*Annual Peak Discharge (cfs)*	*Water Year*	*Date*	*Annual Peak Discharge (cfs)*
1960	12/25/59	9400	1978	3/1/78	3590
1961	n/a	0	1979	1/18/79	600
1962	n/a	175	1980	2/20/80	1210
1963	n/a	480	1981	7/16/81	311
1964	8/1/64	11500	1982	10/2/81	281
1965	2/7/65	400	1983	11/30/82	6170
1966	8/18/66	700	1984	9/26/84	565
1967	9/2/67	950	1985	1/26/85	1320
1968	12/19/67	5900	1986	7/22/86	906
1969	n/a	0	1987	10/10/86	3440
1970	9/5/70	9650	1988	11/1/87	2250
1971	8/21/71	4770	1989	1/4/89	111
1972	7/17/72	2380	1990	8/12/90	8160
1973	10/6/72	4700	1991	8/11/91	1250
1974	7/21/74	300	1992	8/23/92	7020
1975	10/29/74	240	1993	1/8/93	4990
1976	7/28/76	13	1994	n/a	0
1977	1/3/77	70			

Note: A zero value indicates that no measurable flow was recorded during that year.

Comparison of Results

	Discharge (cfs)					
Return period (years)	**2**	**5**	**10**	**25**	**50**	**100**
Probability Function	0.00	0.84	1.28	1.75	2.05	2.33
Published Flood Frequency Analysis	967	3,570	6,910	13,700	21,200	31,000
Current Flood Frequency Analysis	1,090	4,069	7,776	15,050	22,683	32,455
USGS Regression Curves	873	3,211	6,236	12,313	19,129	27,953
ADWR Regression Curves	562	3,122	5,464	9,559	16,560	24,423



Period of Record 1960-1994
N = 35 Years

Water Year	Q (cfs)	Rank (m)	Log10 Q (X)	(X-X̄)^2	(X-X̄)^3	(100m/n+1)
1964	11500	1	4.0607	0.8660	0.8059	3
1970	9650	2	3.9845	0.7301	0.6238	6
1960	9400	3	3.9731	0.7107	0.5992	8
1990	8160	4	3.9117	0.6109	0.4775	11
1992	7020	5	3.8463	0.5130	0.3675	14
1983	6170	6	3.7903	0.4359	0.2878	17
1968	5900	7	3.7709	0.4106	0.2631	19
1993	4990	8	3.6981	0.3226	0.1833	22
1971	4770	9	3.6785	0.3008	0.1650	25
1973	4700	10	3.6721	0.2938	0.1592	28
1978	3590	11	3.5551	0.1806	0.0768	31
1987	3440	12	3.5366	0.1652	0.0672	33
1972	2380	13	3.3766	0.0608	0.0150	36
1988	2250	14	3.3522	0.0493	0.0110	39
1985	1320	15	3.1206	0.0001	0.0000	42
1991	1250	16	3.0969	0.0011	0.0000	44
1980	1210	17	3.0828	0.0022	-0.0001	47
1967	950	18	2.9777	0.0232	-0.0035	50
1986	906	19	2.9571	0.0299	-0.0052	53
1966	700	20	2.8451	0.0812	-0.0231	56
1979	600	21	2.7782	0.1239	-0.0436	58
1984	565	22	2.7520	0.1429	-0.0540	61
1963	480	23	2.6812	0.2015	-0.0904	64
1965	400	24	2.6021	0.2788	-0.1472	67
1981	311	25	2.4928	0.4062	-0.2589	69
1974	300	26	2.4771	0.4264	-0.2784	72
1982	281	27	2.4487	0.4643	-0.3163	75
1975	240	28	2.3802	0.5623	-0.4217	78
1962	175	29	2.2430	0.7869	-0.6980	81
1989	111	30	2.0453	1.1767	-1.2764	83
1977	70	31	1.8451	1.6512	-2.1218	86
						99
TOTAL			97.0326	12.0090	-1.6367	

Note: Years 1961, 1969, 1976 and 1994 deleted from analysis due to no flow record.

$\bar{X}$ = 3.1301 (N=31)
S = 0.632694
G = -0.230265

Perform test for high and low outliers due to large negative skew and in particular the 1976 and 1977 discharges

$XH = X + KNS$

For a sample size of 35, the value of KN = 2.628

XH = 4.792804

$XL = X - KNS$

XL = 1.467366

Conclusion: Eliminate the low 1976 value from consideration.

P	K G(-0.2)	K G(-0.3)	K G(-0.23027)	Log10 Q	Q(cfs)	Published Q*	Conditional Adjusted P	Conditional Adj. Log10Q	Conditional Adjusted Q
0.98	-2.1594	-2.2108	-2.1749	1.7540	57		0.8680		
0.9	-1.3011	-1.3094	-1.3036	2.3053	202		0.7971		
0.7	-0.4993	-0.4860	-0.4953	2.8167	656		0.6200	2.5858	385
0.5	0.0333	0.0499	0.0383	3.1543	1,427	967	0.4429	3.0454	1,110
0.3	0.5476	0.5584	0.5508	3.4786	3,010		0.2657	3.4158	2,605
0.2	0.8499	0.8529	0.8508	3.6684	4,660	3,570	0.1771	3.6194	4,163
0.1	1.2582	1.2452	1.2543	3.9237	8,388	6,910	0.0886	3.8907	7,775
0.04	1.6800	1.6433	1.6689	4.1860	15,345	13,700	0.0354	4.1634	14,568
0.02	1.9450	1.8896	1.9282	4.3501	22,390	21,200	0.0177	4.3289	21,325
0.01	2.1784	2.1039	2.1559	4.4941	31,195	31,000	0.0089	4.4755	29,888
0.002	2.6367	2.5174	2.6006	4.7755	59,631		0.0018	4.7664	58,398

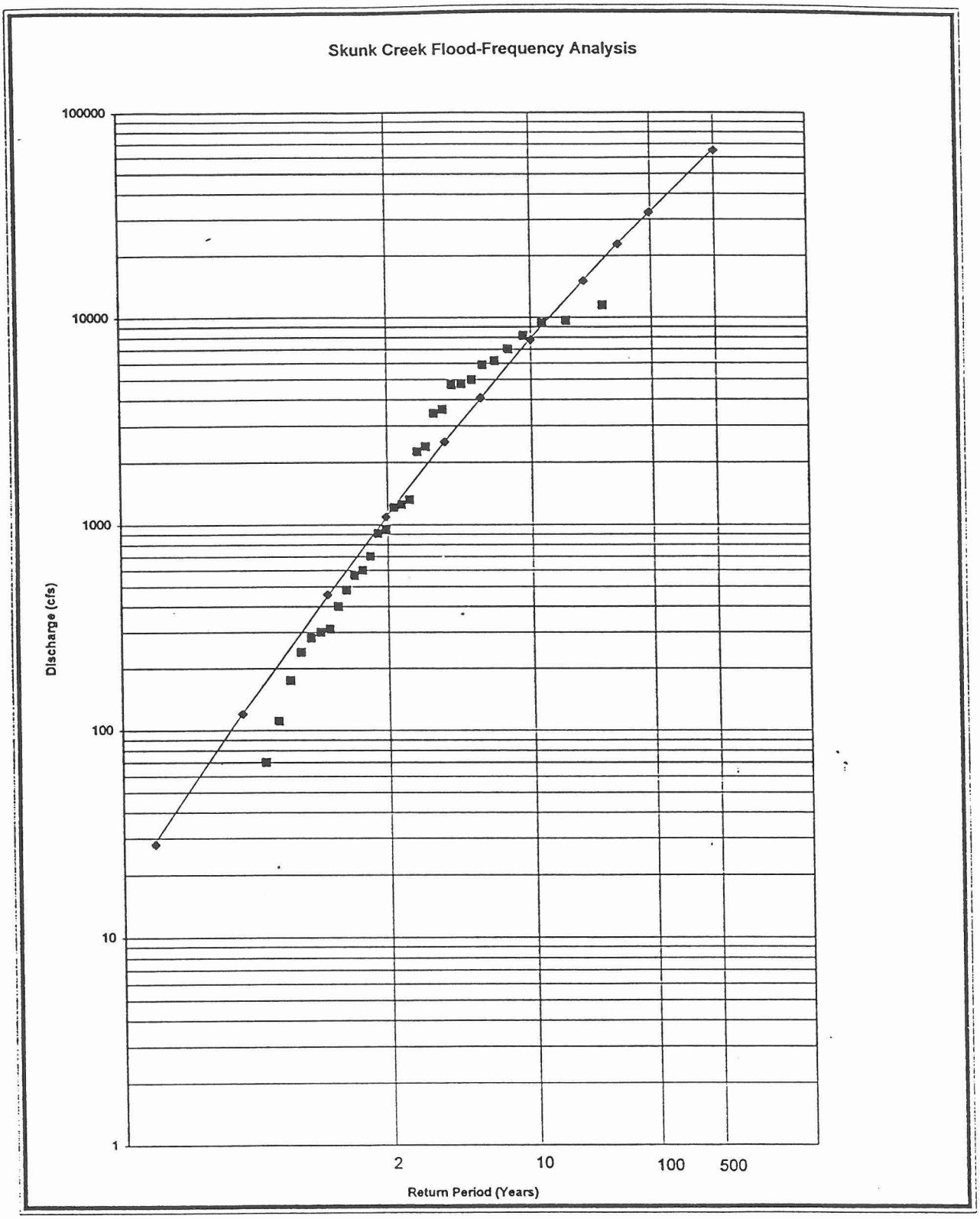
Since there is a truncated record for the period due to no flow records, the procedure described in Appendix 5 of :*"Guidelines For Determining Flood Flow Frequency"* is applied.
* Published in USGS Summary for period 1960-1989

Estimated Probability that annual peak will exceed the truncation level, P = N/n

	Computed Values		Published Values*
$\bar{P}$ =	0.8857	(31/35)	
P0.5 =	1,110 cfs		967 cfs
P0.1 =	7,775 cfs		6,910 cfs
P0.01 =	29,888 cfs		31,000 cfs
Synthetic Values			
Gs =	-0.34		
Ss =	0.71		0.69
Xs =	3.01		2.97
A =	-0.36		
B =	1.03		
MSEG =	0.14		
Gw =	-0.27	0.00	-0.16

P	K G(-0.3)	K G(-0.4)	K G(-0.34)
0.5	0.0499	0.0665	0.0568
0.01	2.1039	2.0293	2.0729

P	K G(-0.2)	K G(-0.3)	K G(-0.28)	Log10 Q	Revised Q(cfs)	Published Q*
0.98	-2.1594	-2.2108	-2.1974	1.4464	28	
0.9	-1.3011	-1.3094	-1.3072	2.0779	120	
0.7	-0.4993	-0.4860	-0.4895	2.6579	455	
0.5	0.0333	0.0499	0.0456	3.0374	1,090	967
0.3	0.5476	0.5584	0.5556	3.3992	2,507	
0.2	0.8499	0.8529	0.8521	3.6095	4,069	3,570
0.1	1.2582	1.2452	1.2486	3.8908	7,776	6,910
0.04	1.6800	1.6433	1.6529	4.1775	15,050	13,700
0.02	1.9450	1.8896	1.9040	4.3557	22,683	21,200
0.01	2.1784	2.1039	2.1234	4.5113	32,455	31,000
0.002	2.6367	2.5174	2.5485	4.8129	64,992	


Skunk Creek Flood-Frequency Analysis
100000
10000
1000
100
10
1
Discharge (cfs)
2
10
100
500
Return Period (Years)

Period of Record 1960-1989
N = 30

Water Year	Q (cfs)	Rank (m)	Log10 Q (X)	(X-$\bar{X}$)^2	(X-$\bar{X}$)^3	(100m/n+1)
1964	11500	1	4.0607	1.0118	1.0178	3
1970	9650	2	3.9845	0.8644	0.8037	6
1960	9400	3	3.9731	0.8433	0.7745	10
1983	6170	4	3.7903	0.5409	0.3979	13
1968	5900	5	3.7709	0.5127	0.3671	16
1971	4770	6	3.6785	0.3890	0.2426	19
1973	4700	7	3.6721	0.3811	0.2352	23
1978	3590	8	3.5551	0.2503	0.1252	26
1987	3440	9	3.5366	0.2321	0.1118	29
1972	2380	10	3.3766	0.1035	0.0333	32
1988	2250	11	3.3522	0.0884	0.0263	35
1985	1320	12	3.1206	0.0043	0.0003	39
1980	1210	13	3.0828	0.0008	0.0000	42
1967	950	14	2.9777	0.0059	-0.0005	45
1986	906	15	2.9571	0.0095	-0.0009	48
1966	700	16	2.8451	0.0440	-0.0092	52
1979	600	17	2.7782	0.0765	-0.0212	55
1984	565	18	2.7520	0.0917	-0.0277	58
1963	480	19	2.6812	0.1395	-0.0521	61
1965	400	20	2.6021	0.2050	-0.0928	65
1981	311	21	2.4928	0.3159	-0.1775	68
1974	300	22	2.4771	0.3337	-0.1928	71
1982	281	23	2.4487	0.3673	-0.2226	74
1975	240	24	2.3802	0.4551	-0.3070	77
1962	175	25	2.2430	0.6590	-0.5349	81
1989	111	26	2.0453	1.0190	-1.0287	84
1977	70	27	1.8451	1.4634	-1.7703	87
TOTAL			82.4796	10.4083	-0.3026	

Note: Years 1961, 1969, and 1976 deleted from analysis due to no or low flow record.

$\bar{X}$ = 3.0548 (n=27)
S = 0.632709
G = -0.049619

P	K G(-0.0)	K G(-0.1)	K G(-0.04962)	Log10 Q	Q(cfs)	Published Q*	Conditional Adjusted P	Conditional Adj. Log10Q	Conditional Adjusted Q
0.98	-2.0538	-2.1070	-2.0802	1.7387	55		0.8820		
0.9	-1.2816	-1.2918	-1.2866	2.2407	174		0.8100		
0.7	-0.5244	-0.5121	-0.5183	2.7269	533		0.6300	2.5378	345
0.5	0.0000	0.0166	0.0082	3.0600	1,148	967	0.4500	2.9675	928
0.3	0.5244	0.5362	0.5303	3.3903	2,456		0.2700	3.3353	2,164
0.2	0.8416	0.8461	0.8438	3.5887	3,879	3,570	0.1800	3.5446	3,504
0.1	1.2816	1.2704	1.2760	3.8621	7,280	6,910	0.0900	3.8318	6,788
0.04	1.7507	1.7158	1.7334	4.1515	14,175	13,700	0.0360	4.1301	13,492
0.02	2.0538	1.9997	2.0269	4.3373	21,740	21,200	0.0180	4.3166	20,731
0.01	2.3264	2.2526	2.2897	4.5035	31,882	31,000	0.0090	4.4851	30,554
0.002	2.8782	2.7571	2.8181	4.8378	68,837		0.0018	4.8285	67,380

Since there is a truncated record for the period due to no flow records, the procedure described in Appendix 5 of :*"Guidelines For Determining Flood Flow Frequency"* is applied.
* Published in USGS Summary for period 1960-1989

Estimated Probability that annual peak will exceed the truncation level, $P = N/\bar{n}$

	Computed Values	Published Values*
$\bar{P}$ =	0.9000 (27/30)	
P0.5 =	928 cfs	967 cfs
P0.1 =	6,788 cfs	6,910 cfs
P0.01 =	30,554 cfs	31,000 cfs
Synthetic Values		
Gs =	-0.14	
Ss =	0.69	0.69
Xs =	2.95	2.97
A =	-0.34	
B =	0.98	
MSEG =	0.17	
Gw =	-0.14	-0.16

P	K G(-0.1)	K G(-0.2)	K G(-0.14)
0.5	0.0166	0.0333	0.0235
0.01	2.2526	2.1784	2.2217

P	K G(-0.1)	K G(-0.2)	K G(-0.16)	Log10 Q	Revised Q(cfs)	Published Q*
0.98	-2.1070	-2.1594	-2.1256	1.4838	30	
0.9	-1.2918	-1.3011	-1.2951	2.0571	114	
0.7	-0.5121	-0.4993	-0.5075	2.6008	399	
0.5	0.0166	0.0333	0.0225	2.9668	926	967
0.3	0.5362	0.5476	0.5403	3.3242	2,110	
0.2	0.8461	0.8499	0.8474	3.5363	3,438	3,570
0.1	1.2704	1.2582	1.2661	3.8253	6,688	6,910
0.04	1.7158	1.6800	1.7031	4.1270	13,397	13,700
0.02	1.9997	1.9450	1.9803	4.3184	20,815	21,200
0.01	2.2526	2.1784	2.2262	4.4882	30,772	31,000
0.002	2.7571	2.6367	2.7143	4.8251	66,851	

Regional Regression Equations - USGS Roeske Method

The following estimates are in accordance with the report entitled *"Methods for Estimating the Magnitude and Frequency of Floods In Arizona."* developed by R.H. Roeske at the U.S.G.S.

