CITY OF FONTANA

SOUTH FONTANA MASTER DRAINAGE PLAN

MASTER PLAN DRAINAGE STUDY

FOR

EMPIRE CENTER AREA

FACILITIES:

P1, P2, P3, DZ-1, DZ-2, DZ-2A, DZ-3, DZ-4, DZ-5, DZ-6, & DZ-7

VOLUME NO. 1

PREPARED FOR: THE CITY OF FONTANA

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JN 04339

APPROVED
SN 3/22/05

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INTRODUCTION

Hall & Foreman, Inc. was retained by the City of Fontana, Community Development Department, to conduct a hydrology and hydraulic study for the 1,700-acre Empire Center in south Fontana. The purpose of this study is to evaluate the hydraulic capacity of the existing Jurupa Avenue reinforced concrete box (RCB) storm drain, existing Declez Channel, and the existing Sierra Avenue storm drain; based on an updated hydrology study to reflect the currently adopted Land Use Plan for the City of Fontana. This purpose of the study also includes evaluating the capacity of proposed Master Drainage Plan (MDP) facilities. The results of this study may be used to update the MDP, including Drainage Fees, adopted by the City in 1992.

Adopted Land use changes in this 1,700-acre watershed have greatly increased the runoff. For example, agriculture is now industrial and school is now single family. Consequently, several existing and proposed MDP storm drain facilities are no longer adequate to provide the adopted level of flood protection during the 25-year and 100-year flood events. Providing the required level of protection will also necessitate extending MDP facilities further upstream in the watershed.

OVERVIEW AND DISCUSSION

The existing MDP is based on a Rational Method runoff model for the 25-year and 100-year storm events. This study utilized Civildesign's Rational Method and Unit Hydrograph runoff computer software for those events. Unit hydrograph studies were also conducted for the Jurupa Avenue RCB, which has a tributary drainage area of more than one square mile. Unit hydrograph models are generally used for areas of one square mile or more. However, since the original MDP used the Rational Method, that methodology was retained for this study. Additionally, the unit hydrograph model resulted in higher runoff values. Design of the recommended detention basin for relief of the Jurupa RCB should be based on a unit hydrograph model that is calibrated to match the peak 100-year rational model runoff determined in this study.

An independent hydrology study was prepared based on the City's adopted Land Use Plan. Subareas were defined on the basis of land use and logical development based on the topography and street patterns. The level of protection criteria for establishing the need for MDP facilities is to maintain Q-25 within top of curb, Q-100 within right-of-way, and one 10-foot dry lane for the Q-10 on arterial highways. Facilities designed for less than the 100-year event must still provide 100-year level of protection. In that case, the street section must be able to carry the differential between the 100-year and the design storm selected for the drain. Soil classifications were taken from the San Bernardino County Hydrology Manual. The soil classification is primarily Type B, with limited areas of Type A. Group B soils have a moderate rate of infiltration and runoff, and group A has high infiltration rates and low runoff potential. Soil Groups C and D produce the maximum runoff. Antecedent Moisture Condition (AMC) 2 and 3 were used for the 100-year storm event. AMC 2 was used for the 25-year event.

Civildesign's WSPGW computer software version of Los Angeles County's WSPG (Water Surface Pressure Gradient) program was used for the hydraulic analysis of Declez Channel, Jurupa RCB, and the Sierra Avenue existing MDP facilities. A Manning's "n" value of 0.013 was used for the hydraulic analyses of these facilities.

FINDINGS

1. The existing RCB in Jurupa Avenue is deficient for the 100-year storm event.

2. The existing Sierra Avenue storm drain system is adequate, based on construction of the Sierra Avenue Detention Basin recommended in this Report. The basin will lower the hydraulic grade line in the Jurupa RCB to an elevation that will be compatible with the existing Sierra system.

3. Declez Channel is adequate, based on construction of the Sierra Avenue Detention Basin recommended in this Report. The resulting water surface elevation in the

channel is slightly above the extended channel walls constructed with the Oleander drain. However, this is not a significant issue when the available storage in the extensive upstream drainage facilities, and the short duration of this event are taken into consideration.

4. The adopted Master Drainage Plan requires upsizing, extensions upstream, and the addition of a new facility in Cypress Avenue.

5. Current City Policy requires land developers to provide a storm drain system designed to pickup and convey the 100-year storm event. This policy is in conflict with the criteria established for the Master Drainage Plan. The MDP criteria are essentially in conformance with FEMA regulations for providing 100-year level of protection. This level of protection criteria can be achieved with either a 100-year or 25-year storm drain design. The MDP systems include both 25-year and 100-year systems to achieve these criteria.

RECOMMENDATIONS

1. Construct a Regional Detention Basin adjacent to Sierra Avenue to provide relief for the Jurupa Avenue RCB.

2. The peak 100-year discharge from the Sierra Detention Basin shall be a maximum of 450 cubic feet per second. The hydraulic grade line control for the basin outlet pipe shall be the soffit elevation at the connection to the Jurupa RCB.

3. Consideration should be given for multiple use of the recommended Sierra Regional Detention Basin. Design options could include water quality, and recreational uses in addition to detention.

4. Revise the existing MDP facilities listed below to incorporate the findings of this study:

Line DZ – 2A

(1) Upsize 500 feet of 42-inch MDP to 48-inch.

(2) Upsize 650 feet of 39-inch MPD to42-inch upstream (U/S) of the 48-inch.

Line DZ – 4

(1) Upsize 660 feet of 36-inch MPD to 42-inch in Juniper Avenue.

Line DZ – 4A (New Facility in Cypress Avenue)

(1) Add 750 feet of 42-inch MPD from the Jurupa Avenue RCB U/S.

(2) Add 660 feet of 36-inch MPD U/S from the 42-inch.

Line DZ – 5

(1) Upsize 1,720 feet of MDP 84-inch to 96-inch from Jurupa Avenue U/S.

(2) Upsize 990 feet of MDP 84-inch to 90-inch U/S from 96-inch to Santa Ana Avenue.

(3) Upsize 1,650 feet of MDP 39-inch to 48-inch U/S from Santa Ana Avenue.

(4) Extend 48-inch MDP 1,000 feet U/S to Slover Avenue.

Line DZ – 6

(1) Upsize 660 feet of MDP from 39-inch to 54-inch U/S of Santa Ana Avenue.

(2) Upsize 990 feet of MPD from 39-inch to 48-inch U/S of 54-inch.

(3) Extend MDP 990 feet U/S with 42-inch to Slover Avenue.

Line DZ – 7

(1) Upsize 660 feet of MDP from 42-inch to 54-inch U/S of Santa Ana Avenue.

(2) Extend 990 feet of MDP from 42-inch to 48-inch U/S of 54-inch.

(3) Extend MDP 990 feet U/S with 42-inch to Slover Avenue.

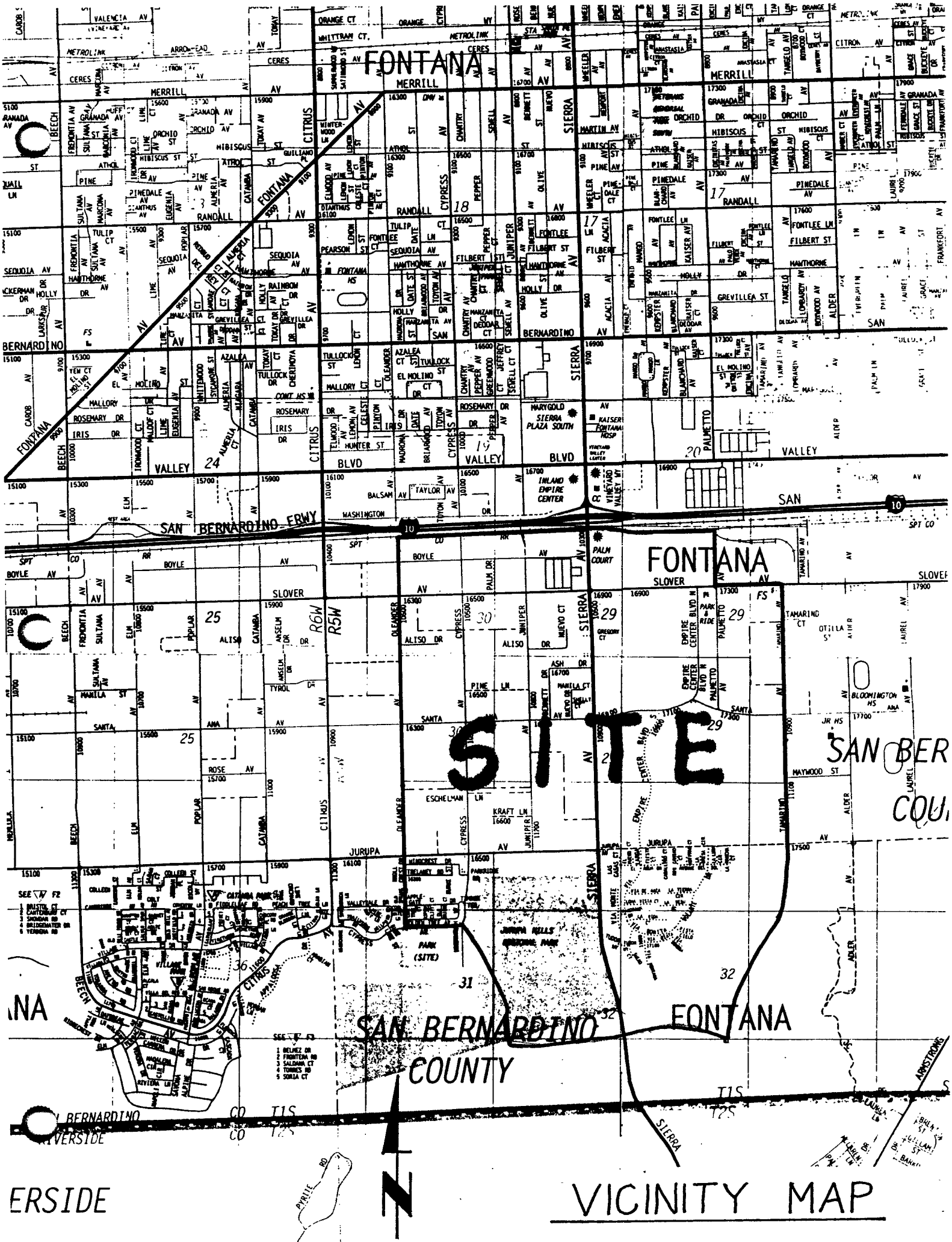
5. Revise the Master Drainage Plan Fees to reflect the changes recommended in this Study.

6. City Staff review Master Drainage Plan design criteria and develop a policy consistent with City land development requirements for storm drains.

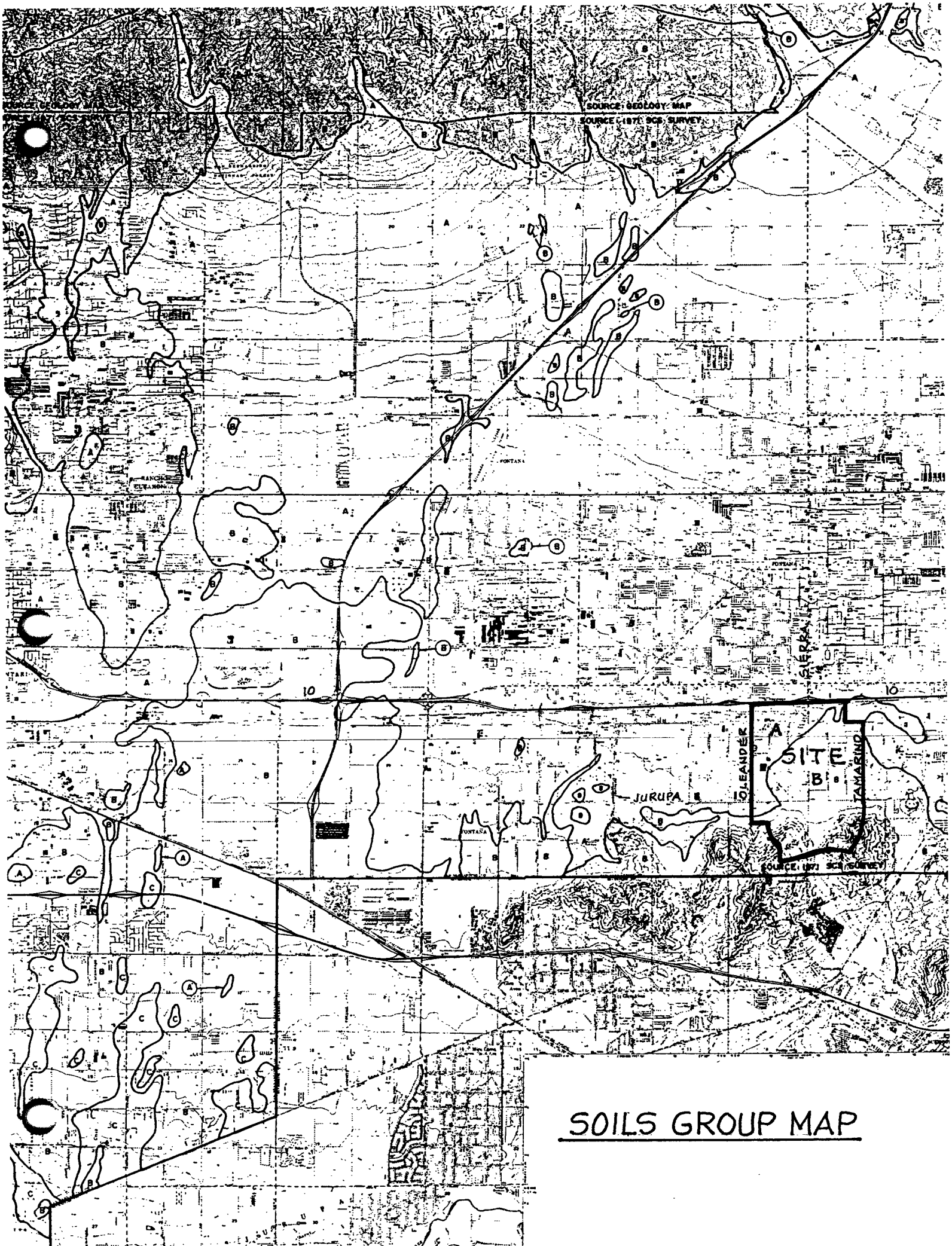
7. Obtain City Council approval and adoption of Master Drainage Plan criteria as recommended by City Staff.

8. Update the entire Master Drainage Plan for South Fontana to reflect the currently adopted City Land Use Plan and City Policy on design criteria.

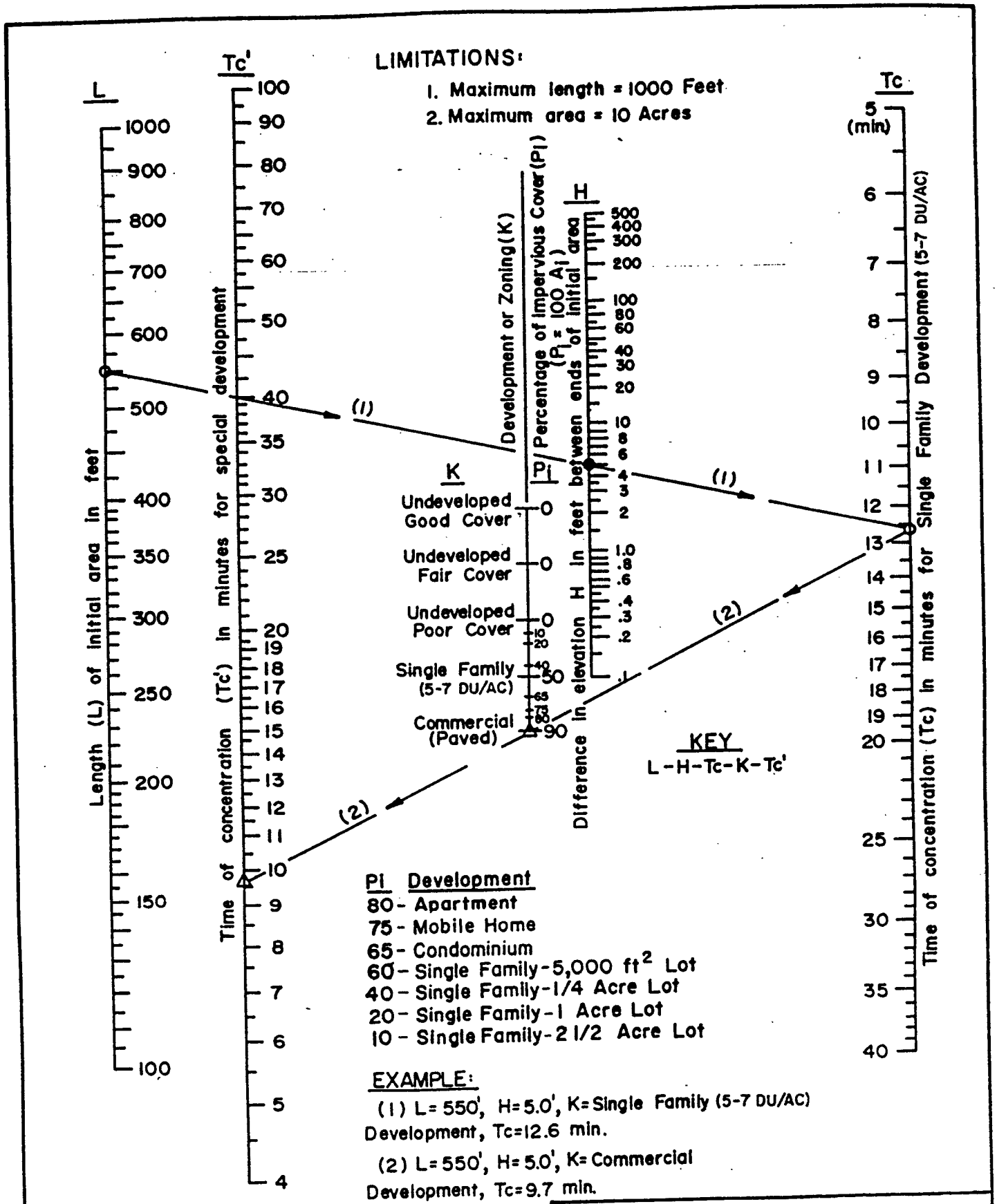
HYDROLOGY



VICINITY MAP



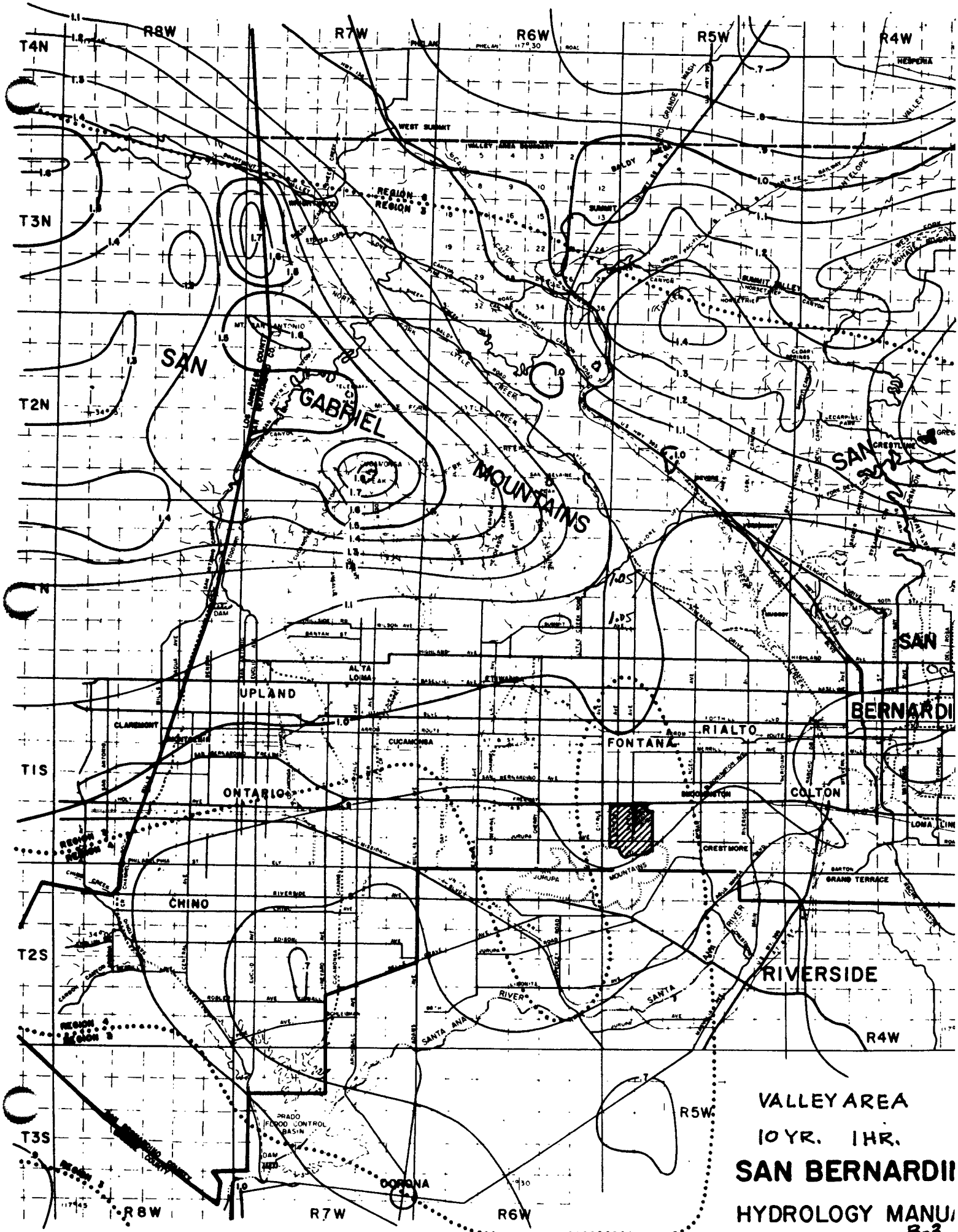
SOILS GROUP MAP

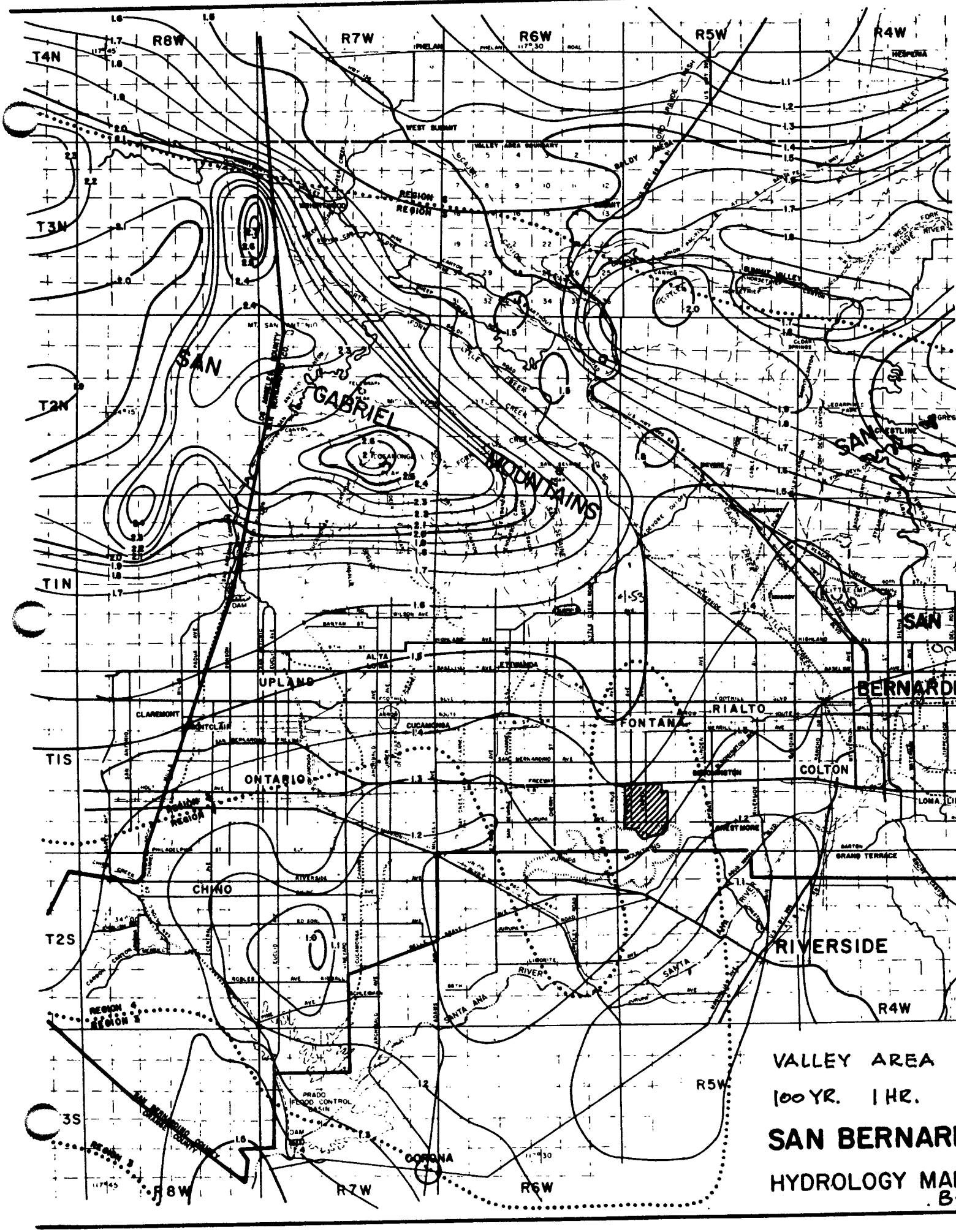


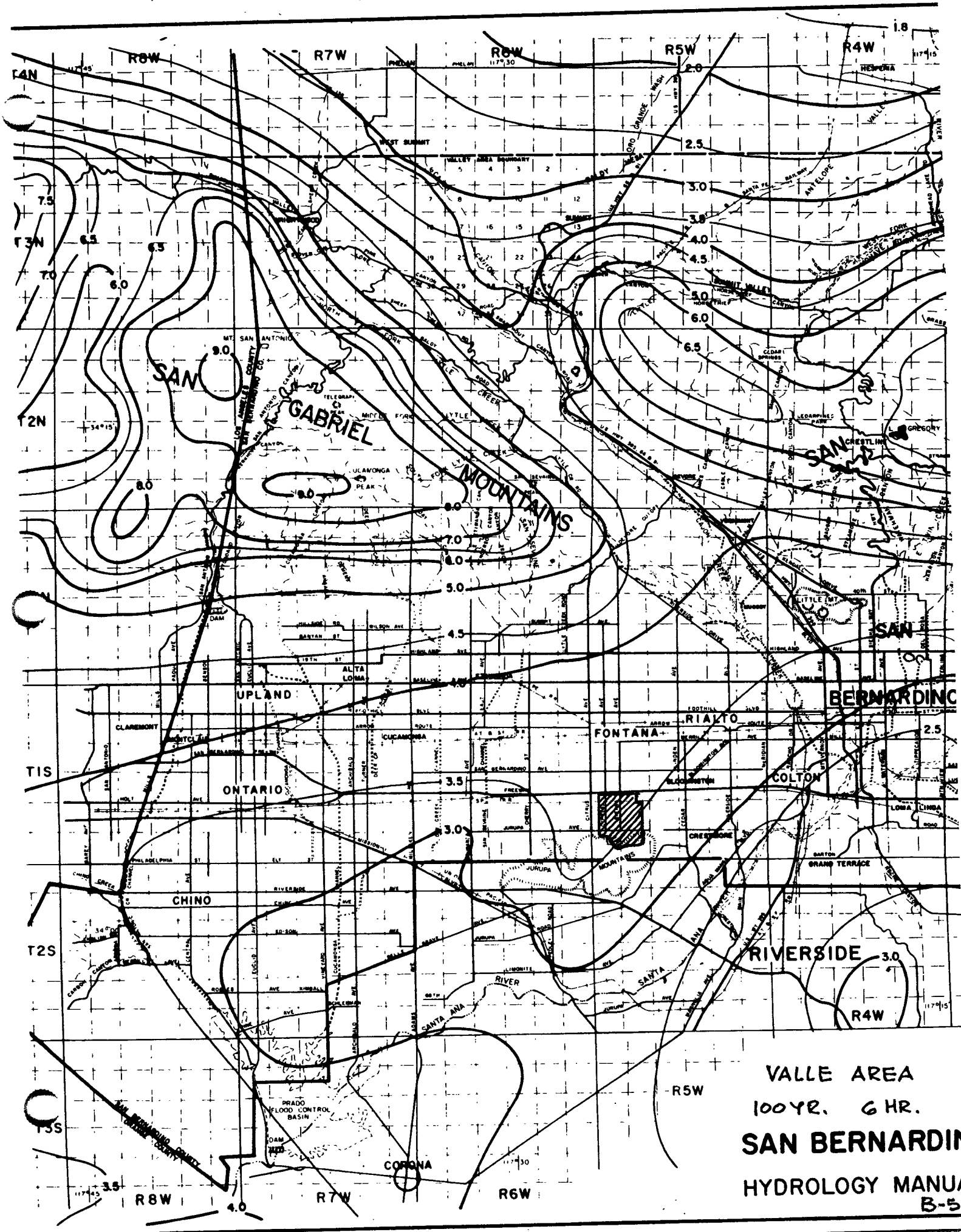
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

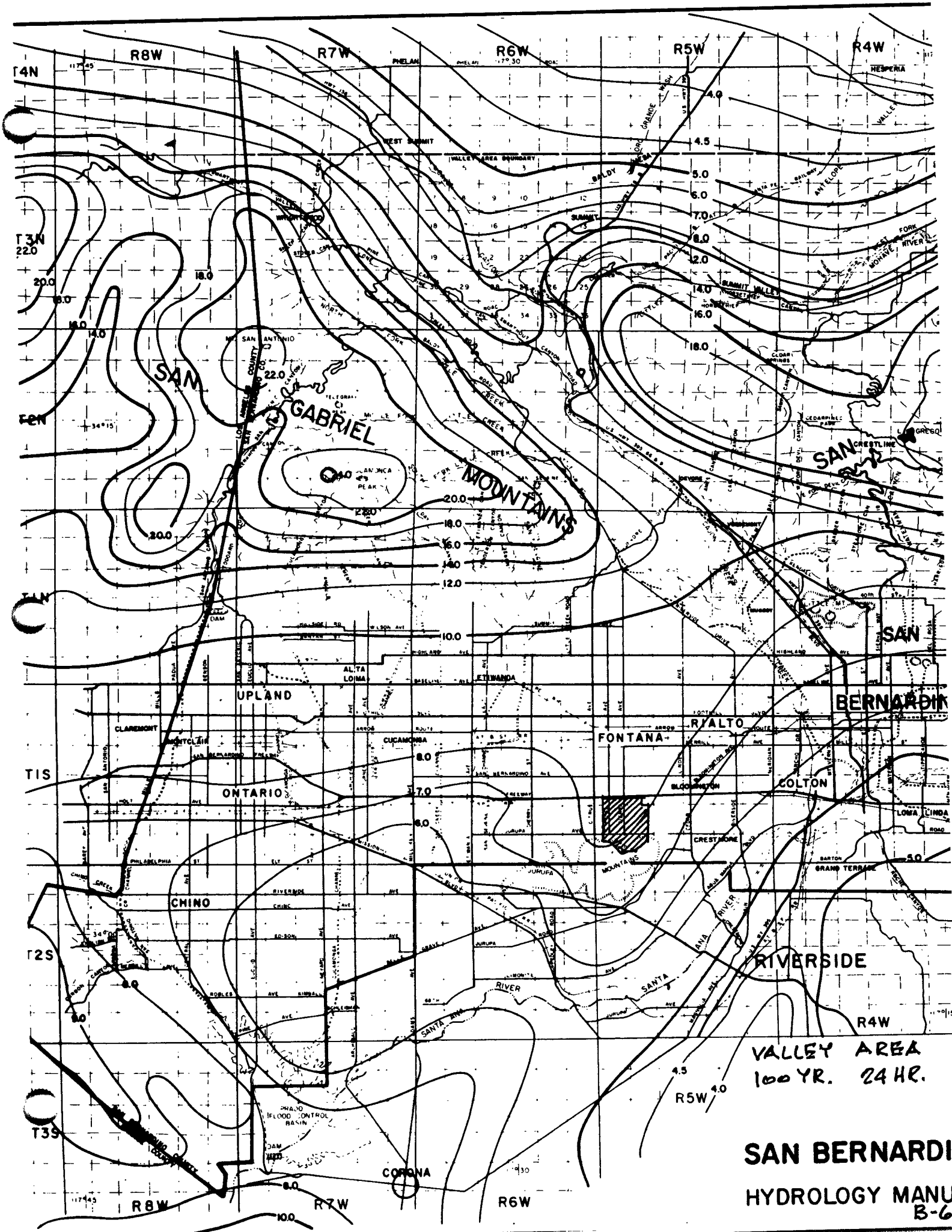
TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1


R8W
R7W
R6W
R5W
R4W
T4N
T3N
T2N
T1N
T1S
T2S
T3S
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
UPLAND
ONTARIO
CHINO
CLAREMONT
ALTA LOMA
CUCAMONGA
FONTANA
RIALTO
COLTON
BERNARDINO
RIVERSIDE
GRAND TERRACE
CRESTMORE
JURUPA MOUNTAINS
SANTA ANA RIVER
PRADO FLOOD CONTROL BASIN
CORONA
VALLEY AREA
10 YR. 1 HR.
SAN BERNARDII
HYDROLOGY MANU
B-3


R8W
R7W
R6W
R5W
R4W
T4N
T3N
T2N
T1N
T1S
T2S
T3S
SAN GABRIEL MOUNTAINS
UPLAND
CLAREMONT
ONTCLIFF
ALTA LOMA
ETIWANDA
CUCAMONGA
FONTANA
RIALTO
COLTON
ONTARIO
CHINO
RIVERSIDE
CORONA
PRADO FLOOD CONTROL BASIN
SANTA ANA RIVER
SANTA ANA
REGION 1
REGION 2
REGION 3
VALLEY AREA
100 YR. 1 HR.
SAN BERNARDI
HYDROLOGY MANU
B-4


R8W
R7W
R6W
R5W
R4W
T4N
T3N
T2N
T1S
T2S
T3S
SAN GABRIEL MOUNTAINS
MT. SAN ANTONIO
UPLAND
ALTA LOMA
CLAREMONT
CUCAMONGA
ONTARIO
CHINO
FONTANA
RIALTO
COLTON
SAN BERNARDINO
RIVERSIDE
GRAND TERRACE
LOMA LINDA
CRESTMORE
JURUPA MOUNTAINS
SANTA ANA RIVER
PRADO FLOOD CONTROL BASIN
CORONA
VALLE AREA
100YR. 6HR.
SAN BERNARDIN
HYDROLOGY MANUA
B-5

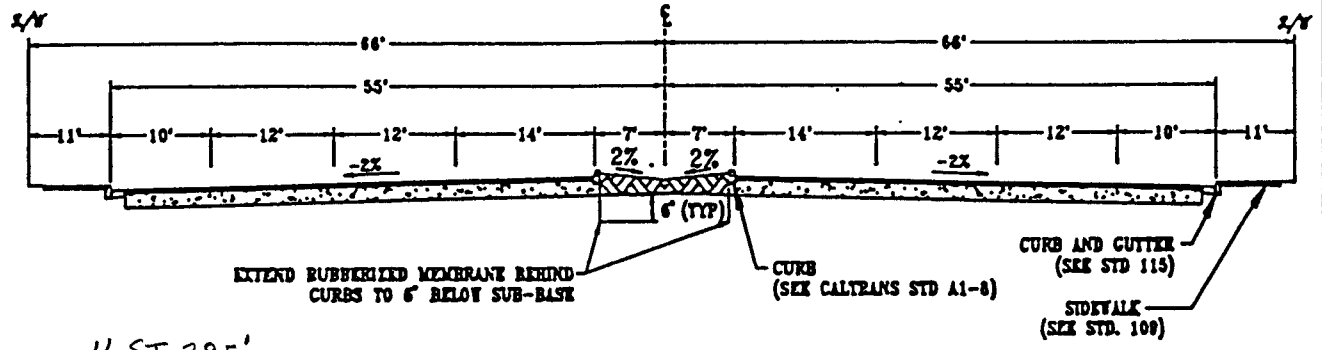


VALLEY AREA
100 YR. 24 HR.

SAN BERNARDI

HYDROLOGY MANU

B-6



1/2 ST. 38.5'
D_{max} = 1.29'
SLOWER

TYPICAL SECTION

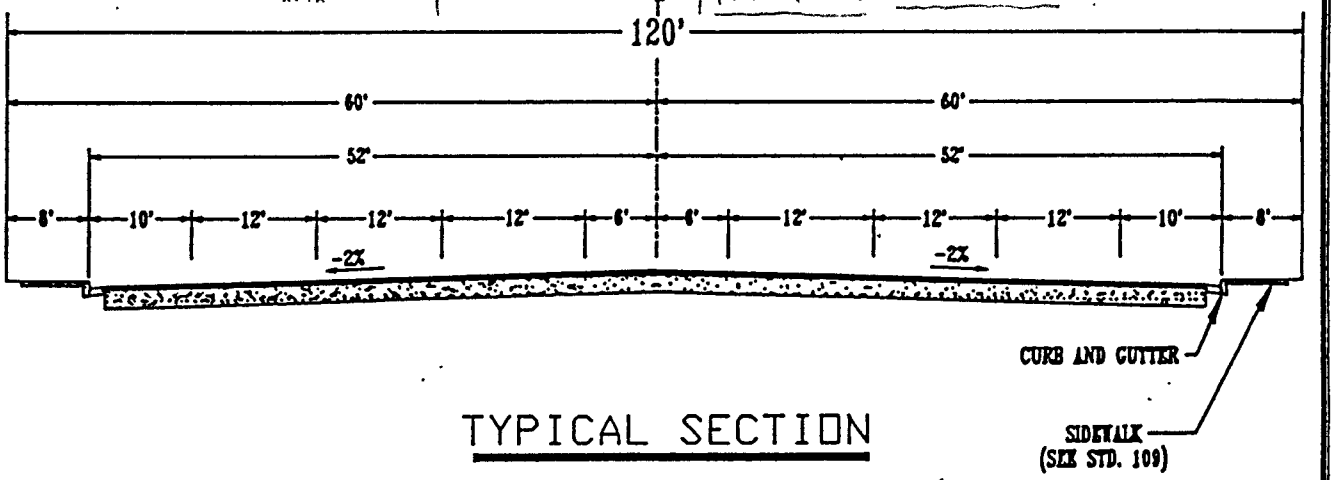
WITH RAISED MEDIAN

D_{max} = 0.94'
SIERRA 1/2 ST. 39' W'LY
= 50' E'LY
D_{max} = 0.94'

JURUPA
N'LY Half = 27' D_{max} = 0.98'
S'LY " = 38' D_{max} = 1.25'

SANTA ANA
D_{max} = 0.92'
1/8 ST = 42'

MIRIGO JUNIPER
PALMETTO CYPRESS
TAMARIND OLEANDER



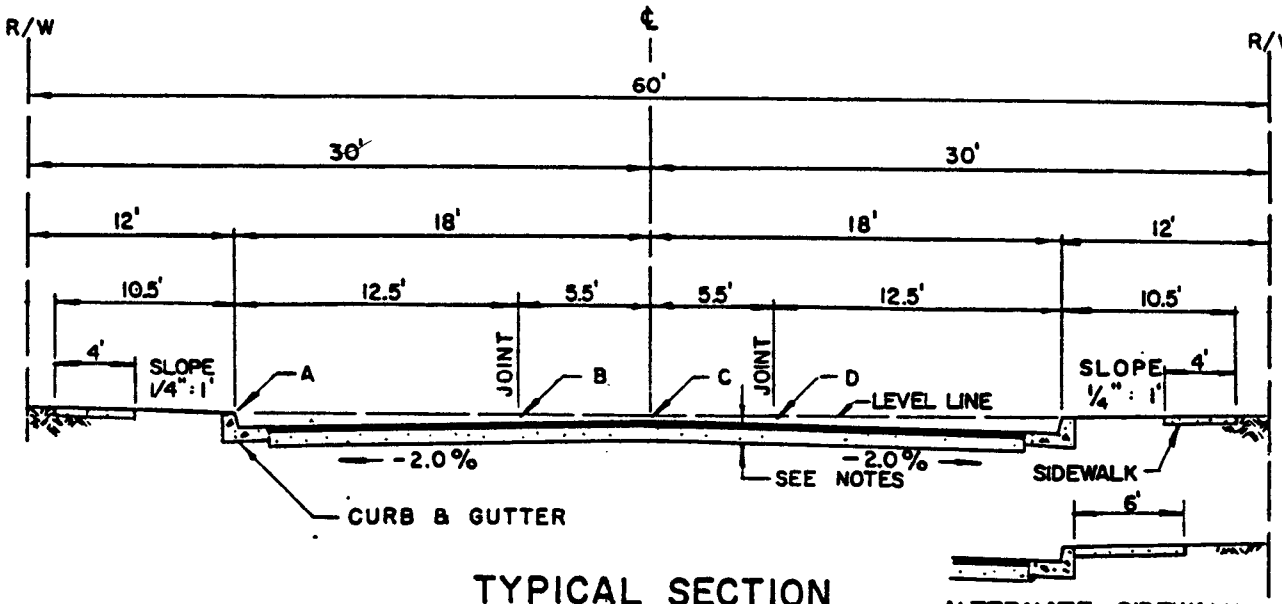
TYPICAL SECTION

WITH CONTINUOUS LEFT TURN LANE

NOTES:

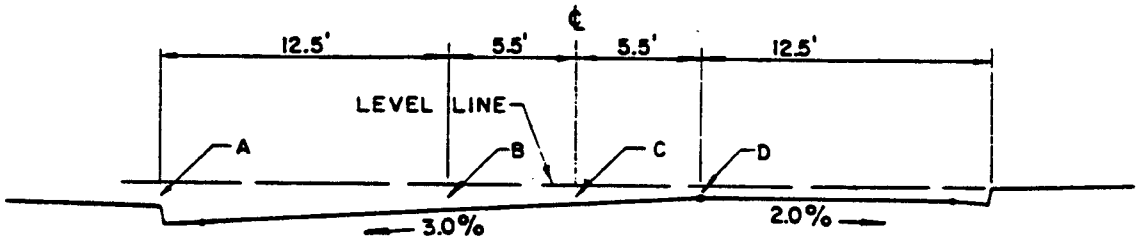
1. STRUCTURAL SECTION OF ROADWAY SHALL BE DETERMINED FROM SOILS TESTS AND SO INDICATED ON CONSTRUCTION PLANS.
2. DRAINAGE FACILITIES SHALL BE PROVIDED TO DEWATER RAISED MEDIAN AREAS.
3. TEN FEET (10') SHOULDER AREAS MAY BE DESIGNATED AS A BIKE LANE AND EMERGENCY PARKING ONLY.
4. IRRIGATION SYSTEM IN MEDIAN AREA SHALL BE DRIP OR BUBBLE SYSTEM.

SAN BERNARDINO COUNTY ROAD DEPARTMENT			
KEN MILLER DIRECTOR OF TRANSPORTATION	**MAJOR ARTERIAL** CHINO HILLS SPECIFIC PLAN AREA	100B



TYPICAL SECTION
LEVEL

ALTERNATE SIDEWALK
(IF SHOWN ON PLAN)



TYPICAL SECTION
TILT

		A	B	C	D
8" CURB	LEVEL	0.00'	0.33'	0.22'	0.33'
	TILT	0.44'	0.66'	0.50'	0.33'
6" CURB	LEVEL	0.00	0.16'	0.05'	0.16'
	TILT	0.44'	0.49'	0.33'	0.16'

$D_{max} = 0.92'$

NOTE

1. STRUCTURAL SECTION OF ROADWAY SHALL BE DETERMINED FROM SOILS TESTS AND SO INDICATED ON CONSTRUCTION PLANS.
2. MINIMUM DESIGN PAVING THICKNESS SHALL BE 0.20' ASPHALT CONCRETE.
3. CONSTRUCTION OUTSIDE R/W WILL REQUIRE SLOPE EASEMENTS
4. WHEN PREPARING SUBGRADE FOR PAVING, CENTERLINE CROWN ON THE "LEVEL SECTION" SHALL BE RELOCATED EITHER LEFT OR RIGHT 0.50' TO MATCH CROWN BREAK IN PAVING MACHINE.

SAN BERNARDINO COUNTY ROAD DEPARTMENT			
DATE: F.V.C. 9-65 Rev. 5-74	John R. Shone COUNTY HIGHWAY ENGINEER	LOCAL STREET	104

Hall & Foreman, Inc.
43513 Ridge Park Drive Temecula, CA 92590
Ph. 909 676-6726 Fax 909 699-0896

To: FONTANA
JN. 04339

	NODE	AREA	Aac	L	ΔH	SOIL
	100 - 101	c A-1	5.0'	960'	1103.0 - 1098.4 = 4.6'	A
	101 - 102	c A-2	5.0'	590'	1098.4 - 1093.6 = 4.8'	B
	102 - 50	24"	—	460'	1085.3 - 1079.5	
	103 - 104	c A-3	5.5'	1,000'	1103.0 - 1098.4 = 4.6'	A
DZ-2 #2	104 - 105	c A-4	9.5'	700'	1098.4 - 1092.2 = 6.2'	A
	105 - 50	30"	—	570'	1083.8 - 1079.5	
	50 - 51	39"	—	1320'	1079.5 - 1071.3	
	106 - 107	I A-5	5.5'	1000'	1093.6 - 1085.4 = 8.2'	B
	107 - 108	I A-6	6.0'	700'	1085.4 - 1078.3 = 7.1	B
	51 - 55	42"	—	900'	1071.3 - 1062.4	
	109 - 110	I A-7	4.5'	1000'	1080.0 - 1073.7 = 6.3'	B
	110 - 111	I A-8	4.0'	350'	1073.7 - 1069.4 = 4.3'	B
	112 - 113	sc A-9	5.5'	800'	1085.3 - 1080.3 = 5.0'	B
	113 - 116	I A-10	11.0'	730'	1080.3 - 1076.6 = 3.7'	B
#1	114 - 115	I A-11	5.5'	1000'	1093.6 - 1084.4 = 9.2'	B
DZ-24'	115 - 116	I A-12	7.0'	600'	1084.4 - 1076.6 = 7.8'	B
	116 - 52	39"	—	650'	1069.6 - 1061.9	
	117 - 118	I A-13	5.0'	1000'	1076.0 - 1071.0 = 5.0'	B
	118 - 119	I A-14	10.0'	420'	1071.0 - 1068.9 = 2.1'	B
	52 - 53	42"	—	500'	1061.9 - 1059.4	

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To: FONTANA
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DZ-2A #1

120-121	1A-15	5.5'	1000'	1072.0 - 1067.0 = 5.0'	B
121-122	1A-16	9.0'	450'	1067.0 - 1064.7 = 2.3'	B
53-54	60"	—	860'	1052.5 - 1048.2	
123-124	1A-17	7.0'	1000'	1064.7 - 1059.7 = 5.0'	
54-55	63"	—	340'	1048.2 - 1046.5 = 1.7'	
125-126	1A-18	5.5'	1000'	1093.2 - 1085.3 = 7.9'	B
126-127	1A-19	12.0'	900'	1085.3 - 1076.3 = 9.0'	B
127-55	30"	—	1000'	1069.3 - 1046.5	
128-129	1A-20	9.0'	1000'	1078.3 - 1069.4 = 8.9'	B
55-56	78"	—	1000'	1046.5 - 1043.3	

DZ-2A

DZ-2 #2

130-131	1A-21	5.5'	1000'	1092.2 - 1084.1 = 8.1'	B
131-132	1A-22	12.0'	900'	1084.1 - 1075.0 = 9.1'	B
132-56	30"	—	1,100'	1068.0 - 1043.3	
133-134	1A-23	5.5'	1,000'	1076.3 - 1070.9 = 5.4'	B
134-135	1A-24	12.0'	800'	1070.9 - 1064.1 = 6.8'	B
56-57	84"	—	640'	1043.3 - 1041.3	
136-137	1A-25	5.5'	1,000'	1091.6 - 1086.6 = 5.0'	B
137-138	1A-26	11.0'	875'	1086.6 - 1074.6 = 12.0'	B
138-57	30"	—	1320'	1067.6 - 1041.3	

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Subject FONTANA
JN 04339

DZ-2 #2

SIERRA AVE. #7

139-140	A-27	5.5'	1,000'	1074.7 - 1069.7 = 5.0'	B
140-141	A-28	11.0'	875'	1069.7 - 1065.3 = 4.4'	B
57-63	87"	—	560'	1041.3 - 1039.5	
200-201	CB-1	5.5'	1,000'	1103.0 - 1098.0 = 5.0'	A
201-202	CB-2	9.5'	670'	1098.0 - 1091.6 = 6.4'	A
202-60	42"	—	555'	1084.6 - 1078.4	
203-204	CB-3	6.5'	1,000'	1103.0 - 1096.0 = 7.0'	A
204-205	CB-4	8.5'	675'	1096.0 - 1090.5 = 5.5'	A
60-61	42"	—	500'	1078.4 - 1076.7	
206-207	CB-5	6.0'	1,000'	1103.0 - 1097.0 = 6.0'	A
207-208	CB-6	10.0'	775'	1097.0 - 1089.3 = 7.7'	A
61-62	48"	—	1320'	1076.7 - 1065.0	
209-210	IB-7	5.5'	1,000'	1090.5 - 1084.5 = 6.0'	A
210-211	IB-8	11.0'	875'	1084.5 - 1076.5 = 8.0'	B
212-213	CB-9	5.0'	1,000'	1092.6 - 1086.0 = 6.6'	A
213-214	CB-10	10.0'	1,000'	1086.0 - 1076.5 = 9.5'	A
62-63	54"	—	1,320'	1065.0 - 1042.2	
215-216	IB-11	5.5'	1,000'	1074.6 - 1071.0 = 3.6'	B
216-217	IB-12	11.0'	875'	1071.0 - 1063.7 = 7.3'	B
63-64	90"	—	1320	1039.1 - 1033.8	
218-219	SB-13	5.0'	1,000'	1065.5 - 1059.0 = 6.5'	B
219-220	SB-14	8.0'	500'	1059.0 - 1056.5 = 2.5'	B
220-221	SB-15	13.0'	660'	1056.5 - 1051.2 = 5.3'	B
64-71	90"	—	660'	1033.8 - 1030.0	
71-89	108"	—	680'	1030.0 - 1025.0	

DZ-2

DZ-1

Hall & Foreman, Inc.
43513 Ridge Park Drive Temecula, CA 92590
Ph. 909 676-6726 Fax 909 699-0896

Subject FONTANA
VN 04339

DZ-1 #3

300-301	IC-1	5.0'	1,000'	1068.1 - 1063.1 = 5.0'	B
301-302	IC-2	14.5'	620'	1063.1 - 1060.0 = 3.1'	B
302-65	36"	—	660'	1055.0 - 1051.7	
303-304	SC-3	8.0'	1,000'	1064.5 - 1060.0 = 5.0'	B
65-66	57"	—	660'	1051.7 - 1048.4	
305-306	SC-4	8.0'	1,000'	1062.0 - 1055.4 = 6.6'	B
307-308	SC-5	5.0'	1,000'	1070.1 - 1065.1 = 5.0'	B
308-309	SC-6	10.0'	650'	1065.1 - 1062.7 = 2.4'	B
309-310	SC-7	15.0'	1,450'	1062.7 - 1055.4 = 7.3'	B
66-67	75"	—	760'	1048.4 - 1044.6	
311-312	SC-8	8.0'	1,000'	1062.4 - 1057.4 = 5.0'	B
312-313	SC-9	8.0'	960'	1057.4 - 1052.6 = 4.8'	B
67-68	84"	—	760'	1044.6 - 1040.8	
324-325	SC-17	8.0'	1,000'	1055.0 - 1050.0 = 5.0'	B
326-327	SC-18	7.0'	1,000'	1055.0 - 1050.0 = 5.0'	B
69-70	102"	—	880'	1038.8 - 1034.6	
328-329	SC-19	5.0'	1,000'	1057.8 - 1052.8 = 5.0'	B
329-330	SC-20	12.0'	800'	1052.8 - 1048.8 = 4.0'	B
330-331	SC-21	17.0'	660'	1048.8 - 1045.5 = 3.3'	B
331-70	42"	—	800'	1038.6 - 1034.6	
332-333	SC-22	5.0'	1,000'	1053.2 - 1048.2 = 5.0'	B
333-334	SC-23	8.0'	520'	1048.2 - 1045.6 = 2.6'	B
335-336	SC-24	6.0'	1,000'	1053.2 - 1048.2 = 5.0'	B
336-337	SC-25	13.0'	520'	1048.2 - 1045.6 = 2.6	B
70-71	102"	—	800'	1034.6 - 1030.6	

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Subject FONTANA
JN 04339

338-339	SC-26	5.0'	1,000'	1056.0 - 1051.0 = 5.0'	B
339-340	SC-27	9.0'	480'	1051.0 - 1048.6 = 2.4'	B
314-315	SC-10	5.0'	1,000'	1079.5 - 1074.5 = 5.0'	B
315-318	SC-11	8.5'	1,000'	1074.5 - 1069.5 = 5.0'	B
316-317	SC-12	5.0'	1,000'	1079.5 - 1074.5 = 5.0'	B
317-318	SC-13	9.0'	1,000'	1074.5 - 1069.5 = 5.0'	B
318-319	SC-14	18.5'	1,300'	1069.5 - 1063.0 = 6.5'	B
319-68	48"	—	900'	1054.8 - 1041.8	
320-321	SC-15	6.5'	1,000'	1057.1 - 1052.1 = 5.0'	B
322-323	SC-16	5.0'	1,000'	1057.1 - 1052.1 = 5.0'	B
68-69	93"	—	400'	1040.8 - 1038.8	
400-401	ND-1	6.0'	1,000'	1850.0 - 1,300 = 550'	B
401-402	ND-2	9.5'	850'	1300.0 - 1087 = 213'	B
402-75	36"	—	550'	1080.0 - 1077.0	
403-404	ND-3	5.5'	1,000'	1,600.0 - 1140.0 = 460'	B
404-405	ND-4	9.0'	470'	1,140.0 - 1085.0 = 55'	B
405-75	36"	—	150'	1,078.0 - 1,077.0 = 1'	
406-408	SD-5	7.5'	1000'	1065.0 - 1055.0 = 10'	B
407-408	SD-6	6.0'	1000'	1065.0 - 1055.0 = 10'	B
75-76	42"	—	550'	1075.0 - 1041.0	
76-80	54"	—	1000'	1047.0 - 1041.3	
80-88	90"	—	1450'	1037.2 - 1031.6	
88-89	96"	—	550'	1031.1 - 1028.8	

FOR CONT. SEE SH. 8

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(6

Subject FONTANA
VN04339

409-410	ND-7	7.5'	1000'	1860.0 - 1460.0 = 400'	B
410-411	ND-8	18.5'	470'	1460.0 - 1300.0 = 160'	B
411-412	ND-9	20.0'	620'	1300.0 - 1180.0 = 120'	B
412-77	30"	—	340'	1152.0 - 1122.5	
413-414	SD-10	4.5'	500'	1163.3 - 1129.0 = 64.3'	B
77-78	39"	—	550'	1122.5 - 1090.5	
415-416	SD-11	7.0'	550'	1129.0 - 1097.0 = 32'	B
417-418	ND-12	10.0'	650'	1420.0 - 1120.0 = 300'	B
78-79	48"	—	900'	1090.5 - 1060.2	
400-420	ND-14	9.5'	1000'	1850.0 - 1320.0 = 530'	B
420-421	ND-15	9.5'	630'	1320.0 - 1140.0 = 180'	B
421-422	ND-16	13.0'	820'	1140.0 - 1064.0 = 76'	B
79-80	54"	—	440'	1052.0 - 1040.2	
423-424	SD-17	9.0'	1000'	1102.5 - 1060.5 = 42'	B
ST. 424-425	SD-18	15.0'	800'	1060.5 - 1049.0 = 11.5'	B
500-501	NE-1	6.0'	1000'	1620.0 - 1350.0 = 270'	B
501-502	NE-2	9.0'	500'	1350.0 - 1180.0 = 170'	B
502-83	24"	—	660'	1167.6 - 1126.0	
503-504	NE-3	10.0'	1000'	1520.0 - 1180.0 = 340'	B
504-505	SE-4	2.0'	660'	1167.6 - 1126.0 = 41.6'	B
83-85	36"	—	450'	1126.0 - 1092.3	

P3 #4

P3 #4

P2 #5

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Subject FONTANA
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518-519	S E-13	8.5'	1000'	1148.0 - 1101.0 = 47'	B
519-520	S E-14	8.5'	900'	1101.0 - 1066.5 = 34.5'	B
521-522	S E-15	5.5'	1000'	1111.0 1101.0 = 10'	B
522-523	S E-16	17.0'	900'	1101.0 - 1066.5 = 34.5	B
86-87	48"	—	445'	1059.3 - 1053.2	
				1031.1 - 1028.9	
524-525	N E-17	9.0'	750'	1072.3 - 1065.0 = 7.3'	B
87-88	54"	—	370'	1050.9 - 1033.6	
506-507	N E-5	8.0'	1000'	2040.0 - 1680.0 = 360'	B
507-508	N E-6	12.0'	580'	1680.0 - 1450.0 = 230'	B
508-509	N E-7	27.5'	1000'	1450.0 - 1140.0 = 310'	B
510-511	N E-8	9.5'	1000'	1560.0 - 1180.0 = 380'	B
511-512	N E-9	24.5'	530'	1180.0 - 1140.0 = 40'	B
512-84	30"	—	450'	1137.5 - 1110.7	
513-514	N E-10	7.0'	1000'	1770.0 - 1460.0 = 310'	B
514-515	N E-11	7.0'	1100'	1460.0 - 1140.0 = 320'	B
515-84	18"	—	280'	1119.1 - 1111.4	
84-85	30"	—	600'	1110.7 - 1092.3	
516-517	S E-12	7.0'	1000'	1148.0 - 1101.0 = 47'	B
85-86	39"	—	950'	1092.3 - 1059.3	
526-527	S E-18	6.5'	1000'	1065.0 - 1060.0 = 5'	B
528-529	S E-19	6.5'	1000'	1065.0 - 1060.0 = 5'	B

SS #2

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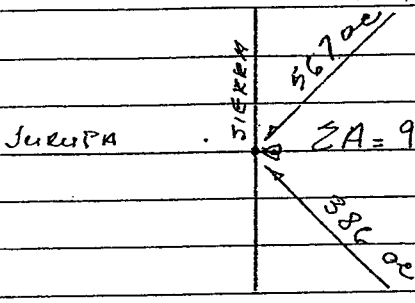
Subject FONTANA
IN04339

BEFORE THIS SEE SH.5

513-530	NE-20	6.0'	1000'	1770.0 - 1380.0 = 390'	B
530-531	NE-21	7.0'	800'	1380-0 - 1120.0 = 260'	B
ST 531-532	NE-22	16.0'	1800'	1120.0 - 1056.0 = 64'	B
533-534	E-23	6.5'	1000'	1064.1 - 1059.1 = 5.0	B
534-535	E-24	5.5'	330'	1059.3 - 1056.2 = 3.1	B



700-701	MG-1	5.0'	1000'	1104.0 - 1096.7 = 7.3'	A
701-702	MG-2	5.0'	330'	1096.7 - 1095.0 = 1.7'	A
702-703	MG-3	10.0'	660'	1095.0 - 1092.0 = 3.0'	A
703-704	MG-4	20.0'	660'	1092.0 - 1082.0 = 10'	A
704-30	39"	—	1000'	1076.0 - 1066.0	
705-706	MG-5	10'	1000'	1085.7 - 1075.3 = 10.4'	A
706-707	SG-6	7.5'	330'	1075.3 - 1072.0 = 3.3'	B
30-31	39"	—	990'	1066.0 - 1062.2	
708-709	SG-7	7.5'	1000'	1072.0 - 1069.2 = 2.8'	B
709-710	SG-8	20.'	660'	1069.2 - 1062.6 = 5.6'	B
31-32	39"	—	660'	1056.6 - 1052.0	B
711-712	SG-9	5'	1000'	1069.6 - 1062.1 = 7.5'	B
712-713	SG-10	15'	990'	1062.1 - 1058.0 = 4.1'	B
DZ-6 32-35	51"	—	1320'	1052.0 - 1041.0	
35-38	84"	—	1320'	1041.0 - 1035.0	

DZ-5 #13

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Subject FONTANA
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DZ-6 #11

714 - 715	I	G-11	7.0'	1000'	1104.0 - 1092.0 = 12'	A
715 - 716	I	G-12	11.0'	800'	1092.0 - 1089.0 = 3'	A
716 - 717	I	G-13	20'	660'	1089.0 - 1081.5 = 7.5'	A
717 - 33		39"	—	990'	1075.0 - 1061.0	
718 - 719	I	G-14	5'	1000'	1082.0 - 1075.0 = 7.0	A
719 - 720	I	G-15	5'	330'	1075.0 - 1073.3 = 1.7'	A
720 - 721	I	G-16	10'	660'	1073.3 - 1070.0 = 3.3'	A
721 - 722	M	G-17	10'	330'	1070.0 - 1068.0 = 2.0'	A
33 - 34		39"	—	990	1061.0 - 1048.2	
723 - 724	M	G-18	5'	1000'	1072.0 - 1066.6 = 5.4'	A
724 - 725	M	G-19	5'	660'	1066.6 - 1063.0 = 2.8'	A
ST 725 - 729	C	G-20	-0-	660'	1063.0 - 1056.6 = 6.4'	
726 - 727	M	G-21	5'	1000'	1069.2 - 1062.6 = 7.2'	A
727 - 728	M	G-22	5'	330'	1062.0 - 1060.0 = 2.0'	A
728 - 729	M	G-23	10'	660'	1060.0 - 1056.6 = 3.4'	A
34 - 35		39"	—	660'	1048.2 - 1042.0	
730 - 731	M	G-24	5'	1000	1063.7 - 1055.8 = 7.9'	B
731 - 732	M	G-25	5'	330	1055.8 - 1053.6 = 2.2'	B
732 - 733	M	G-26	10'	660'	1053.6 - 1049.0 = 4.6'	A

DZ-6 #11

DZ-7 #12

800 - 801	I	H-1	6.0'	1000'	1098.0 - 1088.0 = 10'	A
801 - 802	I	H-2	10.0'	820'	1088.0 - 1081.0 = 7'	A
802 - 803	I	H-3	20.0'	620'	1081.0 - 1075.0 = 6'	A
803 - 36		42"	—	990'	1069.0 - 1054	
804 - 805	I	H-4	5.0'	1000'	1081.5 - 1071.0 = 10.5'	A
805 - 806	I	H-5	10.0'	330'	1071.0 - 1069.0 = 2'	A
806 - 807	S	H-6	5.0'	660'	1069.0 - 1065.0 = 4'	A
807 - 808	S	H-7	10.0'	330'	1065.0 - 1060.0 = 5'	A

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Subject FONTANA
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36-37		42"	—	990'	1054.0 - 1043.5	
809-810	S	H-8	5.0'	1000'	1068.0 - 1061.0 = 7'	A
810-811	S	H-9	5.0'	660'	1061.0 - 1057.0 = 4'	A
811-812	SC	H-10	20.0'	660'	1057.0 - 1051.0 = 6.0'	A
37-38		42"	—	660'	1043.5 - 1038.0	
813-814	M	H-11	5.0'	1000'	1056.6 - 1048.5 = 8.1'	A
814-815	M	H-12	5.0'	330'	1048.5 - 1047.3 = 1.2'	A
815-816	M	H-13	10.0'	660'	1047.3 - 1045.0 = 2.3'	A
38-39		84"	—	990'	1035.0 - 1026.6	
817-818	S	H-14	5'	1000'	1049.0 - 1044.0 = 5'	A
818-819	S	H-15	5'	330'	1044.0 - 1042.3 = 1.7'	A
819-820	S	H-16	10'	660'	1042.3 - 1039.0 = 3.3'	A
820-821	S	H-17	10'	330'	1039.0 - 1037.0 = 2.0'	A
39-40		84"	—	1,720'	1026.6 - 1012.8	
822-823	S	H-18	5'	1000'	1037.7 - 1034.3 = 3.4'	A
823-824	S	H-19	5'	660'	1034.3 - 1032.0 = 3.3	A
824-825	M	H-20	10'	660'	1032.0 - 1027.0 = 5.0'	A
825-826	M	H-21	6'	750'	1027.0 - 1023.0 = 4.0'	A
40-94		102"	—	900'	1011.3 - 1004.0	
827-828	S	H-22	6'	900'	1023.0 - 1014.0 = 9'	A

DZ-7 #12

DZ-7

DZ-5 #13

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Subject FONTANA
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600-601	C	F-1	5'	1000'	1065.0 - 1060.0 = 5'	B
601-602	C	F-2	5'	330'	1060.0 - 1058.3 = 1.7'	B
602-603	C	F-3	10'	660'	1058.3 - 1055.0 = 3.3'	B
ST. 603-607	C	F-4	~~0~~	660'	1055.0 - 1052.0 = 3'	B
604-605	C	F-5	5'	1000'	1062.9 - 1057.9 = 5'	B
605-606	C	F-6	5'	330'	1057.9 - 1055.9 = 2'	B
606-607	M	F-7	10'	660'	1055.9 - 1052.0 = 3.9'	B
607-45		36"	—	660'	1047.0 - 1041.0	
608-609	C	F-8	5'	1000'	1060.8 - 1055.8 = 5'	B
609-610	C	F-9	5'	330'	1055.8 - 1053.5 = 2.3'	B
610-611	M	F-10	10'	660'	1053.5 - 1049.0 = 4.5'	B
45-90		42"	—	750'	1040.0 - 1025.0	
612-613	C	F-11	5'	1000'	1058.7 - 1053.7 = 5'	B
613-614	C	F-12	5'	330'	1053.7 - 1051.1 = 2.6'	B
614-615	M	F-13	10'	660'	1051.1 - 1046.0 = 5.1'	B
89-90		14'x9'	—	1320'	1028.2 - 1022.3	
616-617	N	F-14	7'	1000'	1540.0 - 1160.0 = 380'	B
617-618	N	F-15	18'	900'	1160.0 - 1080.0 = 80'	B
618-90		48"	—	420'	1033.0 - 1025.0	
619-620	C	F-16	6'	1000'	1056.4 - 1051.4 = 5'	B
620-621	C	F-17	6'	1070'	1051.4 - 1046.0 = 5.4	B
90-91		14'-9' RCB	—	1320'	1022.3 - 1013.1	

DZ-4 #8

DZ-4

#10 RCB - 14'x9'