From Figure1, the Skunk Creek Watershed lies within the Central Mountain Area

Q2 = 5.66 A^.673 E^-0.605 p^1.03
Q5 = 31.6 A^0.650 E^-0.868 p^0.987
Q10 = 74.7 a^0.638 E^-1.00 p^ 0.971
Q25 = 186 A^0.626 E^-1.14 p^0.933
Q50 = 329 A^0.617 E^-1.22 p^0.915
Q100 = 553 A^0.610 E^-1.3 p^0.915
Q500 = 1,530 A^0.595 E^-1.45 p^0.886

TOTAL OF ALL SUB-BASINS (A)	64.028 Square Miles
AVERAGE WATERSHED ELEVATION (E)	2.21 feetx1000
AVERAGE ANNUAL PRECIPITATION (p)	14 inches

Q2 =	873 cfs
Q5 =	3,211 cfs
Q10 =	6,236 cfs
Q25 =	12,313 cfs
Q50 =	19,129 cfs
Q100 =	27,953 cfs
Q500 =	59,773 cfs

Regional Regression Equations - ADWR Method

The following estimates are based upon procedures established in the ADWR Draft publication entitled *"State Standard for Estimating Peak Discharges on Ungaged Rural Watersheds"*

According to Figure 1 the Skunk Creek watershed lies within Region 12

TOTAL OF ALL SUB-BASINS (A)	64 Square Miles
AVERAGE WATERSHED ELEVATION (E)	2.21 feetx1000
AVERAGE ANNUAL PRECIPITATION (p)	14 inches

Q2 = 41.1A^0.629
Q5 = 238 A^0.687 E^-0.358
Q10 = 479 A^0.661 E^-0.398
Q25 = 942 A^0.63 E^-0.383
Q50 = 10^(7.36-4.17 A^-0.08) E^-0.440
Q100 = 10^(6.55-3.17 A^-0.11) E-^0.454

Q2 =	562 cfs
Q5 =	3,122 cfs
Q10 =	5,464 cfs
Q25 =	9,559 cfs
Q50 =	16,560 cfs
Q100 =	24,423 cfs

Summary of Drainage Sub-Basins

Sub-basin Name	Drainage Area(mi^2)	Sub-basin Name	Drainage Area(mi^2)	Sub-basin Name	Drainage Area(mi^2)	Sub-basin Name	Drainage Area(mi^2)
S-1	2.08	U-1	2.53	C-1	1.26	R-1	1.56
S-2	1.174	U-2	1.596	C-2	2.15	R-2	1.98
S-3	1.03	U-3	0.843	C-3	1.25	R-3	1.59
S-4	0.97	U-4	2.795	C-4	2.55		
S-5	1.85	U-5	3.251	C-5	3.38		
S-6	0.936	U-6	0.704	C-6	2.25		
S-7	0.681	U-7	1.467	C-7	1.18		
S-8	1.121			C-8	1.42		
S-9	1.021			C-9	0.53		
S-10	1.801						
S-11	0.92						
S-12	0.91						
S-13	1.271						
S-14	0.833						
S-15	0.987						
S-16	1.318						
S-17	1.033						
S-18	1.713						
S-19	0.772						
S-20	1.273						
S-21	2.221						
S-22	1.467						
S-23	1.72						
S-24	0.64						
TOTALS	29.742		13.186		15.97		5.13

Average Basin Elevation Estimation

	Union Hills Node Pt.	Rodger Node Pt.	Cline Node Pt.	U. Skunk Node Pt.	L.Skunk Node Pt.
	2206	2447	2570	1920	2018
	2410	2600	2447	1967	1856
	1899	2550	2206	2040	1868
	1650	2139	2210	2940	1786
	1546	1994	2227	2242	1812
	1581	1920	2410	2083	1821
	1573		2600	2180	1729
	1620		2810	2298	1927
	1681		3160	2281	1812
	1740		2576	2160	1629
	1970		2639	2218	1586
	1731		2670	2360	1495
	1646		3040	2471	
	1633		3080	3709	
	1710		4540	2680	
	1790			2380	
				2309	
				2702	
				2560	
Average	1774	2275	2746	2371	1778

Average of All Watersheds 2207 feet

Appendix D

MONTGOMERY WATSON

SCHEMATIC DIAGRAM OF SKUNK CREEK WATERSHED HEC-1 MODEL

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

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

 43          S1  Subbasin Area = 2.08 sq mi
              V  Subbasin Lag = 24.0 min
              V
              V
 54         S1R  Routing Length = 9574 ft
              .  Routing Slope = .014
              .  Routing Manning n = .045
              .  Routing Velocity = 6.4 fps
              .
              .
 57           .          S2  Subbasin Area = 1.17 sq mi
              .           .  Subbasin Lag = 23.4 min
              .           .
              .           .
 68         S2C............
              .
              .
 71           .          S3  Subbasin Area = 1.03 sq mi
              .           .  Subbasin Lag = 23.5 min
              .           .
              .           .
 82         S3C............
              V
              V
 85         S3R  Routing Length = 8331 ft
              .  Routing Slope = .009
              .  Routing Manning n = .045
              .  Routing Velocity = 5.3 fps
              .
              .
 88           .          S4  Subbasin Area = 0.97 sq mi
              .           .  Subbasin Lag = 24.4 min
              .           .
              .           .
 99           .           .          S5  Subbasin Area = 1.85 sq mi
              .           .           .  Subbasin Lag = 34.0 min
              .           .           .
              .           .           .
111           .         S5C............
              .           V
              .           V
114           .         S5R  Routing Length = 13053 ft
              .           .  Routing Slope = .013
              .           .  Routing Manning n = .045
              .           .  Routing Velocity = 6.3 fps
              .           .
              .           .
117           .           .          S6  Subbasin Area = 0.94 sq mi
              .           .           .  Subbasin Lag = 27.3 min
              .           .           .
              .           .           .
```

```
128     S6C.......................
          V
          V
132     S6R  Routing Length = 6565 ft
          .  Routing Slope = .010
          .  Routing Manning n = .040
          .  Routing Velocity = 6.1 fps
          .
          .
135       .        S9  Subbasin Area = 1.02 sq mi
          .         V  Subbasin Lag = 27.9 min
          .         V
          .         V
146       .       S9R  Routing Length = 9930 ft
          .         .  Routing Slope = .010
          .         .  Routing Manning n = .040
          .         .  Routing Velocity = 6.1 fps
          .         .
          .         .
149       .         .       S10  Subbasin Area = 1.80 sq mi
          .         .         .  Subbasin Lag = 27.9 min
          .         .         .
          .         .         .
160       .         .         .        S7  Subbasin Area = 0.68 sq mi
          .         .         .         .  Subbasin Lag = 25.5 min
          .         .         .         .
          .         .         .         .
170       .         .         .         .        S8  Subbasin Area = 1.12 sq mi
          .         .         .         .         .  Subbasin Lag = 22.9 min
          .         .         .         .         .
          .         .         .         .         .
180       .         .         .       S8C............
          .         .         .         V
          .         .         .         V
183       .         .         .      S8CR  Routing Length = 4724 ft
          .         .         .         .  Routing Slope = .008
          .         .         .         .  Routing Manning n = .040
          .         .         .         .  Routing Velocity = 5.7 fps
          .         .         .         .
          .         .         .         .
186     S10C.................................
          V
          V
189     S10R  Routing Length = 3228 ft
          .  Routing Slope = .009
          .  Routing Manning n = .040
          .  Routing Velocity = 6.0 fps
          .
          .
192       .       S13  Subbasin Area = 1.27 sq mi
          .         .  Subbasin Lag = 24.5 min
          .         .
          .         .
203       .         .       S11  Subbasin Area = 0.92 sq mi
          .         .         V  Subbasin Lag = 26.9 min
          .         .         V
          .         .         V
214       .         .      S11R  Routing Length = 14148 ft
```

```
          .          .          . Routing Slope = .018
          .          .          . Routing Manning n = .035
          .          .          . Routing Velocity = 9.6 fps
          .          .          .
          .          .          .
217       .          .          .        S12  Subbasin Area = 0.91 sq mi
          .          .          .          . Subbasin Lag = 29.1 min
          .          .          .          .
          .          .          .          .
228       .          .       S12C............
          .          .          .
          .          .          .
231     S13C......................
          V
          V
234     S13CR  Routing Length = 5046
          .    Routing Slope = .008
          .    Routing Manning n = .040
          .    Routing Velocity = 5.5 fps
          .
          .
237       .        S14  Subbasin Area = 0.83 sq mi
          .          . Subbasin Lag = 18.8 min
          .          .
          .          .
247     S14C1............
          .
          .
250       .      X1SUB  Subbasin Area = 0.61 sq mi
          .          V  Subbasin Lag = 11.0 min
          .          V
          .          V
259       .      XROX2  Routing Length = *
          .          . Routing Slope = *
          .          . Routing Manning n = *
          .          . Routing Velocity = *
          .          .
          .          .
262       .          .      X2SUB  Subbasin Area = 0.43 sq mi
          .          .          . Subbasin Lag = 12.5 min
          .          .          .
          .          .          .
272       .      XCO-1............
          .          V
          .          V
275       .      XROX3  Routing Length = *
          .          . Routing Slope = *
          .          . Routing Manning n = *
          .          . Routing Velocity = *
          .          .
          .          .
278       .          .      X3SUB  Subbasin Area = 0.56 sq mi
          .          .          . Subbasin Lag = 15.6 min
          .          .          .
          .          .          .
288       .      XCO-2............
          .          .
          .          .
```

```
291     .       .     X4SUB  Subbasin Area = 0.28 sq mi
        .       .         .  Subbasin Lag = 8.8 min
        .       .         .
        .       .         .
300     .   XCO-3............
        .       .
        .       .
303     .       .     X5SUB  Subbasin Area = 0.38 sq mi
        .       .         .  Subbasin Lag  = 11.6 min
        .       .         .
        .       .         .
312     .   XCO-4............
        .       .
        .       .
316     .       .     SUBC1  Subbasin Area = 1.26 sq mi
        .       .         V  Subbasin Lag = 7.8 min
        .       .         V
        .       .         V
325     .       .     CRO-1  Routing Length = *
        .       .         .  Routing Slope = *
        .       .         .  Routing Manning n = *
        .       .         .  Routing Velocity = *
        .       .         .
        .       .         .
328     .       .         .      SUBC2  Subbasin Area = 2.19 sq mi
        .       .         .          .  Subbasin Lag = 20.5 min
        .       .         .          .
        .       .         .          .
339     .       .         .          .      SUBC3  Subbasin Area = 1.24 sq mi
        .       .         .          .          .  Subbasin Lag = 14.8 min
        .       .         .          .          .
        .       .         .          .          .
349     .       .         .          .          .      SUBC4  Subbasin Area = 2.54 sq mi
        .       .         .          .          .          V  Subbasin Lag  = 15.8 min
        .       .         .          .          .          V
        .       .         .          .          .          V
359     .       .         .          .          .      CRO-2  Routing Length = *
        .       .         .          .          .          .  Routing Slope = *
        .       .         .          .          .          .  Routing Manning n = *
        .       .         .          .          .          .  Routing Velocity = *
        .       .         .          .          .          .
        .       .         .          .          .          .
362     .       .         .          .          .          .      SUBC5  Subbasin Area = 3.39 sq mi
        .       .         .          .          .          .          .  Subbasin Lag = 15.0 min
        .       .         .          .          .          .          .
        .       .         .          .          .          .          .
372     .       .         .          .          .      CCO-1............
        .       .         .          .          .          V
        .       .         .          .          .          V
375     .       .         .          .          .      CRO-3  Routing Length = *
        .       .         .          .          .          .  Routing Slope = *
        .       .         .          .          .          .  Routing Manning n = *
        .       .         .          .          .          .  Routing Velocity = *
        .       .         .          .          .          .
        .       .         .          .          .          .
378     .       .     CCO-2...................................
        .       .         V
        .       .         V
```

```
381          .          .      CRO-4  Routing Length = *
             .          .          .  Routing Slope = *
             .          .          .  Routing Manning n = *
             .          .          .  Routing Velocity = *
             .          .          .
             .          .          .
384          .          .          .      SUBC7  Subbasin Area = 1.20 sq mi
             .          .          .          V  Subbasin Lag = 12.6 min
             .          .          .          V
             .          .          .          V
395          .          .          .      CRO-5  Routing Length = *
             .          .          .          .  Routing Slope = *
             .          .          .          .  Routing Manning n = *
             .          .          .          .  Routing Velocity = *
             .          .          .          .
             .          .          .          .
398          .          .          .          .      SUBC8  Subbasin Area = 1.42 sq mi
             .          .          .          .          .  Subbasin Lag = 20.4 min
             .          .          .          .          .
             .          .          .          .          .
409          .          .          .      CCO-3............
             .          .          .          .
             .          .          .          .
412          .      CCO-4........................
             .          V
             .          V
415          .      CRO-6  Routing Length = *
             .          .  Routing Slope = *
             .          .  Routing Manning n = *
             .          .  Routing Velocity = *
             .          .
             .          .
418          .          .      SUBC9  Subbasin Area = 0.58 sq mi
             .          .          .  Subbasin Lag = 21.8 min
             .          .          .
             .          .          .
429          .      CCO-5............
             .          V
             .          V
432          .     CLINER  Routing Length = *
             .          .  Routing Slope = *
             .          .  Routing Manning n = *
             .          .  Routing Velocity = *
             .          .
             .          .
435      S14C2............
             V
             V
438      S14CR  Routing Length = 7809 ft
             .  Routing Slope = .005
             .  Routing Manning n = .040
             .  Routing Velocity = 4.5 fps
             .
             .
441          .        S15  Subbasin Area = 0.99 sq mi
             .          V  Subbasin Lag = 23.5 min
             .          V
             .          V
```

```
451          .        S15R  Routing Length = 2935 ft
             .          .   Routing Slope = .010
             .          .   Routing Manning n = .040
             .          .   Routing Velocity = 6.3 fps
             .          .
             .          .
454          .          .         R1  Subbasin Area = 1.56 sq mi
             .          .          V  Subbasin Lag = 23.3 min
             .          .          V
             .          .          V
464          .          .       RO-1  Routing Length = *
             .          .          .  Routing Slope = *
             .          .          .  Routing Manning n = *
             .          .          .  Routing Velocity = *
             .          .          .
             .          .          .
467          .          .          .         R2  Subbasin Area = 1.98 sq mi
             .          .          .          .  Subbasin Lag = 22.0 min
             .          .          .          .
             .          .          .          .
477          .          .       CO-1............
             .          .          V
             .          .          V
480          .          .       RO-2  Routing Length = *
             .          .          .  Routing Slope = *
             .          .          .  Routing Manning n = *
             .          .          .  Routing Velocity  = *
             .          .          .
             .          .          .
483          .          .          .         R3  Subbasin Area = 1.59 sq mi
             .          .          .          .  Subbasin Lag = 29.9 min
             .          .          .          .
             .          .          .          .
493          .          .       CO-2............
             .          .          .
             .          .          .
496          .          .          .        S16  Subbasin Area = 1.32 sq mi
             .          .          .          .  Subbasin Lag = 19.1 min
             .          .          .          .
             .          .          .          .
506        S16C.................................
             V
             V
509        S16CR  Routing Length = 20327 ft
             .    Routing Slope = .007
             .    Routing Manning n = .030
             .    Routing Velocity = 7.1 fps
             .
             .
512          .        S21  Subbasin Area = 2.22 sq mi
             .          .  Subbasin Lag  = 34.6 min
             .          .
             .          .
523        S21C............
             .
             .
526          .        S17  Subbasin Area = 1.03 sq mi
             .          V  Subbasin Lag = 30.9 min
```

```
          .          V
          .          V
537       .       S17R  Routing Length = 11065 ft
          .          .  Routing Slope = .006
          .          .  Routing Manning n = .035
          .          .  Routing Velocity = 5.7 fps
          .          .
          .          .
540       .          .        S18  Subbasin Area = 1.71 sq mi
          .          .          .  Subbasin Lag = 28.8 min
          .          .          .
          .          .          .
551       .       S18C............
          .          V
          .          V
554       .      S18CR  Routing Length = 1971 ft
          .          .  Routing Slope = .005
          .          .  Routing Manning n = .035
          .          .  Routing Velocity = 5.1 fps
          .          .
          .
557       .          .        S19  Subbasin Area = 0.77 sq mi
          .          .          .  Subbasin Lag = 19.6 min
          .          .          .
          .          .          .
567       .       S19C............
          .          V
          .          V
570       .      S19CR  Routing Length = 7135 ft
          .          .  Routing Slope = .004
          .          .  Routing Manning n = .035
          .          .  Routing Velocity  = 4.2 fps
          .          .
          .          .
573       .          .        S20  Subbasin Area = 1.27 sq mi
          .          .          .  Subbasin Lag = 28.9 min
          .          .          .
          .          .          .
584       .       S20C............
          .          .
          .          .
587    S21C2............
          V
          V
590    S21C2R  Routing Length = 11253 ft
          .  Routing Slope = .007
          .  Routing Manning n = .030
          .  Routing Velocity = 7.0 fps
          .
          .
593       .        S22  Subbasin Area = 1.47 sq mi
          .          .  Subbasin Lag = 22.7 min
          .          .
          .          .
604    S22C............
          V
          V
608    S22CR  Routing Length = 23183 ft
```

```
          . Routing Slope = .007
          . Routing Manning n = .030
          . Routing Velocity = 6.9 fps
          .
          .
611       .        S23  Subbasin Area = 1.72 sq mi
          .          . Subbasin Lag = 42.9 min
          .          .
          .          .
623     S23C............
          .
          .
627       .         U1  Subbasin Area = 2.53 sq mi
          .          . Subbasin Lag = 33.5 min
          .          .
          .          .
639       .          .         U2  Subbasin Area = 1.60 sq mi
          .          .          . Subbasin Lag = 37.1 min
          .          .          .
          .          .          .
651       .          .          .         U3  Subbasin Area = 0.84 sq mi
          .          .          .          . Subbasin Lag = 30.4 min
          .          .          .          .
          .          .          .          .
662       .        U3C........................
          .          V
          .          V
665       .        U3R  Routing Length = 5520 ft
          .          . Routing Slope = .006
          .          . Routing Manning n = .040
          .          . Routing Velocity = 5.0 fps
          .          .
          .          .
668       .          .         U4  Subbasin Area = 2.80 sq mi
          .          .          . Subbasin Lag = 28.7 min
          .          .          .
          .          .          .
679       .        U4C............
          .          V
          .          V
682       .        U4R  Routing Length = 5175 ft
          .          . Routing Slope = .005
          .          . Routing Manning n = .040
          .          . Routing Velocity = 4.3 fps
          .          .
          .          .
685       .          .         U5  Subbasin Area = 3.25 sq mi
          .          .          . Subbasin Lag = 35.0 min
          .          .          .
          .          .          .
696       .        U5C............
          .          V
          .          V
699       .        U5R  Routing Length = 7475 ft
          .          . Routing Slope = .005
          .          . Routing Manning n = .035
          .          . Routing Velocity = 5.2 fps
          .          .
```

```
                .          .
702             .          .        U6  Subbasin Area = 0.70 sq mi
                .          .         V  Subbasin Lag = 20.7 min
                .          .         V
                .          .         V
713             .          .       U6R  Routing Length = 2875 ft
                .          .         .  Routing Slope = .005
                .          .         .  Routing Manning n = .035
                .          .         .  Routing Velocity = 5.1 fps
                .          .         .
                .          .         .
716             .          .         .        U7  Subbasin Area = 1.47 sq mi
                .          .         .         .  Subbasin Lag = 34.1 min
                .          .         .         .
                .          .         .         .
727             .        U7C.........................
                .          .
                .          .
731           CAP............
                V
                V
735          CAPR2  Routing Length = 9200 ft
                .   Routing Slope = .004
                .   Routing Manning n = .030
                .   Routing Velocity = 5.1 fps
                .
                .
738             .        S24  Subbasin Area = 0.64 sq mi
                .          .  Subbasin Lag = 19.0 min
                .          .
                .          .
748           S24C............
```

Notes:

* - Data developed by FCDMC

HEC1 S/N: 1906330269 HMVersion: 6.31 Data File: sc100y24.dat

```
****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE (HEC-1)   *
*              MAY  1991               *
*           VERSION 4.0.1E             *
*                                      *
* RUN DATE 05/08/1996 TIME 07:55:07    *
*                                      *
****************************************
```

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

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

```
::::::::::::::::::::::::::::::::::::::::
:::                                  :::
::: Full Microcomputer Implementation :::
:::              by                  :::
:::      Haestad Methods, Inc.       :::
:::                                  :::
::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::
```

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

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

  1         ID    FLOOD CONTROL DISTRICT OF MARICOPA COUNTY
  2         ID
  3         ID    SKUNK CREEK FOODPLAIN DELINEATION STUDY
  4         ID    CAP AQUEDUCT THROUGH TOWN OF NEW RIVER
  5         ID
  6         ID    100-YEAR 24-HOUR FLOOD HYDROLOGY
  7         ID
  8         ID              METHODS OF STUDY:
  9         ID    - FCD STORM PATTERNS
 10         ID    - FCD PHOENIX AREA S-GRAPHS
 11         ID    - GREEN-AMPT LOSSES
 12         ID    - MUSKINGUM STREAM ROUTING
 13         ID    - FCD DDMS PROGRAM (VER 1.1, AUG 1995) USED TO COMPUTE PARAMETERS
 14         ID
 15         ID    INPUT FILE NAME - SC100Y24.DAT
 16         ID
 17         ID    MONTGOMERY WATSON
 18         ID    MARCH 1996
 19         ID
 20         ID   DDM MCUHP2 SKUNK CREEK FOODPLAIN DELINEATION STUDY
            *DIAGRAM
 21         IT       5 05JAN96     0000      300
 22         IN      15
 23         IO       5
            * THE FOLLOWING JD CARDS DESCRIBE A PRECIP DEPTH/AREA CURVE FOR HEC-1.
            * THE JD CARD DATA IS DERIVED FROM DARF DATA GIVEN IN THE MARICOPA COUNTY
            * DRAINAGE DESIGN MANUAL (TBL 2.2).  USING THE JD CARDS HEC-1 APPLIES THE
            * CORRECT DARF TO POINT RAINFALL VALUES FOR EACH CONCENTRATION POINT.
 24         JD  4.602     .001
            * THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL
 25         PC    .000     .002     .005     .008     .011     .014     .017     .020     .023     .026
 26         PC    .029     .032     .035     .038     .041     .044     .048     .052     .056     .060
 27         PC    .064     .068     .072     .076     .080     .085     .090     .095     .100     .105
 28         PC    .110     .115     .120     .126     .135     .142     .150     .158     .166     .175
 29         PC    .184     .195     .208     .224     .243     .266     .318     .479     .678     .716
 30         PC    .743     .764     .781     .795     .808     .818     .828     .837     .844     .851
 31         PC    .858     .865     .871     .877     .883     .889     .895     .900     .905     .910
 32         PC    .915     .919     .923     .927     .931     .935     .939     .943     .947     .951
 33         PC    .954     .957     .960     .963     .966     .969     .972     .975     .978     .981
 34         PC    .984     .987     .990     .993     .996     .999    1.000
 35         JD  4.574        1
 36         JD  4.464        5
 37         JD  4.326       10
 38         JD  4.188       20
 39         JD  4.142       30
 40         JD  4.050       40
 41         JD  4.004       50
 42         JD  3.949       65
            * DDM   ***** Updated *****
```

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

 43         KK      S1
 44         KM   BASIN S1
 45         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 46         KM    L=      2.5  Lca=       .9   S=  535.5  Kn= .040  LAG=  24.0
 47         KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 48         BA    2.08
 49         LG     .22     .38    6.40     .14    6.00
 50         UI   292.    975.   1892.   2662.   2623.   1696.   1381.   1093.    796.    657.
 51         UI   486.    358.    293.    224.    156.    143.     92.     56.     56.     56.
 52         UI    56.     56.      0.      0.      0.      0.      0.      0.      0.      0.
 53         UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

 54         KK     S1R
 55         KM    ROUTE S1 THROUGH S2
 56         RM      4    0.31    0.35
            * DDM   ***** Updated *****

 57         KK      S2
 58         KM   BASIN S2
 59         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 60         KM    L=      2.2  Lca=      1.1   S=  384.2  Kn= .036  LAG=  23.4
 61         KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 62         BA    1.17
 63         LG     .18     .35    7.00     .11    7.00
 64         UI   169.    592.   1118.   1615.   1407.    953.    770.    600.    436.    362.
 65         UI   251.    198.    152.    120.     83.     83.     33.     32.     32.     32.
 66         UI    32.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 67         UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

 68         KK     S2C
 69         KM    COMBINE S1+S2
 70         HC      2
            * DDM   ***** Updated *****

 71         KK      S3
 72         KM   BASIN S3
 73         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 74         KM    L=      2.3  Lca=      1.1   S=  331.3  Kn= .035  LAG=  23.5
 75         KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 76         BA    1.03
 77         LG     .17     .39    5.70     .19    4.00
 78         UI   148.    513.    974.   1398.   1248.    837.    677.    529.    385.    320.
 79         UI   222.    174.    135.    108.     72.     72.     32.     28.     28.     28.
 80         UI    28.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 81         UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****
```

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

 82         KK     S3C
 83         KM    COMBINE S3+S2C (SUBAREAS S1-S3)
 84         HC       2
            * DDM   ***** Preserved *****

 85         KK     S3R
 86         KM    ROUTE S3C THROUGH S6
 87         RM       4    0.33    0.30
            * DDM   ***** Updated *****

 88         KK     S4
 89         KM   BASIN S4
 90         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 91         KM    L=      2.3  Lca=      1.1   S=  588.7  Kn= .040  LAG=  24.4
 92         KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 93         BA     .97
 94         LG     .20     .39    5.70     .19     .00
 95         UI   134.    437.    853.   1188.   1253.    794.    648.    517.    381.    309.
 96         UI   241.    170.    144.    103.     80.     66.     53.     26.     26.     26.
 97         UI    26.     26.      0.      0.      0.      0.      0.      0.      0.      0.
 98         UI     0.      0.      0       C.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Updated *****

 99         KK     S5
100         KM   BASIN S5
101         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
102         KM    L=      2.9  Lca=      1.8   S=  618.6  Kn= .043  LAG=  34.0
103         KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
104         BA    1.85
105         LG     .23     .39    5.70     .18     .00
106         UI   183.    333.    782.   1176.   1442.   2021.   1475.   1109.    962.    830.
107         UI   702.    564.    461.    409.    335.    259.    220.    201.    142.    140.
108         UI    93.     90.     90.     49.     35.     35.     35.     35.     35.     35.
109         UI    35.      0.      0.      0.      0.      0.      0.      0.      0.      0.
110         UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

111         KK     S5C
112         KM    COMBINE S4+S5
113         HC       2
            * DDM   ***** Preserved *****

114         KK     S5R
115         KM    ROUTE S5C THROUGH S6
116         RM       5    0.44    0.30
            * DDM   ***** Updated *****

117         KK     S6
118         KM   BASIN S6
119         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
120         KM    L=      2.4  Lca=      1.1   S=  152.5  Kn= .034  LAG=  27.3
121         KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
122         BA     .94
123         LG     .23     .35    7.00     .12    2.00
```

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

 124        UI    115.    313.    666.    939.   1088.   1061.    849.    614.    450.    322.
 125        UI    234.    175.    122.     83.     75.     28.     28.     28.     28.     28.
 126        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 127        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

 128        KK     S6C
 129        KM    COMBINE S6+S5R+S3R (SUBAREAS S1-S6)
 130        KM    NEW RIVER ROAD
 131        HC       3
            * DDM   ***** Preserved *****

 132        KK     S6R
 133        KM    ROUTE S6C THROUGH S10
 134        RM       2    0.18    0.25
            * DDM   ***** Updated *****

 135        KK      S9
 136        KM   BASIN S9
 137        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 138        KM    L=      2.3  Lca=      .9   S=  329.0  Kn= .044  LAG=  27.9
 139        KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 140        BA    1.02
 141        LG     .20     .39    5.70     .19     .00
 142        UI    123.    321.    680.    925.   1329.    913.    702.    590.    484.    372
 143        UI    299.    254.    185.    149.    126.     94.     76.     60.     60.     27.
 144        UI     24.     24.     24.     24.     24.      0.      0.      0.      0.      0.
 145        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

 146        KK     S9R
 147        KM    ROUTE S9 THROUGH S10
 148        RM       3    0.22    0.30
            * DDM   ***** Updated *****

 149        KK     S10
 150        KM   BASIN S10
 151        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 152        KM    L=      2.7  Lca=     1.2   S=  156.7  Kn= .032  LAG=  27.9
 153        KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 154        BA    1.80
 155        LG     .17     .40    6.00     .18     .00
 156        UI    217.    569.   1215.   1741.   2034.   2025.   1669.   1212.    894.    656.
 157        UI    465.    358.    247.    179.    149.     76.     53.     53.     53.     53.
 158        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 159        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Updated *****