DZ-4A

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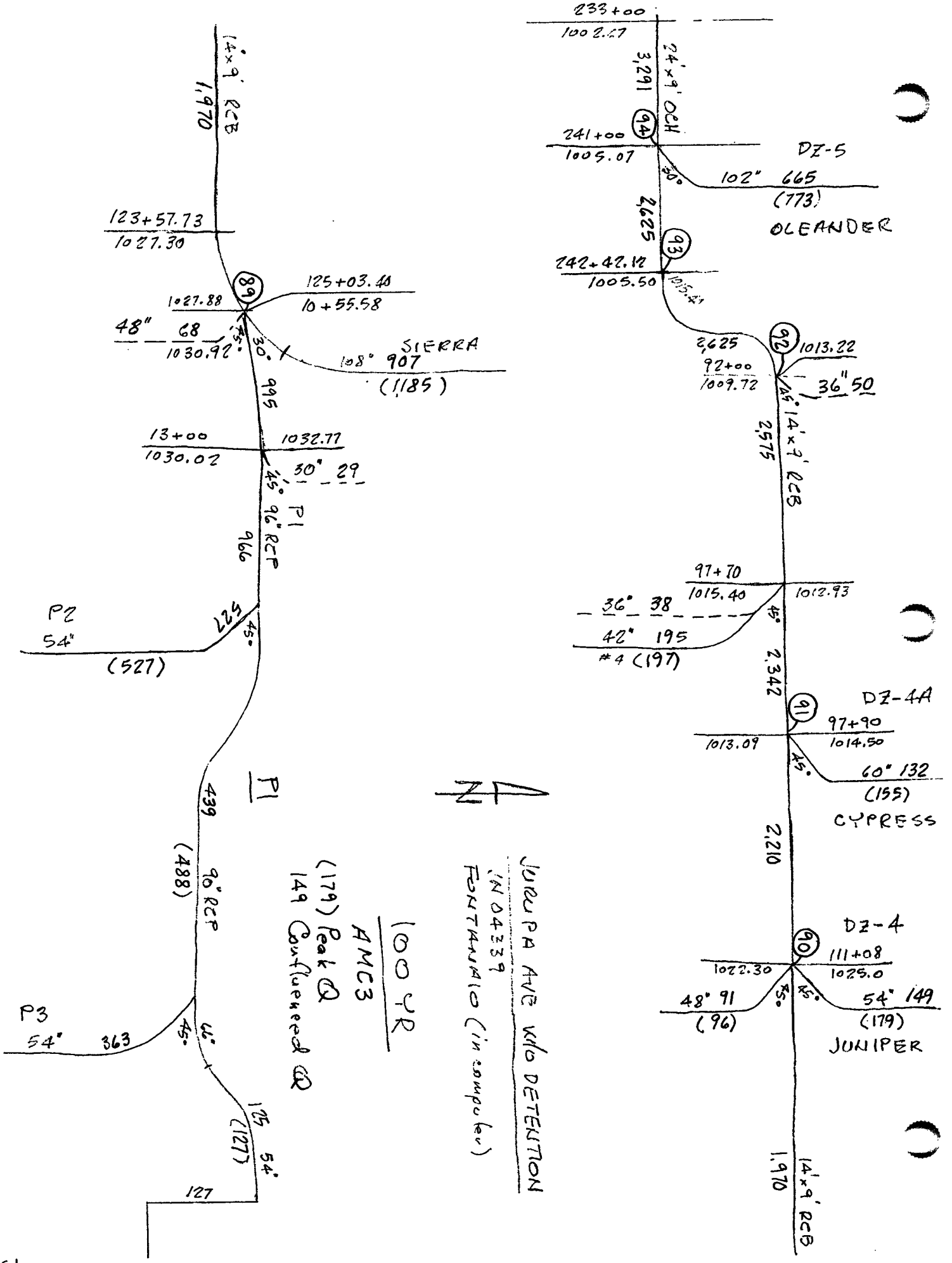
625-626	S	F-20	5'	1000'	1058.0 - 1051.3 = 6.7	B
626-627	S	F-21	5'	330'	1051.3 - 1049.0 = 2.3'	B
627-628	S	F-22	10'	660'	1049.0 - 1044.6 = 4.4'	B
628-629	S	F-23	20'	660'	1044.6 - 1040.3 = 4.3'	B
629-46		36"	—	660'	1033.3 - 1026.0	
630-631	S	F-24	5'	1000'	1052.2 - 1044.0 = 8.2'	B
631-632	S	F-25	5'	330'	1044.0 - 1041.3 = 2.7'	B
632-633	S	F-26	10'	660'	1041.3 - 1035.9 = 5.4'	B
46-91		60"	—	750'	1026.0 - 1014.5	
634-635	S	F-27	6'	1000'	1046.8 - 1041.8 = 5'	B
635-636	S	F-28	6'	330'	1041.8 - 1037.8 = 4'	B
636-637	S	F-29	11'	660'	1037.8 - 1031.0 = 6.8'	A
638-639	N	F-30	10'	1000'	1900 - 1540 = 360'	B
639-640	N	F-31	20'	600'	1540 - 1200 = 340'	B
640-641	N	F-32	42'	1500'	1200 - 1045 = 155'	B
641-91		42"	—	450'	1035.0 - 1015.4 =	
650-651	S	F-40	5'	1000	1040.3 - 1033.6 = 6.7'	A
651-652	S	F-41	5'	330'	1033.6 - 1031.4 = 2.2'	A
652-653	S	F-42	11'	750'	1031.4 - 1026.0 = 5.4'	A
653-654	S	F-43	11'	660'	1026.0 - 1023.0 = 3.0'	A
92-93		14'x9' RCB	—	450'	1006.4 - 1005.5	
93-94		24'x9' L J	—	700'	1005.5 - 1004.0	
642-643	S	F-33	6'	1000'	1042.0 - 1037.0 = 5'	B
643-644	S	F-34	8'	1200'	1037.0 - 1031.0 = 6'	A
645-646	S	F-35	6'	1000'	1042.0 - 1037.0 = 5'	A
646-647	S	F-36	7'	1200'	1037.0 - 1031.0 = 6'	A
91-92		14'x9 RCB	—	1340'	1013.1 - 1006.4	

DZ-4A #9

DZ-4A

14'x9' RCB #10

Q_{100} SUMMARIES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3,291
24"x9' OCH
94
241+00
1005.07
DZ-5
30°
102" 665
(773)
OLEANDER
2,625
93
242+42.12
1005.50
1013.47
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92
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1009.72
36" 50
45°
14'x7' RCB
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97+70
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45°
42" 195
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(179)
JUNIPER
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14'x9' RCB
14'x9' RCB
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96" RCP
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90° RCP
P3
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363
45°
45°
125
(127)
54"
127
100 YR
AMC3
(179) Peak Q
149 Cont'd Q
JURUPA AVE W/O DETENTION
IN 04339
FONTANA (in compute)

JN04339

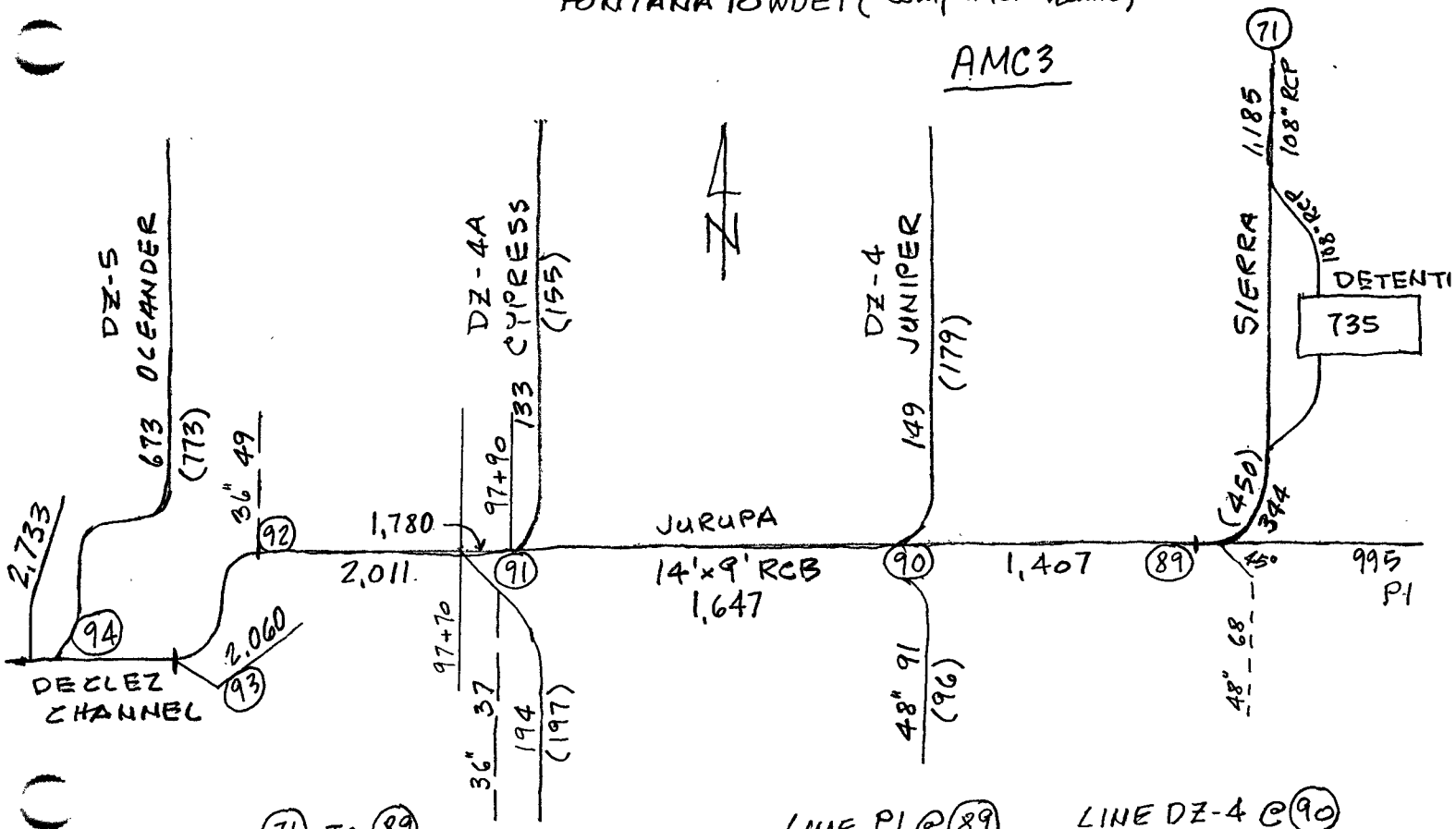
150

FONTANA

JURUPA AVE. 14'x9' RCB W/DET. @SIERRA

FONTANA 10WDET (Computer name)

AMC3



(71) TO (89)
Q_{100} = 450 CFS (After detention)

LINE P1 @ (89)
Q_{100} = 1,063 CFS

LINE DZ-4 @ (90)
Q_{100} = 179 CFS
A = 76.70 ac
t_c = 20.98
A_p = 0.194
F_m = 0.086
SCS #56

Q_{100} = 74 CFS
A = 25 ac.
t_c = 13.30
A_p = 1.000
F_m = 0.140

Q_{100} = 22 CFS
A = 6 ac.
t_c = 25.03
A_p = 0.500
F_m = 0.220

(179) Peak Q
150 Confluenced Q

DZ-4A @ (91)
Q_{100} = 155 cfs
A = 75.26 ac
t_c = 22.06
A_p = 0.500
F_m = 0.245
SCS # 52.8

Q_{100} = 197 cfs
A = 72 ac
t_c = 14.74
A_p = 1.000
F_m = 0.140

Q_{100} = 24 cfs
A = 14 ac
t_c = 25.60
A_p = 0.500
F_m = 0.319

Q_{100} = 22 cfs
A = 13 ac.
t_c = 25.99
A_p = 0.500
F_m = 0.393

@ (92)
Q_{100} = 58 cfs
A = 32 ac
t_c = 26.08
A_p = 0.500
F_m = 0.220

@ (93)
Q_{100} = 2,060 cfs

@ (94) DZ-5
Q_{100} = 773 cfs

SIERRA AVE W/O DETENTION

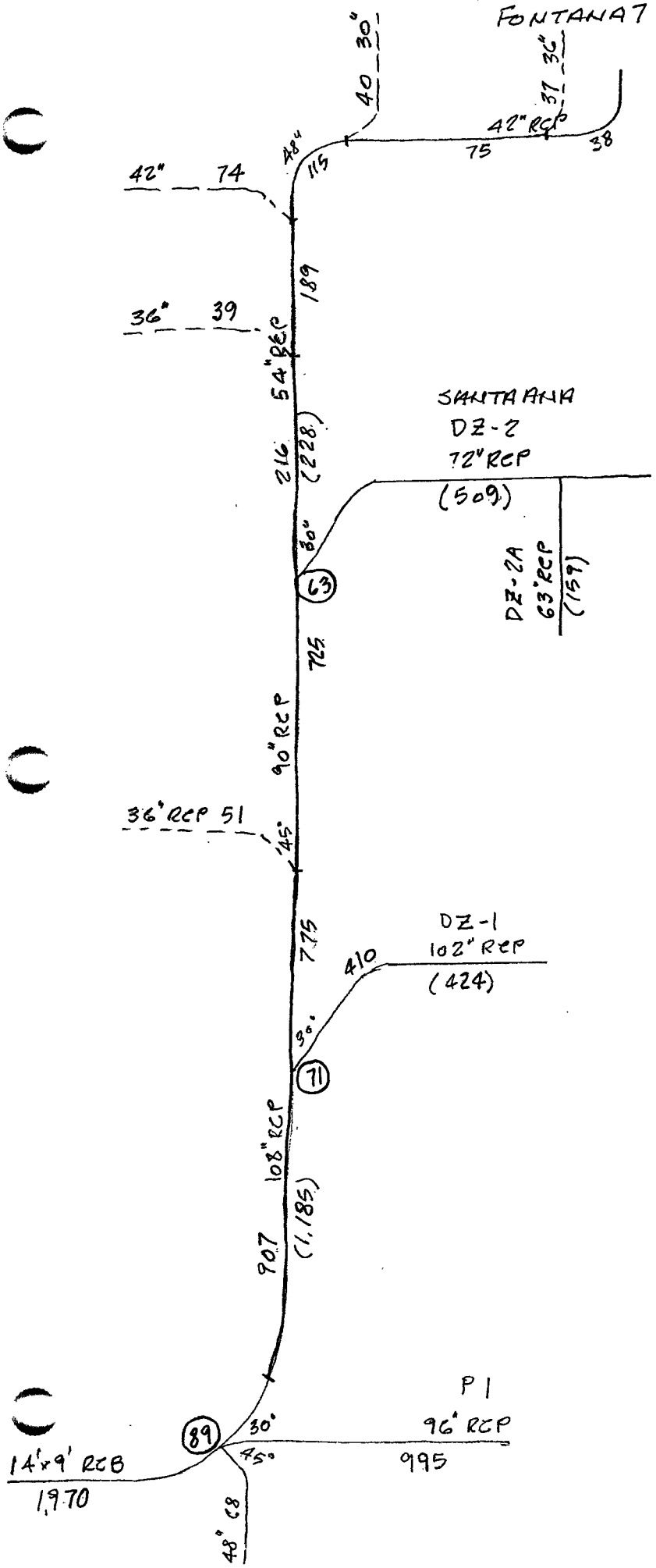
FONTANA7 (in computer)

JN.04339

1504

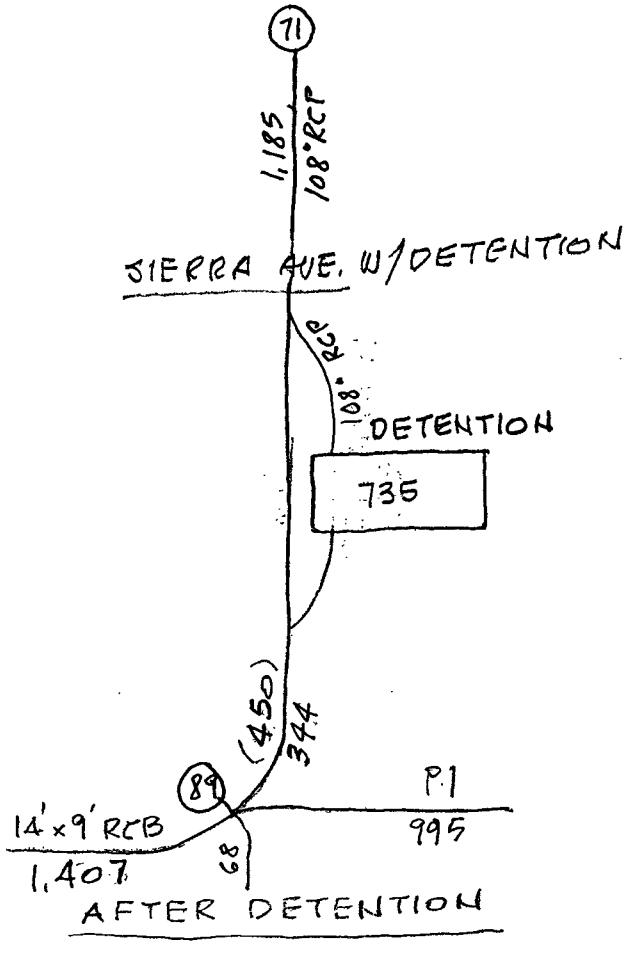
100 YR

AMC3



(228) Peak Q

209 Confluenced Q



◆ LAND PLANNING ◆ CIVIL ENGINEERING ◆ SURVEYING

FONTANA

JOB No. 04339
BY HERMAN
DATE 7/14/04
SHT. 99
OF

100 YEAR

W/AMC3

LINE "DZ-2A"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/05/05

FONTANA / LINE DZ-2A HYDROLOGY
100 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

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Process from Point/Station 112.000 to Point/Station 113.000
**** INITIAL AREA EVALUATION ****

SCHOOL subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.6000 Max loss rate(Fm)= 0.264(In/Hr)
Initial subarea data:
Initial area flow distance = 800.000(Ft.)
Top (of initial area) elevation = 1085.300(Ft.)
Bottom (of initial area) elevation = 1080.300(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.00625 s(%)= 0.63
TC = k(0.412)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 16.480 min.
Rainfall intensity = 2.931(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.819
Subarea runoff = 13.203(CFS)
Total initial stream area = 5.500(Ac.)
Pervious area fraction = 0.600
Initial area Fm value = 0.264(In/Hr)

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Process from Point/Station 113.000 to Point/Station 116.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1080.300(Ft.)
End of street segment elevation = 1076.600(Ft.)

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Length of street segment  =   730.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     26.406(CFS)
Depth of flow =   0.535(Ft.), Average velocity =   2.705(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.71(Ft/s)
Travel time =    4.50 min.     TC =   20.98  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.536(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.858
Subarea runoff =     22.717(CFS) for   11.000(Ac.)
Total runoff =     35.920(CFS)
Effective area this stream =       16.50(Ac.)
Total Study Area (Main Stream No. 1) =       16.50(Ac.)
Area averaged Fm value =    0.117(In/Hr)
Street flow at end of street =     35.920(CFS)
Half street flow at end of street =     17.960(CFS)
Depth of flow =   0.585(Ft.), Average velocity =   3.057(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      116.000 to Point/Station      116.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     16.500(Ac.)
Runoff from this stream =     35.920(CFS)
Time of concentration =   20.98 min.
Rainfall intensity =     2.536(In/Hr)
Area averaged loss rate (Fm) =    0.1173(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2667


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Process from Point/Station      114.000 to Point/Station      115.000
**** INITIAL AREA EVALUATION ****
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COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1093.600(Ft.)
Bottom (of initial area) elevation =  1084.400(Ft.)
Difference in elevation =     9.200(Ft.)
Slope =    0.00920  s(%)=       0.92
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.306 min.
Rainfall intensity =      3.493(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.889
Subarea runoff =     17.071(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)


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Process from Point/Station      115.000 to Point/Station      116.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------------
Top of street segment elevation =  1084.400(Ft.)
End of street segment elevation =  1076.600(Ft.)
Length of street segment  =   600.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     27.934(CFS)
Depth of flow =   0.478(Ft.), Average velocity =   3.738(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.146(Ft.)
Flow velocity =   3.74(Ft/s)
Travel time =    2.68 min.     TC =   14.98  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      3.104(In/Hr) for a   100.0 year storm
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Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.887
Subarea runoff =     17.352(CFS) for    7.000(Ac.)
Total runoff =     34.423(CFS)
Effective area this stream =       12.50(Ac.)
Total Study Area (Main Stream No. 1) =       29.00(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     34.423(CFS)
Half street flow at end of street =     17.211(CFS)
Depth of flow =   0.507(Ft.), Average velocity =   3.992(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      116.000 to Point/Station      116.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     12.500(Ac.)
Runoff from this stream =     34.423(CFS)
Time of concentration =   14.98 min.
Rainfall intensity =     3.104(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream    Flow rate       TC             Rainfall Intensity
 No.        (CFS)        (min)                  (In/Hr)


1        35.920      20.98                2.536
2        34.423      14.98                3.104
Qmax(1) =
          1.000 *     1.000 *     35.920) +
          0.814 *     1.000 *     34.423) + =       63.956
Qmax(2) =
          1.235 *     0.714 *     35.920) +
          1.000 *     1.000 *     34.423) + =       66.096

Total of 2 streams to confluence:
Flow rates before confluence point:
      35.920      34.423
Maximum flow rates at confluence using above data:
       63.956       66.096
Area of streams before confluence:
       16.500       12.500
Effective area values after confluence:
       29.000       24.284
Results of confluence:
Total flow rate =     66.096(CFS)
Time of concentration =    14.982 min.
Effective stream area after confluence =     24.284(Ac.)
Stream Area average Pervious fraction(Ap) =  0.195
Stream Area average soil loss rate(Fm) =    0.086(In/Hr)
Study area (this main stream) =      29.00(Ac.)


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Process from Point/Station      116.000 to Point/Station       52.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
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Upstream point/station elevation =  1069.600(Ft.)
Downstream point/station elevation =  1061.900(Ft.)
Pipe length  =   650.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    66.096(CFS)
Given pipe size =     39.00(In.)
Calculated individual pipe flow  =    66.096(CFS)
Normal flow depth in pipe =   24.87(In.)
Flow top width inside pipe =   37.49(In.)
Critical Depth =   31.05(In.)
Pipe flow velocity =     11.84(Ft/s)
Travel time through pipe =    0.91 min.
Time of concentration (TC) =    15.90 min.


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Process from Point/Station       52.000 to Point/Station       52.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     24.284(Ac.)
Runoff from this stream =     66.096(CFS)
Time of concentration =   15.90 min.
Rainfall intensity =     2.995(In/Hr)
Area averaged loss rate (Fm) =    0.0857(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1948


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Process from Point/Station      117.000 to Point/Station      118.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1076.000(Ft.)
Bottom (of initial area) elevation =  1071.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =     3.246(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =     14.410(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)


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Process from Point/Station      118.000 to Point/Station      119.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
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Top of street segment elevation =  1071.000(Ft.)
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End of street segment elevation =  1068.900(Ft.)
Length of street segment  =   420.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     28.820(CFS)
Depth of flow =   0.550(Ft.), Average velocity =   2.789(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.79(Ft/s)
Travel time =    2.51 min.     TC =   16.41  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.939(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.887
Subarea runoff =     24.667(CFS) for   10.000(Ac.)
Total runoff =     39.077(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       44.00(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     39.077(CFS)
Half street flow at end of street =     19.538(CFS)
Depth of flow =   0.602(Ft.), Average velocity =   3.147(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      119.000 to Point/Station      119.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     15.000(Ac.)
Runoff from this stream =     39.077(CFS)
Time of concentration =   16.41 min.
Rainfall intensity =     2.939(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream    Flow rate       TC              Rainfall Intensity
 No.        (CFS)        (min)                  (In/Hr)
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1       66.096      15.90                2.995
2       39.077      16.41                2.939
Qmax(1) =
          1.000 *     1.000 *    66.096) +
          1.020 *     0.969 *    39.077) + =     104.688
Qmax(2) =
          0.980 *     1.000 *    66.096) +
          1.000 *     1.000 *    39.077) + =     103.882

Total of 2 streams to confluence:
Flow rates before confluence point:
      66.096      39.077
Maximum flow rates at confluence using above data:
      104.688      103.882
Area of streams before confluence:
       24.284       15.000
Effective area values after confluence:
       38.813       39.284
Results of confluence:
Total flow rate =    104.688(CFS)
Time of concentration =    15.896 min.
Effective stream area after confluence =     38.813(Ac.)
Stream Area average Pervious fraction(Ap) =  0.159
Stream Area average soil loss rate(Fm) =    0.070(In/Hr)
Study area (this main stream) =      39.28(Ac.)


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Process from Point/Station       52.000 to Point/Station       53.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1061.900(Ft.)
Downstream point/station elevation =  1059.400(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   104.688(CFS)
Given pipe size =     42.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     5.669(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      5.412(Ft.)
 Minor friction loss =      2.758(Ft.)    K-factor =   1.50
Pipe flow velocity =     10.88(Ft/s)
Travel time through pipe =    0.77 min.
Time of concentration (TC) =    16.66 min.


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Process from Point/Station       53.000 to Point/Station       53.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     38.813(Ac.)
Runoff from this stream =    104.688(CFS)
Time of concentration =   16.66 min.
Rainfall intensity =     2.912(In/Hr)
Area averaged loss rate (Fm) =    0.0698(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1586
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Process from Point/Station      120.000 to Point/Station      121.000
**** INITIAL AREA EVALUATION ****

----------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1072.000(Ft.)
Bottom (of initial area) elevation =  1067.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      3.246(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =     15.851(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)


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Process from Point/Station      121.000 to Point/Station      122.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

----------------------------------------------------------------------------
Top of street segment elevation =  1067.000(Ft.)
End of street segment elevation =  1064.700(Ft.)
Length of street segment  =   450.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     28.820(CFS)
Depth of flow =   0.548(Ft.), Average velocity =   2.808(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.81(Ft/s)
Travel time =    2.67 min.     TC =   16.57  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
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SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.921(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.886
Subarea runoff =     21.698(CFS) for    9.000(Ac.)
Total runoff =     37.549(CFS)
Effective area this stream =       14.50(Ac.)
Total Study Area (Main Stream No. 1) =       58.50(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     37.549(CFS)
Half street flow at end of street =     18.775(CFS)
Depth of flow =   0.592(Ft.), Average velocity =   3.119(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      122.000 to Point/Station      122.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     14.500(Ac.)
Runoff from this stream =     37.549(CFS)
Time of concentration =   16.57 min.
Rainfall intensity =     2.921(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      104.688     16.66                2.912
2       37.549     16.57                2.921
Qmax(1) =
          1.000 *    1.000 *   104.688) +
          0.997 *    1.000 *    37.549) + =     142.115
Qmax(2) =
          1.003 *    0.995 *   104.688) +
          1.000 *    1.000 *    37.549) + =     142.021

Total of 2 streams to confluence:
Flow rates before confluence point:
     104.688      37.549
Maximum flow rates at confluence using above data:
      142.115      142.021
Area of streams before confluence:
       38.813       14.500
Effective area values after confluence:
       53.313       53.105
Results of confluence:
Total flow rate =    142.115(CFS)
Time of concentration =    16.662 min.
Effective stream area after confluence =     53.313(Ac.)
Stream Area average Pervious fraction(Ap) =  0.143
Stream Area average soil loss rate(Fm) =    0.063(In/Hr)
Study area (this main stream) =      53.31(Ac.)
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Process from Point/Station       53.000 to Point/Station       54.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1052.500(Ft.)
Downstream point/station elevation =  1048.200(Ft.)
Pipe length  =   860.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   142.115(CFS)
Given pipe size =     60.00(In.)
Calculated individual pipe flow  =   142.115(CFS)
Normal flow depth in pipe =   39.56(In.)
Flow top width inside pipe =   56.87(In.)
Critical Depth =   41.02(In.)
Pipe flow velocity =     10.35(Ft/s)
Travel time through pipe =    1.38 min.
Time of concentration (TC) =    18.05 min.


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Process from Point/Station       54.000 to Point/Station       54.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     53.313(Ac.)
Runoff from this stream =    142.115(CFS)
Time of concentration =   18.05 min.
Rainfall intensity =     2.776(In/Hr)
Area averaged loss rate (Fm) =    0.0628(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1427


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Process from Point/Station      123.000 to Point/Station      124.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1064.700(Ft.)
Bottom (of initial area) elevation =  1059.700(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      3.246(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =     20.174(CFS)
Total initial stream area =        7.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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Process from Point/Station      124.000 to Point/Station      124.000
**** CONFLUENCE OF MINOR STREAMS ****
--------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      7.000(Ac.)
Runoff from this stream =     20.174(CFS)
Time of concentration =   13.90 min.
Rainfall intensity =     3.246(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                 (In/Hr)


1       142.115      18.05                2.776
2        20.174      13.90                3.246
Qmax(1) =
          1.000 *     1.000 *   142.115) +
          0.853 *     1.000 *    20.174) + =     159.325
Qmax(2) =
          1.173 *     0.770 *   142.115) +
          1.000 *     1.000 *    20.174) + =     148.633

Total of 2 streams to confluence:
Flow rates before confluence point:
     142.115      20.174
Maximum flow rates at confluence using above data:
      159.325      148.633
Area of streams before confluence:
       53.313       7.000
Effective area values after confluence:
       60.313      48.069
Results of confluence:
Total flow rate =    159.325(CFS)
Time of concentration =    18.047 min.
Effective stream area after confluence =     60.313(Ac.)
Stream Area average Pervious fraction(Ap) =  0.138
Stream Area average soil loss rate(Fm) =    0.061(In/Hr)
Study area (this main stream) =      60.31(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      54.000 to Point/Station      55.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
--------------------------------------------------------------------------
Upstream point/station elevation =  1048.200(Ft.)
Downstream point/station elevation =  1046.500(Ft.)
Pipe length  =   340.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   159.325(CFS)
Given pipe size =     63.00(In.)
Calculated individual pipe flow  =   159.325(CFS)
Normal flow depth in pipe =   41.06(In.)
Flow top width inside pipe =   60.03(In.)
Critical Depth =   42.87(In.)
Pipe flow velocity =     10.66(Ft/s)
Travel time through pipe =    0.53 min.
Time of concentration (TC) =    18.58 min.
End of computations, Total Study Area =          65.50 (Ac.)
The following figures may
```

be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.142
Area averaged SCS curve number = 56.0

LINE "DZ-2"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/05/05

FONTANA / LINE DZ-2 HYDROLOGY
100 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
Initial subarea data:
Initial area flow distance = 960.000(Ft.)
Top (of initial area) elevation = 1103.000(Ft.)
Bottom (of initial area) elevation = 1098.400(Ft.)
Difference in elevation = 4.600(Ft.)
Slope = 0.00479 s(%)= 0.48
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.794 min.
Rainfall intensity = 3.261(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.878
Subarea runoff = 14.323(CFS)
Total initial stream area = 5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.079(In/Hr)

++
Process from Point/Station 101.000 to Point/Station 102.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1098.400(Ft.)
End of street segment elevation = 1093.600(Ft.)

```
Length of street segment  =   590.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     21.485(CFS)
Depth of flow =   0.474(Ft.), Average velocity =   2.936(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.940(Ft.)
Flow velocity =   2.94(Ft/s)
Travel time =    3.35 min.     TC =   17.14  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.863(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.881
Subarea runoff =     10.890(CFS) for    5.000(Ac.)
Total runoff =     25.213(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       10.00(Ac.)
Area averaged Fm value =    0.061(In/Hr)
Street flow at end of street =     25.213(CFS)
Half street flow at end of street =     12.607(CFS)
Depth of flow =   0.497(Ft.), Average velocity =   3.063(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station       50.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1085.300(Ft.)
Downstream point/station elevation =  1079.500(Ft.)
Pipe length  =   460.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    25.213(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =    25.213(CFS)
Normal flow depth in pipe =   19.50(In.)
Flow top width inside pipe =   18.73(In.)
Critical Depth =   21.21(In.)
Pipe flow velocity =      9.22(Ft/s)
Travel time through pipe =    0.83 min.
Time of concentration (TC) =    17.97 min.
```

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Process from Point/Station       50.000 to Point/Station       50.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      10.000(Ac.)
Runoff from this stream =      25.213(CFS)
Time of concentration =   17.97 min.
Rainfall intensity =      2.782(In/Hr)
Area averaged loss rate (Fm) =    0.0613(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station      103.000 to Point/Station      104.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1103.000(Ft.)
Bottom (of initial area) elevation =  1098.400(Ft.)
Difference in elevation =     4.600(Ft.)
Slope =    0.00460  s(%)=       0.46
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.136 min.
Rainfall intensity =      3.214(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.878
Subarea runoff =     15.520(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1098.400(Ft.)
End of street segment elevation =  1092.200(Ft.)
Length of street segment  =   700.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
```

```
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    28.924(CFS)
Depth of flow =   0.509(Ft.), Average velocity =   3.319(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.32(Ft/s)
Travel time =    3.52 min.     TC =   17.65  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =      2.813(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.875
Subarea runoff =     21.395(CFS) for    9.500(Ac.)
Total runoff =     36.915(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       25.00(Ac.)
Area averaged Fm value =    0.079(In/Hr)
Street flow at end of street =     36.915(CFS)
Half street flow at end of street =     18.457(CFS)
Depth of flow =   0.544(Ft.), Average velocity =   3.656(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station       50.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1083.800(Ft.)
Downstream point/station elevation =  1079.500(Ft.)
Pipe length  =   570.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    36.915(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =    36.915(CFS)
Normal flow depth in pipe =   25.69(In.)
Flow top width inside pipe =   21.05(In.)
Critical Depth =   24.68(In.)
Pipe flow velocity =      8.25(Ft/s)
Travel time through pipe =    1.15 min.
Time of concentration (TC) =    18.80 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       50.000 to Point/Station       50.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     15.000(Ac.)
Runoff from this stream =     36.915(CFS)
Time of concentration =   18.80 min.
Rainfall intensity =     2.708(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
```

Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	25.213	17.97	2.782
2	36.915	18.80	2.708

```
Qmax(1) =
        1.000 *    1.000 *    25.213) +
        1.028 *    0.956 *    36.915) + =      61.497
Qmax(2) =
        0.973 *    1.000 *    25.213) +
        1.000 *    1.000 *    36.915) + =      61.440

Total of 2 streams to confluence:
Flow rates before confluence point:
      25.213      36.915
Maximum flow rates at confluence using above data:
       61.497       61.440
Area of streams before confluence:
       10.000       15.000
Effective area values after confluence:
       24.339       25.000
Results of confluence:
Total flow rate =     61.497(CFS)
Time of concentration =    17.974 min.
Effective stream area after confluence =     24.339(Ac.)
Stream Area average Pervious fraction(Ap) =  0.100
Stream Area average soil loss rate(Fm) =    0.072(In/Hr)
Study area (this main stream) =      25.00(Ac.)


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Process from Point/Station       50.000 to Point/Station       51.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1079.500(Ft.)
Downstream point/station elevation =  1071.300(Ft.)
Pipe length  =  1320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    61.497(CFS)
Given pipe size =     39.00(In.)
Calculated individual pipe flow  =    61.497(CFS)
Normal flow depth in pipe =   30.19(In.)
Flow top width inside pipe =   32.62(In.)
Critical Depth =   30.01(In.)
Pipe flow velocity =      8.92(Ft/s)
Travel time through pipe =    2.47 min.
Time of concentration (TC) =    20.44 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       51.000 to Point/Station       51.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     24.339(Ac.)
Runoff from this stream =     61.497(CFS)
Time of concentration =   20.44 min.
Rainfall intensity =     2.576(In/Hr)
Area averaged loss rate (Fm) =    0.0716(In/Hr)
```

```
Area averaged Pervious ratio (Ap) = 0.1000

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Process from Point/Station      106.000 to Point/Station      107.000
**** INITIAL AREA EVALUATION ****
-------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1093.600(Ft.)
Bottom (of initial area) elevation =  1085.400(Ft.)
Difference in elevation =     8.200(Ft.)
Slope =    0.00820  s(%)=       0.82
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.592 min.
Rainfall intensity =      3.445(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.889
Subarea runoff =     16.834(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------------
Top of street segment elevation =  1085.400(Ft.)
End of street segment elevation =  1078.300(Ft.)
Length of street segment  =   700.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     26.016(CFS)
Depth of flow =   0.486(Ft.), Average velocity =   3.345(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.539(Ft.)
Flow velocity =   3.34(Ft/s)
Travel time =    3.49 min.     TC =   16.08  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
```

```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.975(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.887
Subarea runoff =     13.499(CFS) for    6.000(Ac.)
Total runoff =     30.333(CFS)
Effective area this stream =       11.50(Ac.)
Total Study Area (Main Stream No. 1) =       36.50(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     30.333(CFS)
Half street flow at end of street =     15.167(CFS)
Depth of flow =   0.507(Ft.), Average velocity =   3.523(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     11.500(Ac.)
Runoff from this stream =     30.333(CFS)
Time of concentration =   16.08 min.
Rainfall intensity =     2.975(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                 (In/Hr)


1        61.497     20.44                2.576
2        30.333     16.08                2.975
Qmax(1) =
          1.000 *    1.000 *    61.497) +
          0.864 *    1.000 *    30.333) + =      87.703
Qmax(2) =
          1.159 *    0.787 *    61.497) +
          1.000 *    1.000 *    30.333) + =      86.418

Total of 2 streams to confluence:
Flow rates before confluence point:
      61.497      30.333
Maximum flow rates at confluence using above data:
       87.703       86.418
Area of streams before confluence:
       24.339       11.500
Effective area values after confluence:
       35.839       30.648
Results of confluence:
Total flow rate =     87.703(CFS)
Time of concentration =    20.440 min.
Effective stream area after confluence =     35.839(Ac.)
Stream Area average Pervious fraction(Ap) =  0.100
Stream Area average soil loss rate(Fm) =    0.063(In/Hr)
```

```
Study area (this main stream) =      35.84(Ac.)


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Process from Point/Station       51.000 to Point/Station       55.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1071.300(Ft.)
Downstream point/station elevation =  1062.400(Ft.)
Pipe length  =   900.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    87.703(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =    87.703(CFS)
Normal flow depth in pipe =   30.47(In.)
Flow top width inside pipe =   37.49(In.)
Critical Depth =   34.95(In.)
Pipe flow velocity =     11.73(Ft/s)
Travel time through pipe =    1.28 min.
Time of concentration (TC) =    21.72 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       55.000 to Point/Station       55.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     35.839(Ac.)
Runoff from this stream =     87.703(CFS)
Time of concentration =   21.72 min.
Rainfall intensity =     2.484(In/Hr)
Area averaged loss rate (Fm) =    0.0627(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station      109.000 to Point/Station      110.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1080.000(Ft.)
Bottom (of initial area) elevation =  1073.700(Ft.)
Difference in elevation =     6.300(Ft.)
Slope =    0.00630  s(%)=       0.63
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.274 min.
Rainfall intensity =      3.337(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =     13.339(CFS)
Total initial stream area =        4.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------------
Top of street segment elevation =  1073.700(Ft.)
End of street segment elevation =  1069.400(Ft.)
Length of street segment  =   350.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     19.267(CFS)
Depth of flow =   0.431(Ft.), Average velocity =   3.338(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.777(Ft.)
Flow velocity =   3.34(Ft/s)
Travel time =    1.75 min.     TC =   15.02  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      3.099(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.887
Subarea runoff =     10.031(CFS) for    4.000(Ac.)
Total runoff =     23.369(CFS)
Effective area this stream =        8.50(Ac.)
Total Study Area (Main Stream No. 1) =       45.00(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     23.369(CFS)
Half street flow at end of street =     11.685(CFS)
Depth of flow =   0.456(Ft.), Average velocity =   3.501(Ft/s)
Flow width (from curb towards crown)=  18.073(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      111.000
**** CONFLUENCE OF MINOR STREAMS ****
-------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      8.500(Ac.)
Runoff from this stream =     23.369(CFS)
Time of concentration =   15.02 min.
Rainfall intensity =     3.099(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      125.000 to Point/Station      126.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1093.200(Ft.)
Bottom (of initial area) elevation =  1085.300(Ft.)
Difference in elevation =     7.900(Ft.)
Slope =    0.00790  s(%)=       0.79
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.687 min.
Rainfall intensity =      3.429(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =     16.758(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      126.000 to Point/Station      127.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =  1085.300(Ft.)
End of street segment elevation =  1076.300(Ft.)
Length of street segment  =   900.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     35.039(CFS)
Depth of flow =   0.527(Ft.), Average velocity =   3.715(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.71(Ft/s)
Travel time =    4.04 min.     TC =   16.72  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
```

```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.905(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.886
Subarea runoff =     28.310(CFS) for   12.000(Ac.)
Total runoff =     45.068(CFS)
Effective area this stream =       17.50(Ac.)
Total Study Area (Main Stream No. 1) =       62.50(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     45.068(CFS)
Half street flow at end of street =     22.534(CFS)
Depth of flow =   0.566(Ft.), Average velocity =   4.105(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      127.000 to Point/Station       55.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1069.300(Ft.)
Downstream point/station elevation =  1046.500(Ft.)
Pipe length  =  1000.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    45.068(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =    45.068(CFS)
Normal flow depth in pipe =   18.98(In.)
Flow top width inside pipe =   28.92(In.)
Critical Depth =   26.72(In.)
Pipe flow velocity =     13.76(Ft/s)
Travel time through pipe =    1.21 min.
Time of concentration (TC) =    17.94 min.


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Process from Point/Station       55.000 to Point/Station       55.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     17.500(Ac.)
Runoff from this stream =     45.068(CFS)
Time of concentration =   17.94 min.
Rainfall intensity =     2.786(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station      128.000 to Point/Station      129.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
```

```
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1078.300(Ft.)
Bottom (of initial area) elevation =  1069.400(Ft.)
Difference in elevation =     8.900(Ft.)
Slope =    0.00890  s(%)=       0.89
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.388 min.
Rainfall intensity =      3.479(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.889
Subarea runoff =     27.822(CFS)
Total initial stream area =        9.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)

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Process from Point/Station      129.000 to Point/Station      129.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 4
Stream flow area =      9.000(Ac.)
Runoff from this stream =     27.822(CFS)
Time of concentration =   12.39 min.
Rainfall intensity =     3.479(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000

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Process from Point/Station       55.000 to Point/Station       55.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 91.40
Adjusted SCS curve number for AMC 3 = 98.28
Pervious ratio(Ap) = 0.1380     Max loss rate(Fm)=     0.005(In/Hr)
Rainfall intensity =      2.728(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  18.58 min.  Rain intensity =       2.73(In/Hr)
Total area this stream =        60.31(Ac.)
Total Study Area (Main Stream No. 1) =      131.81(Ac.)
Total runoff =    159.33(CFS)

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Process from Point/Station       55.000 to Point/Station       55.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 5
Stream flow area =     60.310(Ac.)
Runoff from this stream =    159.330(CFS)
Time of concentration =   18.58 min.
Rainfall intensity =     2.728(In/Hr)
Area averaged loss rate (Fm) =    0.0047(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1380
Summary of stream data:
```

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	87.703	21.72	2.484
2	23.369	15.02	3.099
3	45.068	17.94	2.786
4	27.822	12.39	3.479
5	159.330	18.58	2.728

```
Qmax(1) =
          1.000 *    1.000 *    87.703) +
          0.799 *    1.000 *    23.369) +
          0.890 *    1.000 *    45.068) +
          0.710 *    1.000 *    27.822) +
          0.910 *    1.000 *   159.330) + =     311.289
Qmax(2) =
          1.254 *    0.692 *    87.703) +
          1.000 *    1.000 *    23.369) +
          1.114 *    0.838 *    45.068) +
          0.889 *    1.000 *    27.822) +
          1.136 *    0.808 *   159.330) + =     312.601
Qmax(3) =
          1.125 *    0.826 *    87.703) +
          0.898 *    1.000 *    23.369) +
          1.000 *    1.000 *    45.068) +
          0.798 *    1.000 *    27.822) +
          1.021 *    0.965 *   159.330) + =     326.824
Qmax(4) =
          1.411 *    0.570 *    87.703) +
          1.124 *    0.825 *    23.369) +
          1.253 *    0.691 *    45.068) +
          1.000 *    1.000 *    27.822) +
          1.276 *    0.667 *   159.330) + =     294.594
Qmax(5) =
          1.101 *    0.855 *    87.703) +
          0.879 *    1.000 *    23.369) +
          0.979 *    1.000 *    45.068) +
          0.781 *    1.000 *    27.822) +
          1.000 *    1.000 *   159.330) + =     328.291

Total of 5 streams to confluence:
Flow rates before confluence point:
      87.703      23.369      45.068      27.822     159.330
Maximum flow rates at confluence using above data:
      311.289     312.601     326.824     294.594     328.291
Area of streams before confluence:
       35.839       8.500      17.500       9.000      60.310
Effective area values after confluence:
      131.149     105.703     122.813      88.749     125.969
Results of confluence:
Total flow rate =    328.291(CFS)
Time of concentration =    18.580 min.
Effective stream area after confluence =    125.969(Ac.)
Stream Area average Pervious fraction(Ap) =  0.117
Stream Area average soil loss rate(Fm) =    0.031(In/Hr)
Study area (this main stream) =     131.15(Ac.)

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Process from Point/Station       55.000 to Point/Station       56.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

```
Upstream point/station elevation =  1046.500(Ft.)
Downstream point/station elevation =  1043.300(Ft.)
Pipe length  =  1000.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   328.291(CFS)
Given pipe size =     81.00(In.)
Calculated individual pipe flow  =   328.291(CFS)
Normal flow depth in pipe =   66.47(In.)
Flow top width inside pipe =   62.16(In.)
Critical Depth =   57.84(In.)
Pipe flow velocity =     10.45(Ft/s)
Travel time through pipe =    1.60 min.
Time of concentration (TC) =    20.18 min.


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Process from Point/Station       56.000 to Point/Station       56.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    125.969(Ac.)
Runoff from this stream =    328.291(CFS)
Time of concentration =   20.18 min.
Rainfall intensity =     2.596(In/Hr)
Area averaged loss rate (Fm) =    0.0311(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1175


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Process from Point/Station      130.000 to Point/Station      131.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1092.200(Ft.)
Bottom (of initial area) elevation =  1084.100(Ft.)
Difference in elevation =     8.100(Ft.)
Slope =    0.00810  s(%)=       0.81
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.623 min.
Rainfall intensity =      3.440(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =     16.809(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)


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Process from Point/Station      131.000 to Point/Station      132.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1084.100(Ft.)
```

```
End of street segment elevation =  1075.000(Ft.)
Length of street segment  =   900.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     35.145(CFS)
Depth of flow =   0.527(Ft.), Average velocity =   3.732(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.73(Ft/s)
Travel time =    4.02 min.     TC =   16.64  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.914(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.886
Subarea runoff =     28.394(CFS) for   12.000(Ac.)
Total runoff =     45.202(CFS)
Effective area this stream =       17.50(Ac.)
Total Study Area (Main Stream No. 1) =      149.31(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     45.202(CFS)
Half street flow at end of street =     22.601(CFS)
Depth of flow =   0.565(Ft.), Average velocity =   4.124(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      132.000 to Point/Station       56.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1068.000(Ft.)
Downstream point/station elevation =  1043.300(Ft.)
Pipe length  =  1100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    45.202(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =    45.202(CFS)
Normal flow depth in pipe =   19.13(In.)
Flow top width inside pipe =   28.84(In.)
Critical Depth =   26.74(In.)
Pipe flow velocity =     13.69(Ft/s)
Travel time through pipe =    1.34 min.
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Time of concentration (TC) =    17.98 min.


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Process from Point/Station       56.000 to Point/Station       56.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     17.500(Ac.)
Runoff from this stream =     45.202(CFS)
Time of concentration =   17.98 min.
Rainfall intensity =     2.782(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station      133.000 to Point/Station      134.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1076.300(Ft.)
Bottom (of initial area) elevation =  1070.900(Ft.)
Difference in elevation =     5.400(Ft.)
Slope =    0.00540  s(%)=       0.54
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.690 min.
Rainfall intensity =      3.276(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =     16.000(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)


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Process from Point/Station      134.000 to Point/Station      135.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1070.900(Ft.)
End of street segment elevation =  1064.100(Ft.)
Length of street segment  =   800.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
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```
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     48.000(CFS)
Depth of flow =   0.591(Ft.), Average velocity =   4.008(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   4.01(Ft/s)
Travel time =    3.33 min.     TC =   17.02  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.875(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.886
Subarea runoff =     54.078(CFS) for   22.000(Ac.)
Total runoff =     70.078(CFS)
Effective area this stream =       27.50(Ac.)
Total Study Area (Main Stream No. 1) =      176.81(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     70.078(CFS)
Half street flow at end of street =     35.039(CFS)
Depth of flow =   0.668(Ft.), Average velocity =   4.649(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    0.08(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      135.000 to Point/Station      135.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     27.500(Ac.)
Runoff from this stream =     70.078(CFS)
Time of concentration =   17.02 min.
Rainfall intensity =     2.875(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      328.291     20.18                2.596
2       45.202     17.98                2.782
3       70.078     17.02                2.875
Qmax(1) =
         1.000 *    1.000 *   328.291) +
         0.932 *    1.000 *    45.202) +
         0.901 *    1.000 *    70.078) + =     433.596
Qmax(2) =
```

```
          1.072 *    0.891 *   328.291) +
          1.000 *    1.000 *    45.202) +
          0.967 *    1.000 *    70.078) + =     426.738
Qmax(3) =
          1.109 *    0.843 *   328.291) +
          1.034 *    0.946 *    45.202) +
          1.000 *    1.000 *    70.078) + =     421.353

Total of 3 streams to confluence:
Flow rates before confluence point:
     328.291      45.202      70.078
Maximum flow rates at confluence using above data:
      433.596      426.738      421.353
Area of streams before confluence:
      125.969       17.500       27.500
Effective area values after confluence:
      170.969      157.276      150.307
Results of confluence:
Total flow rate =    433.596(CFS)
Time of concentration =    20.175 min.
Effective stream area after confluence =    170.969(Ac.)
Stream Area average Pervious fraction(Ap) =  0.113
Stream Area average soil loss rate(Fm) =    0.034(In/Hr)
Study area (this main stream) =     170.97(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       56.000 to Point/Station       57.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1043.300(Ft.)
Downstream point/station elevation =  1041.300(Ft.)
Pipe length  =   640.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   433.596(CFS)
Given pipe size =     84.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     3.904(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      2.947(Ft.)
 Minor friction loss =      2.957(Ft.)    K-factor =   1.50
Pipe flow velocity =     11.27(Ft/s)
Travel time through pipe =    0.95 min.
Time of concentration (TC) =    21.12 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       57.000 to Point/Station       57.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    170.969(Ac.)
Runoff from this stream =    433.596(CFS)
Time of concentration =   21.12 min.
Rainfall intensity =     2.526(In/Hr)
Area averaged loss rate (Fm) =    0.0345(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1129


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      136.000 to Point/Station      137.000
**** INITIAL AREA EVALUATION ****
```

```
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1091.600(Ft.)
Bottom (of initial area) elevation =  1086.600(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      3.246(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =     15.851(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      137.000 to Point/Station      138.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =  1086.600(Ft.)
End of street segment elevation =  1074.600(Ft.)
Length of street segment  =   875.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     31.702(CFS)
Depth of flow =   0.493(Ft.), Average velocity =   3.935(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.892(Ft.)
Flow velocity =   3.93(Ft/s)
Travel time =    3.71 min.     TC =   17.61  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.817(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.886
Subarea runoff =     25.329(CFS) for   11.000(Ac.)
Total runoff =     41.180(CFS)
Effective area this stream =       16.50(Ac.)
Total Study Area (Main Stream No. 1) =      193.31(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     41.180(CFS)
Half street flow at end of street =     20.590(CFS)
Depth of flow =   0.528(Ft.), Average velocity =   4.357(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      138.000 to Point/Station       57.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1067.600(Ft.)
Downstream point/station elevation =  1041.300(Ft.)
Pipe length  =  1320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    41.180(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =    41.180(CFS)
Normal flow depth in pipe =   18.70(In.)
Flow top width inside pipe =   29.07(In.)
Critical Depth =   25.85(In.)
Pipe flow velocity =     12.81(Ft/s)
Travel time through pipe =    1.72 min.
Time of concentration (TC) =    19.33 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       57.000 to Point/Station       57.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     16.500(Ac.)
Runoff from this stream =     41.180(CFS)
Time of concentration =   19.33 min.
Rainfall intensity =     2.664(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      139.000 to Point/Station      140.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1074.700(Ft.)
Bottom (of initial area) elevation =  1069.700(Ft.)
```

```
Difference in elevation =      5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      3.246(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =     15.851(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      140.000 to Point/Station      141.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1069.700(Ft.)
End of street segment elevation =  1065.300(Ft.)
Length of street segment  =   875.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     31.702(CFS)
Depth of flow =   0.565(Ft.), Average velocity =   2.902(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.90(Ft/s)
Travel time =    5.03 min.     TC =   18.93  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.698(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.885
Subarea runoff =     23.554(CFS) for   11.000(Ac.)
Total runoff =     39.405(CFS)
Effective area this stream =       16.50(Ac.)
Total Study Area (Main Stream No. 1) =      209.81(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     39.405(CFS)
Half street flow at end of street =     19.703(CFS)
Depth of flow =   0.603(Ft.), Average velocity =   3.163(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      141.000 to Point/Station      141.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     16.500(Ac.)
Runoff from this stream =     39.405(CFS)
Time of concentration =   18.93 min.
Rainfall intensity =     2.698(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      433.596     21.12               2.526
2       41.180     19.33               2.664
3       39.405     18.93               2.698
Qmax(1) =
         1.000 *    1.000 *   433.596) +
         0.947 *    1.000 *    41.180) +
         0.935 *    1.000 *    39.405) + =     509.456
Qmax(2) =
         1.056 *    0.915 *   433.596) +
         1.000 *    1.000 *    41.180) +
         0.987 *    1.000 *    39.405) + =     498.843
Qmax(3) =
         1.069 *    0.896 *   433.596) +
         1.013 *    0.979 *    41.180) +
         1.000 *    1.000 *    39.405) + =     495.599

Total of 3 streams to confluence:
Flow rates before confluence point:
     433.596      41.180      39.405
Maximum flow rates at confluence using above data:
      509.456      498.843      495.599
Area of streams before confluence:
      170.969       16.500       16.500
Effective area values after confluence:
      203.969      189.433      185.865
Results of confluence:
Total flow rate =    509.456(CFS)
Time of concentration =    21.122 min.
Effective stream area after confluence =    203.969(Ac.)
Stream Area average Pervious fraction(Ap) =  0.111
Stream Area average soil loss rate(Fm) =    0.036(In/Hr)
Study area (this main stream) =     203.97(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       57.000 to Point/Station       63.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1041.300(Ft.)
Downstream point/station elevation =  1039.500(Ft.)
Pipe length  =   560.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   509.456(CFS)
```

```
Given pipe size =     92.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     3.228(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      2.192(Ft.)
 Minor friction loss =     2.837(Ft.)    K-factor =   1.50
Pipe flow velocity =     11.04(Ft/s)
Travel time through pipe =    0.85 min.
Time of concentration (TC) =    21.97 min.
End of computations, Total Study Area =          209.81 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.111
Area averaged SCS curve number =  63.9
```

LINE "DZ-1"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/05/05

FONTANA / LINE DZ-1 HYDROLOGY
100 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 300.000 to Point/Station 301.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1068.100(Ft.)
Bottom (of initial area) elevation = 1063.100(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.00500 s(%)= 0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.902 min.
Rainfall intensity = 3.246(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff = 14.410(CFS)
Total initial stream area = 5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.044(In/Hr)

++
Process from Point/Station 301.000 to Point/Station 302.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1063.100(Ft.)
End of street segment elevation = 1060.000(Ft.)

```
Length of street segment  =   620.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     35.304(CFS)
Depth of flow =   0.761(Ft.), Average velocity =   3.099(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    4.73(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  33.314(Ft.)
Flow velocity =   3.10(Ft/s)
Travel time =    3.33 min.     TC =   17.24  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.853(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.886
Subarea runoff =     34.894(CFS) for   14.500(Ac.)
Total runoff =     49.304(CFS)
Effective area this stream =       19.50(Ac.)
Total Study Area (Main Stream No. 1) =       19.50(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     49.304(CFS)
Half street flow at end of street =     49.304(CFS)
Depth of flow =   0.849(Ft.), Average velocity =   3.265(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    9.10(Ft.)
Flow width (from curb towards crown)=  37.686(Ft.)


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Process from Point/Station      302.000 to Point/Station       65.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1055.000(Ft.)
Downstream point/station elevation =  1051.700(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    49.304(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    49.304(CFS)
Normal flow depth in pipe =   31.22(In.)
Flow top width inside pipe =   24.43(In.)
Critical Depth =   27.42(In.)
Pipe flow velocity =      7.57(Ft/s)
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```
Travel time through pipe =    1.45 min.
Time of concentration (TC) =    18.69 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       65.000 to Point/Station       65.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     19.500(Ac.)
Runoff from this stream =     49.304(CFS)
Time of concentration =   18.69 min.
Rainfall intensity =     2.718(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      304.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1064.500(Ft.)
Bottom (of initial area) elevation =  1060.000(Ft.)
Difference in elevation =     4.500(Ft.)
Slope =    0.00450  s(%)=       0.45
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   18.168 min.
Rainfall intensity =      2.765(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.828
Subarea runoff =     18.322(CFS)
Total initial stream area =        8.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      304.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      8.000(Ac.)
Runoff from this stream =     18.322(CFS)
Time of concentration =   18.17 min.
Rainfall intensity =     2.765(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream    Flow rate       TC            Rainfall Intensity
 No.        (CFS)        (min)                 (In/Hr)
```

```
1       49.304     18.69                2.718
2       18.322     18.17                2.765
Qmax(1) =
          1.000 *    1.000 *    49.304) +
          0.982 *    1.000 *    18.322) + =      67.290
Qmax(2) =
          1.017 *    0.972 *    49.304) +
          1.000 *    1.000 *    18.322) + =      67.083

Total of 2 streams to confluence:
Flow rates before confluence point:
      49.304      18.322
Maximum flow rates at confluence using above data:
       67.290       67.083
Area of streams before confluence:
       19.500        8.000
Effective area values after confluence:
       27.500       26.955
Results of confluence:
Total flow rate =     67.290(CFS)
Time of concentration =    18.690 min.
Effective stream area after confluence =     27.500(Ac.)
Stream Area average Pervious fraction(Ap) =  0.216
Stream Area average soil loss rate(Fm) =    0.095(In/Hr)
Study area (this main stream) =      27.50(Ac.)


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Process from Point/Station      65.000 to Point/Station       66.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1051.700(Ft.)
Downstream point/station elevation =  1048.400(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    67.290(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    67.290(CFS)
Normal flow depth in pipe =   28.55(In.)
Flow top width inside pipe =   47.13(In.)
Critical Depth =   29.74(In.)
Pipe flow velocity =      8.64(Ft/s)
Travel time through pipe =    1.27 min.
Time of concentration (TC) =    19.96 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       66.000 to Point/Station       66.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     27.500(Ac.)
Runoff from this stream =     67.290(CFS)
Time of concentration =   19.96 min.
Rainfall intensity =     2.613(In/Hr)
Area averaged loss rate (Fm) =    0.0952(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2164


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Process from Point/Station      305.000 to Point/Station      306.000
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**** INITIAL AREA EVALUATION ****

SCHOOL subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.264(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1062.000(Ft.)
Bottom (of initial area) elevation =  1055.400(Ft.)
Difference in elevation =     6.600(Ft.)
Slope =    0.00660  s(%)=       0.66
TC = k(0.412)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.823 min.
Rainfall intensity =      2.797(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.815
Subarea runoff =     18.235(CFS)
Total initial stream area =        8.000(Ac.)
Pervious area fraction = 0.600
Initial area Fm value =    0.264(In/Hr)


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Process from Point/Station      306.000 to Point/Station      306.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      8.000(Ac.)
Runoff from this stream =     18.235(CFS)
Time of concentration =   17.82 min.
Rainfall intensity =     2.797(In/Hr)
Area averaged loss rate (Fm) =    0.2640(In/Hr)
Area averaged Pervious ratio (Ap) = 0.6000


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Process from Point/Station      307.000 to Point/Station      308.000
**** INITIAL AREA EVALUATION ****

RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1070.100(Ft.)
Bottom (of initial area) elevation =  1065.100(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
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Subarea runoff =     11.609(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)

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Process from Point/Station      308.000 to Point/Station      309.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1065.100(Ft.)
End of street segment elevation =  1062.700(Ft.)
Length of street segment  =   650.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     23.219(CFS)
Depth of flow =   0.540(Ft.), Average velocity =   2.336(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.34(Ft/s)
Travel time =    4.64 min.     TC =   22.43  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.437(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.819
Subarea runoff =     18.315(CFS) for   10.000(Ac.)
Total runoff =     29.924(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       50.50(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     29.924(CFS)
Half street flow at end of street =     14.962(CFS)
Depth of flow =   0.581(Ft.), Average velocity =   2.584(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)

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Process from Point/Station      309.000 to Point/Station      310.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
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Top of street segment elevation =  1062.700(Ft.)
End of street segment elevation =  1055.400(Ft.)
Length of street segment  =  1450.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     44.886(CFS)
Depth of flow =   0.628(Ft.), Average velocity =   3.332(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.33(Ft/s)
Travel time =    7.25 min.     TC =   29.68  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.059(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.804
Subarea runoff =     19.743(CFS) for   15.000(Ac.)
Total runoff =     49.667(CFS)
Effective area this stream =       30.00(Ac.)
Total Study Area (Main Stream No. 1) =       65.50(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     49.667(CFS)
Half street flow at end of street =     24.833(CFS)
Depth of flow =   0.649(Ft.), Average velocity =   3.468(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      310.000 to Point/Station      310.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     30.000(Ac.)
Runoff from this stream =     49.667(CFS)
Time of concentration =   29.68 min.
Rainfall intensity =     2.059(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
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```
 No.       (CFS)        (min)                  (In/Hr)

1        67.290      19.96                2.613
2        18.235      17.82                2.797
3        49.667      29.68                2.059
Qmax(1) =
          1.000 *     1.000 *    67.290) +
          0.927 *     1.000 *    18.235) +
          1.301 *     0.673 *    49.667) + =      127.656
Qmax(2) =
          1.073 *     0.893 *    67.290) +
          1.000 *     1.000 *    18.235) +
          1.401 *     0.601 *    49.667) + =      124.481
Qmax(3) =
          0.780 *     1.000 *    67.290) +
          0.709 *     1.000 *    18.235) +
          1.000 *     1.000 *    49.667) + =      115.098

Total of 3 streams to confluence:
Flow rates before confluence point:
      67.290      18.235      49.667
Maximum flow rates at confluence using above data:
      127.656      124.481      115.098
Area of streams before confluence:
       27.500        8.000       30.000
Effective area values after confluence:
       55.679       50.569       65.500
Results of confluence:
Total flow rate =    127.656(CFS)
Time of concentration =    19.963 min.
Effective stream area after confluence =     55.679(Ac.)
Stream Area average Pervious fraction(Ap) =  0.393
Stream Area average soil loss rate(Fm) =    0.173(In/Hr)
Study area (this main stream) =      65.50(Ac.)


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Process from Point/Station       66.000 to Point/Station       67.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1048.400(Ft.)
Downstream point/station elevation =  1044.600(Ft.)
Pipe length  =   760.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   127.656(CFS)
Given pipe size =     54.00(In.)
Calculated individual pipe flow  =   127.656(CFS)
Normal flow depth in pipe =   40.73(In.)
Flow top width inside pipe =   46.49(In.)
Critical Depth =   39.91(In.)
Pipe flow velocity =      9.92(Ft/s)
Travel time through pipe =    1.28 min.
Time of concentration (TC) =    21.24 min.


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Process from Point/Station       67.000 to Point/Station       67.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     55.679(Ac.)
```

```
Runoff from this stream =    127.656(CFS)
Time of concentration =   21.24 min.
Rainfall intensity =     2.517(In/Hr)
Area averaged loss rate (Fm) =    0.1729(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3931


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Process from Point/Station      311.000 to Point/Station      312.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1062.400(Ft.)
Bottom (of initial area) elevation =  1057.400(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     18.575(CFS)
Total initial stream area =        8.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


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Process from Point/Station      312.000 to Point/Station      313.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1057.400(Ft.)
End of street segment elevation =  1052.600(Ft.)
Length of street segment  =   960.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     27.863(CFS)
Depth of flow =   0.545(Ft.), Average velocity =   2.752(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.75(Ft/s)
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```
Travel time =    5.81 min.     TC =   23.60  min.
 Adding area flow to street
SCHOOL subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.264(In/Hr)
Rainfall intensity =      2.363(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.808
Subarea runoff =     11.967(CFS) for    8.000(Ac.)
Total runoff =     30.542(CFS)
Effective area this stream =       16.00(Ac.)
Total Study Area (Main Stream No. 1) =       81.50(Ac.)
Area averaged Fm value =    0.242(In/Hr)
Street flow at end of street =     30.542(CFS)
Half street flow at end of street =     15.271(CFS)
Depth of flow =   0.559(Ft.), Average velocity =   2.854(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      313.000 to Point/Station      313.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     16.000(Ac.)
Runoff from this stream =     30.542(CFS)
Time of concentration =   23.60 min.
Rainfall intensity =     2.363(In/Hr)
Area averaged loss rate (Fm) =    0.2420(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5500
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      127.656     21.24               2.517
2       30.542     23.60               2.363
Qmax(1) =
         1.000 *    1.000 *   127.656) +
         1.073 *    0.900 *    30.542) + =     157.141
Qmax(2) =
         0.934 *    1.000 *   127.656) +
         1.000 *    1.000 *    30.542) + =     149.793

Total of 2 streams to confluence:
Flow rates before confluence point:
     127.656      30.542
Maximum flow rates at confluence using above data:
      157.141      149.793
Area of streams before confluence:
       55.679       16.000
Effective area values after confluence:
       70.078       71.679
Results of confluence:
```

```
Total flow rate =    157.141(CFS)
Time of concentration =   21.240 min.
Effective stream area after confluence =     70.078(Ac.)
Stream Area average Pervious fraction(Ap) =  0.428
Stream Area average soil loss rate(Fm) =    0.188(In/Hr)
Study area (this main stream) =      71.68(Ac.)


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Process from Point/Station       67.000 to Point/Station       68.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1044.600(Ft.)
Downstream point/station elevation =  1040.800(Ft.)
Pipe length  =   760.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   157.141(CFS)
Given pipe size =     60.00(In.)
Calculated individual pipe flow  =   157.141(CFS)
Normal flow depth in pipe =   42.61(In.)
Flow top width inside pipe =   54.44(In.)
Critical Depth =   43.13(In.)
Pipe flow velocity =     10.53(Ft/s)
Travel time through pipe =    1.20 min.
Time of concentration (TC) =    22.44 min.


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Process from Point/Station       68.000 to Point/Station       68.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Effective stream flow area =     70.078(Ac.)
Total study area this main stream =     81.500(Ac.)
Runoff from this stream =    157.141(CFS)
Time of concentration =   22.44 min.
Rainfall intensity =     2.435(In/Hr)
Area averaged loss rate (Fm) =    0.1884(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4281
Program is now starting with Main Stream No. 2


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Process from Point/Station      314.000 to Point/Station      315.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1079.500(Ft.)
Bottom (of initial area) elevation =  1074.500(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     11.609(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


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Process from Point/Station      315.000 to Point/Station      318.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1074.500(Ft.)
End of street segment elevation =  1069.500(Ft.)
Length of street segment  =  1000.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     21.477(CFS)
Depth of flow =   0.508(Ft.), Average velocity =   2.482(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.48(Ft/s)
Travel time =    6.72 min.     TC =   24.50  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.310(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.814
Subarea runoff =     13.789(CFS) for    8.500(Ac.)
Total runoff =     25.398(CFS)
Effective area this stream =       13.50(Ac.)
Total Study Area (Main Stream No. 2) =       13.50(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     25.398(CFS)
Half street flow at end of street =     12.699(CFS)
Depth of flow =   0.531(Ft.), Average velocity =   2.653(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      318.000 to Point/Station      318.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     13.500(Ac.)
Runoff from this stream =     25.398(CFS)
Time of concentration =   24.50 min.
Rainfall intensity =     2.310(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000

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Process from Point/Station      316.000 to Point/Station      317.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1079.500(Ft.)
Bottom (of initial area) elevation =  1074.500(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     11.609(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)

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Process from Point/Station      317.000 to Point/Station      318.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1074.500(Ft.)
End of street segment elevation =  1069.500(Ft.)
Length of street segment  =  1000.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     22.058(CFS)
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Depth of flow =   0.511(Ft.), Average velocity =   2.508(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.51(Ft/s)
Travel time =    6.64 min.     TC =   24.43  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.314(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.814
Subarea runoff =     14.780(CFS) for    9.000(Ac.)
Total runoff =     26.389(CFS)
Effective area this stream =       14.00(Ac.)
Total Study Area (Main Stream No. 2) =       27.50(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     26.389(CFS)
Half street flow at end of street =     13.195(CFS)
Depth of flow =   0.536(Ft.), Average velocity =   2.694(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      318.000 to Point/Station      318.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     14.000(Ac.)
Runoff from this stream =     26.389(CFS)
Time of concentration =   24.43 min.
Rainfall intensity =     2.314(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1       25.398     24.50              2.310
2       26.389     24.43              2.314
Qmax(1) =
         1.000 *    1.000 *    25.398) +
         0.998 *    1.000 *    26.389) + =      51.737
Qmax(2) =
         1.002 *    0.997 *    25.398) +
         1.000 *    1.000 *    26.389) + =      51.763

Total of 2 streams to confluence:
Flow rates before confluence point:
      25.398      26.389
Maximum flow rates at confluence using above data:
       51.737       51.763
```

```
Area of streams before confluence:
       13.500       14.000
Effective area values after confluence:
       27.500       27.461
Results of confluence:
Total flow rate =     51.763(CFS)
Time of concentration =    24.434 min.
Effective stream area after confluence =     27.461(Ac.)
Stream Area average Pervious fraction(Ap) =  0.500
Stream Area average soil loss rate(Fm) =    0.220(In/Hr)
Study area (this main stream) =      27.50(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      318.000 to Point/Station      319.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1069.500(Ft.)
End of street segment elevation =  1063.000(Ft.)
Length of street segment  =  1300.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     69.199(CFS)
Depth of flow =   0.755(Ft.), Average velocity =   3.657(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    4.41(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.66(Ft/s)
Travel time =    5.92 min.     TC =   30.36  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.032(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.803
Subarea runoff =     23.179(CFS) for   18.500(Ac.)
Total runoff =     74.942(CFS)
Effective area this stream =       45.96(Ac.)
Total Study Area (Main Stream No. 2) =       46.00(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     74.942(CFS)
Half street flow at end of street =     37.471(CFS)
```

```
Depth of flow =   0.782(Ft.), Average velocity =   3.698(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    5.75(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      319.000 to Point/Station       68.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1054.800(Ft.)
Downstream point/station elevation =  1041.800(Ft.)
Pipe length  =   900.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    74.942(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    74.942(CFS)
Normal flow depth in pipe =   22.13(In.)
Flow top width inside pipe =   47.85(In.)
Critical Depth =   31.46(In.)
Pipe flow velocity =     13.26(Ft/s)
Travel time through pipe =    1.13 min.
Time of concentration (TC) =    31.49 min.


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Process from Point/Station       68.000 to Point/Station       68.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Effective stream flow area =     45.961(Ac.)
Total study area this main stream =     46.000(Ac.)
Runoff from this stream =     74.942(CFS)
Time of concentration =   31.49 min.
Rainfall intensity =     1.988(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      157.141     22.44               2.435
2       74.942     31.49               1.988
Qmax(1) =
         1.000 *    1.000 *   157.141) +
         1.253 *    0.713 *    74.942) + =     224.085
Qmax(2) =
         0.801 *    1.000 *   157.141) +
         1.000 *    1.000 *    74.942) + =     200.762

Total of 2 main streams to confluence:
Flow rates before confluence point:
     158.141      75.942
Maximum flow rates at confluence using above data:
      224.085      200.762
Effective Area of streams before confluence:
       70.078       45.961
Effective area values after confluence:
```

```
      102.834      116.039


Results of confluence:
Total flow rate =    224.085(CFS)
Time of concentration =    22.443 min.
Effective stream area after confluence  =    102.834(Ac.)
Stream Area average Pervious fraction(Ap) =  0.457
Stream Area average soil loss rate(Fm) =    0.201(In/Hr)
Steam effective area =     116.04(Ac.)