 160        KK      S7
 161        KM   BASIN S7
 162        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 163        KM    L=      2.1  Lca=     1.3   S=  136.4  Kn= .031  LAG=  25.5
 164        KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 165        BA     .68
 166        LG     .15     .32    7.60     .09    4.00
```

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

 167        UI     90.    278.    556.    774.    863.    777.    571.    406.    288.    202.
 168        UI    149.    100.     69.     59.     22.     22.     22.     22.      0.      0.
 169        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DIM   ***** Updated *****

 170        KK     S8
 171        KM   BASIN S8
 172        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 173        KM    L=      1.9  Lca=      1.0   S=  207.2  Kn= .034  LAG=  22.9
 174        KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 175        BA    1.12
 176        LG     .17     .39    5.70     .19     .00
 177        UI    165.    611.   1147.   1509.   1531.   1190.    814.    554.    375.    268.
 178        UI    173.    113.     77.     40.     40.     40.      0.      0.      0.      0.
 179        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DIM   ***** Preserved *****

 180        KK     S8C
 181        KM    COMBINE S7+S8
 182        HC       2
            * DIM   ***** Preserved *****

 183        KK    S8CR
 184        KM    ROUTE S8C THROUGH S10
 185        RM       2    0.14    0.25
            * DIM   ***** Preserved *****

 186        KK    S10C
 187        KM    COMBINE S9R+S10+S6R+S8CR (SUBAREAS S1-S10)
 188        HC       4
            * DIM   ***** Preserved *****

 189        KK    S10R
 190        KM    ROUTE S10C THROUGH S13
 191        RM       1    0.09    0.25
            * DIM   ***** Updated *****

 192        KK     S13
 193        KM   BASIN S13
 194        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 195        KM    L=      2.7  Lca=      1.2   S=  425.1  Kn= .035  LAG=  24.5
 196        KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 197        BA    1.27
 198        LG     .22     .37    5.30     .23   20.00
 199        UI    175.    567.   1109.   1541.   1652.   1043.    851.    680.    503.    406.
 200        UI    318.    227.    191.    134.    108.     86.     73.     34.     34.     34.
 201        UI     34.     34.      0.      0.      0.      0.      0.      0.      0.      0.
 202        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DIM   ***** Updated *****
```

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

 203        KK     S11
 204        KM   BASIN S11
 205        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 206        KM    L=      2.7  Lca=      1.3   S=  438.1  Kn= .037  LAG=  26.9
 207        KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 208        BA     .92
 209        LG     .20     .39    5.70     .19     .00
 210        UI    115.    317.    664.    896.   1241.    783.    631.    523.    422.    315.
 211        UI    265.    210.    154.    129.     98.     84.     56.     56.     36.     22.
 212        UI     22.     22.     22.     22.      0.      0.      0.      0.      0.      0.
 213        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

 214        KK    S11R
 215        KM    ROUTE S11 THROUGH S12
 216        RM      3    0.24    0.30
            * DDM   ***** Updated *****

 217        KK     S12
 218        KM   BASIN S12
 219        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 220        KM    L=      2.8  Lca=      1.3   S=  123.2  Kn= .031  LAG=  29.1
 221        KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 222        BA     91
 223        LG     .15     .32    7.60     .09    1.00
 224        UI    105.    257.    558.    811.    971.    995.    868.    652.    482.    359.
 225        UI    262.    195.    146.    109.     72.     67.     26.     26.     26.     26.
 226        UI     26.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 227        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

 228        KK    S12C
 229        KM    COMBINE S11R+S12 (SUBAREAS S11 AND S12)
 230        HC      2
            * DDM   ***** Preserved *****

 231        KK    S13C
 232        KM    COMBINE S10R+S13+S12C        (SUBAREAS S1-S13)
 233        HC      3
            * DDM   ***** Preserved *****

 234        KK   S13CR
 235        KM    ROUTE S13C THROUGH S14
 236        RM      2    0.15    0.25
            * DDM   ***** Updated *****

 237        KK     S14
 238        KM   BASIN S14
 239        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 240        KM    L=      1.8  Lca=      1.0   S=  670.5  Kn= .036  LAG=  18.8
 241        KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 242        BA     .83
 243        LG     .23     .39    5.80     .18   25.00
 244        UI    187.    709.   1211.   1355.    825.    631.    435.    331.    218.    166.
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 245        UI   114.    77.    67.    29.    29.    29.    29.     0.     0.     0.
 246        UI     0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
            * ******************************************************************
            * INFLOW FROM CLINE CREEK                                          *
            *                                                                  *
            * INPUT TAKEN FROM CLINE CREEK FLOODPLAIN DELINEATION STUDY BY BAKER *
            * ENGINEERS (12/11/89) AS REVISED BY FCDMC (2/27/96).               *
            *                                                                  *
            * FILE CLINE.DAT
            * ******************************************************************
            *
            *     HYDROLOGY FOR:    100-YEAR 24 HOUR EVENT
            *
            *     PURPOSE OF STUDY: DELINEATION OF THE 100-YEAR FLOODPLAIN OF
            *                       CLINE CREEK AND TRIBUTARIES - SKUNK CREEK
            *                       TO THE TONTO NATIONAL FOREST BOUNDARY
            *
            *     METHODS OF STUDY: HEC-1   DIMENSIONLESS SCS HYDROGRAPH 6 MIN. INTERVALS
            *     (ORIGINAL MODEL)  PRECIPITATION- SCS TYPE II STORM BY 15 MIN. INCREMENTS
            *                       EXCESS PRECIPITATION- INITIAL AND UNIFORM LOSS RATES
            *                                 &  PERCENT IMPERVIOUS
            *                       STREAM ROUTING- MUSKINGUM METHOD
            *
            *     WATERSHED NAME:   CLINE CREEK   ( BASIN X IS SUBBASIN C-6 )
            *     Revised by :      Hasan Mushtaq, FCDMC
            *                       February 23, 1996.
            *
            *     (1)     A reduction factor of 1.00 was used to be consistent with
            *             the previous study.  DARFS are applied in full watershed model.
            *     (2)     Green-Ampt infiltration method was used for soil loss.
            *     (3)     Phoenix Valley S-graph and Mountain S-graphs were
            *             used to generate the excess rainfall.
            *     (4)     L, Lca, S, were measured from the work maps.
            *     (5)     Roughness values for the subbasins are assumed to vary
            *             between 0.025 and 0.030.  These may be changed as necessary.
            *
            *                              Names (KK cards) of routing and combination step
            *     with the format CO-1 and RO-1 were changed by MW to include a prefix of
            *     "C" (indicating Cline Creek) so they would be differently named than
            *     combination and routing steps in Roger Creek.  This was necessary
            *     because the DDMS was transposing data from one the lower data blocks
            *     to the upper ones and deleting the lower blocks.
            *
            * DDM   ***** Updated *****

 247        KK   X1SUB
 248        KM   BASIN X1SUB
 249        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 250        KM    L=      1.8  Lca=       .8   S=  320.0  Kn= .020  LAG=  11.0
 251        KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 252        BA     .61
 253        LG     .20     .30    8.00     .07   16.00
 254        UI    456.   1602.   1122.    665.    379.    205.    116.     64.     35.     35.
 255        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 256        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 257        KK  XROX2
 258        KM       ROUTE X1 THROUGH SUBBASIN X2
 259        RM      2    0.15    0.30
            * DIM   ***** Updated *****

 260        KK  X2SUB
 261        KM  BASIN X2SUB
 262        KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 263        KM   L=      2.0  Lca=      1.0   S=  311.6  Kn= .020  LAG=  12.5
 264        KM   PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 265        BA     .43
 266        LG     .20     .32    7.60     .08    6.00
 267        UI   241.    860.    931.    528.    317.    193.    115.     69.     41.     22.
 268        UI    22.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 269        UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DIM   ***** Preserved *****

 270        KK  XCO-1
 271        KM       COMBINE RUNOFF FROM SUBBASINS X1 AND X2
 272        HC      2
            * DIM   ***** Preserved *****

 273        KK  XROX3
 274        KM       ROUTE X1 & X2 THROUGH SUBBASINS X3 & X5
 275        RM      2    0.23    0.30
            * DIM   ***** Updated *****

 276        KK  X3SUB
 277        KM  BASIN X3SUB
 278        KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 279        KM   L=      2.3  Lca=      1.2   S=  196.0  Kn= .020  LAG=  15.6
 280        KM   DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 281        BA     .56
 282        LG     .20     .32    7.60     .08    1.00
 283        UI   188.    723.   1108.    970.    572.    326.    187.    104.     57.     29.
 284        UI    29.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 285        UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DIM   ***** Preserved *****

 286        KK  XCO-2
 287        KM       COMBINE RUNOFF FROM SUBBASINS X1,X2, AND X3
 288        HC      2
            * DIM   ***** Updated *****

 289        KK  X4SUB
 290        KM  BASIN X4SUB
 291        KM   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 292        KM   L=      1.1  Lca=       .6   S=  250.0  Kn= .020  LAG=   8.8
 293        KM   DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 294        BA     .28
 295        LG     .20     .27    8.80     .05     .00
 296        UI   356.    968.    551.    203.     74.     26.      0.      0.      0.      0.
 297        UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DIM   ***** Preserved *****
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

298         KK   XCO-3
299         KM        COMBINE RUNOFF FROM SUBBASINS X1,X2,X3,AND X4
300         HC       2
            * DDM   ***** Updated *****

301         KK   X5SUB
302         KM   BASIN X5SUB
303         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
304         KM    L=      1.5  Lca=       .9   S=  198.7  Kn= .020  LAG=  11.6
305         KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
306         BA     .38
307         LG     .20     .37    6.60     .13     .00
308         UI    253.    874.    917.    470.    221.    101.     43.     27.      0.      0.
309         UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

310         KK   XCO-4
311         KM        COMBINE RUNOFF FROM SUBBASINS X1,X2,X3,X4,AND X5
312         KM        BASIN X OUTFLOW HYDROGRAPH = SUB C-6 RUNOFF HYDROGRAPH
313         HC       2
            * DDM   ***** Updated *****

314         KK   SUBC1
315         KM   BASIN SUBC1
316         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
317         KM    L=      1.3  Lca=       .8   S= 1143.0  Kn= .020  LAG=   7.8
318         KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
319         BA    1.26
320         LG     .20     .35    4.80     .26     .00
321         UI   2015.   4263.   1937.    870.    381.    158.    104.      0.      0.      0.
322         UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

323         KK   CRO-1
324         KM        ROUTE C-1       THROUGH      C-2
325         RM       6     .58      .3
            * DDM   ***** Updated *****

326         KK   SUBC2
327         KM   BASIN SUBC2
328         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
329         KM    L=      3.8  Lca=      2.1   S=  369.4  Kn= .020  LAG=  20.5
330         KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
331         BA    2.19
332         LG     .20     .35    4.80     .26     .00
333         UI    398.   1547.   2645.   3635.   2218.   1726.   1306.    918.    721.    495.
334         UI    378.    276.    186.    176.     71.     69.     69.     69.      0.      0.
335         UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Updated *****
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 336        KK   SUBC3
 337        KM   BASIN SUBC3
 338        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 339        KM    L=      2.2  Lca=      1.6   S=  403.7  Kn= .020  LAG=  14.8
 340        KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 341        BA    1.24
 342        LG     .23     .35    4.90     .26    1.00
 343        UI    474.   1738.   2670.   1591.   1112.    710.    467.    306.    195.    138.
 344        UI     64.     54.     54.      0.      0.      0.      0.      0.      0.      0.
 345        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Updated *****

 346        KK   SUBC4
 347        KM   BASIN SUBC4
 348        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 349        KM    L=      2.9  Lca=      1.9   S=  688.4  Kn= .020  LAG=  15.8
 350        KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 351        BA    2.54
 352        LG     .20     .35    4.80     .26     .00
 353        UI    829.   3129.   5236.   3326.   2386.   1563.   1101.    691.    481.    313.
 354        UI    234.    104.    104.    104.      0.      0.      0.      0.      0.      0.
 355        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

 356        KK   CRO-2
 357        KM        ROUTE C-4 THROUGH C-5
 358        RM       3     .27      .3
            * DDM   ***** Updated *****

 359        KK   SUBC5
 360        KM   BASIN SUBC5
 361        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 362        KM    L=      2.9  Lca=      1.4   S=  540.8  Kn= .020  LAG=  15.0
 363        KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 364        BA    3.39
 365        LG     .24     .37    5.20     .23    6.00
 366        UI   1255.   4625.   7250.   4358.   3077.   1965.   1317.    866.    552.    372.
 367        UI    205.    146.    146.      0.      0.      0.      0.      0.      0.      0.
 368        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

 369        KK   CCO-1
 370        KM        COMBINE RUNOFF FROM SUBBASINS C-4 AND C-5
 371        HC       2
            * DDM   ***** Preserved *****

 372        KK   CRO-3
 373        KM        ROUTE C-4&5 THROUGH C-3
 374        RM       3     .24      .3
            * DDM   ***** Preserved *****
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

375         KK   CCO-2
376         KM        COMBINE RUNOFF FROM SUBBASINS 4&5 WITH C-1,2&3
377         HC       4
            * DDM   ***** Preserved *****

378         KK   CRO-4
379         KM        ROUTE C-1,2,3,4,5 THROUGH C-9 UPST
380         RM       3      .25       .3
            * DDM   ***** Updated *****

381         KK   SUBC7
382         KM   BASIN SUBC7
383         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
384         KM    L=       2.5  Lca=       1.1   S=  561.0  Kn= .020  LAG=  12.6
385         KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
386         BA    1.20
387         LG     .40      .27     8.80      .06    18.00
388         UI    656.    2330.    2590.    1467.     882.     544.     325.     195.     120.      61.
389         UI     61.      0.       0.       0.       0.       0.       0.       0.       0.       0.
390         UI      0.      0.       0.       0.       0.       0.       0.       0.       0.       0.
            * DDM   ***** Preserved *****

391         KK   CRO-5
392         KM        ROUTE C-7 THROUGH C-8
393         RM       8      .77       .3
            * DDM   ***** Updated *****

394         KK   SUBC8
395         KM   BASIN SUBC8
396         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
397         KM    L=       2.6  Lca=       1.2   S=  101.6  Kn= .022  LAG=  20.4
398         KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
399         BA    1.42
400         LG     .37      .19    10.10      .04    13.00
401         UI    262.    1020.    1830.    2221.    1951.    1316.     858.     550.     371.     229.
402         UI    161.      72.      57.      57.      57.      0.       0.       0.       0.       0.
403         UI      0.      0.       0.       0.       0.       0.       0.       0.       0.       0.
            * DDM   ***** Preserved *****

404         KK   CCO-3
405         KM        COMBINE RUNOFF FROM SUBBASINS C-7 AND C-8
406         HC       2
            * DDM   ***** Preserved *****

407         KK   CCO-4
408         KM        COMBINE RUNOFF FROM SUBBASINS C-1 THROUGH 5; C-6 AND C-7&8
409         HC       3
            * DDM   ***** Preserved *****
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 410        KK   CRO-6
 411        KM        ROUTE C-1 THROUGH 8 THROUGH C-9 DWN
 412        RM       2     .21      .3
            * DDM   ***** Updated *****

 413        KK   SUBC9
 414        KM   BASIN SUBC9
 415        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 416        KM    L=      2.5  Lca=      1.4   S=   81.3  Kn= .022  LAG=  21.8
 417        KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 418        BA      .58
 419        LG      .35     .31    6.80     .14    7.00
 420        UI      89.    358.    655.    832.    804.    579.    389.    260.    173.    116.
 421        UI      76.     58.     22.     22.     22.     22.      0.      0.      0.      0.
 422        UI       0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

 423        KK   CCO-5
 424        KM        COMBINE RUNOFF FROM SUBBASINS C-1 THROUGH 8 AND C-9
 425        HC       2
            *  ******************************'*************
            *  END CLINE CREEK WATERSHED MODEL
            *  RESUME SKUNK CREEK WATERSHED MODEL
            *  ****************************************
            * DDM   ***** Preserved *****

 426        KK  CLINER
 427        KM    ROUTE CLINE CREEK FLOWS THROUGH S14
 428        RM       1  0.0583    0.25
            * DDM   ***** Preserved *****

 429        KK    S14C
 430        KM    COMBINE S13G+S14+CLINE CREEK BASINS  (SUBAREAS S1-S14 & CLINE CREEK BASIN)
 431        HC       3
            * DDM   ***** Preserved *****

 432        KK   S14CR
 433        KM    ROUTE S14C THROUGH S16
 434        RM       4    0.29    0.25
            * DDM   ***** Updated *****

 435        KK     S15
 436        KM   BASIN S15
 437        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 438        KM    L=      2.0  Lca=      1.0   S=  238.1  Kn= .035  LAG=  23.5
 439        KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 440        BA      .99
 441        LG      .21     .35    7.00     .12   15.00
 442        UI     141.    501.    959.   1278.   1326.   1077.    741.    513.    352.    244.
 443        UI     166.    111.     87.     34.     34.     34.     34.      0.      0.      0.
 444        UI       0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 445        KK    S15R
 446        KM    ROUTE S15 THROUGH S16
 447        RM       1    0.08    0.25
            * ***********************************************************************
            * INFLOW FROM RODGER CREEK                                              *
            * INPUT TAKEN FROM RODGER CREEK FLOODPLAIN DELINEATION STUDY BY BAKER   *
            * ENGINEERS (12/7/89) AS REVISED BY FCDMC (2/27/96)                     *
            *                                                                       *
            * FILE ROGER.DAT
            * ***********************************************************************
            *
            *     HYDROLOGY FOR:     100-YEAR 24 HOUR EVENT
            *
            *     PURPOSE OF STUDY: DELINEATION OF THE 100-YEAR FLOODPLAIN OF
            *                       RODGER CREEK ABOVE CONFLUENCE WITH SKUNK CREEK
            *
            *     METHODS OF STUDY: HEC-1   DIMENSIONLESS SCS HYDROGRAPH 5 MIN. INTERVALS
            *     (ORIGINAL MODEL)          PRECIPITATION- SCS TYPE II STORM BY 15 MIN. INC
            *                                   -AREAL REDUCTION NOT USED  < 10 SQ. MI.
            *                       EXCESS PRECIPITATION- INITIAL AND UNIFORM LOSS RATES
            *                                   &  PERCENT IMPERVIOUS
            *                       STREAM ROUTING- MUSKINGUM METHOD
            *
            *     CURRENT MODEL USES FCD STORM PATTERNS FOR PRECIP DISTRIBUTION
            *
            *     WATERSHED NAME: RODGER CREEK
            *     Revision by:       Hasan Mushtaq, Flood Control District
            *                        January 24, 1996.
            *
            *     (1)      A reduction factor of 1.00 was used to be consistent with
            *              the previous study.  DARFS are applied in full watershed model.
            *     (2)      Green-Ampt infiltration method was used for soil loss.
            *     (3)      Valley S-graph was used to derive the unit hydrograph.
            *     (4)      L, Lca, S, were measured from the work map.
            *     (5)      Roughness value for the subbasins are assumed constant
            *              at 0.030.  These may be changed as needed.
            *
            * DDM   ***** Updated *****

 448        KK     R1
 449        KM   BASIN R1
 450        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 451        KM    L=      2.9  Lca=      1.1   S=  112.2  Kn= .025  LAG=  23.3
 452        KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 453        BA    1.56
 454        LG     .15      .25     9.70      .05    17.00
 455        UI   226.    812.   1543.   2048.   2113.   1686.   1158.    801.    542.    382.
 456        UI   256.    168.    128.     55.     55.     55.     55.      0.      0.      0.
 457        UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 458        KK    RO-1
 459        KM        ROUTE R-1 THROUGH R-2
 460        RM       4       .3       .3
            * DDM   ***** Updated *****

 461        KK     R2
 462        KM   BASIN R2
 463        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 464        KM    L=      3.4  Lca=      1.5   S=  327.4  Kn= .025  LAG=  22.0
 465        KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 466        BA    1.98
 467        LG     .15      .29    8.40      .07    14.00
 468        UI    304.   1191.   2106.   3147.   2080.   1599.   1264.    916.    706.    537.
 469        UI    373.    299.    231.    149.    149.     63.     58.     58.     58.     58.
 470        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 471        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

 472        KK    CO-1
 473        KM        COMBINE RUNOFF FROM SUBBASINS R-1 AND R-2
 474        HC       2    3.54
            * DDM   ***** Preserved *****

 475        KK    RO-2
 476        KM        ROUTE R-1 AND R-2 THROUGH R-3
 477        RM       5       .4       .3
            * DDM   ***** Updated *****

 478        KK     R3
 479        KM   BASIN R3
 480        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 481        KM    L=      3.5  Lca=      2.1   S=  365.7  Kn= .030  LAG=  29.9
 482        KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 483        BA    1.59
 484        LG     .10      .35    7.00      .13    25.00
 485        UI    179.    414.    909.   1272.   1709.   1694.   1105.    936.    789.    649.
 486        UI    496.    423.    349.    262.    215.    187.    137.    119.     88.     88.
 487        UI     58.     34.     34.     34.     34.     34.     34.      0.      0.      0.
 488        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

 489        KK    CO-2
 490        KM        COMBINE RUNOFF FROM R-1, R-2, AND R-3
 491        HC       2    5.13
            *  ****************************************
            *  END RODGER CREEK WATERSHED MODEL
            *  RESUME SKUNK CREEK WATERSHED MODEL
            *  ****************************************
            * DDM   ***** Updated *****
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

492         KK     S16
493         KM   BASIN S16
494         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
495         KM    L=      1.9  Lca=       .9   S=  333.3  Kn= .033  LAG=  19.1
496         KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
497         BA    1.32
498         LG     .29     .39    5.80     .20     .00
499         UI    285.   1084.   1846.   2166.   1310.   1007.    707.    529.    361.    268.
500         UI    188.    131.    114.     49.     45.     45.     45.      0.      0.      0.
501         UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

502         KK    S16C
503         KM   COMBINE S14R+S16+S15+RODGER CREEK (SUBAREAS S1-S16, CLINE & RODGER CR BASINS)
504         HC       4
            * DDM   ***** Preserved *****

505         KK   S16CR
506         KM    ROUTE S16C THROUGH S21
507         RM       6    0.47    0.25
            * DDM   ***** Updated *****

508         KK     S21
509         KM   BASIN S21
510         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
511         KM    L=      3.7  Lca=      1.6   S=   56.6  Kn= .026  LAG=  34.6
512         KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
513         BA    2.22
514         LG     .21     .27    8.80     .06     .00
515         UI    216.    382.    914.   1387.   1793.   2018.   2050.   1870.   1478.   1148.
516         UI    900.    695.    535.    422.    334.    237.    195.    148.    139.     53.
517         UI     53.     53.     53.     53.     53.      0.      0.      0.      0.      0.
518         UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

519         KK    S21C
520         KM    COMBINE S16CR+S21 (SUBAREAS S1-S16, S21, CLINE & RODGER CREEK BASINS)
521         HC       2
            * DDM   ***** Updated *****

522         KK     S17
523         KM   BASIN S17
524         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
525         KM    L=      2.5  Lca=      1.0   S=  136.0  Kn= .038  LAG=  30.9
526         KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
527         BA    1.03
528         LG     .16     .33    7.30     .10     .00
529         UI    113.    244.    554.    816.   1007.   1079.   1002.    791.    596.    452.
530         UI    340.    251.    194.    144.    111.     77.     71.     27.     27.     27.
531         UI     27.     27.      0.      0.      0.      0.      0.      0.      0.      0.
532         UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 533          KK    S17R
 534          KM    ROUTE S17 THROUGH S18
 535          RM       4    0.33    0.25
              * IDM   ***** Updated *****

 536          KK     S18
 537          KM   BASIN S18
 538          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 539          KM    L=      2.4  Lca=      1.1   S=   59.5  Kn= .030  LAG=  28.8
 540          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 541          BA    1.71
 542          LG     .15     .27    8.80     .06     .00
 543          UI    200.    498.   1075.   1559.   1854.   1883.   1625.   1211.    895.    660.
 544          UI    486.    355.    265.    197.    137.    114.     49.     49.     49.     49.
 545          UI     49.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 546          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              * IDM   ***** Preserved *****

 547          KK    S18C
 548          KM    COMBINE S17+S18
 549          HC       2
              * IDM   ***** Preserved *****

 550          KK   S18CR
 551          KM    RGUTE S18C THROUGH S19
 552          RM       1    0.06    0.20
              * IDM   ***** Updated *****

 553          KK     S19
 554          KM   BASIN S19
 555          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 556          KM    L=      1.5  Lca=       .7   S=   76.5  Kn= .031  LAG=  19.6
 557          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 558          BA     .77
 559          LG     .17     .29    8.40     .07    4.00
 560          UI    157.    605.   1069.   1255.   1042.    674.    433.    275.    175.    110.
 561          UI     74.     32.     32.     32.      0.      0.      0.      0.      0.      0.
 562          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              * IDM   ***** Preserved *****

 563          KK    S19C
 564          KM    COMBINE S19+S18CR (SUBAREAS S17-S19)
 565          HC       2
              * IDM   ***** Preserved *****

 566          KK   S19CR
 567          KM    ROUTE S19C THROUGH S20
 568          RM       3    0.28    0.20
              * IDM   ***** Updated *****
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

569         KK     S20
570         KM   BASIN S20
571         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
572         KM    L=      2.4  Lca=      1.0   S=   43.3  Kn= .030  LAG=  28.9
573         KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
574         BA    1.27
575         LG     .17     .27    8.80     .05    6.00
576         UI   148.    366.    792.   1150.   1371.   1397.   1210.    904.    668.    495.
577         UI   363.    267.    199.    149.    102.     88.     36.     36.     36.     36.
578         UI    36.      0.      0.      0.      0.      0.      0.      0.      0.      0.
579         UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

580         KK    S20C
581         KM    COMBINE S19CR+S20    (SUBAREAS S17-S19 & S20)
582         HC       2
            * DDM   ***** Preserved *****

583         KK   S21C2
584         KM    COMBINE S20G+S21C    (SUBAREAS S1-S21, CLINE & RODGER CREEK BASINS)
585         HC       2
            * DDM   ***** Preserved *****

586         KK  S21C2R
587         KM    ROUTE S21C2 THROUGH S22
588         RM       3    0.27    0.25
            * DDM   ***** Updated *****

589         KK     S22
590         KM   BASIN S22
591         KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
592         KM    L=      2.3  Lca=      1.1   S=  277.5  Kn= .032  LAG=  22.7
593         KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
594         BA    1.47
595         LG     .25     .39    5.80     .19     .00
596         UI   218.    808.   1472.   2195.   1629.   1188.    949.    716.    532.    424.
597         UI   299.    241.    169.    130.    106.     76.     42.     42.     42.     42.
598         UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
599         UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

600         KK    S22C
601         KM    COMBINE S22+S21CR    (SUBAREAS S1-S22, CLINE & RODGER CREEK BASINS)
602         KM    CAREFREE HIGHWAY
603         HC       2
            * DDM   ***** Preserved *****

604         KK   S22CR
605         KM    ROUTE S22C THROUGH S23
606         RM       7    0.56    0.25
            * DDM   ***** Updated *****
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 607          KK     S23
 608          KM   BASIN S23
 609          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 610          KM    L=      4.6  Lca=      2.1   S=   43.9  Kn= .026  LAG=  42.9
 611          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 612          BA    1.72
 613          LG     .35     .25    9.70     .05     .00
 614          UI    135.    142.    435.    671.    900.   1112.   1232.   1294.   1251.   1142.
 615          UI    931.    757.    624.    508.    410.    334.    271.    226.    188.    143.
 616          UI    121.     92.     92.     59.     33.     33.     33.     33.     33.     33.
 617          UI     33.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 618          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              * DDM   ***** Preserved *****

 619          KK    S23C
 620          KM    COMBINE S23+S22CR    (SUBAREAS S1-S23, CLINE AND RODGER CREEK BASINS)
 621          KM   CAP OVERCHUTES
 622          HC       2
              *  ******************************************************************
              *  INFLOW FROM UNION HILLS                                          *
              *  HOSKIN ENGINEERING CONSULTANTS UNDER CONTRACT TO MONTGOMERY WATSON  *
              *                                                                   *
              *  FILE:C:\FILEDIR\950008\HYDRO\HEC1\UNIONHL\H1UH100B.I
              *  ******************************************************************
              *
              * DDM   ***** Updated *****

 623          KK      U1
 624          KM   BASIN U1
 625          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 626          KM    L=      2.6  Lca=      1.7   S=   72.5  Kn= .030  LAG=  33.5
 627          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 628          BA    2.53
 629          LG     .27     .25    9.70     .05    8.00
 630          UI    254.    473.   1127.   1672.   2183.   2397.   2379.   2101.   1625.   1252.
 631          UI    975.    743.    559.    443.    342.    270.    179.    174.     96.     62.
 632          UI     62.     62.     62.     62.      0.      0.      0.      0.      0.      0.
 633          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              * DDM   ***** Updated *****

 634          KK      U2
 635          KM   BASIN U2
 636          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 637          KM    L=      2.8  Lca=      1.7   S=   58.2  Kn= .031  LAG=  37.1
 638          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 639          BA    1.60
 640          LG     .29     .22   10.10     .04    6.00
 641          UI    145.    225.    554.    862.   1125.   1309.   1388.   1334.   1141.    909.
 642          UI    717.    569.    447.    352.    281.    225.    165.    141.     99.     99.
 643          UI     53.     35.     35.     35.     35.     35.     35.      0.      0.      0.
 644          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              * DDM   ***** Updated *****
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 645        KK     U3
 646        KM   BASIN U3
 647        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 648        KM    L=      2.1  Lca=      1.3   S=   91.3  Kn= .034  LAG=  30.4
 649        KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 650        BA     .84
 651        LG     .24     .36    6.80     .13    8.00
 652        UI     93.    210.    468.    689.    843.    892.    818.    633.    476.    361.
 653        UI    268.    195.    154.    110.     84.     64.     48.     23.     23.     23.
 654        UI     23.     23.      0.      0.      0.      0.      0.      0.      0.      0.
 655        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DIM   ***** Preserved *****

 656        KK    U3C
 657        KM      COMBINE RUNOFF FROM SUB-BASINS U1, U2 AND U3
 658        HC      3
            * DIM   ***** Preserved *****

 659        KK    U3R
 660        KM       ROUTE U3C THROUGH U4 TO U4C
 661        RM      2    0.19      .2
            * DIM   ***** Updated *****