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Process from Point/Station       68.000 to Point/Station       68.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    102.834(Ac.)
Runoff from this stream =    224.085(CFS)
Time of concentration =   22.44 min.
Rainfall intensity =     2.435(In/Hr)
Area averaged loss rate (Fm) =    0.2009(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4566


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Process from Point/Station      320.000 to Point/Station      321.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1057.100(Ft.)
Bottom (of initial area) elevation =  1052.100(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     15.092(CFS)
Total initial stream area =        6.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


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Process from Point/Station      321.000 to Point/Station      321.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      6.500(Ac.)
Runoff from this stream =     15.092(CFS)
Time of concentration =   17.79 min.
```

```
Rainfall intensity =     2.800(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      322.000 to Point/Station      323.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1057.100(Ft.)
Bottom (of initial area) elevation =  1052.100(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     11.609(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      323.000 to Point/Station      323.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      5.000(Ac.)
Runoff from this stream =     11.609(CFS)
Time of concentration =   17.79 min.
Rainfall intensity =     2.800(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      224.085     22.44                2.435
2       15.092     17.79                2.800
3       11.609     17.79                2.800
Qmax(1) =
          1.000 *    1.000 *   224.085) +
          0.859 *    1.000 *    15.092) +
          0.859 *    1.000 *    11.609) + =     247.015
Qmax(2) =
          1.163 *    0.793 *   224.085) +
          1.000 *    1.000 *    15.092) +
          1.000 *    1.000 *    11.609) + =     233.286
```

```
Qmax(3) =
        1.163 *    0.793 *   224.085) +
        1.000 *    1.000 *    15.092) +
        1.000 *    1.000 *    11.609) + =     233.286

Total of 3 streams to confluence:
Flow rates before confluence point:
     224.085      15.092      11.609
Maximum flow rates at confluence using above data:
      247.015      233.286      233.286
Area of streams before confluence:
      102.834        6.500        5.000
Effective area values after confluence:
      114.334       93.011       93.011
Results of confluence:
Total flow rate =    247.015(CFS)
Time of concentration =    22.443 min.
Effective stream area after confluence =    114.334(Ac.)
Stream Area average Pervious fraction(Ap) =  0.461
Stream Area average soil loss rate(Fm) =    0.203(In/Hr)
Study area (this main stream) =     114.33(Ac.)


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Process from Point/Station       68.000 to Point/Station       69.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1040.800(Ft.)
Downstream point/station elevation =  1038.800(Ft.)
Pipe length  =   400.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   247.015(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   247.015(CFS)
Normal flow depth in pipe =   44.30(In.)
Flow top width inside pipe =   83.87(In.)
Critical Depth =   49.42(In.)
Pipe flow velocity =     12.00(Ft/s)
Travel time through pipe =    0.56 min.
Time of concentration (TC) =    23.00 min.


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Process from Point/Station       69.000 to Point/Station       69.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    114.334(Ac.)
Runoff from this stream =    247.015(CFS)
Time of concentration =   23.00 min.
Rainfall intensity =     2.400(In/Hr)
Area averaged loss rate (Fm) =    0.2028(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4610


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Process from Point/Station      324.000 to Point/Station      325.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
```

```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1055.000(Ft.)
Bottom (of initial area) elevation =  1050.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     18.575(CFS)
Total initial stream area =        8.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


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Process from Point/Station      325.000 to Point/Station      325.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      8.000(Ac.)
Runoff from this stream =     18.575(CFS)
Time of concentration =   17.79 min.
Rainfall intensity =     2.800(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


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Process from Point/Station      326.000 to Point/Station      327.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1055.000(Ft.)
Bottom (of initial area) elevation =  1050.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     16.253(CFS)
Total initial stream area =        7.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)
```

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Process from Point/Station      327.000 to Point/Station      327.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      7.000(Ac.)
Runoff from this stream =     16.253(CFS)
Time of concentration =   17.79 min.
Rainfall intensity =     2.800(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream    Flow rate       TC             Rainfall Intensity
 No.        (CFS)        (min)                  (In/Hr)


1       247.015      23.00                2.400
2        18.575      17.79                2.800
3        16.253      17.79                2.800
Qmax(1) =
          1.000 *     1.000 *   247.015) +
          0.845 *     1.000 *    18.575) +
          0.845 *     1.000 *    16.253) + =     276.446
Qmax(2) =
          1.182 *     0.774 *   247.015) +
          1.000 *     1.000 *    18.575) +
          1.000 *     1.000 *    16.253) + =     260.665
Qmax(3) =
          1.182 *     0.774 *   247.015) +
          1.000 *     1.000 *    18.575) +
          1.000 *     1.000 *    16.253) + =     260.665

Total of 3 streams to confluence:
Flow rates before confluence point:
     247.015       18.575       16.253
Maximum flow rates at confluence using above data:
      276.446       260.665       260.665
Area of streams before confluence:
      114.334         8.000         7.000
Effective area values after confluence:
      129.334       103.437       103.437
Results of confluence:
Total flow rate =     276.446(CFS)
Time of concentration =    22.998 min.
Effective stream area after confluence =     129.334(Ac.)
Stream Area average Pervious fraction(Ap) =  0.465
Stream Area average soil loss rate(Fm) =    0.205(In/Hr)
Study area (this main stream) =      129.33(Ac.)


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Process from Point/Station       69.000 to Point/Station       70.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1038.800(Ft.)
Downstream point/station elevation =  1034.600(Ft.)
Pipe length  =   880.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   276.446(CFS)
Given pipe size =     96.00(In.)
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Calculated individual pipe flow  =   276.446(CFS)
Normal flow depth in pipe =   44.48(In.)
Flow top width inside pipe =   95.74(In.)
Critical Depth =   50.33(In.)
Pipe flow velocity =     12.12(Ft/s)
Travel time through pipe =    1.21 min.
Time of concentration (TC) =    24.21 min.


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Process from Point/Station       70.000 to Point/Station       70.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    129.334(Ac.)
Runoff from this stream =    276.446(CFS)
Time of concentration =   24.21 min.
Rainfall intensity =     2.327(In/Hr)
Area averaged loss rate (Fm) =    0.2048(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4655


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Process from Point/Station      328.000 to Point/Station      329.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1057.800(Ft.)
Bottom (of initial area) elevation =  1052.800(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     11.609(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


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Process from Point/Station      329.000 to Point/Station      330.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1052.800(Ft.)
End of street segment elevation =  1048.800(Ft.)
Length of street segment  =   800.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
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Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     25.541(CFS)
Depth of flow =   0.532(Ft.), Average velocity =   2.659(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.66(Ft/s)
Travel time =    5.01 min.     TC =   22.80  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.412(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.818
Subarea runoff =     21.932(CFS) for   12.000(Ac.)
Total runoff =     33.542(CFS)
Effective area this stream =       17.00(Ac.)
Total Study Area (Main Stream No. 1) =       89.50(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     33.542(CFS)
Half street flow at end of street =     16.771(CFS)
Depth of flow =   0.574(Ft.), Average velocity =   2.963(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      330.000 to Point/Station      331.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1048.800(Ft.)
End of street segment elevation =  1045.500(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     50.312(CFS)
```

```
Depth of flow =   0.653(Ft.), Average velocity =   3.479(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.48(Ft/s)
Travel time =    3.16 min.     TC =   25.97  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.231(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.811
Subarea runoff =     28.009(CFS) for   17.000(Ac.)
Total runoff =     61.551(CFS)
Effective area this stream =       34.00(Ac.)
Total Study Area (Main Stream No. 1) =      106.50(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     61.551(CFS)
Half street flow at end of street =     30.775(CFS)
Depth of flow =   0.715(Ft.), Average velocity =   3.606(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    2.42(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      331.000 to Point/Station       70.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1038.600(Ft.)
Downstream point/station elevation =  1034.600(Ft.)
Pipe length  =   800.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    61.551(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =    61.551(CFS)
Normal flow depth in pipe =   30.14(In.)
Flow top width inside pipe =   37.81(In.)
Critical Depth =   29.50(In.)
Pipe flow velocity =      8.32(Ft/s)
Travel time through pipe =    1.60 min.
Time of concentration (TC) =    27.57 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       70.000 to Point/Station       70.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     34.000(Ac.)
Runoff from this stream =     61.551(CFS)
Time of concentration =   27.57 min.
Rainfall intensity =     2.153(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      332.000 to Point/Station      333.000
**** INITIAL AREA EVALUATION ****

-------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1053.200(Ft.)
Bottom (of initial area) elevation =  1048.200(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     11.609(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      333.000 to Point/Station      334.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

-------------------------------------------------------------------------------
Top of street segment elevation =  1048.200(Ft.)
End of street segment elevation =  1045.600(Ft.)
Length of street segment  =   520.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     20.897(CFS)
Depth of flow =   0.504(Ft.), Average velocity =   2.455(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.46(Ft/s)
Travel time =    3.53 min.     TC =   21.32  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
```

```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.512(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =     15.203(CFS) for    8.000(Ac.)
Total runoff =     26.813(CFS)
Effective area this stream =       13.00(Ac.)
Total Study Area (Main Stream No. 1) =      119.50(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     26.813(CFS)
Half street flow at end of street =     13.406(CFS)
Depth of flow =   0.539(Ft.), Average velocity =   2.711(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      334.000 to Point/Station      334.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     13.000(Ac.)
Runoff from this stream =     26.813(CFS)
Time of concentration =   21.32 min.
Rainfall intensity =     2.512(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      335.000 to Point/Station      336.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1053.200(Ft.)
Bottom (of initial area) elevation =  1048.200(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     13.931(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      336.000 to Point/Station      337.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1048.200(Ft.)
End of street segment elevation =  1045.600(Ft.)
Length of street segment  =   520.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     29.023(CFS)
Depth of flow =   0.551(Ft.), Average velocity =   2.797(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.80(Ft/s)
Travel time =    3.10 min.     TC =   20.89  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.543(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =     25.787(CFS) for   13.000(Ac.)
Total runoff =     39.719(CFS)
Effective area this stream =       19.00(Ac.)
Total Study Area (Main Stream No. 1) =      138.50(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     39.719(CFS)
Half street flow at end of street =     19.859(CFS)
Depth of flow =   0.605(Ft.), Average velocity =   3.168(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      337.000 to Point/Station      337.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 4
Stream flow area =     19.000(Ac.)
Runoff from this stream =     39.719(CFS)
Time of concentration =   20.89 min.
Rainfall intensity =     2.543(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
```

```
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.       (CFS)        (min)                (In/Hr)


1       276.446      24.21                2.327
2        61.551      27.57                2.153
3        26.813      21.32                2.512
4        39.719      20.89                2.543
Qmax(1) =
          1.000 *     1.000 *   276.446) +
          1.090 *     0.878 *    61.551) +
          0.920 *     1.000 *    26.813) +
          0.907 *     1.000 *    39.719) + =      396.068
Qmax(2) =
          0.918 *     1.000 *   276.446) +
          1.000 *     1.000 *    61.551) +
          0.843 *     1.000 *    26.813) +
          0.832 *     1.000 *    39.719) + =      370.916
Qmax(3) =
          1.087 *     0.881 *   276.446) +
          1.186 *     0.773 *    61.551) +
          1.000 *     1.000 *    26.813) +
          0.987 *     1.000 *    39.719) + =      387.048
Qmax(4) =
          1.101 *     0.863 *   276.446) +
          1.202 *     0.758 *    61.551) +
          1.014 *     0.980 *    26.813) +
          1.000 *     1.000 *    39.719) + =      385.123

Total of 4 streams to confluence:
Flow rates before confluence point:
     276.446       61.551       26.813       39.719
Maximum flow rates at confluence using above data:
      396.068      370.916      387.048      385.123
Area of streams before confluence:
      129.334       34.000       13.000       19.000
Effective area values after confluence:
      191.189      195.334      172.195      169.091
Results of confluence:
Total flow rate =    396.068(CFS)
Time of concentration =    24.208 min.
Effective stream area after confluence =    191.189(Ac.)
Stream Area average Pervious fraction(Ap) =  0.477
Stream Area average soil loss rate(Fm) =    0.210(In/Hr)
Study area (this main stream) =     195.33(Ac.)


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Process from Point/Station       70.000 to Point/Station       71.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

------------------------------------------------------------------------
Upstream point/station elevation =  1034.600(Ft.)
Downstream point/station elevation =  1030.600(Ft.)
Pipe length  =   800.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   396.068(CFS)
Given pipe size =    102.00(In.)
Calculated individual pipe flow  =   396.068(CFS)
Normal flow depth in pipe =   52.36(In.)
```

```
Flow top width inside pipe =  101.96(In.)
Critical Depth =   59.61(In.)
Pipe flow velocity =     13.51(Ft/s)
Travel time through pipe =    0.99 min.
Time of concentration (TC) =    25.19 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       71.000 to Point/Station       71.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    191.189(Ac.)
Runoff from this stream =    396.068(CFS)
Time of concentration =   25.19 min.
Rainfall intensity =     2.272(In/Hr)
Area averaged loss rate (Fm) =    0.2099(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4772


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      338.000 to Point/Station      339.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1056.000(Ft.)
Bottom (of initial area) elevation =  1051.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      3.246(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =     14.410(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)


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Process from Point/Station      339.000 to Point/Station      340.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1051.000(Ft.)
End of street segment elevation =  1048.600(Ft.)
Length of street segment  =   480.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
```

```
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     27.379(CFS)
Depth of flow =   0.542(Ft.), Average velocity =   2.733(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.73(Ft/s)
Travel time =    2.93 min.     TC =   16.83  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.895(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.886
Subarea runoff =     21.508(CFS) for    9.000(Ac.)
Total runoff =     35.918(CFS)
Effective area this stream =       14.00(Ac.)
Total Study Area (Main Stream No. 1) =      152.50(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     35.918(CFS)
Half street flow at end of street =     17.959(CFS)
Depth of flow =   0.586(Ft.), Average velocity =   3.044(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      340.000 to Point/Station      340.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     14.000(Ac.)
Runoff from this stream =     35.918(CFS)
Time of concentration =   16.83 min.
Rainfall intensity =     2.895(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                 (In/Hr)


1       396.068     25.19               2.272
2        35.918     16.83               2.895
Qmax(1) =
          1.000 *    1.000 *   396.068) +
          0.782 *    1.000 *    35.918) + =     424.142
Qmax(2) =
```

```
          1.302 *    0.668 *   396.068) +
          1.000 *    1.000 *    35.918) + =     380.324

Total of 2 streams to confluence:
Flow rates before confluence point:
     396.068      35.918
Maximum flow rates at confluence using above data:
      424.142      380.324
Area of streams before confluence:
      191.189       14.000
Effective area values after confluence:
      205.189      141.706
Results of confluence:
Total flow rate =    424.142(CFS)
Time of concentration =    25.195 min.
Effective stream area after confluence =    205.189(Ac.)
Stream Area average Pervious fraction(Ap) =  0.451
Stream Area average soil loss rate(Fm) =    0.199(In/Hr)
Study area (this main stream) =     205.19(Ac.)
End of computations, Total Study Area =          234.00 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.450
Area averaged SCS curve number =  56.0
```

LINE "P3"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/05/05

FONTANA / LINE P3 HYDROLOGY
100 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 409.000 to Point/Station 410.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.140(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1860.000(Ft.)
Bottom (of initial area) elevation = 1460.000(Ft.)
Difference in elevation = 400.000(Ft.)
Slope = 0.40000 s(%)= 40.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.994 min.
Rainfall intensity = 3.957(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.868
Subarea runoff = 25.765(CFS)
Total initial stream area = 7.500(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.140(In/Hr)

++
Process from Point/Station 410.000 to Point/Station 411.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 57.542(CFS)
Depth of flow = 0.275(Ft.), Average velocity = 10.312(Ft/s)

```
      ******* Irregular Channel Data **********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             20.00
      2             20.00              0.00
      3             40.00              0.00
      4             60.00             20.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     57.543(CFS)
   '      '    flow top width =     20.550(Ft.)
   '      '    velocity=   10.312(Ft/s)
   '      '    area =      5.580(Sq.Ft)
   '      '    Froude number =     3.487

Upstream point elevation =  1460.000(Ft.)
Downstream point elevation =  1300.000(Ft.)
Flow length =   470.000(Ft.)
Travel time  =    0.76 min.
Time of concentration =   10.75 min.
Depth of flow =   0.275(Ft.)
Average velocity =  10.312(Ft/s)
Total irregular channel flow =    57.542(CFS)
Irregular channel normal depth above invert elev. =   0.275(Ft.)
Average velocity of channel(s) =  10.312(Ft/s)

Sub-Channel No. 1 Critical depth =      0.633(Ft.)
   '      '       '     Critical flow top width =     21.266(Ft.)
   '      '       '     Critical flow velocity=    4.407(Ft/s)
   '      '       '     Critical flow area =     13.057(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      3.787(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =     59.572(CFS) for   18.500(Ac.)
Total runoff =     85.338(CFS)
Effective area this stream =       26.00(Ac.)
Total Study Area (Main Stream No. 1) =       26.00(Ac.)
Area averaged Fm value =    0.140(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      411.000 to Point/Station      412.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    118.160(CFS)
Depth of flow =   0.510(Ft.), Average velocity =  11.301(Ft/s)
      ******* Irregular Channel Data **********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
```

```
      1             0.00            20.00
      2            20.00             0.00
      3            40.00             0.00
      4            60.00            20.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =    118.160(CFS)
  '     '    flow top width =     21.020(Ft.)
  '     '    velocity=   11.301(Ft/s)
  '     '    area =     10.455(Sq.Ft)
  '     '    Froude number =     2.824

Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   650.000(Ft.)
Travel time  =    0.96 min.
Time of concentration =   11.71 min.
Depth of flow =   0.510(Ft.)
Average velocity =  11.301(Ft/s)
Total irregular channel flow =   118.160(CFS)
Irregular channel normal depth above invert elev. =   0.510(Ft.)
Average velocity of channel(s) =  11.301(Ft/s)

Sub-Channel No. 1 Critical depth =      1.016(Ft.)
  '     '       '     Critical flow top width =     22.031(Ft.)
  '     '       '     Critical flow velocity=    5.536(Ft/s)
  '     '       '     Critical flow area =     21.344(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      3.598(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.865
Subarea runoff =     57.814(CFS) for   20.000(Ac.)
Total runoff =    143.152(CFS)
Effective area this stream =       46.00(Ac.)
Total Study Area (Main Stream No. 1) =       46.00(Ac.)
Area averaged Fm value =    0.140(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      412.000 to Point/Station       77.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
-----------------------------------------------------------------------
Upstream point/station elevation =  1152.000(Ft.)
Downstream point/station elevation =  1122.500(Ft.)
Pipe length  =   450.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   143.152(CFS)
Given pipe size =     30.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    45.103(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     54.794(Ft.)
 Minor friction loss =     19.809(Ft.)    K-factor =   1.50
```

```
Critical depth could not be calculated.
Pipe flow velocity =      29.16(Ft/s)
Travel time through pipe =     0.26 min.
Time of concentration (TC) =     11.97 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       77.000 to Point/Station       77.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      46.000(Ac.)
Runoff from this stream =     143.152(CFS)
Time of concentration =   11.97 min.
Rainfall intensity =      3.551(In/Hr)
Area averaged loss rate (Fm) =     0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      413.000 to Point/Station      414.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =   500.000(Ft.)
Top (of initial area) elevation =  1163.300(Ft.)
Bottom (of initial area) elevation =  1129.000(Ft.)
Difference in elevation =    34.300(Ft.)
Slope =    0.06860  s(%)=       6.86
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.985 min.
Rainfall intensity =      4.528(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.856
Subarea runoff =     17.446(CFS)
Total initial stream area =        4.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      414.000 to Point/Station      414.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      4.500(Ac.)
Runoff from this stream =     17.446(CFS)
Time of concentration =    7.98 min.
Rainfall intensity =     4.528(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
```

```
 No.       (CFS)        (min)                  (In/Hr)

1      143.152      11.97                3.551
2       17.446       7.98                4.528
Qmax(1) =
          1.000 *     1.000 *   143.152) +
          0.773 *     1.000 *    17.446) + =     156.643
Qmax(2) =
          1.286 *     0.667 *   143.152) +
          1.000 *     1.000 *    17.446) + =     140.275

Total of 2 streams to confluence:
Flow rates before confluence point:
     143.152      17.446
Maximum flow rates at confluence using above data:
      156.643      140.275
Area of streams before confluence:
       46.000        4.500
Effective area values after confluence:
       50.500       35.187
Results of confluence:
Total flow rate =    156.643(CFS)
Time of concentration =    11.970 min.
Effective stream area after confluence =     50.500(Ac.)
Stream Area average Pervious fraction(Ap) =  0.955
Stream Area average soil loss rate(Fm) =    0.147(In/Hr)
Study area (this main stream) =      50.50(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       77.000 to Point/Station       78.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1122.500(Ft.)
Downstream point/station elevation =  1090.500(Ft.)
Pipe length  =   550.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   156.643(CFS)
Given pipe size =     39.00(In.)
Calculated individual pipe flow  =   156.643(CFS)
Normal flow depth in pipe =   26.06(In.)
Flow top width inside pipe =   36.73(In.)
Critical depth could not be calculated.
Pipe flow velocity =     26.59(Ft/s)
Travel time through pipe =    0.34 min.
Time of concentration (TC) =    12.31 min.


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Process from Point/Station       78.000 to Point/Station       78.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     50.500(Ac.)
Runoff from this stream =    156.643(CFS)
Time of concentration =   12.31 min.
Rainfall intensity =     3.491(In/Hr)
Area averaged loss rate (Fm) =    0.1471(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9554
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      415.000 to Point/Station      416.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =   550.000(Ft.)
Top (of initial area) elevation =  1129.000(Ft.)
Bottom (of initial area) elevation =  1097.000(Ft.)
Difference in elevation =    32.000(Ft.)
Slope =    0.05818  s(%)=       5.82
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.573 min.
Rainfall intensity =      4.339(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.854
Subarea runoff =     25.947(CFS)
Total initial stream area =        7.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      416.000 to Point/Station      416.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      7.000(Ac.)
Runoff from this stream =     25.947(CFS)
Time of concentration =    8.57 min.
Rainfall intensity =     4.339(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      417.000 to Point/Station      418.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   650.000(Ft.)
Top (of initial area) elevation =  1420.000(Ft.)
Bottom (of initial area) elevation =  1120.000(Ft.)
Difference in elevation =   300.000(Ft.)
Slope =    0.46154  s(%)=      46.15
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.175 min.
```

```
Rainfall intensity =      4.464(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.872
Subarea runoff =     38.917(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.140(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      418.000 to Point/Station      418.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     10.000(Ac.)
Runoff from this stream =     38.917(CFS)
Time of concentration =    8.17 min.
Rainfall intensity =     4.464(In/Hr)
Area averaged loss rate (Fm) =    0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      156.643     12.31               3.491
2       25.947      8.57               4.339
3       38.917      8.17               4.464
Qmax(1) =
          1.000 *    1.000 *   156.643) +
          0.794 *    1.000 *    25.947) +
          0.775 *    1.000 *    38.917) + =     207.413
Qmax(2) =
          1.253 *    0.696 *   156.643) +
          1.000 *    1.000 *    25.947) +
          0.971 *    1.000 *    38.917) + =     200.418
Qmax(3) =
          1.291 *    0.664 *   156.643) +
          1.030 *    0.954 *    25.947) +
          1.000 *    1.000 *    38.917) + =     198.654

Total of 3 streams to confluence:
Flow rates before confluence point:
     156.643      25.947      38.917
Maximum flow rates at confluence using above data:
      207.413      200.418      198.654
Area of streams before confluence:
       50.500        7.000       10.000
Effective area values after confluence:
       67.500       52.157       50.199
Results of confluence:
Total flow rate =    207.413(CFS)
Time of concentration =    12.314 min.
Effective stream area after confluence =     67.500(Ac.)
Stream Area average Pervious fraction(Ap) =  0.915
Stream Area average soil loss rate(Fm) =    0.154(In/Hr)
Study area (this main stream) =      67.50(Ac.)

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Process from Point/Station       78.000 to Point/Station       79.000
```

```
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1090.500(Ft.)
Downstream point/station elevation =  1060.200(Ft.)
Pipe length  =   900.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   207.413(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =   207.413(CFS)
Normal flow depth in pipe =   32.11(In.)
Flow top width inside pipe =   45.18(In.)
Critical depth could not be calculated.
Pipe flow velocity =     23.24(Ft/s)
Travel time through pipe =    0.65 min.
Time of concentration (TC) =    12.96 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       79.000 to Point/Station       79.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     67.500(Ac.)
Runoff from this stream =    207.413(CFS)
Time of concentration =   12.96 min.
Rainfall intensity =     3.386(In/Hr)
Area averaged loss rate (Fm) =    0.1536(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9148


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      420.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1850.000(Ft.)
Bottom (of initial area) elevation =  1320.000(Ft.)
Difference in elevation =   530.000(Ft.)
Slope =    0.53000  s(%)=      53.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.447 min.
Rainfall intensity =      4.093(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.869
Subarea runoff =     33.798(CFS)
Total initial stream area =        9.500(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.140(In/Hr)


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Process from Point/Station      420.000 to Point/Station      421.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
```

```
Estimated mean flow rate at midpoint of channel =     50.697(CFS)
Depth of flow =   0.989(Ft.), Average velocity =  13.832(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2            100.00               0.00
      3            150.00              20.00
Manning's 'N' friction factor =   0.035
--------------------------------------------------------------
Sub-Channel flow  =     50.697(CFS)
  '     '    flow top width =      7.415(Ft.)
  '     '    velocity=   13.832(Ft/s)
  '     '    area =      3.665(Sq.Ft)
  '     '    Froude number =     3.467

Upstream point elevation =  1320.000(Ft.)
Downstream point elevation =  1140.000(Ft.)
Flow length =   630.000(Ft.)
Travel time  =    0.76 min.
Time of concentration =   10.21 min.
Depth of flow =   0.989(Ft.)
Average velocity =  13.832(Ft/s)
Total irregular channel flow =    50.697(CFS)
Irregular channel normal depth above invert elev. =   0.989(Ft.)
Average velocity of channel(s) =  13.832(Ft/s)

Sub-Channel No. 1 Critical depth =      1.625(Ft.)
  '     '       '     Critical flow top width =     12.188(Ft.)
  '     '       '     Critical flow velocity=    5.120(Ft/s)
  '     '       '     Critical flow area =      9.902(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      3.908(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.868
Subarea runoff =     30.626(CFS) for    9.500(Ac.)
Total runoff =     64.424(CFS)
Effective area this stream =       19.00(Ac.)
Total Study Area (Main Stream No. 1) =       86.50(Ac.)
Area averaged Fm value =    0.140(In/Hr)


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Process from Point/Station      421.000 to Point/Station      422.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
--------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     86.464(CFS)
Depth of flow =   1.224(Ft.), Average velocity =   9.235(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------
Information entered for subchannel number 1 :
```

```
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2            100.00               0.00
      3            250.00              20.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =     86.465(CFS)
  '     '    flow top width =     15.299(Ft.)
  '     '    velocity=    9.235(Ft/s)
  '     '    area =      9.362(Sq.Ft)
  '     '    Froude number =     2.081

Upstream point elevation =  1140.000(Ft.)
Downstream point elevation =  1064.000(Ft.)
Flow length =   820.000(Ft.)
Travel time  =    1.48 min.
Time of concentration =   11.69 min.
Depth of flow =   1.224(Ft.)
Average velocity =   9.235(Ft/s)
Total irregular channel flow =    86.464(CFS)
Irregular channel normal depth above invert elev. =   1.224(Ft.)
Average velocity of channel(s) =   9.235(Ft/s)

Sub-Channel No. 1 Critical depth =      1.641(Ft.)
  '     '       '     Critical flow top width =     20.508(Ft.)
  '     '       '     Critical flow velocity=    5.140(Ft/s)
  '     '       '     Critical flow area =     16.823(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      3.603(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.865
Subarea runoff =     35.299(CFS) for   13.000(Ac.)
Total runoff =     99.724(CFS)
Effective area this stream =       32.00(Ac.)
Total Study Area (Main Stream No. 1) =       99.50(Ac.)
Area averaged Fm value =    0.140(In/Hr)


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Process from Point/Station      422.000 to Point/Station      422.000
**** CONFLUENCE OF MINOR STREAMS ****
_________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     32.000(Ac.)
Runoff from this stream =     99.724(CFS)
Time of concentration =   11.69 min.
Rainfall intensity =     3.603(In/Hr)
Area averaged loss rate (Fm) =    0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
```

```
 No.        (CFS)        (min)                    (In/Hr)

1       207.413      12.96                3.386
2        99.724      11.69                3.603
Qmax(1) =
          1.000 *     1.000 *   207.413) +
          0.937 *     1.000 *    99.724) + =      300.892
Qmax(2) =
          1.067 *     0.902 *   207.413) +
          1.000 *     1.000 *    99.724) + =      299.298

Total of 2 streams to confluence:
Flow rates before confluence point:
     207.413      99.724
Maximum flow rates at confluence using above data:
      300.892      299.298
Area of streams before confluence:
       67.500       32.000
Effective area values after confluence:
       99.500       92.866
Results of confluence:
Total flow rate =    300.892(CFS)
Time of concentration =    12.960 min.
Effective stream area after confluence =     99.500(Ac.)
Stream Area average Pervious fraction(Ap) =  0.942
Stream Area average soil loss rate(Fm) =    0.149(In/Hr)
Study area (this main stream) =      99.50(Ac.)


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Process from Point/Station       79.000 to Point/Station       80.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1052.000(Ft.)
Downstream point/station elevation =  1040.200(Ft.)
Pipe length  =   440.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   300.892(CFS)
Given pipe size =     54.00(In.)
Calculated individual pipe flow  =   300.892(CFS)
Normal flow depth in pipe =   41.34(In.)
Flow top width inside pipe =   45.75(In.)
Critical depth could not be calculated.
Pipe flow velocity =     23.01(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =    13.28 min.


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Process from Point/Station       80.000 to Point/Station       80.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     99.500(Ac.)
Runoff from this stream =    300.892(CFS)
Time of concentration =   13.28 min.
Rainfall intensity =     3.337(In/Hr)
Area averaged loss rate (Fm) =    0.1493(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9422
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      423.000 to Point/Station      424.000
**** INITIAL AREA EVALUATION ****

----------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1102.500(Ft.)
Bottom (of initial area) elevation =  1060.500(Ft.)
Difference in elevation =    42.000(Ft.)
Slope =    0.04200  s(%)=       4.20
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.623 min.
Rainfall intensity =      3.614(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.845
Subarea runoff =     27.496(CFS)
Total initial stream area =        9.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


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Process from Point/Station      424.000 to Point/Station      425.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

----------------------------------------------------------------------------
Top of street segment elevation =  1060.500(Ft.)
End of street segment elevation =  1049.000(Ft.)
Length of street segment  =   800.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     50.408(CFS)
Depth of flow =   0.555(Ft.), Average velocity =   4.788(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   4.79(Ft/s)
Travel time =    2.78 min.     TC =   14.41  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
```

```
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      3.177(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.838
Subarea runoff =     36.386(CFS) for   15.000(Ac.)
Total runoff =     63.882(CFS)
Effective area this stream =       24.00(Ac.)
Total Study Area (Main Stream No. 1) =      123.50(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     63.882(CFS)
Half street flow at end of street =     31.941(CFS)
Depth of flow =   0.595(Ft.), Average velocity =   5.260(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      425.000 to Point/Station      425.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     24.000(Ac.)
Runoff from this stream =     63.882(CFS)
Time of concentration =   14.41 min.
Rainfall intensity =     3.177(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                 (In/Hr)


1       300.892     13.28               3.337
2        63.882     14.41               3.177
Qmax(1) =
          1.000 *    1.000 *   300.892) +
          1.054 *    0.922 *    63.882) + =     362.943
Qmax(2) =
          0.950 *    1.000 *   300.892) +
          1.000 *    1.000 *    63.882) + =     349.731

Total of 2 streams to confluence:
Flow rates before confluence point:
     300.892      63.882
Maximum flow rates at confluence using above data:
      362.943      349.731
Area of streams before confluence:
       99.500       24.000
Effective area values after confluence:
      121.620      123.500
Results of confluence:
Total flow rate =    362.943(CFS)
Time of concentration =    13.279 min.
Effective stream area after confluence =    121.620(Ac.)
Stream Area average Pervious fraction(Ap) =  0.856
Stream Area average soil loss rate(Fm) =    0.163(In/Hr)
Study area (this main stream) =     123.50(Ac.)
End of computations, Total Study Area =          123.50 (Ac.)
```

The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.856
Area averaged SCS curve number = 71.7

LINE "P2"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/05/05

FONTANA / LINE P2 HYDROLOGY
100 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 500.000 to Point/Station 501.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.140(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1620.000(Ft.)
Bottom (of initial area) elevation = 1350.000(Ft.)
Difference in elevation = 270.000(Ft.)
Slope = 0.27000 s(%)= 27.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.812 min.
Rainfall intensity = 3.775(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.867
Subarea runoff = 19.628(CFS)
Total initial stream area = 6.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.140(In/Hr)