 662        KK     U4
 663        KM   BASIN U4
 664        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 665        KM    L=      2.1  Lca=      1.2   S=  135.3  Kn= .036  LAG=  28.7
 666        KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 667        BA    2.80
 668        LG     .23     .35    7.00     .12    8.00
 669        UI    328.    820.   1767.   2561.   3039.   3078.   2647.   1967.   1453.   1068.
 670        UI    785.    577.    426.    317.    224.    178.     80.     80.     80.     80.
 671        UI     80.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 672        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DIM   ***** Preserved *****

 673        KK    U4C
 674        KM       COMBINE U3R WITH SUB-BASIN U4
 675        HC      2
            * DIM   ***** Preserved *****

 676        KK    U4R
 677        KM       ROUTE FLOW FROM U4C THROUGH SUB-BASIN U4 TO U5C
 678        RM      2      .2      .2
            * DIM   ***** Updated *****

 679        KK     U5
 680        KM   BASIN U5
 681        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 682        KM    L=      3.3  Lca=      1.9   S=  163.2  Kn= .032  LAG=  35.0
 683        KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 684        BA    3.25
 685        LG     .28     .37    6.60     .15    3.00
 686        UI    313.    541.   1299.   1989.   2565.   2906.   2976.   2741.   2195.   1708.
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 687        UI  1339.  1042.   802.   628.   502.   369.   305.   214.   214.    93.
 688        UI    76.    76.    76.    76.    76.     0.     0.     0.     0.     0.
 689        UI     0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
            * DDM   ***** Preserved *****

 690        KK     U5C
 691        KM        COMBINE FLOW FROM U4R WITH SUB-BASIN U5
 692        HC      2
            * DDM   ***** Preserved *****

 693        KK     U5R
 694        KM        ROUTE FLOW FROM U5C THROUGH U7 TO U7C
 695        RM      3     .24     .15
            * DDM   ***** Updated *****

 696        KK     U6
 697        KM   BASIN U6
 698        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 699        KM    L=     1.4  Lca=      .8   S=  315.6  Kn= .041  LAG=  20.7
 700        KM    PHOENIX MOUNTAIN S-GRAPH WAS USED FOR THIS BASIN
 701        BA     .70
 702        LG     .21     .33    7.30     .10   11.00
 703        UI   125.    487.    834.   1165.    715.    557.    424.    299.    236.    161.
 704        UI   126.     88.     63.     56.     27.     22.     22.     22.     22.      0.
 705        UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 706        UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

 707        KK     U6R
 708        KM        ROUTE FLOW FROM SUB-BASIN U6 THROUGH U7 TO U7C
 709        RM      1     .09     .15
            * DDM   ***** Updated *****

 710        KK     U7
 711        KM   BASIN U7
 712        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 713        KM    L=     3.3  Lca=     1.8   S=   49.4  Kn= .025  LAG=  34.1
 714        KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 715        BA    1.47
 716        LG     .35     .25    9.70     .05    1.00
 717        UI   145.    262.    626.    940.   1219.   1360.   1368.   1227.    961.    746.
 718        UI   577.    446.    346.    265.    213.    154.    118.     99.     76.     35.
 719        UI    35.     35.     35.     35.     35.      0.      0.      0.      0.      0.
 720        UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * DDM   ***** Preserved *****

 721        KK     U7C
 722        KM        COMBINE SUB-BASIN U7 WITH U5R AND U6R
 723        KM        CAP OVERCHUTES. ALL UNION HILLS SUB-BASINS COMBINE
 724        HC      3
            * DDM   ***** Preserved *****
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LINE        ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 725        KK     CAP
 726        KM    COMBINE S23G-U7C     (SUBAREAS S1-S23, CLINE CR, RODGER CR & UNION HILLS BASI
 727        KM    COMBINED FLOW AT CAP OVERCHUTES
 728        HC       2
            *  KK CAPR1
            *  KM STORAGE ROUTING FOR PONDING AT CAP OVERCHUTES
            *   (NOT INCLUDED AT THIS TIME)
            *  RS
            *  RV
            *  RQ
            * IDM   ***** Preserved *****

 729        KK   CAPR2
 730        KM    ROUTE CAP OVERFLOW THROUGH S24
 731        RM       3    0.23    0.25
            * IDM   ***** Updated *****

 732        KK     S24
 733        KM   BASIN S24
 734        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 735        KM    L=      1.4  Lca=       .8   S=   38.0  Kn= .026  LAG=  19.0
 736        KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 737        BA     .64
 738        LG     .35     .30    8.00     .09     .00
 739        UI   140.    538.    935.   1070.    844.    535.    336.    212.    135.     82.
 740        UI    47.     28.     28.      0.      0.      0.      0.      0.      0.      0.
 741        UI     0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            * IDM   ***** Preserved *****

 742        KK    S24C
 743        KM   COMBINE S24+CAPR2     (SUBAREAS S1-S24, CLINE CR, RODGER CR & UNION HILLS BASI
 744        KM    COMBINED FLOW AT I-17
 745        HC       2
 746        ZZ
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SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

  43        S1
             V
             V
  54        S1R
             .
             .
  57         .          S2
             .           .
             .           .
  68        S2C............
             .
             .
  71         .          S3
             .           .
             .           .
  82        S3C............
             V
             V
  85        S3R
             .
             .
  88                    S4
             .           .
             .           .
  99         .           .          S5
             .           .           .
             .           .           .
 111         .         S5C...........
             .           V
             .           V
 114         .         S5R
             .           .
             .           .
 117         .           .          S6
             .           .           .
             .           .           .
 128        S6C.......................
             V
             V
 132        S6R
             .
             .
 135         .          S9
             .           V
             .           V
 146         .         S9R
             .           .
             .           .
 149         .           .         S10
             .           .           .
             .           .           .
 160         .           .           .          S7
             .           .           .           .
             .           .           .           .
 170         .           .           .           .          S8
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        .         .         .         .         .
        .         .         .         .         .
180     .         .         .       S8C.........
        .         .         .         V
        .         .         .         V
183     .         .         .       S8CR
        .         .         .         .
        .         .         .         .
186   S10C.......................................
        V
        V
189   S10R
        .
        .
192     .       S13
        .         .
        .         .
203     .         .       S11
        .         .         V
        .         .         V
214     .         .       S11R
        .         .         .
        .         .         .
217     .         .         .       S12
        .         .         .         .
        .         .         .         .
228     .         .       S12C.........
        .         .         .
        .         .         .
231   S13C.......................
        V
        V
234   S13CR
        .
        .
237     .       S14
        .         .
        .         .
247     .         .     X1SUB
        .         .       V
        .         .       V
257     .         .     XROX2
        .         .         .
        .         .         .
260     .         .         .     X2SUB
        .         .         .         .
        .         .         .         .
270     .         .     XCO-1.........
        .         .       V
        .         .       V
273     .         .     XROX3
        .         .         .
        .         .         .
276     .         .         .     X3SUB
        .         .         .         .
        .         .         .         .
286     .         .     XCO-2.........
        .         .         .
        .         .         .
289     .         .         .     X4SUB
        .         .         .         .
        .         .         .         .
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298   .     .     XCO-3............
      .     .       .
      .     .       .
301   .     .       .     X5SUB
      .     .       .       .
      .     .       .       .
310   .     .     XCO-4............
      .     .       .
      .     .       .
314   .     .       .     SUBC1
      .     .       .       V
      .     .       .       V
323   .     .       .     CRO-1
      .     .       .       .
      .     .       .       .
326   .     .       .       .     SUBC2
      .     .       .       .       .
      .     .       .       .       .
336   .     .       .       .       .     SUBC3
      .     .       .       .       .       .
      .     .       .       .       .       .
346   .     .       .       .       .       .     SUBC4
      .     .       .       .       .       .       V
      .     .       .       .       .       .       V
356   .     .       .       .       .       .     CRO-2
      .     .       .       .       .       .       .
      .     .       .       .       .       .       .
359   .     .       .       .       .       .       .       SUBC5
      .     .       .       .               .       .         .
      .     .       .       .       .       .       .         .
369   .     .       .       .       .       .     CCO-1............
      .     .       .       .       .       .       V
      .     .       .       .       .       .       V
372   .     .       .       .       .       .     CRO-3
      .     .       .       .       .       .       .
      .     .       .       .       .       .       .
375   .     .       .     CCO-2.......................................
      .     .       .       V
      .     .       .       V
378   .     .       .     CRO-4
      .     .       .       .
      .     .       .       .
381   .     .       .       .     SUBC7
      .     .       .       .       V
      .     .       .       .       V
391   .     .       .       .     CRO-5
      .     .       .       .       .
      .     .       .       .       .
394   .     .       .       .       .     SUBC8
      .     .       .       .       .       .
      .     .       .       .       .       .
404   .     .       .       .     CCO-3............
      .     .       .       .       .
      .     .       .       .       .
407   .     .     CCO-4.......................
      .     .       V
      .     .       V
410   .     .     CRO-6
      .     .       .
      .     .       .
413   .     .       .     SUBC9
      .     .       .       .
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          .         .         .         .
423       .         .      CCO-5.........
          .         .         V
          .         .         V
426       .         .      CLINER
          .         .         .
          .         .         .
429     S14C.......................
          V
          V
432     S14CR
          .
          .
435       .       S15
          .         V
          .         V
445       .      S15R
          .         .
          .         .
448       .         .        R1
          .         .         V
          .         .         V
458       .         .      RO-1
          .         .         .
          .         .         .
461       .         .         .        R2
          .         .         .         .
          .         .         .         .
472       .         .      CO-1.........
          .         .         V
          .         .         V
475       .         .      RO-2
          .         .         .
          .         .         .
478       .         .         .        R3
          .         .         .         .
          .         .         .         .
489       .         .      CO-2.........
          .         .         .
          .         .         .
492       .         .         .       S16
          .         .         .         .
          .         .         .         .
502     S16C.......................................
          V
          V
505     S16CR
          .
          .
508       .       S21
          .         .
          .         .
519     S21C............
          .
          .
522       .       S17
          .         V
          .         V
533       .      S17R
          .         .
          .         .
536       .         .      S18
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            .          .          .
            .          .          .
547         .       S18C...........
            .          V
            .          V
550         .       S18CR
            .          .
            .          .
553         .          .       S19
            .          .          .
            .          .          .
563         .       S19C...........
            .          V
            .          V
566         .       S19CR
            .          .
            .          .
569         .          .       S20
            .          .          .
            .          .          .
580         .       S20C...........
            .          .
            .          .
583      S21C2...........
            V
            V
586      S21C2R
            .

589         .       S22
            .          .
            .          .
600      S22C...........
            V
            V
604      S22CR
            .
            .
607         .       S23
            .          .
            .          .
619      S23C...........
            .
            .
623         .       U1
            .          .
            .          .
634         .          .       U2
            .          .          .
            .          .          .
645         .          .          .       U3
            .          .          .          .
            .          .          .          .
656         .       U3C.......................
            .          V
            .          V
659         .       U3R
            .          .
            .          .
662         .          .       U4
            .          .          .
            .          .          .
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673          .        U4C...........
             .         V
             .         V
676          .        U4R
             .         .
             .         .
679          .         .        U5
             .         .         .
             .         .         .
690          .        U5C...........
             .         V
             .         V
693          .        U5R
             .         .
             .         .
696          .         .        U6
             .         .         V
             .         .         V
707          .         .       U6R
             .         .         .
             .         .         .
710          .         .         .        U7
             .         .         .         .
             .         .         .         .
721          .        U7C.......................
             .         .
             .         .
725        CAP...........
             V
             V
729       CAPR2
             .
             .
732          .        S24
             .         .
             .         .
742       S24C...........
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(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

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*                                      *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*            MAY  1991                 *
*          VERSION 4.0.1E              *
*                                      *
* RUN DATE 00/02/ 20  TIME  00:55:05   *
*                                      *
****************************************
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****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*        609 SECOND STREET             *
*      DAVIS, CALIFORNIA 95616         *
*         (916) 756-1104               *
*                                      *
****************************************
```

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

SKUNK CREEK FOODPLAIN DELINEATION STUDY
CAP AQUEDUCT THROUGH TOWN OF NEW RIVER

100-YEAR 24-HOUR FLOOD HYDROLOGY

METHODS OF STUDY:
- FCD STORM PATTERNS
- FCD PHOENIX AREA S-GRAPHS
- GREEN-AMPT LOSSES
- MUSKINGUM STREAM ROUTING
- FCD DDMS PROGRAM (VER 1.1, AUG 1995) USED TO COMPUTE PARAMETERS

INPUT FILE NAME - SC100Y24.DAT

MONTGOMERY WATSON
MARCH 1996

IDM MOUHP2 SKUNK CREEK FOODPLAIN DELINEATION STUDY

```
 23 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     5JAN96  STARTING DATE
                  ITIME       0000  STARTING TIME
                     NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE     6JAN96  ENDING DATE
                 NDTIME       0055  ENDING TIME
                  ICENT         19  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         ACRE-FEET
            SURFACE AREA           ACRES
            TEMPERATURE            DEGREES FAHRENHEIT
```

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	S1	2911.	12.17	389.	102.	98.	2.03		
ROUTED TO	S1R	2737.	12.50	388.	102.	98.	2.03		
HYDROGRAPH AT	S2	1738.	12.17	240.	63.	61.	1.17		
2 COMBINED AT	S2C	3760.	12.33	619.	162.	156.	3.25		
HYDROGRAPH AT	S3	1415.	12.17	179.	46.	45.	1.03		
2 COMBINED AT	S3C	4899.	12.25	788.	206.	198.	4.28		
ROUTED TO	S3R	4664.	12.58	788.	206	198.	4.28		
HYDROGRAPH AT	S4	1295.	12.17	161.	40.	39.	0.97		
HYDROGRAPH AT	S5	2007.	12.25	307.	77.	74.	1.85		
2 COMBINED AT	S5C	3169.	12.25	461.	115.	111.	2.82		
ROUTED TO	S5R	2936.	12.67	461.	115.	111.	2.82		
HYDROGRAPH AT	S6	1339.	12.17	179.	45.	44.	0.94		
3 COMBINED AT	S6C	7840.	12.58	1365.	350.	337.	8.04		
ROUTED TO	S6R	7610.	12.75	1365.	350.	337.	8.04		
HYDROGRAPH AT	S9	1254.	12.17	169.	42.	41.	1.02		
ROUTED TO	S9R	1209.	12.42	169.	42.	41.	1.02		
HYDROGRAPH AT	S10	2350.	12.17	297.	74.	71.	1.80		
HYDROGRAPH AT	S7	1061.	12.17	146.	37.	36.	0.68		

HYDROGRAPH AT							
	S8	1650.	12.17	186.	47.	45.	1.12
2 COMBINED AT							
	S8C	2685.	12.17	327.	83.	80.	1.80
ROUTED TO							
	S8CR	2567.	12.33	327.	83.	80.	1.80
4 COMBINED AT							
	S10C	9741.	12.50	2042.	520.	501.	12.66
ROUTED TO							
	S10R	9693.	12.67	2042.	520.	501.	12.66
HYDROGRAPH AT							
	S13	1734.	12.17	249.	71.	69.	1.27
HYDROGRAPH AT							
	S11	1161.	12.17	153.	38.	37.	0.92
ROUTED TO							
	S11R	1104.	12.42	153.	38.	37.	0.92
HYDROGRAPH AT							
	S12	1307.	12.25	190.	48.	46.	0.91
2 COMBINED AT							
	S12C	2246.	12.33	338.	85.	82.	1.83
3 COMBINED AT							
	S13C	11811.	12.50	2536.	652.	629.	15.76
ROUTED TO							
	S13CR	11671.	12.67	2536.	652.	628.	15.76
HYDROGRAPH AT							
	S14	1336.	12.08	177.	52.	50.	0.83
HYDROGRAPH AT							
	X1SUB	1216.	12.00	147.	40.	39.	0.61
ROUTED TO							
	XROX2	1165.	12.17	147.	40.	39.	0.61
HYDROGRAPH AT							
	X2SUB	824.	12.00	96.	25.	24.	0.43
2 COMBINED AT							
	XCO-1	1933.	12.08	242.	65.	63.	1.04
ROUTED TO							
	XROX3	1772.	12.33	242.	65.	63.	1.04
HYDROGRAPH AT							
	X3SUB	1054.	12.08	119.	30.	29.	0.56
2 COMBINED AT							
	XCO-2	2500.	12.17	358.	94.	91.	1.60
HYDROGRAPH AT							

	X4SUB	613.	12.00	69.	17.	17.	0.28
2 COMBINED AT							
	XCO-3	2890.	12.08	424.	111.	107.	1.88
HYDROGRAPH AT							
	X5SUB	727.	12.00	69.	17.	17.	0.38
2 COMBINED AT							
	XCO-4	3571.	12.08	491.	127.	122.	2.26
HYDROGRAPH AT							
	SUBC1	2369.	12.00	197.	49.	47.	1.26
ROUTED TO							
	CRO-1	1917.	12.50	197.	49.	47.	1.26
HYDROGRAPH AT							
	SUBC2	3033.	12.08	337.	84.	81.	2.19
HYDROGRAPH AT							
	SUBC3	1990.	12.08	194.	49.	47.	1.24
HYDROGRAPH AT							
	SUBC4	3948.	12.08	390.	97.	94.	2.54
ROUTED TO							
	CRO-2	3600.	12.33	390.	97.	94.	2.54
HYDROGRAPH AT							
	SUBC5	5426.	12.08	559.	147.	141.	3.39
2 COMBINED AT							
	CCO-1	7632.	12.08	925.	238.	230.	5.93
ROUTED TO							
	CRO-3	7189.	12.33	925.	238.	230.	5.93
4 COMBINED AT							
	CCO-2	10883.	12.25	1556.	396.	382.	10.62
ROUTED TO							
	CRO-4	10520.	12.50	1556.	396.	382.	10.62
HYDROGRAPH AT							
	SUBC7	2311.	12.00	293.	81.	78.	1.20
ROUTED TO							
	CRO-5	1901.	12.75	293.	81.	78.	1.20
HYDROGRAPH AT							
	SUBC8	2543.	12.08	382.	102.	99.	1.42
2 COMBINED AT							
	CCO-3	2818.	12.17	665.	181.	174.	2.62
3 COMBINED AT							
	CCO-4	13884.	12.50	2567.	666.	642.	15.50
ROUTED TO							
	CRO-6	13620.	12.67	2567.	666.	642.	15.50

HYDROGRAPH AT							
	SUBC9	915.	12.17	112.	29.	28.	0.58
2 COMBINED AT							
	CCO-5	13747.	12.67	2659.	691.	665.	16.08
ROUTED TO							
	CLINER	13687.	12.75	2659.	691.	665.	16.08
3 COMBINED AT							
	S14C	24427.	12.67	5120.	1329.	1281.	32.67
ROUTED TO							
	S14CR	23990.	13.00	5120.	1329.	1281.	32.67
HYDROGRAPH AT							
	S15	1564.	12.17	209.	58.	55.	0.99
ROUTED TO							
	S15R	1528.	12.25	209.	58.	55.	0.99
HYDROGRAPH AT							
	R1	2636.	12.17	406.	111.	107.	1.56
ROUTED TO							
	RO-1	2487.	12.42	406.	111.	107.	1.56
HYDROGRAPH AT							
	R2	3120	12.17	471.	128.	123.	1.98
2 COMBINED AT							
	CO-1	4800.	12.25	865.	235.	227.	3.54
ROUTED TO							
	RO-2	4536.	12.67	865.	235.	227.	3.54
HYDROGRAPH AT							
	R3	2074.	12.25	357.	103.	100.	1.59
2 COMBINED AT							
	CO-2	5624.	12.58	1206.	334.	322.	5.13
HYDROGRAPH AT							
	S16	1930.	12.08	208.	52.	50.	1.32
4 COMBINED AT							
	S16C	27332.	12.92	6394.	1682.	1620.	40.11
ROUTED TO							
	S16CR	26483.	13.42	6394.	1681.	1619.	40.11
HYDROGRAPH AT							
	S21	2946.	12.25	506.	127.	122.	2.22
2 COMBINED AT							
	S21C	26688.	13.33	6794.	1781.	1715.	42.33
HYDROGRAPH AT							
	S17	1422.	12.25	207.	52.	50.	1.03
ROUTED TO							
	S17R	1332.	12.58	207.	52.	50.	1.03

HYDROGRAPH AT						
	S18	2537.	12.25	397.	99.	96.	1.71
2 COMBINED AT						
	S18C	3343.	12.33	596.	149.	143.	2.74
ROUTED TO						
	S18CR	3305.	12.33	596.	149.	143.	2.74
HYDROGRAPH AT						
	S19	1368.	12.08	176.	45.	43.	0.77
2 COMBINED AT						
	S19C	4239.	12.25	763.	192.	185.	3.51
ROUTED TO						
	S19CR	3991.	12.58	763.	192.	185.	3.51
HYDROGRAPH AT						
	S20	1900.	12.25	305.	79.	76.	1.27
2 COMBINED AT						
	S20C	5257.	12.42	1054.	267.	257.	4.78
2 COMBINED AT						
	S21C2	27733.	13.33	7634.	1994.	1920.	47.11
ROUTED TO						
	S21C2R	27283.	13.58	7634.	1993.	1920.	47.11
HYDROGRAPH AT						
	S22	1987.	12.17	238.	59.	57.	1.47
2 COMBINED AT						
	S22C	27283.	13.58	7824.	2040.	1965.	48.58
ROUTED TO						
	S22CR	26498.	14.17	7807.	2034.	1959.	48.58
HYDROGRAPH AT						
	S23	2027.	12.42	401.	100.	97.	1.72
2 COMBINED AT						
	S23C	26513.	14.17	8116.	2111.	2034.	50.30
HYDROGRAPH AT						
	U1	3481.	12.25	616.	161.	155.	2.53
HYDROGRAPH AT						
	U2	2119.	12.33	414.	107.	103.	1.60
HYDROGRAPH AT						
	U3	1138.	12.25	165.	44.	42.	0.84
3 COMBINED AT						
	U3C	6584.	12.25	1170.	305.	294.	4.97
ROUTED TO						
	U3R	6303.	12.50	1170.	305.	294.	4.97
HYDROGRAPH AT						

U4	3846.	12.25	548.	145.	140.	2.80
2 COMBINED AT						
U4C	9151.	12.33	1662.	436.	420.	7.77
ROUTED TO						
U4R	8782.	12.58	1662.	436.	420.	7.77
HYDROGRAPH AT						
U5	3759.	12.33	565.	145.	139.	3.25
2 COMBINED AT						
U5C	11462.	12.50	2153.	561.	541.	11.02
ROUTED TO						
U5R	10980.	12.75	2153.	561.	541.	11.02
HYDROGRAPH AT						
U6	1121.	12.08	152.	41.	39.	0.70
ROUTED TO						
U6R	1075.	12.17	152.	41.	39.	0.70
HYDROGRAPH AT						
U7	1991.	12.25	346.	87.	84.	1.47
3 COMBINED AT						
U7C	12209.	12.67	2578.	671.	646.	13.19
2 COMBINED AT						
CAP	26747.	14.17	10252.	2669.	2571.	63.49
ROUTED TO						
CAPR2	26544.	14.33	10251.	2668.	2570.	63.49
HYDROGRAPH AT						
S24	1113.	12.08	128.	32.	31.	0.64
2 COMBINED AT						
S24C	26544.	14.33	10353.	2694.	2594.	64.13

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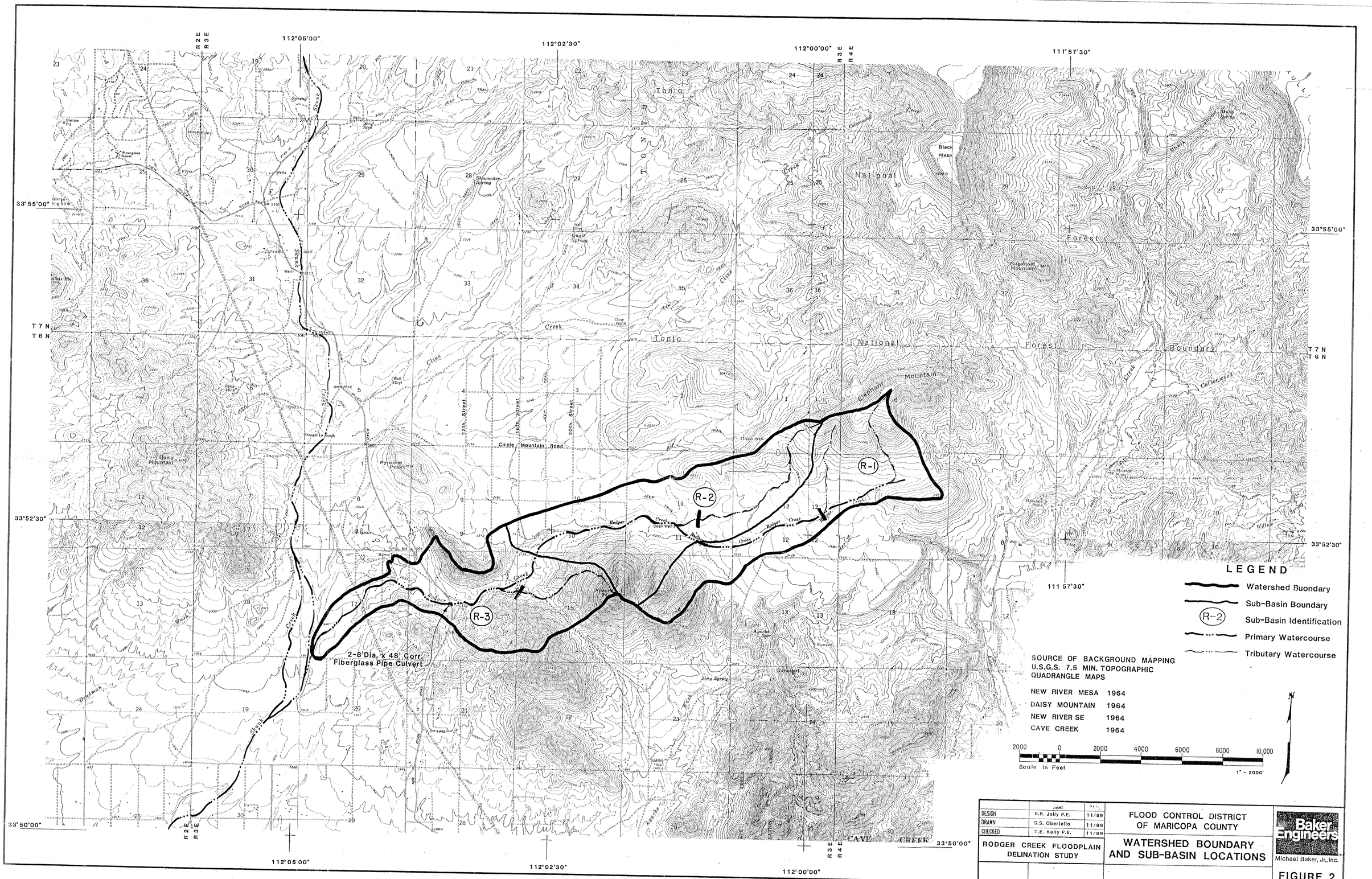


	name	date
DESIGN	B.R. Jolly P.E.	11/89
DRAWN	S.S. Obertello	11/89
CHECKED	T.E. Kelly P.E.	11/89

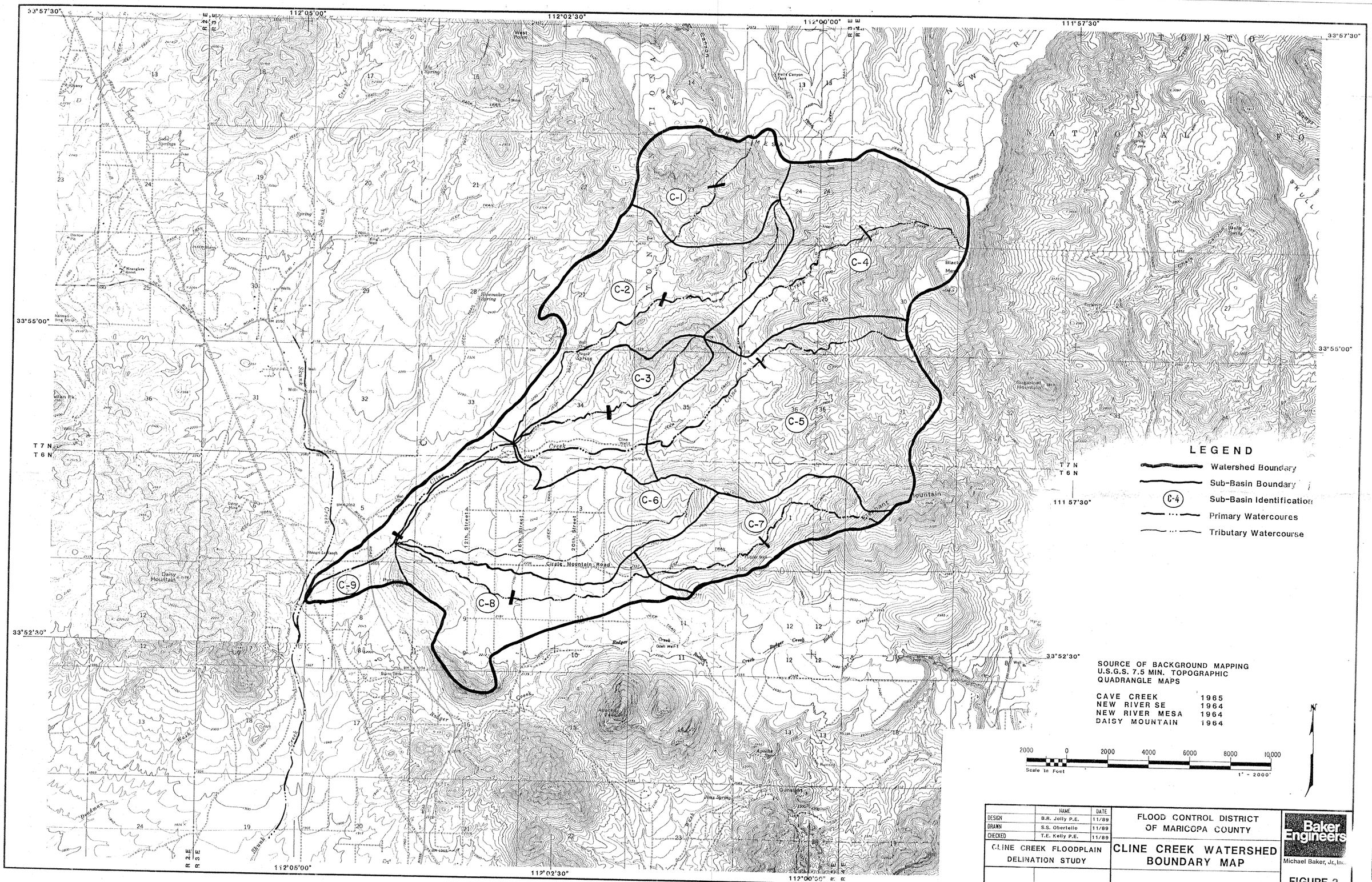
RODGER CREEK FLOODPLAIN DELINATION STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

WATERSHED BOUNDARY AND SUB-BASIN LOCATIONS

Baker Engineers
Michael Baker, Jr., Inc.

FIGURE 2



	NAME	DATE