++
Process from Point/Station 501.000 to Point/Station 502.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 34.349(CFS)
Depth of flow = 0.739(Ft.), Average velocity = 12.581(Ft/s)

```
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2            100.00               0.00
      3            200.00              20.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     34.349(CFS)
  '     '    flow top width =      7.389(Ft.)
  '     '    velocity=   12.581(Ft/s)
  '     '    area =      2.730(Sq.Ft)
  '     '    Froude number =     3.648

Upstream point elevation =  1350.000(Ft.)
Downstream point elevation =  1180.000(Ft.)
Flow length =   500.000(Ft.)
Travel time  =    0.66 min.
Time of concentration =   11.47 min.
Depth of flow =   0.739(Ft.)
Average velocity =  12.581(Ft/s)
Total irregular channel flow =    34.349(CFS)
Irregular channel normal depth above invert elev. =   0.739(Ft.)
Average velocity of channel(s) =  12.581(Ft/s)

Sub-Channel No. 1 Critical depth =      1.242(Ft.)
  '     '       '     Critical flow top width =     12.422(Ft.)
  '     '       '     Critical flow velocity=    4.452(Ft/s)
  '     '       '     Critical flow area =      7.715(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      3.642(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.865
Subarea runoff =     27.656(CFS) for    9.000(Ac.)
Total runoff =     47.283(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       15.00(Ac.)
Area averaged Fm value =    0.140(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station       83.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1167.600(Ft.)
Downstream point/station elevation =  1126.000(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    47.283(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =    47.283(CFS)
Normal flow depth in pipe =   16.73(In.)
```

```
Flow top width inside pipe =   22.05(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.23(Ft/s)
Travel time through pipe =    0.54 min.
Time of concentration (TC) =    12.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       83.000 to Point/Station       83.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     15.000(Ac.)
Runoff from this stream =     47.283(CFS)
Time of concentration =   12.02 min.
Rainfall intensity =     3.543(In/Hr)
Area averaged loss rate (Fm) =    0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      504.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1520.000(Ft.)
Bottom (of initial area) elevation =  1180.000(Ft.)
Difference in elevation =   340.000(Ft.)
Slope =    0.34000  s(%)=      34.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.324 min.
Rainfall intensity =      3.881(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.868
Subarea runoff =     33.666(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.140(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      504.000 to Point/Station      505.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1167.600(Ft.)
End of street segment elevation =  1126.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
```

```
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     37.032(CFS)
Depth of flow =   0.410(Ft.), Average velocity =   7.262(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  15.743(Ft.)
Flow velocity =   7.26(Ft/s)
Travel time =    1.51 min.     TC =   11.84  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      3.575(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.861
Subarea runoff =      3.284(CFS) for    2.000(Ac.)
Total runoff =     36.950(CFS)
Effective area this stream =       12.00(Ac.)
Total Study Area (Main Stream No. 1) =       27.00(Ac.)
Area averaged Fm value =    0.153(In/Hr)
Street flow at end of street =     36.950(CFS)
Half street flow at end of street =     18.475(CFS)
Depth of flow =   0.410(Ft.), Average velocity =   7.258(Ft/s)
Flow width (from curb towards crown)=  15.730(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      505.000 to Point/Station      505.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     12.000(Ac.)
Runoff from this stream =     36.950(CFS)
Time of concentration =   11.84 min.
Rainfall intensity =     3.575(In/Hr)
Area averaged loss rate (Fm) =    0.1533(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9167
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                 (In/Hr)


1        47.283     12.02                3.543
2        36.950     11.84                3.575
Qmax(1) =
          1.000 *    1.000 *    47.283) +
          0.991 *    1.000 *    36.950) + =      83.888
Qmax(2) =
          1.009 *    0.985 *    47.283) +
          1.000 *    1.000 *    36.950) + =      83.968
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
      47.283      36.950
Maximum flow rates at confluence using above data:
       83.888       83.968
Area of streams before confluence:
       15.000       12.000
Effective area values after confluence:
       27.000       26.777
Results of confluence:
Total flow rate =      83.968(CFS)
Time of concentration =    11.839 min.
Effective stream area after confluence =      26.777(Ac.)
Stream Area average Pervious fraction(Ap) =  0.963
Stream Area average soil loss rate(Fm) =    0.146(In/Hr)
Study area (this main stream) =      27.00(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       83.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1126.000(Ft.)
Downstream point/station elevation =  1092.300(Ft.)
Pipe length  =   450.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    83.968(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    83.968(CFS)
Normal flow depth in pipe =   17.16(In.)
Flow top width inside pipe =   35.96(In.)
Critical Depth =   33.65(In.)
Pipe flow velocity =     25.29(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =    12.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       85.000 to Point/Station       85.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Effective stream flow area =     26.777(Ac.)
Total study area this main stream =     27.000(Ac.)
Runoff from this stream =     83.968(CFS)
Time of concentration =   12.14 min.
Rainfall intensity =     3.522(In/Hr)
Area averaged loss rate (Fm) =    0.1459(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9630
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      506.000 to Point/Station      507.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
```

```
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  2040.000(Ft.)
Bottom (of initial area) elevation =  1680.000(Ft.)
Difference in elevation =   360.000(Ft.)
Slope =    0.36000  s(%)=      36.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.207 min.
Rainfall intensity =      3.907(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.868
Subarea runoff =     27.125(CFS)
Total initial stream area =        8.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.140(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      507.000 to Point/Station      508.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     47.469(CFS)
Depth of flow =   1.066(Ft.), Average velocity =  16.723(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2             50.00               0.00
      3            100.00              20.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------------
Sub-Channel flow  =     47.469(CFS)
  '     '    flow top width =      5.328(Ft.)
  '     '    velocity=   16.723(Ft/s)
  '     '    area =      2.839(Sq.Ft)
  '     '    Froude number =     4.037

Upstream point elevation =  1680.000(Ft.)
Downstream point elevation =  1450.000(Ft.)
Flow length =   580.000(Ft.)
Travel time  =    0.58 min.
Time of concentration =   10.79 min.
Depth of flow =   1.066(Ft.)
Average velocity =  16.723(Ft/s)
Total irregular channel flow =    47.469(CFS)
Irregular channel normal depth above invert elev. =   1.066(Ft.)
Average velocity of channel(s) =  16.723(Ft/s)

Sub-Channel No. 1 Critical depth =      1.859(Ft.)
  '     '       '     Critical flow top width =      9.297(Ft.)
  '     '       '     Critical flow velocity=    5.492(Ft/s)
  '     '       '     Critical flow area =      8.643(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
```

```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      3.780(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =     38.401(CFS) for   12.000(Ac.)
Total runoff =     65.526(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 2) =       20.00(Ac.)
Area averaged Fm value =    0.140(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      508.000 to Point/Station      509.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    110.575(CFS)
Depth of flow =   1.532(Ft.), Average velocity =  18.838(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2             50.00               0.00
      3            100.00              20.00
Manning's 'N' friction factor =   0.035
----------------------------------------------------------------------------
Sub-Channel flow  =    110.575(CFS)
  '     '    flow top width =      7.662(Ft.)
  '     '    velocity=   18.837(Ft/s)
  '     '    area =      5.870(Sq.Ft)
  '     '    Froude number =     3.793

Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1140.000(Ft.)
Flow length =  1000.000(Ft.)
Travel time  =    0.88 min.
Time of concentration =   11.67 min.
Depth of flow =   1.532(Ft.)
Average velocity =  18.838(Ft/s)
Total irregular channel flow =   110.575(CFS)
Irregular channel normal depth above invert elev. =   1.532(Ft.)
Average velocity of channel(s) =  18.838(Ft/s)

Sub-Channel No. 1 Critical depth =      2.609(Ft.)
  '     '       '     Critical flow top width =     13.047(Ft.)
  '     '       '     Critical flow velocity=    6.496(Ft/s)
  '     '       '     Critical flow area =     17.022(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
```

```
Rainfall intensity =      3.606(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.865
Subarea runoff =     82.631(CFS) for   27.500(Ac.)
Total runoff =    148.157(CFS)
Effective area this stream =       47.50(Ac.)
Total Study Area (Main Stream No. 2) =       47.50(Ac.)
Area averaged Fm value =    0.140(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      509.000 to Point/Station      509.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     47.500(Ac.)
Runoff from this stream =    148.157(CFS)
Time of concentration =   11.67 min.
Rainfall intensity =     3.606(In/Hr)
Area averaged loss rate (Fm) =    0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      510.000 to Point/Station      511.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1560.000(Ft.)
Bottom (of initial area) elevation =  1180.000(Ft.)
Difference in elevation =   380.000(Ft.)
Slope =    0.38000  s(%)=      38.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.097 min.
Rainfall intensity =      3.933(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.868
Subarea runoff =     32.428(CFS)
Total initial stream area =        9.500(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.140(In/Hr)


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Process from Point/Station      511.000 to Point/Station      512.000
**** IMPROVED CHANNEL TRAVEL TIME ****
----------------------------------------------------------------------------
Upstream point elevation =  1180.000(Ft.)
Downstream point elevation =  1140.000(Ft.)
Channel length thru subarea  =   530.000(Ft.)
Channel base width      =    0.000(Ft.)
Slope or 'Z' of left channel bank =   1.500
Slope or 'Z' of right channel bank =   1.500
```

```
Estimated mean flow rate at midpoint of channel =     74.244(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =     74.244(CFS)
Depth of flow =   1.558(Ft.), Average velocity =  20.385(Ft/s)
Channel flow top width =    4.675(Ft.)
Flow Velocity =   20.39(Ft/s)
Travel time  =    0.43 min.
Time of concentration =   10.53 min.
Critical depth =      2.688(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      3.835(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =     80.635(CFS) for   24.500(Ac.)
Total runoff =    113.063(CFS)
Effective area this stream =       34.00(Ac.)
Total Study Area (Main Stream No. 2) =       81.50(Ac.)
Area averaged Fm value =    0.140(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      512.000 to Point/Station      512.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     34.000(Ac.)
Runoff from this stream =    113.063(CFS)
Time of concentration =   10.53 min.
Rainfall intensity =     3.835(In/Hr)
Area averaged loss rate (Fm) =    0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      148.157     11.67                3.606
2      113.063     10.53                3.835
Qmax(1) =
         1.000 *    1.000 *   148.157) +
         0.938 *    1.000 *   113.063) + =     254.205
Qmax(2) =
         1.066 *    0.902 *   148.157) +
         1.000 *    1.000 *   113.063) + =     255.599

Total of 2 streams to confluence:
Flow rates before confluence point:
     148.157     113.063
Maximum flow rates at confluence using above data:
      254.205     255.599
Area of streams before confluence:
```

```
      47.500       34.000
Effective area values after confluence:
      81.500       76.863
Results of confluence:
Total flow rate =    255.599(CFS)
Time of concentration =    10.531 min.
Effective stream area after confluence =     76.863(Ac.)
Stream Area average Pervious fraction(Ap) =  1.000
Stream Area average soil loss rate(Fm) =    0.140(In/Hr)
Study area (this main stream) =      81.50(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      512.000 to Point/Station       84.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1137.500(Ft.)
Downstream point/station elevation =  1110.000(Ft.)
Pipe length  =   450.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   255.599(CFS)
Given pipe size =     30.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
   210.337(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =    174.685(Ft.)
 Minor friction loss =     63.151(Ft.)    K-factor =   1.50
Pipe flow velocity =     52.07(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    10.67 min.


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Process from Point/Station       84.000 to Point/Station       84.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     76.863(Ac.)
Runoff from this stream =    255.599(CFS)
Time of concentration =   10.67 min.
Rainfall intensity =     3.804(In/Hr)
Area averaged loss rate (Fm) =    0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      513.000 to Point/Station      514.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1770.000(Ft.)
Bottom (of initial area) elevation =  1460.000(Ft.)
Difference in elevation =   310.000(Ft.)
```

```
Slope =    0.31000  s(%)=      31.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.517 min.
Rainfall intensity =      3.838(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.867
Subarea runoff =     23.297(CFS)
Total initial stream area =        7.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.140(In/Hr)


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Process from Point/Station      514.000 to Point/Station      515.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     34.945(CFS)
Depth of flow =   0.656(Ft.), Average velocity =  10.827(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2            150.00               0.00
      3            300.00              20.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------------
Sub-Channel flow  =     34.945(CFS)
  '     '    flow top width =      9.840(Ft.)
  '     '    velocity=   10.827(Ft/s)
  '     '    area =      3.227(Sq.Ft)
  '     '    Froude number =     3.332

Upstream point elevation =  1460.000(Ft.)
Downstream point elevation =  1140.000(Ft.)
Flow length =  1100.000(Ft.)
Travel time  =    1.69 min.
Time of concentration =   12.21 min.
Depth of flow =   0.656(Ft.)
Average velocity =  10.827(Ft/s)
Total irregular channel flow =    34.945(CFS)
Irregular channel normal depth above invert elev. =   0.656(Ft.)
Average velocity of channel(s) =  10.827(Ft/s)

Sub-Channel No. 1 Critical depth =      1.063(Ft.)
  '     '       '     Critical flow top width =     15.938(Ft.)
  '     '       '     Critical flow velocity=    4.127(Ft/s)
  '     '       '     Critical flow area =      8.467(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      3.509(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.864
Subarea runoff =     19.154(CFS) for    7.000(Ac.)
```

```
Total runoff =     42.450(CFS)
Effective area this stream =       14.00(Ac.)
Total Study Area (Main Stream No. 2) =       95.50(Ac.)
Area averaged Fm value =    0.140(In/Hr)


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Process from Point/Station      515.000 to Point/Station       84.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1119.100(Ft.)
Downstream point/station elevation =  1111.400(Ft.)
Pipe length  =   280.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    42.450(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    51.453(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     45.712(Ft.)
 Minor friction loss =     13.441(Ft.)    K-factor =   1.50
Pipe flow velocity =     24.02(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    12.40 min.


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Process from Point/Station       84.000 to Point/Station       84.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     14.000(Ac.)
Runoff from this stream =     42.450(CFS)
Time of concentration =   12.40 min.
Rainfall intensity =     3.476(In/Hr)
Area averaged loss rate (Fm) =    0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      255.599     10.67               3.804
2       42.450     12.40               3.476
Qmax(1) =
         1.000 *    1.000 *   255.599) +
         1.098 *    0.861 *    42.450) + =     295.718
Qmax(2) =
         0.911 *    1.000 *   255.599) +
         1.000 *    1.000 *    42.450) + =     275.182

Total of 2 streams to confluence:
Flow rates before confluence point:
     255.599      42.450
Maximum flow rates at confluence using above data:
      295.718      275.182
Area of streams before confluence:
       76.863       14.000
Effective area values after confluence:
       88.911       90.863
Results of confluence:
```

```
Total flow rate =    295.718(CFS)
Time of concentration =    10.675 min.
Effective stream area after confluence =     88.911(Ac.)
Stream Area average Pervious fraction(Ap) =  1.000
Stream Area average soil loss rate(Fm) =    0.140(In/Hr)
Study area (this main stream) =      90.86(Ac.)


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Process from Point/Station       84.000 to Point/Station       85.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1110.700(Ft.)
Downstream point/station elevation =  1092.300(Ft.)
Pipe length  =   600.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   295.718(CFS)
Given pipe size =     30.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
   377.902(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =    311.770(Ft.)
 Minor friction loss =     84.532(Ft.)    K-factor =   1.50
Pipe flow velocity =     60.24(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    10.84 min.


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Process from Point/Station       85.000 to Point/Station       85.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Effective stream flow area =     88.911(Ac.)
Total study area this main stream =     95.500(Ac.)
Runoff from this stream =    295.718(CFS)
Time of concentration =   10.84 min.
Rainfall intensity =     3.769(In/Hr)
Area averaged loss rate (Fm) =    0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 3


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Process from Point/Station      516.000 to Point/Station      517.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1148.000(Ft.)
Bottom (of initial area) elevation =  1101.000(Ft.)
Difference in elevation =    47.000(Ft.)
Slope =    0.04700  s(%)=       4.70
```

```
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.364 min.
Rainfall intensity =      3.664(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.846
Subarea runoff =     21.695(CFS)
Total initial stream area =        7.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


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Process from Point/Station      517.000 to Point/Station      517.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Effective stream flow area =      7.000(Ac.)
Total study area this main stream =      7.000(Ac.)
Runoff from this stream =     21.695(CFS)
Time of concentration =   11.36 min.
Rainfall intensity =     3.664(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream    Flow rate       TC            Rainfall Intensity
 No.        (CFS)        (min)                 (In/Hr)


1        83.968      12.14                3.522
2       295.718      10.84                3.769
3        21.695      11.36                3.664
Qmax(1) =
          1.000 *     1.000 *    83.968) +
          0.932 *     1.000 *   295.718) +
          0.959 *     1.000 *    21.695) + =      380.382
Qmax(2) =
          1.073 *     0.893 *    83.968) +
          1.000 *     1.000 *   295.718) +
          1.031 *     0.954 *    21.695) + =      397.535
Qmax(3) =
          1.042 *     0.936 *    83.968) +
          0.971 *     1.000 *   295.718) +
          1.000 *     1.000 *    21.695) + =      390.773

Total of 3 main streams to confluence:
Flow rates before confluence point:
      84.968      296.718       22.695
Maximum flow rates at confluence using above data:
      380.382       397.535       390.773
Effective Area of streams before confluence:
       26.777        88.911        7.000
Effective area values after confluence:
      122.688       119.508       120.985


Results of confluence:
Total flow rate =     397.535(CFS)
Time of concentration =     10.841 min.
Effective stream area after confluence  =     119.508(Ac.)
Stream Area average Pervious fraction(Ap) =  0.963
```

```
Stream Area average soil loss rate(Fm) =    0.146(In/Hr)
Steam effective area =     122.69(Ac.)


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Process from Point/Station       85.000 to Point/Station       86.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1092.300(Ft.)
Downstream point/station elevation =  1059.300(Ft.)
Pipe length  =   950.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   397.535(CFS)
Given pipe size =     39.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
   240.629(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =    220.142(Ft.)
 Minor friction loss =     53.486(Ft.)    K-factor =   1.50
Pipe flow velocity =     47.92(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =    11.17 min.


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Process from Point/Station       86.000 to Point/Station       86.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    119.508(Ac.)
Runoff from this stream =    397.535(CFS)
Time of concentration =   11.17 min.
Rainfall intensity =     3.701(In/Hr)
Area averaged loss rate (Fm) =    0.1459(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9634


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Process from Point/Station      518.000 to Point/Station      519.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1148.000(Ft.)
Bottom (of initial area) elevation =  1101.000(Ft.)
Difference in elevation =    47.000(Ft.)
Slope =    0.04700  s(%)=       4.70
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.364 min.
Rainfall intensity =     3.664(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.846
Subarea runoff =     26.344(CFS)
Total initial stream area =        8.500(Ac.)
Pervious area fraction = 0.500
```

```
Initial area Fm value =    0.220(In/Hr)

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Process from Point/Station      519.000 to Point/Station      520.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1101.000(Ft.)
End of street segment elevation =  1066.500(Ft.)
Length of street segment  =   900.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =  1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     39.516(CFS)
Depth of flow =   0.450(Ft.), Average velocity =   6.118(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.771(Ft.)
Flow velocity =   6.12(Ft/s)
Travel time =    2.45 min.     TC =   13.82  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =     3.258(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.839
Subarea runoff =     20.144(CFS) for    8.500(Ac.)
Total runoff =     46.487(CFS)
Effective area this stream =       17.00(Ac.)
Total Study Area (Main Stream No. 1) =       24.00(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     46.487(CFS)
Half street flow at end of street =     23.244(CFS)
Depth of flow =   0.473(Ft.), Average velocity =   6.369(Ft/s)
Flow width (from curb towards crown)=  18.917(Ft.)


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Process from Point/Station      520.000 to Point/Station      520.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     17.000(Ac.)
Runoff from this stream =     46.487(CFS)
Time of concentration =   13.82 min.
Rainfall intensity =     3.258(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000

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Process from Point/Station      521.000 to Point/Station      522.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1111.000(Ft.)
Bottom (of initial area) elevation =  1101.000(Ft.)
Difference in elevation =    10.000(Ft.)
Slope =    0.01000  s(%)=       1.00
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.486 min.
Rainfall intensity =      3.043(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.835
Subarea runoff =     13.972(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


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Process from Point/Station      522.000 to Point/Station      523.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1101.000(Ft.)
End of street segment elevation =  1066.500(Ft.)
Length of street segment  =   900.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     35.566(CFS)
Depth of flow =   0.436(Ft.), Average velocity =   5.961(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.064(Ft.)
Flow velocity =   5.96(Ft/s)
Travel time =    2.52 min.     TC =   18.00  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
```

```
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.780(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.829
Subarea runoff =     37.865(CFS) for   17.000(Ac.)
Total runoff =     51.838(CFS)
Effective area this stream =       22.50(Ac.)
Total Study Area (Main Stream No. 1) =       46.50(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     51.838(CFS)
Half street flow at end of street =     25.919(CFS)
Depth of flow =   0.489(Ft.), Average velocity =   6.542(Ft/s)
Flow width (from curb towards crown)=  19.724(Ft.)


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Process from Point/Station      523.000 to Point/Station      523.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     22.500(Ac.)
Runoff from this stream =     51.838(CFS)
Time of concentration =   18.00 min.
Rainfall intensity =     2.780(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream    Flow rate       TC            Rainfall Intensity
 No.        (CFS)        (min)                (In/Hr)

1       397.535      11.17                3.701
2        46.487      13.82                3.258
3        51.838      18.00                2.780
Qmax(1) =
          1.000 *    1.000 *   397.535) +
          1.146 *    0.809 *    46.487) +
          1.360 *    0.621 *    51.838) + =     484.351
Qmax(2) =
          0.875 *    1.000 *   397.535) +
          1.000 *    1.000 *    46.487) +
          1.187 *    0.767 *    51.838) + =     441.703
Qmax(3) =
          0.741 *    1.000 *   397.535) +
          0.843 *    1.000 *    46.487) +
          1.000 *    1.000 *    51.838) + =     385.501

Total of 3 streams to confluence:
Flow rates before confluence point:
     397.535      46.487      51.838
Maximum flow rates at confluence using above data:
      484.351      441.703      385.501
Area of streams before confluence:
      119.508       17.000       22.500
Effective area values after confluence:
```

```
      147.215      153.775      159.008
Results of confluence:
Total flow rate =    484.351(CFS)
Time of concentration =    11.171 min.
Effective stream area after confluence =    147.215(Ac.)
Stream Area average Pervious fraction(Ap) =  0.848
Stream Area average soil loss rate(Fm) =    0.164(In/Hr)
Study area (this main stream) =     159.01(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       86.000 to Point/Station       87.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1059.300(Ft.)
Downstream point/station elevation =  1053.200(Ft.)
Pipe length  =   445.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   484.351(CFS)
Given pipe size =     48.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    79.081(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     50.579(Ft.)
 Minor friction loss =     34.602(Ft.)    K-factor =   1.50
Pipe flow velocity =     38.54(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    11.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       87.000 to Point/Station       87.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    147.215(Ac.)
Runoff from this stream =    484.351(CFS)
Time of concentration =   11.36 min.
Rainfall intensity =     3.664(In/Hr)
Area averaged loss rate (Fm) =    0.1643(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8483


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      524.000 to Point/Station      525.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   750.000(Ft.)
Top (of initial area) elevation =  1072.300(Ft.)
Bottom (of initial area) elevation =  1065.000(Ft.)
Difference in elevation =     7.300(Ft.)
Slope =    0.00973  s(%)=       0.97
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =   18.730 min.
Rainfall intensity =      2.715(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.854
Subarea runoff =     20.854(CFS)
Total initial stream area =        9.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.140(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      525.000 to Point/Station      525.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      9.000(Ac.)
Runoff from this stream =     20.854(CFS)
Time of concentration =   18.73 min.
Rainfall intensity =     2.715(In/Hr)
Area averaged loss rate (Fm) =    0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream    Flow rate       TC            Rainfall Intensity
 No.        (CFS)        (min)                 (In/Hr)


1       484.351      11.36                3.664
2        20.854      18.73                2.715
Qmax(1) =
          1.000 *     1.000 *   484.351) +
          1.369 *     0.607 *    20.854) + =      501.668
Qmax(2) =
          0.729 *     1.000 *   484.351) +
          1.000 *     1.000 *    20.854) + =      373.842

Total of 2 streams to confluence:
Flow rates before confluence point:
     484.351      20.854
Maximum flow rates at confluence using above data:
      501.668      373.842
Area of streams before confluence:
      147.215        9.000
Effective area values after confluence:
      152.675      156.215
Results of confluence:
Total flow rate =    501.668(CFS)
Time of concentration =    11.363 min.
Effective stream area after confluence =    152.675(Ac.)
Stream Area average Pervious fraction(Ap) =  0.857
Stream Area average soil loss rate(Fm) =    0.163(In/Hr)
Study area (this main stream) =     156.21(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       87.000 to Point/Station       88.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1050.900(Ft.)
Downstream point/station elevation =  1033.600(Ft.)
Pipe length  =   370.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   501.668(CFS)
```

```
Given pipe size =     54.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    29.946(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     24.072(Ft.)
 Minor friction loss =     23.174(Ft.)    K-factor =   1.50
Pipe flow velocity =     31.54(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    11.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       88.000 to Point/Station       88.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    152.675(Ac.)
Runoff from this stream =    501.668(CFS)
Time of concentration =   11.56 min.
Rainfall intensity =     3.626(In/Hr)
Area averaged loss rate (Fm) =    0.1629(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8570


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      526.000 to Point/Station      527.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1065.000(Ft.)
Bottom (of initial area) elevation =  1060.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     15.092(CFS)
Total initial stream area =        6.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      527.000 to Point/Station      527.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      6.500(Ac.)
Runoff from this stream =     15.092(CFS)
Time of concentration =   17.79 min.
Rainfall intensity =     2.800(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      528.000 to Point/Station      529.000
**** INITIAL AREA EVALUATION ****

------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1065.000(Ft.)
Bottom (of initial area) elevation =  1060.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     15.092(CFS)
Total initial stream area =        6.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      529.000 to Point/Station      529.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      6.500(Ac.)
Runoff from this stream =     15.092(CFS)
Time of concentration =   17.79 min.
Rainfall intensity =     2.800(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream    Flow rate       TC            Rainfall Intensity
 No.        (CFS)        (min)                 (In/Hr)


1       501.668      11.56                3.626
2        15.092      17.79                2.800
3        15.092      17.79                2.800
Qmax(1) =
          1.000 *     1.000 *    501.668) +
          1.320 *     0.650 *     15.092) +
          1.320 *     0.650 *     15.092) + =     527.564
Qmax(2) =
          0.761 *     1.000 *    501.668) +
          1.000 *     1.000 *     15.092) +
          1.000 *     1.000 *     15.092) + =     412.130
Qmax(3) =
```

```
          0.761 *    1.000 *   501.668) +
          1.000 *    1.000 *    15.092) +
          1.000 *    1.000 *    15.092) + =     412.130

Total of 3 streams to confluence:
Flow rates before confluence point:
     501.668      15.092      15.092
Maximum flow rates at confluence using above data:
      527.564      412.130      412.130
Area of streams before confluence:
      152.675        6.500        6.500
Effective area values after confluence:
      161.122      165.675      165.675
Results of confluence:
Total flow rate =    527.564(CFS)
Time of concentration =    11.559 min.
Effective stream area after confluence =    161.122(Ac.)
Stream Area average Pervious fraction(Ap) =  0.829
Stream Area average soil loss rate(Fm) =    0.167(In/Hr)
Study area (this main stream) =     165.68(Ac.)
End of computations, Total Study Area =          191.00 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.839
Area averaged SCS curve number =  70.9
```

LINE "P1"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/06/05

FONTANA / LINE P1 HYDROLOGY
100 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 400.000 to Point/Station 401.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.140(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1850.000(Ft.)
Bottom (of initial area) elevation = 1300.000(Ft.)
Difference in elevation = 550.000(Ft.)
Slope = 0.55000 s(%)= 55.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.377 min.
Rainfall intensity = 4.111(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.869
Subarea runoff = 21.445(CFS)
Total initial stream area = 6.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.140(In/Hr)

++
Process from Point/Station 401.000 to Point/Station 402.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 38.422(CFS)
Depth of flow = 0.659(Ft.), Average velocity = 10.099(Ft/s)

```
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2            150.00               0.00
      3            350.00              20.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     38.422(CFS)
  '     '    flow top width =     11.540(Ft.)
  '     '    velocity=   10.099(Ft/s)
  '     '    area =      3.805(Sq.Ft)
  '     '    Froude number =     3.099

Upstream point elevation =  1300.000(Ft.)
Downstream point elevation =  1087.000(Ft.)
Flow length =   850.000(Ft.)
Travel time  =    1.40 min.
Time of concentration =   10.78 min.
Depth of flow =   0.659(Ft.)
Average velocity =  10.099(Ft/s)
Total irregular channel flow =    38.422(CFS)
Irregular channel normal depth above invert elev. =   0.659(Ft.)
Average velocity of channel(s) =  10.099(Ft/s)

Sub-Channel No. 1 Critical depth =      1.039(Ft.)
  '     '       '     Critical flow top width =     18.184(Ft.)
  '     '       '     Critical flow velocity=    4.067(Ft/s)
  '     '       '     Critical flow area =      9.447(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      3.781(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =     29.352(CFS) for    9.500(Ac.)
Total runoff =     50.796(CFS)
Effective area this stream =       15.50(Ac.)
Total Study Area (Main Stream No. 1) =       15.50(Ac.)
Area averaged Fm value =    0.140(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station       75.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1080.000(Ft.)
Downstream point/station elevation =  1077.000(Ft.)
Pipe length  =   550.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    50.796(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    50.796(CFS)
Normal flow depth in pipe =   30.66(In.)
```

```
Flow top width inside pipe =    25.60(In.)
Critical Depth =    27.82(In.)
Pipe flow velocity =       7.92(Ft/s)
Travel time through pipe =     1.16 min.
Time of concentration (TC) =     11.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        75.000 to Point/Station        75.000
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Effective stream flow area =      15.500(Ac.)
Total study area this main stream =      15.500(Ac.)
Runoff from this stream =      50.796(CFS)
Time of concentration =    11.94 min.
Rainfall intensity =      3.557(In/Hr)
Area averaged loss rate (Fm) =     0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       403.000 to Point/Station       404.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=      0.140(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1600.000(Ft.)
Bottom (of initial area) elevation =  1140.000(Ft.)
Difference in elevation =   460.000(Ft.)
Slope =    0.46000  s(%)=      46.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =     9.719 min.
Rainfall intensity =      4.024(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.869
Subarea runoff =     19.226(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.140(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       404.000 to Point/Station       405.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     34.956(CFS)
Depth of flow =   0.698(Ft.), Average velocity =   7.175(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
```

```
      1              0.00              20.00
      2            200.00               0.00
      3            400.00              20.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------

Sub-Channel flow  =     34.956(CFS)
  '      '    flow top width =     13.959(Ft.)
  '      '    velocity=    7.175(Ft/s)
  '      '    area =      4.872(Sq.Ft)
  '      '    Froude number =     2.141

Upstream point elevation =  1140.000(Ft.)
Downstream point elevation =  1085.000(Ft.)
Flow length =   470.000(Ft.)
Travel time  =    1.09 min.
Time of concentration =   10.81 min.
Depth of flow =   0.698(Ft.)
Average velocity =   7.175(Ft/s)
Total irregular channel flow =    34.956(CFS)
Irregular channel normal depth above invert elev. =   0.698(Ft.)
Average velocity of channel(s) =   7.175(Ft/s)

Sub-Channel No. 1 Critical depth =      0.945(Ft.)
  '      '       '     Critical flow top width =     18.906(Ft.)
  '      '       '     Critical flow velocity=    3.912(Ft/s)
  '      '       '     Critical flow area =      8.936(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      3.775(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =     28.211(CFS) for    9.000(Ac.)
Total runoff =     47.437(CFS)
Effective area this stream =       14.50(Ac.)
Total Study Area (Main Stream No. 2) =       14.50(Ac.)
Area averaged Fm value =    0.140(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      405.000 to Point/Station       75.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1078.000(Ft.)
Downstream point/station elevation =  1077.000(Ft.)
Pipe length  =   150.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    47.437(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    47.437(CFS)
Normal flow depth in pipe =   25.99(In.)
Flow top width inside pipe =   32.26(In.)
Critical Depth =   26.92(In.)
Pipe flow velocity =      8.68(Ft/s)
Travel time through pipe =    0.29 min.
```

```
Time of concentration (TC) =    11.10 min.


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Process from Point/Station       75.000 to Point/Station       75.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Effective stream flow area =     14.500(Ac.)
Total study area this main stream =     14.500(Ac.)
Runoff from this stream =     47.437(CFS)
Time of concentration =   11.10 min.
Rainfall intensity =     3.716(In/Hr)
Area averaged loss rate (Fm) =    0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      408.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1065.000(Ft.)
Bottom (of initial area) elevation =  1055.000(Ft.)
Difference in elevation =    10.000(Ft.)
Slope =    0.01000  s(%)=       1.00
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.486 min.
Rainfall intensity =      3.043(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.835
Subarea runoff =     19.053(CFS)
Total initial stream area =        7.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      408.000 to Point/Station      408.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      7.500(Ac.)
Runoff from this stream =     19.053(CFS)
Time of concentration =   15.49 min.
Rainfall intensity =     3.043(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


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```

```
Process from Point/Station      407.000 to Point/Station      408.000
**** INITIAL AREA EVALUATION ****

RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1065.000(Ft.)
Bottom (of initial area) elevation =  1055.000(Ft.)
Difference in elevation =    10.000(Ft.)
Slope =    0.01000  s(%)=       1.00
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.486 min.
Rainfall intensity =      3.043(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.835
Subarea runoff =     15.243(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


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Process from Point/Station      408.000 to Point/Station      408.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 3 in normal stream number 2
Stream flow area =      6.000(Ac.)
Runoff from this stream =     15.243(CFS)
Time of concentration =   15.49 min.
Rainfall intensity =     3.043(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       19.053     15.49               3.043
2       15.243     15.49               3.043
Qmax(1) =
         1.000 *    1.000 *    19.053) +
         1.000 *    1.000 *    15.243) + =      34.296
Qmax(2) =
         1.000 *    1.000 *    19.053) +
         1.000 *    1.000 *    15.243) + =      34.296

Total of 2 streams to confluence:
Flow rates before confluence point:
      19.053      15.243
Maximum flow rates at confluence using above data:
       34.296       34.296
Area of streams before confluence:
        7.500        6.000
Effective area values after confluence:
```

```
       13.500       13.500
Results of confluence:
Total flow rate =     34.296(CFS)
Time of concentration =    15.486 min.
Effective stream area after confluence =     13.500(Ac.)
Stream Area average Pervious fraction(Ap) =  0.500
Stream Area average soil loss rate(Fm) =    0.220(In/Hr)
Study area (this main stream) =      13.50(Ac.)


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Process from Point/Station      408.000 to Point/Station      408.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Effective stream flow area =     13.500(Ac.)
Total study area this main stream =     13.500(Ac.)
Runoff from this stream =     34.296(CFS)
Time of concentration =   15.49 min.
Rainfall intensity =     3.043(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       50.796     11.94              3.557
2       47.437     11.10              3.716
3       34.296     15.49              3.043
Qmax(1) =
         1.000 *    1.000 *    50.796) +
         0.956 *    1.000 *    47.437) +
         1.182 *    0.771 *    34.296) + =     127.378
Qmax(2) =
         1.047 *    0.930 *    50.796) +
         1.000 *    1.000 *    47.437) +
         1.239 *    0.717 *    34.296) + =     127.302
Qmax(3) =
         0.849 *    1.000 *    50.796) +
         0.812 *    1.000 *    47.437) +
         1.000 *    1.000 *    34.296) + =     115.951

Total of 3 main streams to confluence:
Flow rates before confluence point:
      51.796      48.437      35.296
Maximum flow rates at confluence using above data:
      127.378      127.302      115.951
Effective Area of streams before confluence:
       15.500       14.500       13.500
Effective area values after confluence:
       40.406       38.586       43.500


Results of confluence:
Total flow rate =    127.378(CFS)
Time of concentration =    11.937 min.
Effective stream area after confluence  =     40.406(Ac.)
Stream Area average Pervious fraction(Ap) =  0.845
```

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Stream Area average soil loss rate(Fm) =    0.165(In/Hr)
Steam effective area =      43.50(Ac.)


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Process from Point/Station       75.000 to Point/Station       76.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1075.000(Ft.)
Downstream point/station elevation =  1047.000(Ft.)
Pipe length  =   550.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   127.378(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =   127.378(CFS)
Normal flow depth in pipe =   22.50(In.)
Flow top width inside pipe =   41.89(In.)
Critical Depth =   39.54(In.)
Pipe flow velocity =     24.27(Ft/s)
Travel time through pipe =    0.38 min.
Time of concentration (TC) =    12.31 min.


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Process from Point/Station       76.000 to Point/Station       80.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1047.000(Ft.)
Downstream point/station elevation =  1041.300(Ft.)
Pipe length  =  1000.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   127.378(CFS)
Given pipe size =     54.00(In.)
Calculated individual pipe flow  =   127.378(CFS)
Normal flow depth in pipe =   38.53(In.)
Flow top width inside pipe =   48.83(In.)
Critical Depth =   39.87(In.)
Pipe flow velocity =     10.49(Ft/s)
Travel time through pipe =    1.59 min.
Time of concentration (TC) =    13.90 min.


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Process from Point/Station       80.000 to Point/Station       80.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     40.406(Ac.)
Runoff from this stream =    127.378(CFS)
Time of concentration =   13.90 min.
Rainfall intensity =     3.246(In/Hr)
Area averaged loss rate (Fm) =    0.1648(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8448


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Process from Point/Station       80.000 to Point/Station       80.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 98.02
Adjusted SCS curve number for AMC 3 = 99.60
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Pervious ratio(Ap) = 0.8560     Max loss rate(Fm)=     0.007(In/Hr)
Rainfall intensity =      3.337(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  13.28 min.  Rain intensity =       3.34(In/Hr)
Total area this stream =       121.62(Ac.)
Total Study Area (Main Stream No. 1) =      135.12(Ac.)
Total runoff =    362.94(CFS)


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Process from Point/Station       80.000 to Point/Station       80.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    121.620(Ac.)
Runoff from this stream =    362.940(CFS)
Time of concentration =   13.28 min.
Rainfall intensity =     3.337(In/Hr)
Area averaged loss rate (Fm) =    0.0068(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8560
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      127.378     13.90                3.246
2      362.940     13.28                3.337
Qmax(1) =
         1.000 *    1.000 *   127.378) +
         0.973 *    1.000 *   362.940) + =     480.453
Qmax(2) =
         1.029 *    0.955 *   127.378) +
         1.000 *    1.000 *   362.940) + =     488.185

Total of 2 streams to confluence:
Flow rates before confluence point:
     127.378     362.940
Maximum flow rates at confluence using above data:
      480.453     488.185
Area of streams before confluence:
       40.406     121.620
Effective area values after confluence:
      162.026     160.216
Results of confluence:
Total flow rate =    488.185(CFS)
Time of concentration =    13.280 min.
Effective stream area after confluence =    160.216(Ac.)
Stream Area average Pervious fraction(Ap) =  0.853
Stream Area average soil loss rate(Fm) =    0.046(In/Hr)
Study area (this main stream) =     162.03(Ac.)


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Process from Point/Station       80.000 to Point/Station       88.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1037.200(Ft.)
Downstream point/station elevation =  1031.600(Ft.)
Pipe length  =  1450.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   488.185(CFS)
```

```
Given pipe size =     90.00(In.)
Calculated individual pipe flow  =   488.185(CFS)
Normal flow depth in pipe =   75.75(In.)
Flow top width inside pipe =   65.71(In.)
Critical Depth =   68.63(In.)
Pipe flow velocity =     12.30(Ft/s)
Travel time through pipe =    1.97 min.
Time of concentration (TC) =    15.25 min.


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Process from Point/Station       88.000 to Point/Station       88.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    160.216(Ac.)
Runoff from this stream =    488.185(CFS)
Time of concentration =   15.25 min.
Rainfall intensity =     3.071(In/Hr)
Area averaged loss rate (Fm) =    0.0462(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8532


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Process from Point/Station       88.000 to Point/Station       88.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 97.90
Adjusted SCS curve number for AMC 3 = 99.58
Pervious ratio(Ap) = 0.8290     Max loss rate(Fm)=     0.007(In/Hr)
Rainfall intensity =      3.626(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  11.56 min.  Rain intensity =       3.63(In/Hr)
Total area this stream =       131.12(Ac.)
Total Study Area (Main Stream No. 1) =      266.24(Ac.)
Total runoff =    527.56(CFS)


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Process from Point/Station       88.000 to Point/Station       88.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    131.120(Ac.)
Runoff from this stream =    527.560(CFS)
Time of concentration =   11.56 min.
Rainfall intensity =     3.626(In/Hr)
Area averaged loss rate (Fm) =    0.0069(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8290
Summary of stream data:

Stream    Flow rate       TC             Rainfall Intensity
 No.        (CFS)        (min)                  (In/Hr)


1       488.185      15.25                3.071
2       527.560      11.56                3.626
Qmax(1) =
         1.000 *    1.000 *   488.185) +
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```
          0.847 *    1.000 *   527.560) + =     934.886
Qmax(2) =
          1.183 *    0.758 *   488.185) +
          1.000 *    1.000 *   527.560) + =     965.614

Total of 2 streams to confluence:
Flow rates before confluence point:
     488.185     527.560
Maximum flow rates at confluence using above data:
      934.886      965.614
Area of streams before confluence:
      160.216      131.120
Effective area values after confluence:
      291.336      252.607
Results of confluence:
Total flow rate =    965.614(CFS)
Time of concentration =    11.560 min.
Effective stream area after confluence =    252.607(Ac.)
Stream Area average Pervious fraction(Ap) =  0.842
Stream Area average soil loss rate(Fm) =    0.029(In/Hr)
Study area (this main stream) =     291.34(Ac.)


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Process from Point/Station       88.000 to Point/Station       89.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1031.100(Ft.)
Downstream point/station elevation =  1028.800(Ft.)
Pipe length  =   550.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   965.614(CFS)
Given pipe size =     96.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    12.458(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      6.163(Ft.)
 Minor friction loss =      8.596(Ft.)    K-factor =   1.50
Pipe flow velocity =     19.21(Ft/s)
Travel time through pipe =    0.48 min.
Time of concentration (TC) =    12.04 min.


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Process from Point/Station       89.000 to Point/Station       89.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    252.607(Ac.)
Runoff from this stream =    965.614(CFS)
Time of concentration =   12.04 min.
Rainfall intensity =     3.539(In/Hr)
Area averaged loss rate (Fm) =    0.0285(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8423


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Process from Point/Station      513.000 to Point/Station      530.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1770.000(Ft.)
Bottom (of initial area) elevation =  1380.000(Ft.)
Difference in elevation =   390.000(Ft.)
Slope =    0.39000  s(%)=      39.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.045 min.
Rainfall intensity =      3.945(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.868
Subarea runoff =     20.547(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.140(In/Hr)


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Process from Point/Station      530.000 to Point/Station      531.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     32.533(CFS)
Depth of flow =   0.482(Ft.), Average velocity =   9.354(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              10.00
      2            150.00               0.00
      3            300.00              10.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------------
Sub-Channel flow  =     32.533(CFS)
  '     '    flow top width =     14.446(Ft.)
  '     '    velocity=    9.354(Ft/s)
  '     '    area =      3.478(Sq.Ft)
  '     '    Froude number =     3.359

Upstream point elevation =  1380.000(Ft.)
Downstream point elevation =  1120.000(Ft.)
Flow length =   800.000(Ft.)
Travel time  =    1.43 min.
Time of concentration =   11.47 min.
Depth of flow =   0.482(Ft.)
Average velocity =   9.354(Ft/s)
Total irregular channel flow =    32.533(CFS)
Irregular channel normal depth above invert elev. =   0.482(Ft.)
Average velocity of channel(s) =   9.354(Ft/s)

Sub-Channel No. 1 Critical depth =      0.781(Ft.)
  '     '       '     Critical flow top width =     23.438(Ft.)
  '     '       '     Critical flow velocity=    3.554(Ft/s)
  '     '       '     Critical flow area =      9.155(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      3.643(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.865
Subarea runoff =     20.439(CFS) for    7.000(Ac.)
Total runoff =     40.987(CFS)
Effective area this stream =       13.00(Ac.)
Total Study Area (Main Stream No. 1) =      279.24(Ac.)
Area averaged Fm value =    0.140(In/Hr)


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Process from Point/Station      531.000 to Point/Station      532.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1120.000(Ft.)
End of street segment elevation =  1056.000(Ft.)
Length of street segment  =  1800.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     66.209(CFS)
Depth of flow =   0.528(Ft.), Average velocity =   7.011(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   7.01(Ft/s)
Travel time =    4.28 min.     TC =   15.75  min.
 Adding area flow to street
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      3.012(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.858
Subarea runoff =     33.974(CFS) for   16.000(Ac.)
Total runoff =     74.961(CFS)
Effective area this stream =       29.00(Ac.)
Total Study Area (Main Stream No. 1) =      295.24(Ac.)
Area averaged Fm value =    0.140(In/Hr)
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```
Street flow at end of street =     74.961(CFS)
Half street flow at end of street =     37.480(CFS)
Depth of flow =   0.546(Ft.), Average velocity =   7.365(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      532.000 to Point/Station      532.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     29.000(Ac.)
Runoff from this stream =     74.961(CFS)
Time of concentration =   15.75 min.
Rainfall intensity =     3.012(In/Hr)
Area averaged loss rate (Fm) =    0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      533.000 to Point/Station      534.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1064.100(Ft.)
Bottom (of initial area) elevation =  1059.100(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      3.246(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =     18.733(CFS)
Total initial stream area =        6.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)


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Process from Point/Station      534.000 to Point/Station      535.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1059.300(Ft.)
End of street segment elevation =  1056.200(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
```

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Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     26.658(CFS)
Depth of flow =   0.495(Ft.), Average velocity =   3.270(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.27(Ft/s)
Travel time =    1.68 min.     TC =   15.58  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      3.031(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.887
Subarea runoff =     13.529(CFS) for    5.500(Ac.)
Total runoff =     32.262(CFS)
Effective area this stream =       12.00(Ac.)
Total Study Area (Main Stream No. 1) =      307.24(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     32.262(CFS)
Half street flow at end of street =     16.131(CFS)
Depth of flow =   0.520(Ft.), Average velocity =   3.528(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      535.000 to Point/Station      535.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     12.000(Ac.)
Runoff from this stream =     32.262(CFS)
Time of concentration =   15.58 min.
Rainfall intensity =     3.031(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                (In/Hr)


1       965.614     12.04               3.539
2        74.961     15.75               3.012
3        32.262     15.58               3.031
Qmax(1) =
          1.000 *    1.000 *   965.614) +
          1.184 *    0.764 *    74.961) +
```

```
          1.170 *    0.772 *    32.262) + =    1062.579
Qmax(2) =
          0.850 *    1.000 *   965.614) +
          1.000 *    1.000 *    74.961) +
          0.994 *    1.000 *    32.262) + =     927.634
Qmax(3) =
          0.855 *    1.000 *   965.614) +
          1.007 *    0.989 *    74.961) +
          1.000 *    1.000 *    32.262) + =     932.819

Total of 3 streams to confluence:
Flow rates before confluence point:
     965.614      74.961      32.262
Maximum flow rates at confluence using above data:
     1062.579      927.634      932.819
Area of streams before confluence:
      252.607       29.000       12.000
Effective area values after confluence:
      284.041      293.607      293.302
Results of confluence:
Total flow rate =   1062.579(CFS)
Time of concentration =    12.037 min.
Effective stream area after confluence =    284.041(Ac.)
Stream Area average Pervious fraction(Ap) =  0.828
Stream Area average soil loss rate(Fm) =    0.040(In/Hr)
Study area (this main stream) =     293.61(Ac.)
End of computations, Total Study Area =          337.24 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.830
Area averaged SCS curve number =  91.3
```

LINE "SIERRA AVE

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/06/05

FONTANA / LINE SIERRA AVENUE HYDROLOGY
100 YEARV STORM
JN 04339

Hall & Forman, Inc. - S/N 950

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1103.000(Ft.)
Bottom (of initial area) elevation = 1098.000(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.00500 s(%)= 0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.902 min.
Rainfall intensity = 3.246(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.878
Subarea runoff = 15.680(CFS)
Total initial stream area = 5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.079(In/Hr)

++
Process from Point/Station 201.000 to Point/Station 202.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1098.000(Ft.)
End of street segment elevation = 1091.600(Ft.)

```
Length of street segment  =   670.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     29.222(CFS)
Depth of flow =   0.506(Ft.), Average velocity =   3.409(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.41(Ft/s)
Travel time =    3.28 min.     TC =   17.18  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =      2.859(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.875
Subarea runoff =     21.859(CFS) for    9.500(Ac.)
Total runoff =     37.539(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       15.00(Ac.)
Area averaged Fm value =    0.079(In/Hr)
Street flow at end of street =     37.539(CFS)
Half street flow at end of street =     18.770(CFS)
Depth of flow =   0.541(Ft.), Average velocity =   3.766(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      202.000 to Point/Station       60.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1084.600(Ft.)
Downstream point/station elevation =  1078.400(Ft.)
Pipe length  =   555.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    37.539(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =    37.539(CFS)
Normal flow depth in pipe =   17.23(In.)
Flow top width inside pipe =   41.32(In.)
Critical Depth =   22.80(In.)
Pipe flow velocity =     10.09(Ft/s)
Travel time through pipe =    0.92 min.
Time of concentration (TC) =    18.09 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       60.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =     15.000(Ac.)
Runoff from this stream =     37.539(CFS)
Time of concentration =   18.09 min.
Rainfall intensity =     2.771(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      204.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1103.000(Ft.)
Bottom (of initial area) elevation =  1096.000(Ft.)
Difference in elevation =     7.000(Ft.)
Slope =    0.00700  s(%)=       0.70
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.997 min.
Rainfall intensity =      3.380(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.879
Subarea runoff =     19.313(CFS)
Total initial stream area =        6.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


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Process from Point/Station      204.000 to Point/Station      205.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =  1096.000(Ft.)
End of street segment elevation =  1090.500(Ft.)
Length of street segment  =   675.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
```

```
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     31.942(CFS)
Depth of flow =   0.529(Ft.), Average velocity =   3.367(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.37(Ft/s)
Travel time =    3.34 min.     TC =   16.34  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =      2.946(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.876
Subarea runoff =     19.403(CFS) for    8.500(Ac.)
Total runoff =     38.716(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       30.00(Ac.)
Area averaged Fm value =    0.079(In/Hr)
Street flow at end of street =     38.716(CFS)
Half street flow at end of street =     19.358(CFS)
Depth of flow =   0.558(Ft.), Average velocity =   3.634(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     15.000(Ac.)
Runoff from this stream =     38.716(CFS)
Time of concentration =   16.34 min.
Rainfall intensity =     2.946(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       37.539     18.09               2.771
2       38.716     16.34               2.946
Qmax(1) =
         1.000 *    1.000 *    37.539) +
         0.939 *    1.000 *    38.716) + =      73.894
Qmax(2) =
         1.065 *    0.903 *    37.539) +
         1.000 *    1.000 *    38.716) + =      74.817

Total of 2 streams to confluence:
Flow rates before confluence point:
```

```
      37.539      38.716
Maximum flow rates at confluence using above data:
       73.894       74.817
Area of streams before confluence:
       15.000       15.000
Effective area values after confluence:
       30.000       28.545
Results of confluence:
Total flow rate =     74.817(CFS)
Time of concentration =    16.339 min.
Effective stream area after confluence =     28.545(Ac.)
Stream Area average Pervious fraction(Ap) =  0.100
Stream Area average soil loss rate(Fm) =    0.079(In/Hr)
Study area (this main stream) =      30.00(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       61.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1078.400(Ft.)
Downstream point/station elevation =  1076.700(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    74.817(CFS)
Given pipe size =     42.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     2.473(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      2.764(Ft.)
 Minor friction loss =      1.408(Ft.)    K-factor =   1.50
Pipe flow velocity =      7.78(Ft/s)
Travel time through pipe =    1.07 min.
Time of concentration (TC) =    17.41 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       61.000 to Point/Station       61.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     28.545(Ac.)
Runoff from this stream =     74.817(CFS)
Time of concentration =   17.41 min.
Rainfall intensity =     2.836(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      207.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
```

```
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1103.000(Ft.)
Bottom (of initial area) elevation =  1097.000(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.00600  s(%)=       0.60
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.404 min.
Rainfall intensity =      3.318(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.879
Subarea runoff =     17.493(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      208.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1097.000(Ft.)
End of street segment elevation =  1089.300(Ft.)
Length of street segment  =   775.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     32.071(CFS)
Depth of flow =   0.515(Ft.), Average velocity =   3.580(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.58(Ft/s)
Travel time =    3.61 min.     TC =   17.01  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =      2.876(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.875
Subarea runoff =     22.788(CFS) for   10.000(Ac.)
Total runoff =     40.281(CFS)
Effective area this stream =       16.00(Ac.)
Total Study Area (Main Stream No. 1) =       46.00(Ac.)
Area averaged Fm value =    0.079(In/Hr)
Street flow at end of street =     40.281(CFS)
Half street flow at end of street =     20.141(CFS)
```

```
Depth of flow =   0.548(Ft.), Average velocity =   3.919(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      208.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     16.000(Ac.)
Runoff from this stream =     40.281(CFS)
Time of concentration =   17.01 min.
Rainfall intensity =     2.876(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       74.817     17.41                2.836
2       40.281     17.01                2.876
Qmax(1) =
         1.000 *    1.000 *    74.817) +
         0.986 *    1.000 *    40.281) + =     114.527
Qmax(2) =
         1.014 *    0.977 *    74.817) +
         1.000 *    1.000 *    40.281) + =     114.438

Total of 2 streams to confluence:
Flow rates before confluence point:
      74.817      40.281
Maximum flow rates at confluence using above data:
      114.527      114.438
Area of streams before confluence:
       28.545       16.000
Effective area values after confluence:
       44.545       43.893
Results of confluence:
Total flow rate =    114.527(CFS)
Time of concentration =    17.411 min.
Effective stream area after confluence =     44.545(Ac.)
Stream Area average Pervious fraction(Ap) =  0.100
Stream Area average soil loss rate(Fm) =    0.079(In/Hr)
Study area (this main stream) =      44.55(Ac.)


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Process from Point/Station       61.000 to Point/Station       62.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1076.700(Ft.)
Downstream point/station elevation =  1065.000(Ft.)
Pipe length  =  1320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   114.527(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =   114.527(CFS)
Normal flow depth in pipe =   33.89(In.)
Flow top width inside pipe =   43.73(In.)
```

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Critical Depth =   38.74(In.)
Pipe flow velocity =     12.07(Ft/s)
Travel time through pipe =    1.82 min.
Time of concentration (TC) =    19.23 min.


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Process from Point/Station       62.000 to Point/Station       62.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     44.545(Ac.)
Runoff from this stream =    114.527(CFS)
Time of concentration =   19.23 min.
Rainfall intensity =     2.672(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station      209.000 to Point/Station      210.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1090.500(Ft.)
Bottom (of initial area) elevation =  1084.500(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.00600  s(%)=       0.60
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.404 min.
Rainfall intensity =      3.318(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.879
Subarea runoff =     16.036(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


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Process from Point/Station      210.000 to Point/Station      211.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1084.500(Ft.)
End of street segment elevation =  1076.500(Ft.)
Length of street segment  =   875.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
```

```
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     32.071(CFS)
Depth of flow =   0.521(Ft.), Average velocity =   3.491(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.49(Ft/s)
Travel time =    4.18 min.     TC =   17.58  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.820(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.882
Subarea runoff =     25.012(CFS) for   11.000(Ac.)
Total runoff =     41.047(CFS)
Effective area this stream =       16.50(Ac.)
Total Study Area (Main Stream No. 1) =       62.50(Ac.)
Area averaged Fm value =    0.056(In/Hr)
Street flow at end of street =     41.047(CFS)
Half street flow at end of street =     20.524(CFS)
Depth of flow =   0.558(Ft.), Average velocity =   3.850(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      211.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     16.500(Ac.)
Runoff from this stream =     41.047(CFS)
Time of concentration =   17.58 min.
Rainfall intensity =     2.820(In/Hr)
Area averaged loss rate (Fm) =    0.0555(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      213.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
```

```
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1092.600(Ft.)
Bottom (of initial area) elevation =  1086.000(Ft.)
Difference in elevation =     6.600(Ft.)
Slope =    0.00660  s(%)=       0.66
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.151 min.
Rainfall intensity =      3.356(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.879
Subarea runoff =     14.750(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      213.000 to Point/Station      214.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1086.000(Ft.)
End of street segment elevation =  1076.500(Ft.)
Length of street segment  =  1000.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     29.499(CFS)
Depth of flow =   0.507(Ft.), Average velocity =   3.416(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.42(Ft/s)
Travel time =    4.88 min.     TC =   18.03  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =      2.777(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.875
Subarea runoff =     21.685(CFS) for   10.000(Ac.)
Total runoff =     36.434(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       77.50(Ac.)
Area averaged Fm value =    0.079(In/Hr)
```

```
Street flow at end of street =     36.434(CFS)
Half street flow at end of street =     18.217(CFS)
Depth of flow =   0.537(Ft.), Average velocity =   3.715(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      214.000 to Point/Station      214.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     15.000(Ac.)
Runoff from this stream =     36.434(CFS)
Time of concentration =   18.03 min.
Rainfall intensity =     2.777(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream    Flow rate       TC            Rainfall Intensity
 No.        (CFS)        (min)                 (In/Hr)


1       114.527      19.23                2.672
2        41.047      17.58                2.820
3        36.434      18.03                2.777
Qmax(1) =
          1.000 *     1.000 *   114.527) +
          0.947 *     1.000 *    41.047) +
          0.961 *     1.000 *    36.434) + =     188.387
Qmax(2) =
          1.057 *     0.914 *   114.527) +
          1.000 *     1.000 *    41.047) +
          1.016 *     0.975 *    36.434) + =     187.795
Qmax(3) =
          1.041 *     0.937 *   114.527) +
          0.985 *     1.000 *    41.047) +
          1.000 *     1.000 *    36.434) + =     188.588

Total of 3 streams to confluence:
Flow rates before confluence point:
     114.527      41.047      36.434
Maximum flow rates at confluence using above data:
      188.387      187.795      188.588
Area of streams before confluence:
       44.545       16.500       15.000
Effective area values after confluence:
       76.045       71.848       73.259
Results of confluence:
Total flow rate =    188.588(CFS)
Time of concentration =    18.030 min.
Effective stream area after confluence =     73.259(Ac.)
Stream Area average Pervious fraction(Ap) =  0.100
Stream Area average soil loss rate(Fm) =    0.074(In/Hr)
Study area (this main stream) =      76.05(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       62.000 to Point/Station       63.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
```

```
Upstream point/station elevation =  1065.000(Ft.)
Downstream point/station elevation =  1042.200(Ft.)
Pipe length  =  1320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   188.588(CFS)
Given pipe size =     54.00(In.)
Calculated individual pipe flow  =   188.588(CFS)
Normal flow depth in pipe =   34.22(In.)
Flow top width inside pipe =   52.03(In.)
Critical Depth =   47.46(In.)
Pipe flow velocity =     17.73(Ft/s)
Travel time through pipe =    1.24 min.
Time of concentration (TC) =    19.27 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       63.000 to Point/Station       63.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     73.259(Ac.)
Runoff from this stream =    188.588(CFS)
Time of concentration =   19.27 min.
Rainfall intensity =     2.669(In/Hr)
Area averaged loss rate (Fm) =    0.0735(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      215.000 to Point/Station      216.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1074.600(Ft.)
Bottom (of initial area) elevation =  1071.000(Ft.)
Difference in elevation =     3.600(Ft.)
Slope =    0.00360  s(%)=       0.36
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.846 min.
Rainfall intensity =      3.121(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.887
Subarea runoff =     15.230(CFS)
Total initial stream area =        5.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)


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Process from Point/Station      216.000 to Point/Station      217.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1071.000(Ft.)
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```
End of street segment elevation =  1063.700(Ft.)
Length of street segment  =   875.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     30.460(CFS)
Depth of flow =   0.520(Ft.), Average velocity =   3.327(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.33(Ft/s)
Travel time =    4.38 min.     TC =   19.23  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.672(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.885
Subarea runoff =     23.797(CFS) for   11.000(Ac.)
Total runoff =     39.027(CFS)
Effective area this stream =       16.50(Ac.)
Total Study Area (Main Stream No. 1) =       94.00(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     39.027(CFS)
Half street flow at end of street =     19.513(CFS)
Depth of flow =   0.557(Ft.), Average velocity =   3.671(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      217.000 to Point/Station      217.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     16.500(Ac.)
Runoff from this stream =     39.027(CFS)
Time of concentration =   19.23 min.
Rainfall intensity =     2.672(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station       63.000 to Point/Station       63.000
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**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 95.59
Adjusted SCS curve number for AMC 3 = 99.12
Pervious ratio(Ap) = 0.1110     Max loss rate(Fm)=     0.002(In/Hr)
Rainfall intensity =      2.526(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  21.12 min.  Rain intensity =       2.53(In/Hr)
Total area this stream =       203.97(Ac.)
Total Study Area (Main Stream No. 1) =      297.97(Ac.)
Total runoff =    509.46(CFS)


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Process from Point/Station       63.000 to Point/Station       63.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area =    203.970(Ac.)
Runoff from this stream =    509.460(CFS)
Time of concentration =   21.12 min.
Rainfall intensity =     2.526(In/Hr)
Area averaged loss rate (Fm) =    0.0020(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1110
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      188.588     19.27               2.669
2       39.027     19.23               2.672
3      509.460     21.12               2.526
Qmax(1) =
         1.000 *    1.000 *   188.588) +
         0.999 *    1.000 *    39.027) +
         1.057 *    0.912 *   509.460) + =     718.707
Qmax(2) =
         1.001 *    0.998 *   188.588) +
         1.000 *    1.000 *    39.027) +
         1.058 *    0.910 *   509.460) + =     718.181
Qmax(3) =
         0.945 *    1.000 *   188.588) +
         0.944 *    1.000 *    39.027) +
         1.000 *    1.000 *   509.460) + =     724.528

Total of 3 streams to confluence:
Flow rates before confluence point:
     188.588      39.027     509.460
Maximum flow rates at confluence using above data:
      718.707      718.181      724.528
Area of streams before confluence:
       73.259       16.500      203.970
Effective area values after confluence:
      275.867      275.311      293.729
Results of confluence:
Total flow rate =    724.528(CFS)
Time of concentration =    21.120 min.
Effective stream area after confluence =    293.729(Ac.)
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Stream Area average Pervious fraction(Ap) =  0.108
Stream Area average soil loss rate(Fm) =    0.022(In/Hr)
Study area (this main stream) =     293.73(Ac.)


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Process from Point/Station       63.000 to Point/Station       64.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1039.100(Ft.)
Downstream point/station elevation =  1033.800(Ft.)
Pipe length  =  1320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   724.528(CFS)
Given pipe size =     90.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    12.713(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     11.748(Ft.)
 Minor friction loss =      6.265(Ft.)    K-factor =   1.50
Pipe flow velocity =     16.40(Ft/s)
Travel time through pipe =    1.34 min.
Time of concentration (TC) =    22.46 min.


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Process from Point/Station       64.000 to Point/Station       64.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    293.729(Ac.)
Runoff from this stream =    724.528(CFS)
Time of concentration =   22.46 min.
Rainfall intensity =     2.434(In/Hr)
Area averaged loss rate (Fm) =    0.0222(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1076


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Process from Point/Station      218.000 to Point/Station      219.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1065.500(Ft.)
Bottom (of initial area) elevation =  1059.000(Ft.)
Difference in elevation =     6.500(Ft.)
Slope =    0.00650  s(%)=       0.65
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.880 min.
Rainfall intensity =     2.889(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.831
Subarea runoff =     12.012(CFS)
Total initial stream area =        5.000(Ac.)
```

```
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      219.000 to Point/Station      220.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------------
Top of street segment elevation =  1059.000(Ft.)
End of street segment elevation =  1056.500(Ft.)
Length of street segment  =   500.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     21.622(CFS)
Depth of flow =   0.509(Ft.), Average velocity =   2.489(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.49(Ft/s)
Travel time =    3.35 min.     TC =   20.23  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.592(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.824
Subarea runoff =     15.741(CFS) for    8.000(Ac.)
Total runoff =     27.754(CFS)
Effective area this stream =       13.00(Ac.)
Total Study Area (Main Stream No. 1) =      310.97(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     27.754(CFS)
Half street flow at end of street =     13.877(CFS)
Depth of flow =   0.544(Ft.), Average velocity =   2.748(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      221.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------------
Top of street segment elevation =  1056.500(Ft.)
End of street segment elevation =  1051.200(Ft.)
```

```
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     41.630(CFS)
Depth of flow =   0.742(Ft.), Average velocity =   3.892(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    3.79(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  32.374(Ft.)
Flow velocity =   3.89(Ft/s)
Travel time =    2.83 min.     TC =   23.05  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.396(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.817
Subarea runoff =     23.176(CFS) for   13.000(Ac.)
Total runoff =     50.930(CFS)
Effective area this stream =       26.00(Ac.)
Total Study Area (Main Stream No. 1) =      323.97(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     50.930(CFS)
Half street flow at end of street =     50.930(CFS)
Depth of flow =   0.795(Ft.), Average velocity =   4.000(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    6.42(Ft.)
Flow width (from curb towards crown)=  34.999(Ft.)


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Process from Point/Station      221.000 to Point/Station      221.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     26.000(Ac.)
Runoff from this stream =     50.930(CFS)
Time of concentration =   23.05 min.
Rainfall intensity =     2.396(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
```

```
 No.       (CFS)       (min)                  (In/Hr)

1      724.528     22.46                2.434
2       50.930     23.05                2.396
Qmax(1) =
          1.000 *    1.000 *   724.528) +
          1.017 *    0.974 *    50.930) + =     775.009
Qmax(2) =
          0.984 *    1.000 *   724.528) +
          1.000 *    1.000 *    50.930) + =     764.111

Total of 2 streams to confluence:
Flow rates before confluence point:
     724.528      50.930
Maximum flow rates at confluence using above data:
      775.009      764.111
Area of streams before confluence:
      293.729       26.000
Effective area values after confluence:
      319.060      319.729
Results of confluence:
Total flow rate =    775.009(CFS)
Time of concentration =    22.461 min.
Effective stream area after confluence =    319.060(Ac.)
Stream Area average Pervious fraction(Ap) =  0.140
Stream Area average soil loss rate(Fm) =    0.038(In/Hr)
Study area (this main stream) =     319.73(Ac.)


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Process from Point/Station       64.000 to Point/Station       71.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1033.800(Ft.)
Downstream point/station elevation =  1030.000(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   775.009(CFS)
Given pipe size =     90.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    10.089(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      6.721(Ft.)
 Minor friction loss =      7.168(Ft.)    K-factor =   1.50
Pipe flow velocity =     17.54(Ft/s)
Travel time through pipe =    0.63 min.
Time of concentration (TC) =    23.09 min.


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Process from Point/Station       71.000 to Point/Station       71.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    319.060(Ac.)
Runoff from this stream =    775.009(CFS)
Time of concentration =   23.09 min.
Rainfall intensity =     2.394(In/Hr)
Area averaged loss rate (Fm) =    0.0382(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1395
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       71.000 to Point/Station       71.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 91.43
Adjusted SCS curve number for AMC 3 = 98.29
Pervious ratio(Ap) = 0.4510     Max loss rate(Fm)=     0.015(In/Hr)
Rainfall intensity =      2.272(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  25.20 min.  Rain intensity =       2.27(In/Hr)
Total area this stream =       205.19(Ac.)
Total Study Area (Main Stream No. 1) =      529.16(Ac.)
Total runoff =    424.14(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       71.000 to Point/Station       71.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    205.190(Ac.)
Runoff from this stream =    424.140(CFS)
Time of concentration =   25.20 min.
Rainfall intensity =     2.272(In/Hr)
Area averaged loss rate (Fm) =    0.0154(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4510
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                  (In/Hr)


1      775.009     23.09               2.394
2      424.140     25.20               2.272
Qmax(1) =
         1.000 *    1.000 *   775.009) +
         1.054 *    0.916 *   424.140) + =    1184.702
Qmax(2) =
         0.948 *    1.000 *   775.009) +
         1.000 *    1.000 *   424.140) + =    1158.863

Total of 2 streams to confluence:
Flow rates before confluence point:
     775.009     424.140
Maximum flow rates at confluence using above data:
     1184.702     1158.863
Area of streams before confluence:
      319.060      205.190
Effective area values after confluence:
      507.057      524.250
Results of confluence:
Total flow rate =   1184.702(CFS)
Time of concentration =    23.089 min.
Effective stream area after confluence =    507.057(Ac.)
Stream Area average Pervious fraction(Ap) =  0.261
Stream Area average soil loss rate(Fm) =    0.029(In/Hr)
Study area (this main stream) =     524.25(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       71.000 to Point/Station       89.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1030.000(Ft.)
Downstream point/station elevation =  1025.000(Ft.)
Pipe length  =   680.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =  1184.702(CFS)
Given pipe size =    108.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     9.197(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      6.119(Ft.)
 Minor friction loss =      8.077(Ft.)    K-factor =   1.50
Pipe flow velocity =     18.62(Ft/s)
Travel time through pipe =    0.61 min.
Time of concentration (TC) =    23.70 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       89.000 to Point/Station       89.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    507.057(Ac.)
Runoff from this stream =   1184.702(CFS)
Time of concentration =   23.70 min.
Rainfall intensity =     2.357(In/Hr)
Area averaged loss rate (Fm) =    0.0293(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2614


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       89.000 to Point/Station       89.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 99.51
Adjusted SCS curve number for AMC 3 = 99.90
Pervious ratio(Ap) = 0.8280     Max loss rate(Fm)=     0.002(In/Hr)
Rainfall intensity =      3.539(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.04 min.  Rain intensity =       3.54(In/Hr)
Total area this stream =       284.04(Ac.)
Total Study Area (Main Stream No. 1) =      813.20(Ac.)
Total runoff =   1062.58(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       89.000 to Point/Station       89.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    284.040(Ac.)
Runoff from this stream =   1062.580(CFS)
Time of concentration =   12.04 min.
Rainfall intensity =     3.539(In/Hr)
Area averaged loss rate (Fm) =    0.0016(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8280
```

Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	1184.702	23.70	2.357
2	1062.580	12.04	3.539

```
Qmax(1) =
         1.000 *    1.000 *  1184.702) +
         0.666 *    1.000 *  1062.580) + =    1892.356
Qmax(2) =
         1.508 *    0.508 *  1184.702) +
         1.000 *    1.000 *  1062.580) + =    1969.987

Total of 2 streams to confluence:
Flow rates before confluence point:
    1184.702    1062.580
Maximum flow rates at confluence using above data:
     1892.356     1969.987
Area of streams before confluence:
      507.057      284.040
Effective area values after confluence:
      791.097      541.665
Results of confluence:
Total flow rate =   1969.987(CFS)
Time of concentration =    12.040 min.
Effective stream area after confluence =    541.665(Ac.)
Stream Area average Pervious fraction(Ap) =  0.465
Stream Area average soil loss rate(Fm) =    0.019(In/Hr)
Study area (this main stream) =     791.10(Ac.)
End of computations, Total Study Area =          813.20 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.458
Area averaged SCS curve number =  88.1
```