DESIGN	B.R. Jolly P.E.	11/89
DRAWN	S.S. Obertello	11/89
CHECKED	T.E. Kelly P.E.	11/89

CLINE CREEK FLOODPLAIN DELINATION STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

CLINE CREEK WATERSHED BOUNDARY MAP

Baker Engineers
Michael Baker, Jr., Inc.

FIGURE 3

SOURCE OF BACKGROUND MAPPING :
McLain Harbers Co. Inc.
Aerial Mapping & Surveying
Tucson Arizion.
Based upon information provided by
Baker Engineers, Phoenix Arizona .

	NAME	DATE
DESIGN	T.E. Kelly P.E.	12/89
DRAWN	S.S. Sbertello	12/89
CHECKED	B.R. Jolly P.E.	12/89

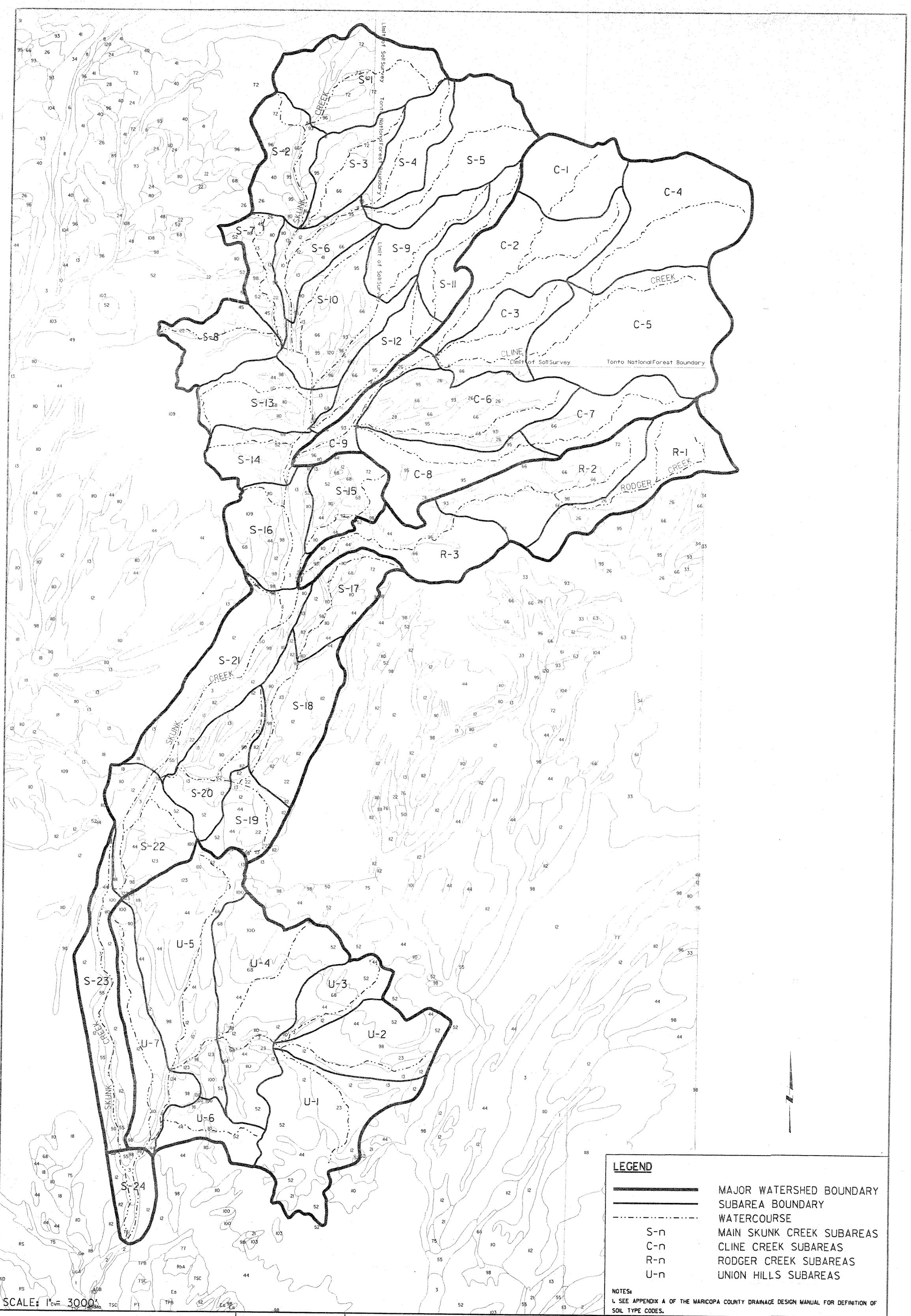
CLINE CREEK FLOODPLAIN DELINEATION STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

BASIN X WATERSHED BOUNDARY MAP

Baker Engineers
Michael Baker, Jr., Inc.

FIGURE 4



MONTGOMERY WATSON
Phoenix, Arizona

WARNING
0 ½ 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

SKUNK CREEK FLOODPLAIN DELINEATION STUDY

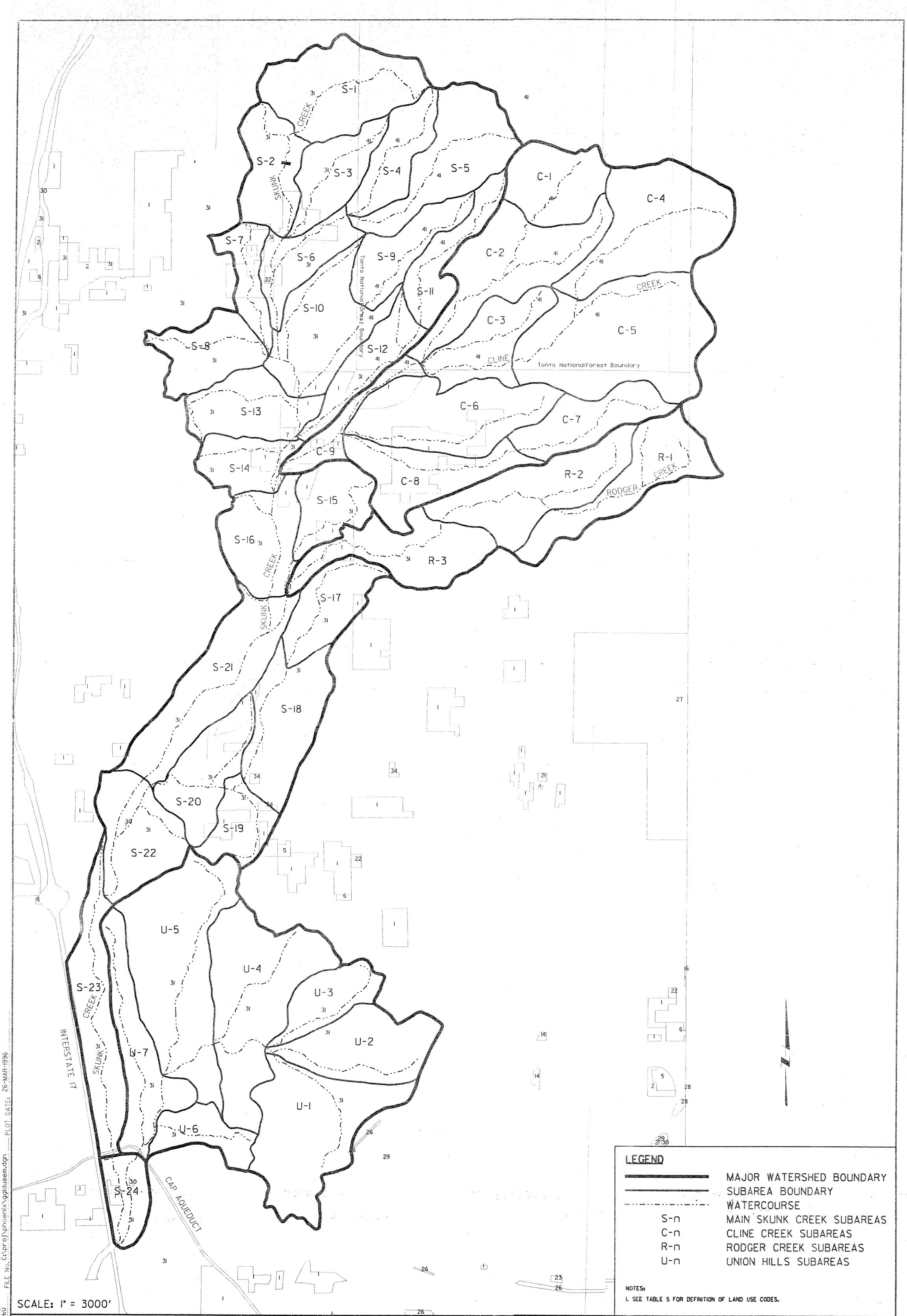
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FIGURE 3

SOILS MAP

SOURCE: MARICOPA COUNTY GEOGRAPHIC INFORMATION SYSTEM

JOB No. 1213.0060 FILE No. C:\proj\phoenix\ggsoilm.dgn PLOT DATE: 26-MAR-1996



MONTGOMERY WATSON
Phoenix, Arizona

WARNING
0 1/2
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

SKUNK CREEK FLOODPLAIN DELINEATION STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

FIGURE 4

EXISTING LANDUSE MAP

SOURCE: MARICOPA COUNTY GEOGRAPHIC INFORMATION SYSTEM

JOB No. 1213.0060 FILE No. G:\proj\phoenix\ggldusem.dgn PLOT DATE: 26-MAR-1996

Appendix E

MONTGOMERY WATSON

3.0 INTRODUCTION

Montgomery Watson as prime contractor, in association with Hoskin Engineering Consultants, was retained by the Flood Control District of Maricopa County (District) to prepare a re-delineation of the Skunk Creek floodplain from the Central Arizona Project (CAP) Aqueduct upstream a distance of approximately 13.1 river miles. The study effort includes Data Collection, Hydrology, Hydraulic Analysis, and Floodplain Delineation tasks.

3.0.1 Purpose of Addendum

A Hydrology Report has been previously submitted to, and accepted by, the District in support of proposed peak discharges to be used for the study reach. This addendum is submitted to address changes in the hydrology that have resulted since that report was completed. Flow changes are the result of the detailed hydraulic analysis which has determined that a flow diversion can occur within the study reach upstream of the Carefree Highway.

3.0.2 Description of Flow Diversion

During the course of hydraulic modeling, it was discovered that a portion of the flow, from the 100-year flow event within the Skunk Creek, has the potential to diverge into the right overbank from Cross Section 17.48 downstream to the Carefree Highway (Cross Section 16.87). An island would be formed by the resulting flow split between the main channel flow and the right overbank. At the Carefree Highway, flow within the right overbank would remain separated from the main channel flow, and would either pass underneath the highway through a triple barrel 42-inch corrugated metal pipe (CMP) or weir over the highway embankment. After flowing over the highway, any flow within the right overbank would be unable to rejoin the main channel and would be lost from the Skunk Creek.

3.0.3 Methodology

The HEC-2 Water Surface Profile model, version 4.6.0 (February 1991) was used to model the floodplain hydraulics for the Skunk Creek. After performing initial model runs, it became apparent that an island, commencing at the Carefree Highway (Cross Section 16.87) and extending upstream to Cross Section 17.30, would be formed by the 100-year peak discharge of 27,300 cfs. A split flow analysis was performed to determine the discharge within the right overbank. The Carefree Highway cross section (i.e., 16.87) was used as a starting point for the right overbank flow model. The main channel model and the right overbank models were separated by encroachment records placed at, or near, the physical high point of flow separation. The discharges in both models were then adjusted so as to compute an equal water surface elevation at the point of flow divergence (Cross Sections 17.30 and 17.48).

A balanced water surface was achieved at both cross sections using a flow split of 23,600 cfs in the main channel and 3,600 cfs in the right overbank. By applying this approach, the water surface elevations within the main channel and the right overbank differ by up to one foot through the reach. At the Carefree Highway the water surface elevation computed for the right overbank is approximately 0.5 feet below that of the main channel. The water surface elevations thus computed would not be sufficient high to cause the flows to recombine. Flow within the right overbank would cross Carefree Highway through a triple barrel 42-inch CMP, and also by weir flow over the highway. After crossing the highway, flow would continue within a watercourse that is unconnected to the Skunk Creek main channel and the flow would thus be lost from the Carefree Highway downstream to the CAP overchutes, which form the lower limit of this study.

Hydrology proposed for this study of the Skunk Creek was prepared using the HEC-1 Flood Hydrograph Package program, version 4.0.1 (May 1991), as explained in detail in the "Skunk Creek

Floodplain Delineation Study Hydrology Report". In order to assess the impact of the flow diversion on the lower reaches of the Skunk Creek, the originally proposed HEC-1 model was modified to include the 3,600 cfs diversion out of the watershed at the Carefree Highway. No change in discharges result upstream of Cross Section 17.48. A comparison of the resulting discharges, as taken from the HEC-1 output summary, are as follows:

Location	HEC-1 Concentration Point	Previously Proposed Discharge (cfs)	Current Proposed Discharge (cfs)
Sta. 17.48 - 3,590 feet upstream of Carefree Highway	S22C	27,283	27,283
Sta. 17.30 - 2,270 feet upstream of Carefree Highway	S22C downstream	27,283	23,636
Upstream of Union Hills watershed	S23C	26,513	23,026
Upstream of CAP canal	CAP	26,747	23,342
Upstream of Interstate 17	S24C	26,544	23,166

3.0.4 Conclusions

The revised discharges proposed for the Skunk Creek Floodplain Delineation Study project area are as follows, with italicized flows representing those that are changed as a result of the analysis described in this Addendum.

Upstream Study Limit	4,900 cfs
At New River Road	7,800 cfs
Upstream of Cline Creek	11,800 cfs
Upstream of Rodger Creek	24,400 cfs
Downstream of Rodger Creek to Sta. 17.48	27,300 cfs
Downstream of Sta. 17.48	*23,600 cfs*
Flow Diversion at Sta. 17.30	*3,600 cfs*
At Carefree Highway	*23,600 cfs*
At CAP Aqueduct	*23,300 cfs*

Adoption of the discharges proposed above will result in a discharge within the lower reaches of the Skunk Creek which is significantly lower than the FEMA regulatory discharge of 35,000 cfs. Reasons for adoption of the lower discharges have been previously discussed in the Skunk Creek Floodplain Delineation Hydrology Report. Any differences between the discharges proposed above and the flood-frequency analysis results for the 100-year peak discharge can be expected to be accentuated since the 3,600 cfs diversion will not occur during more frequent flood events. A change in the skew coefficient for the flood-frequency analysis should thus be anticipated.