LINE "DZ-4"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 07/13/04

FONTANA / LINE DZ-4 HYDROLOGY
100 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 600.000 to Point/Station 601.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1065.000(Ft.)
Bottom (of initial area) elevation = 1060.000(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.00500 s(%)= 0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.902 min.
Rainfall intensity = 3.246(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff = 14.410(CFS)
Total initial stream area = 5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.044(In/Hr)

++
Process from Point/Station 601.000 to Point/Station 602.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1060.000(Ft.)

```
End of street segment elevation =  1058.300(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     21.615(CFS)
Depth of flow =   0.507(Ft.), Average velocity =   2.511(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.51(Ft/s)
Travel time =    2.19 min.     TC =   16.09  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.973(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.887
Subarea runoff =     11.954(CFS) for    5.000(Ac.)
Total runoff =     26.364(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       10.00(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     26.364(CFS)
Half street flow at end of street =     13.182(CFS)
Depth of flow =   0.534(Ft.), Average velocity =   2.717(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      602.000 to Point/Station      603.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------------
Top of street segment elevation =  1058.300(Ft.)
End of street segment elevation =  1055.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
```

```
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     39.546(CFS)
Depth of flow =   0.604(Ft.), Average velocity =   3.162(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.16(Ft/s)
Travel time =    3.48 min.     TC =   19.57  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =     2.644(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.885
Subarea runoff =     20.435(CFS) for   10.000(Ac.)
Total runoff =     46.800(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       20.00(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     46.800(CFS)
Half street flow at end of street =     23.400(CFS)
Depth of flow =   0.638(Ft.), Average velocity =   3.381(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      603.000 to Point/Station      607.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1055.000(Ft.)
End of street segment elevation =  1052.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     46.800(CFS)
Depth of flow =   0.848(Ft.), Average velocity =   3.110(Ft/s)
Warning: depth of flow exceeds top of curb
```

```
Distance that curb overflow reaches into property =     9.04(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  37.627(Ft.)
Flow velocity =   3.11(Ft/s)
Travel time =    3.54 min.      TC =   23.11  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000      Max loss rate(Fm)=      0.044(In/Hr)
Rainfall intensity =      2.393(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.883
Subarea runoff =       0.000(CFS) for    0.000(Ac.)
Total runoff =     46.800(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       20.00(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     46.800(CFS)
Half street flow at end of street =     46.800(CFS)
Depth of flow =   0.848(Ft.), Average velocity =   3.110(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =     9.04(Ft.)
Flow width (from curb towards crown)=  37.627(Ft.)


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Process from Point/Station      607.000 to Point/Station      607.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     20.000(Ac.)
Runoff from this stream =     46.800(CFS)
Time of concentration =   23.11 min.
Rainfall intensity =     2.393(In/Hr)
Area averaged loss rate (Fm) =    0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      604.000 to Point/Station      605.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000      Max loss rate(Fm)=      0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1062.900(Ft.)
Bottom (of initial area) elevation =  1057.900(Ft.)
Difference in elevation =     5.000(Ft.)
```

```
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      3.246(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =     14.410(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      605.000 to Point/Station      606.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1057.900(Ft.)
End of street segment elevation =  1055.900(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     21.615(CFS)
Depth of flow =   0.496(Ft.), Average velocity =   2.637(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.64(Ft/s)
Travel time =    2.09 min.     TC =   15.99  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.985(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.887
Subarea runoff =     12.059(CFS) for    5.000(Ac.)
Total runoff =     26.469(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       30.00(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     26.469(CFS)
Half street flow at end of street =     13.235(CFS)
Depth of flow =   0.523(Ft.), Average velocity =   2.858(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      606.000 to Point/Station      607.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1055.900(Ft.)
End of street segment elevation =  1052.000(Ft.)
Length of street segment   =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     39.704(CFS)
Depth of flow =   0.589(Ft.), Average velocity =   3.331(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.33(Ft/s)
Travel time =    3.30 min.     TC =   19.29  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.154(In/Hr)
Rainfall intensity =      2.667(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =     19.755(CFS) for   10.000(Ac.)
Total runoff =     46.224(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       40.00(Ac.)
Area averaged Fm value =    0.099(In/Hr)
Street flow at end of street =     46.224(CFS)
Half street flow at end of street =     23.112(CFS)
Depth of flow =   0.618(Ft.), Average velocity =   3.538(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      607.000 to Point/Station      607.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     20.000(Ac.)
Runoff from this stream =     46.224(CFS)
```

```
Time of concentration =   19.29 min.
Rainfall intensity =     2.667(In/Hr)
Area averaged loss rate (Fm) =    0.0990(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2250
Summary of stream data:

Stream    Flow rate       TC              Rainfall Intensity
 No.        (CFS)        (min)                 (In/Hr)

1        46.800      23.11                    2.393
2        46.224      19.29                    2.667
Qmax(1) =
            1.000 *    1.000 *    46.800) +
            0.893 *    1.000 *    46.224) + =       88.094
Qmax(2) =
            1.117 *    0.835 *    46.800) +
            1.000 *    1.000 *    46.224) + =       89.846

Total of 2 streams to confluence:
Flow rates before confluence point:
      46.800       46.224
Maximum flow rates at confluence using above data:
       88.094       89.846
Area of streams before confluence:
       20.000       20.000
Effective area values after confluence:
       40.000       36.696
Results of confluence:
Total flow rate =      89.846(CFS)
Time of concentration =    19.290 min.
Effective stream area after confluence =      36.696(Ac.)
Stream Area average Pervious fraction(Ap) =  0.163
Stream Area average soil loss rate(Fm) =    0.071(In/Hr)
Study area (this main stream) =       40.00(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       607.000 to Point/Station        45.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1047.000(Ft.)
Downstream point/station elevation =  1041.000(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    89.846(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =    89.846(CFS)
Normal flow depth in pipe =   32.25(In.)
Flow top width inside pipe =   35.46(In.)
Critical Depth =   35.27(In.)
Pipe flow velocity =     11.33(Ft/s)
Travel time through pipe =    0.97 min.
Time of concentration (TC) =    20.26 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       45.000 to Point/Station        45.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
```

```
Stream flow area =     36.696(Ac.)
Runoff from this stream =     89.846(CFS)
Time of concentration =   20.26 min.
Rainfall intensity =     2.590(In/Hr)
Area averaged loss rate (Fm) =    0.0715(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1625

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      608.000 to Point/Station      609.000
**** INITIAL AREA EVALUATION ****
-------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1060.800(Ft.)
Bottom (of initial area) elevation =  1055.800(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =      3.246(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =     14.410(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      609.000 to Point/Station      610.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------
Top of street segment elevation =  1055.800(Ft.)
End of street segment elevation =  1053.500(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     21.615(CFS)
Depth of flow =   0.486(Ft.), Average velocity =   2.774(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.556(Ft.)
```

```
Flow velocity =   2.77(Ft/s)
Travel time =    1.98 min.      TC =   15.88  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      2.997(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.887
Subarea runoff =     12.164(CFS) for    5.000(Ac.)
Total runoff =     26.574(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       50.00(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     26.574(CFS)
Half street flow at end of street =     13.287(CFS)
Depth of flow =   0.514(Ft.), Average velocity =   2.985(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      610.000 to Point/Station      611.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1053.500(Ft.)
End of street segment elevation =  1049.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     39.861(CFS)
Depth of flow =   0.577(Ft.), Average velocity =   3.484(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.48(Ft/s)
Travel time =    3.16 min.      TC =   19.04  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
```

Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.3500 Max loss rate(Fm)= 0.154(In/Hr)
Rainfall intensity = 2.688(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.867
Subarea runoff = 20.024(CFS) for 10.000(Ac.)
Total runoff = 46.598(CFS)
Effective area this stream = 20.00(Ac.)
Total Study Area (Main Stream No. 1) = 60.00(Ac.)
Area averaged Fm value = 0.099(In/Hr)
Street flow at end of street = 46.598(CFS)
Half street flow at end of street = 23.299(CFS)
Depth of flow = 0.606(Ft.), Average velocity = 3.706(Ft/s)
Note: depth of flow exceeds top of street crown.
Flow width (from curb towards crown)= 20.000(Ft.)

++
Process from Point/Station 611.000 to Point/Station 611.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 20.000(Ac.)
Runoff from this stream = 46.598(CFS)
Time of concentration = 19.04 min.
Rainfall intensity = 2.688(In/Hr)
Area averaged loss rate (Fm) = 0.0990(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2250
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	89.846	20.26	2.590
2	46.598	19.04	2.688

Qmax(1) =
1.000 * 1.000 * 89.846) +
0.962 * 1.000 * 46.598) + = 134.677

Qmax(2) =
1.039 * 0.940 * 89.846) +
1.000 * 1.000 * 46.598) + = 134.334

Total of 2 streams to confluence:
Flow rates before confluence point:
89.846 46.598
Maximum flow rates at confluence using above data:
134.677 134.334
Area of streams before confluence:
36.696 20.000
Effective area values after confluence:
56.696 54.489
Results of confluence:
Total flow rate = 134.677(CFS)
Time of concentration = 20.261 min.
Effective stream area after confluence = 56.696(Ac.)
Stream Area average Pervious fraction(Ap) = 0.185
Stream Area average soil loss rate(Fm) = 0.081(In/Hr)
Study area (this main stream) = 56.70(Ac.)

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       45.000 to Point/Station       90.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1040.000(Ft.)
Downstream point/station elevation =  1025.000(Ft.)
Pipe length  =   750.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   134.677(CFS)
Given pipe size =     54.00(In.)
Calculated individual pipe flow  =   134.677(CFS)
Normal flow depth in pipe =   26.48(In.)
Flow top width inside pipe =   53.99(In.)
Critical Depth =   40.96(In.)
Pipe flow velocity =     17.34(Ft/s)
Travel time through pipe =    0.72 min.
Time of concentration (TC) =    20.98 min.


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Process from Point/Station       90.000 to Point/Station       90.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     56.696(Ac.)
Runoff from this stream =    134.677(CFS)
Time of concentration =   20.98 min.
Rainfall intensity =     2.536(In/Hr)
Area averaged loss rate (Fm) =    0.0812(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1845


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Process from Point/Station      612.000 to Point/Station      613.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1058.700(Ft.)
Bottom (of initial area) elevation =  1053.700(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.902 min.
Rainfall intensity =     3.246(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
Subarea runoff =     14.410(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.044(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      613.000 to Point/Station      614.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1053.700(Ft.)
End of street segment elevation =  1051.100(Ft.)
Length of street segment   =   330.000(Ft.)
Height of curb above gutter flowline   =    8.0(In.)
Width of half street (curb to crown)   =  20.000(Ft.)
Distance from crown to crossfall grade break   =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line   =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     21.615(CFS)
Depth of flow =   0.477(Ft.), Average velocity =   2.905(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.101(Ft.)
Flow velocity =   2.91(Ft/s)
Travel time =    1.89 min.      TC =   15.80  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.044(In/Hr)
Rainfall intensity =      3.007(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.887
Subarea runoff =    12.256(CFS) for    5.000(Ac.)
Total runoff =     26.666(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       70.00(Ac.)
Area averaged Fm value =    0.044(In/Hr)
Street flow at end of street =     26.666(CFS)
Half street flow at end of street =     13.333(CFS)
Depth of flow =   0.506(Ft.), Average velocity =   3.102(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      614.000 to Point/Station      615.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1051.100(Ft.)
End of street segment elevation =  1046.000(Ft.)
Length of street segment   =   660.000(Ft.)
Height of curb above gutter flowline   =    8.0(In.)
Width of half street (curb to crown)   =  20.000(Ft.)
Distance from crown to crossfall grade break   =  18.500(Ft.)
```

```
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     39.998(CFS)
Depth of flow =   0.567(Ft.), Average velocity =   3.623(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.62(Ft/s)
Travel time =    3.04 min.      TC =   18.83  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.154(In/Hr)
Rainfall intensity =      2.706(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =     20.257(CFS) for   10.000(Ac.)
Total runoff =     46.922(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       80.00(Ac.)
Area averaged Fm value =    0.099(In/Hr)
Street flow at end of street =     46.922(CFS)
Half street flow at end of street =     23.461(CFS)
Depth of flow =   0.595(Ft.), Average velocity =   3.859(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      615.000 to Point/Station      615.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     20.000(Ac.)
Runoff from this stream =     46.922(CFS)
Time of concentration =   18.83 min.
Rainfall intensity =     2.706(In/Hr)
Area averaged loss rate (Fm) =    0.0990(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2250
Summary of stream data:

 Stream    Flow rate      TC              Rainfall Intensity
  No.       (CFS)       (min)                  (In/Hr)

 1       134.677      20.98                    2.536
 2        46.922      18.83                    2.706
```

```
Qmax(1) =
            1.000 *    1.000 *   134.677) +
            0.935 *    1.000 *    46.922) + =      178.541
Qmax(2) =
            1.069 *    0.898 *   134.677) +
            1.000 *    1.000 *    46.922) + =      176.168

Total of 2 streams to confluence:
Flow rates before confluence point:
     134.677      46.922
Maximum flow rates at confluence using above data:
      178.541      176.168
Area of streams before confluence:
       56.696       20.000
Effective area values after confluence:
       76.696       70.886
Results of confluence:
Total flow rate =    178.541(CFS)
Time of concentration =    20.982 min.
Effective stream area after confluence =     76.696(Ac.)
Stream Area average Pervious fraction(Ap) =  0.195
Stream Area average soil loss rate(Fm) =    0.086(In/Hr)
Study area (this main stream) =      76.70(Ac.)
End of computations, Total Study Area =           80.00 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.194
Area averaged SCS curve number =  56.0
```

LINE "DZ-4A"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 07/13/04

FONTANA / LINE DZ-4A HYDROLOGY
100 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 625.000 to Point/Station 626.000
**** INITIAL AREA EVALUATION ****

RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000 Max loss rate(Fm)= 0.220(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1058.000(Ft.)
Bottom (of initial area) elevation = 1051.300(Ft.)
Difference in elevation = 6.700(Ft.)
Slope = 0.00670 s(%)= 0.67
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 16.778 min.
Rainfall intensity = 2.900(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.832
Subarea runoff = 12.060(CFS)
Total initial stream area = 5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value = 0.220(In/Hr)

++
Process from Point/Station 626.000 to Point/Station 627.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1051.300(Ft.)

```
End of street segment elevation =  1049.000(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     18.090(CFS)
Depth of flow =   0.460(Ft.), Average velocity =   2.655(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.264(Ft.)
Flow velocity =   2.65(Ft/s)
Travel time =    2.07 min.     TC =   18.85  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.704(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.827
Subarea runoff =     10.299(CFS) for    5.000(Ac.)
Total runoff =     22.358(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       10.00(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     22.358(CFS)
Half street flow at end of street =     11.179(CFS)
Depth of flow =   0.491(Ft.), Average velocity =   2.798(Ft/s)
Flow width (from curb towards crown)=  19.811(Ft.)


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Process from Point/Station      627.000 to Point/Station      628.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------------
Top of street segment elevation =  1049.000(Ft.)
End of street segment elevation =  1044.600(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
```

```
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     33.538(CFS)
Depth of flow =   0.551(Ft.), Average velocity =   3.231(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.23(Ft/s)
Travel time =    3.40 min.      TC =   22.25  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.448(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.819
Subarea runoff =     17.743(CFS) for   10.000(Ac.)
Total runoff =     40.101(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       20.00(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     40.101(CFS)
Half street flow at end of street =     20.051(CFS)
Depth of flow =   0.580(Ft.), Average velocity =   3.468(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      628.000 to Point/Station      629.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of street segment elevation =  1044.600(Ft.)
End of street segment elevation =  1040.300(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     60.152(CFS)
Depth of flow =   0.867(Ft.), Average velocity =   3.771(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    9.99(Ft.)
Streetflow hydraulics at midpoint of street travel:
```

```
Halfstreet flow width =  38.576(Ft.)
Flow velocity =   3.77(Ft/s)
Travel time =    2.92 min.     TC =   25.17  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.273(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.813
Subarea runoff =     33.824(CFS) for   20.000(Ac.)
Total runoff =     73.925(CFS)
Effective area this stream =       40.00(Ac.)
Total Study Area (Main Stream No. 1) =       40.00(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     73.925(CFS)
Half street flow at end of street =     73.925(CFS)
Depth of flow =   0.923(Ft.), Average velocity =   3.921(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =   12.82(Ft.)
Flow width (from curb towards crown)=  41.399(Ft.)


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Process from Point/Station      629.000 to Point/Station       46.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1033.300(Ft.)
Downstream point/station elevation =  1026.000(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    73.925(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =    73.925(CFS)
Normal flow depth in pipe =   31.69(In.)
Flow top width inside pipe =   23.38(In.)
Critical Depth =   32.48(In.)
Pipe flow velocity =     11.22(Ft/s)
Travel time through pipe =    0.98 min.
Time of concentration (TC) =    26.15 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      629.000 to Point/Station       46.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     40.000(Ac.)
Runoff from this stream =     73.925(CFS)
Time of concentration =   26.15 min.
Rainfall intensity =     2.222(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


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```
Process from Point/Station      630.000 to Point/Station      631.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1052.200(Ft.)
Bottom (of initial area) elevation =  1044.000(Ft.)
Difference in elevation =     8.200(Ft.)
Slope =    0.00820  s(%)=       0.82
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.113 min.
Rainfall intensity =      2.971(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.833
Subarea runoff =     12.380(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      631.000 to Point/Station      632.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Top of street segment elevation =  1044.000(Ft.)
End of street segment elevation =  1041.300(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     18.570(CFS)
Depth of flow =   0.453(Ft.), Average velocity =   2.838(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.888(Ft.)
Flow velocity =   2.84(Ft/s)
Travel time =    1.94 min.     TC =   18.05  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
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Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.775(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.829
Subarea runoff =     10.619(CFS) for    5.000(Ac.)
Total runoff =     22.999(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       50.00(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     22.999(CFS)
Half street flow at end of street =     11.499(CFS)
Depth of flow =   0.483(Ft.), Average velocity =   2.992(Ft/s)
Flow width (from curb towards crown)=  19.420(Ft.)


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Process from Point/Station      632.000 to Point/Station      633.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------------
Top of street segment elevation =  1041.300(Ft.)
End of street segment elevation =  1035.900(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     34.498(CFS)
Depth of flow =   0.540(Ft.), Average velocity =   3.475(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.48(Ft/s)
Travel time =    3.17 min.     TC =   21.22  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.519(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.821
Subarea runoff =     18.383(CFS) for   10.000(Ac.)
Total runoff =     41.382(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       60.00(Ac.)
Area averaged Fm value =    0.220(In/Hr)
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Street flow at end of street =     41.382(CFS)
Half street flow at end of street =     20.691(CFS)
Depth of flow =   0.568(Ft.), Average velocity =   3.736(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      633.000 to Point/Station      633.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     20.000(Ac.)
Runoff from this stream =     41.382(CFS)
Time of concentration =   21.22 min.
Rainfall intensity =     2.519(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream    Flow rate       TC            Rainfall Intensity
 No.        (CFS)        (min)                 (In/Hr)


1        73.925      26.15                  2.222
2        41.382      21.22                  2.519
Qmax(1) =
            1.000 *    1.000 *    73.925) +
            0.871 *    1.000 *    41.382) + =     109.961
Qmax(2) =
            1.148 *    0.811 *    73.925) +
            1.000 *    1.000 *    41.382) + =     110.256

Total of 2 streams to confluence:
Flow rates before confluence point:
      73.925      41.382
Maximum flow rates at confluence using above data:
      109.961      110.256
Area of streams before confluence:
       40.000       20.000
Effective area values after confluence:
       60.000       52.452
Results of confluence:
Total flow rate =    110.256(CFS)
Time of concentration =    21.216 min.
Effective stream area after confluence =     52.452(Ac.)
Stream Area average Pervious fraction(Ap) =  0.500
Stream Area average soil loss rate(Fm) =    0.220(In/Hr)
Study area (this main stream) =      60.00(Ac.)


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Process from Point/Station       46.000 to Point/Station       91.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1026.000(Ft.)
Downstream point/station elevation =  1014.500(Ft.)
Pipe length  =   750.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   110.256(CFS)
Given pipe size =     60.00(In.)
```

```
Calculated individual pipe flow  =   110.256(CFS)
Normal flow depth in pipe =   24.19(In.)
Flow top width inside pipe =   58.86(In.)
Critical Depth =   35.95(In.)
Pipe flow velocity =     14.87(Ft/s)
Travel time through pipe =    0.84 min.
Time of concentration (TC) =    22.06 min.


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Process from Point/Station       91.000 to Point/Station       91.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     52.452(Ac.)
Runoff from this stream =    110.256(CFS)
Time of concentration =   22.06 min.
Rainfall intensity =     2.461(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000


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Process from Point/Station      634.000 to Point/Station      635.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1046.800(Ft.)
Bottom (of initial area) elevation =  1041.800(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     13.931(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


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Process from Point/Station      635.000 to Point/Station      636.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1041.800(Ft.)
End of street segment elevation =  1037.800(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
```

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Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     20.897(CFS)
Depth of flow =   0.442(Ft.), Average velocity =   3.389(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.356(Ft.)
Flow velocity =   3.39(Ft/s)
Travel time =    1.62 min.     TC =   19.41  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.657(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.825
Subarea runoff =     12.388(CFS) for    6.000(Ac.)
Total runoff =     26.319(CFS)
Effective area this stream =       12.00(Ac.)
Total Study Area (Main Stream No. 1) =       72.00(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     26.319(CFS)
Half street flow at end of street =     13.160(CFS)
Depth of flow =   0.474(Ft.), Average velocity =   3.587(Ft/s)
Flow width (from curb towards crown)=  18.966(Ft.)


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Process from Point/Station      636.000 to Point/Station      637.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1037.800(Ft.)
End of street segment elevation =  1031.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     38.382(CFS)
```

```
Depth of flow =   0.538(Ft.), Average velocity =   3.887(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.89(Ft/s)
Travel time =    2.83 min.     TC =   22.24  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Rainfall intensity =      2.449(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.789
Subarea runoff =     18.104(CFS) for   11.000(Ac.)
Total runoff =     44.424(CFS)
Effective area this stream =       23.00(Ac.)
Total Study Area (Main Stream No. 1) =       83.00(Ac.)
Area averaged Fm value =    0.303(In/Hr)
Street flow at end of street =     44.424(CFS)
Half street flow at end of street =     22.212(CFS)
Depth of flow =   0.561(Ft.), Average velocity =   4.119(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      637.000 to Point/Station      637.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     23.000(Ac.)
Runoff from this stream =     44.424(CFS)
Time of concentration =   22.24 min.
Rainfall intensity =     2.449(In/Hr)
Area averaged loss rate (Fm) =    0.3025(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      110.256     22.06                2.461
2       44.424     22.24                2.449
Qmax(1) =
           1.000 *    1.000 *   110.256) +
           1.006 *    0.992 *    44.424) + =     154.562
Qmax(2) =
           0.994 *    1.000 *   110.256) +
           1.000 *    1.000 *    44.424) + =     154.072

Total of 2 streams to confluence:
Flow rates before confluence point:
     110.256      44.424
Maximum flow rates at confluence using above data:
```

```
Depth of flow =   0.538(Ft.), Average velocity =   3.887(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.89(Ft/s)
Travel time =    2.83 min.     TC =   22.24  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Rainfall intensity =      2.449(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.789
Subarea runoff =     18.104(CFS) for   11.000(Ac.)
Total runoff =     44.424(CFS)
Effective area this stream =       23.00(Ac.)
Total Study Area (Main Stream No. 1) =       83.00(Ac.)
Area averaged Fm value =    0.303(In/Hr)
Street flow at end of street =     44.424(CFS)
Half street flow at end of street =     22.212(CFS)
Depth of flow =   0.561(Ft.), Average velocity =   4.119(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      637.000 to Point/Station      637.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     23.000(Ac.)
Runoff from this stream =     44.424(CFS)
Time of concentration =   22.24 min.
Rainfall intensity =     2.449(In/Hr)
Area averaged loss rate (Fm) =    0.3025(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream    Flow rate       TC             Rainfall Intensity
 No.        (CFS)        (min)                  (In/Hr)


1       110.256      22.06                  2.461
2        44.424      22.24                  2.449
Qmax(1) =
            1.000 *    1.000 *   110.256) +
            1.006 *    0.992 *    44.424) + =     154.562
Qmax(2) =
            0.994 *    1.000 *   110.256) +
            1.000 *    1.000 *    44.424) + =     154.072

Total of 2 streams to confluence:
Flow rates before confluence point:
     110.256      44.424
Maximum flow rates at confluence using above data:
```

```
      154.562      154.072
Area of streams before confluence:
       52.452       23.000
Effective area values after confluence:
       75.260       75.452
Results of confluence:
Total flow rate =    154.562(CFS)
Time of concentration =    22.057 min.
Effective stream area after confluence =     75.260(Ac.)
Stream Area average Pervious fraction(Ap) =  0.500
Stream Area average soil loss rate(Fm) =    0.245(In/Hr)
Study area (this main stream) =      75.45(Ac.)
End of computations, Total Study Area =           83.00 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged SCS curve number =  52.8
```

LINE "14'×9' RCB"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/10/05

FONTANA / LINE JURUPA AVE. 14'X 9' RCB HYDROLOGY
100 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

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Process from Point/Station 89.000 to Point/Station 89.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 99.59
Adjusted SCS curve number for AMC 3 = 99.92
Pervious ratio(Ap) = 0.4650 Max loss rate(Fm)= 0.001(In/Hr)
Rainfall intensity = 3.539(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 12.04 min. Rain intensity = 3.54(In/Hr)
Total area this stream = 541.67(Ac.)
Total Study Area (Main Stream No. 1) = 541.67(Ac.)
Total runoff = 1969.99(CFS)

++

Process from Point/Station 89.000 to Point/Station 90.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Covered channel
Upstream point elevation = 1028.200(Ft.)
Downstream point elevation = 1022.300(Ft.)
Channel length thru subarea = 1320.000(Ft.)
Channel base width = 14.000(Ft.)
Slope or 'Z' of left channel bank = 0.000
Slope or 'Z' of right channel bank = 0.000
Manning's 'N' = 0.015
Maximum depth of channel = 9.000(Ft.)
Flow(q) thru subarea = 1969.990(CFS)
Depth of flow = 8.627(Ft.), Average velocity = 16.310(Ft/s)
Channel flow top width = 14.000(Ft.)
Flow Velocity = 16.31(Ft/s)

Travel time = 1.35 min.
Time of concentration = 13.39 min.
Critical depth = 8.500(Ft.)

++
Process from Point/Station 90.000 to Point/Station 90.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 541.670(Ac.)
Runoff from this stream = 1969.990(CFS)
Time of concentration = 13.39 min.
Rainfall intensity = 3.320(In/Hr)
Area averaged loss rate (Fm) = 0.0008(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4650

++
Process from Point/Station 90.000 to Point/Station 90.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 91.44
Adjusted SCS curve number for AMC 3 = 98.29
Pervious ratio(Ap) = 0.1950 Max loss rate(Fm)= 0.007(In/Hr)
Rainfall intensity = 2.536(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 20.98 min. Rain intensity = 2.54(In/Hr)
Total area this stream = 76.70(Ac.)
Total Study Area (Main Stream No. 1) = 618.37(Ac.)
Total runoff = 178.54(CFS)

++
Process from Point/Station 90.000 to Point/Station 90.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 76.700(Ac.)
Runoff from this stream = 178.540(CFS)
Time of concentration = 20.98 min.
Rainfall intensity = 2.536(In/Hr)
Area averaged loss rate (Fm) = 0.0066(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1950

++
Process from Point/Station 616.000 to Point/Station 617.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.140(In/Hr)
Initial subarea data:

```
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1540.000(Ft.)
Bottom (of initial area) elevation =  1160.000(Ft.)
Difference in elevation =   380.000(Ft.)
Slope =    0.38000  s(%)=      38.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.097 min.
Rainfall intensity =      3.933(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.868
Subarea runoff =     23.895(CFS)
Total initial stream area =        7.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.140(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      617.000 to Point/Station      618.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     54.616(CFS)
Depth of flow =   0.575(Ft.), Average velocity =   5.511(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00               5.00
      2            150.00               0.00
      3            300.00               5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------------
Sub-Channel flow  =     54.616(CFS)
  '     '    flow top width =     34.487(Ft.)
  '     '    velocity=    5.511(Ft/s)
  '     '    area =      9.911(Sq.Ft)
  '     '    Froude number =     1.811

Upstream point elevation =  1160.000(Ft.)
Downstream point elevation =  1080.000(Ft.)
Flow length =   900.000(Ft.)
Travel time  =    2.72 min.
Time of concentration =   12.82 min.
Depth of flow =   0.575(Ft.)
Average velocity =   5.511(Ft/s)
Total irregular channel flow =    54.616(CFS)
Irregular channel normal depth above invert elev. =   0.575(Ft.)
Average velocity of channel(s) =   5.511(Ft/s)

Sub-Channel No. 1 Critical depth =      0.727(Ft.)
  '     '       '     Critical flow top width =     43.594(Ft.)
  '     '       '     Critical flow velocity=    3.449(Ft/s)
  '     '       '     Critical flow area =     15.837(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
```

```
Rainfall intensity =      3.408(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.863
Subarea runoff =     49.636(CFS) for   18.000(Ac.)
Total runoff =     73.531(CFS)
Effective area this stream =       25.00(Ac.)
Total Study Area (Main Stream No. 1) =      643.37(Ac.)
Area averaged Fm value =    0.140(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      618.000 to Point/Station       90.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1033.000(Ft.)
Downstream point/station elevation =  1025.000(Ft.)
Pipe length  =   420.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    73.531(CFS)
Given pipe size =     48.00(In.)
Calculated individual pipe flow  =    73.531(CFS)
Normal flow depth in pipe =   20.25(In.)
Flow top width inside pipe =   47.41(In.)
Critical Depth =   31.13(In.)
Pipe flow velocity =     14.61(Ft/s)
Travel time through pipe =    0.48 min.
Time of concentration (TC) =    13.30 min.


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Process from Point/Station       90.000 to Point/Station       90.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     25.000(Ac.)
Runoff from this stream =     73.531(CFS)
Time of concentration =   13.30 min.
Rainfall intensity =     3.334(In/Hr)
Area averaged loss rate (Fm) =    0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      619.000 to Point/Station      620.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1056.400(Ft.)
Bottom (of initial area) elevation =  1051.400(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
```

```
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     13.931(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      620.000 to Point/Station      621.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1051.400(Ft.)
End of street segment elevation =  1046.000(Ft.)
Length of street segment  =  1070.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     20.897(CFS)
Depth of flow =   0.504(Ft.), Average velocity =   2.462(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.46(Ft/s)
Travel time =    7.24 min.     TC =   25.03  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =     2.281(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.813
Subarea runoff =      8.328(CFS) for    6.000(Ac.)
Total runoff =     22.259(CFS)
Effective area this stream =       12.00(Ac.)
Total Study Area (Main Stream No. 1) =      655.37(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     22.259(CFS)
Half street flow at end of street =     11.129(CFS)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   10.00(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station 621.000 to Point/Station 621.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 4
Stream flow area = 12.000(Ac.)
Runoff from this stream = 22.259(CFS)
Time of concentration = 25.03 min.
Rainfall intensity = 2.281(In/Hr)
Area averaged loss rate (Fm) = 0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	1969.990	13.39	3.320
2	178.540	20.98	2.536
3	73.531	13.30	3.334
4	22.259	25.03	2.281

Qmax(1) =
1.000 * 1.000 * 1969.990) +
1.310 * 0.638 * 178.540) +
0.996 * 1.000 * 73.531) +
1.504 * 0.535 * 22.259) + = 2210.391

Qmax(2) =
0.764 * 1.000 * 1969.990) +
1.000 * 1.000 * 178.540) +
0.750 * 1.000 * 73.531) +
1.124 * 0.838 * 22.259) + = 1759.176

Qmax(3) =
1.004 * 0.993 * 1969.990) +
1.315 * 0.634 * 178.540) +
1.000 * 1.000 * 73.531) +
1.511 * 0.531 * 22.259) + = 2204.933

Qmax(4) =
0.687 * 1.000 * 1969.990) +
0.899 * 1.000 * 178.540) +
0.670 * 1.000 * 73.531) +
1.000 * 1.000 * 22.259) + = 1585.277

Total of 4 streams to confluence:
Flow rates before confluence point:
1969.990 178.540 73.531 22.259
Maximum flow rates at confluence using above data:
2210.391 1759.176 2204.933 1585.277
Area of streams before confluence:
541.670 76.700 25.000 12.000
Effective area values after confluence:
622.036 653.427 618.009 655.370
Results of confluence:
Total flow rate = 2210.391(CFS)
Time of concentration = 13.389 min.
Effective stream area after confluence = 622.036(Ac.)
Stream Area average Pervious fraction(Ap) = 0.454
Stream Area average soil loss rate(Fm) = 0.011(In/Hr)
Study area (this main stream) = 655.37(Ac.)

++
Process from Point/Station 90.000 to Point/Station 91.000

**** IMPROVED CHANNEL TRAVEL TIME ****

Covered channel
Upstream point elevation = 1022.300(Ft.)
Downstream point elevation = 1013.100(Ft.)
Channel length thru subarea = 1320.000(Ft.)
Channel base width = 14.000(Ft.)
Slope or 'Z' of left channel bank = 0.000
Slope or 'Z' of right channel bank = 0.000
Manning's 'N' = 0.015
Maximum depth of channel = 9.000(Ft.)
Flow(q) thru subarea = 2210.391(CFS)
Depth of flow = 7.948(Ft.), Average velocity = 19.864(Ft/s)
Channel flow top width = 14.000(Ft.)
Flow Velocity = 19.86(Ft/s)
Travel time = 1.11 min.
Time of concentration = 14.50 min.
Critical depth = 9.125(Ft.)

++
Process from Point/Station 91.000 to Point/Station 91.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 622.036(Ac.)
Runoff from this stream = 2210.391(CFS)
Time of concentration = 14.50 min.
Rainfall intensity = 3.166(In/Hr)
Area averaged loss rate (Fm) = 0.0108(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4545

++
Process from Point/Station 91.000 to Point/Station 91.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 89.16
Adjusted SCS curve number for AMC 3 = 97.83
Pervious ratio(Ap) = 0.5000 Max loss rate(Fm)= 0.021(In/Hr)
Rainfall intensity = 2.461(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 22.06 min. Rain intensity = 2.46(In/Hr)
Total area this stream = 75.26(Ac.)
Total Study Area (Main Stream No. 1) = 730.63(Ac.)
Total runoff = 154.56(CFS)

++
Process from Point/Station 91.000 to Point/Station 91.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 75.260(Ac.)
Runoff from this stream = 154.560(CFS)
Time of concentration = 22.06 min.
Rainfall intensity = 2.461(In/Hr)
Area averaged loss rate (Fm) = 0.0215(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000

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Process from Point/Station      638.000 to Point/Station      639.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1900.000(Ft.)
Bottom (of initial area) elevation =  1540.000(Ft.)
Difference in elevation =   360.000(Ft.)
Slope =    0.36000  s(%)=      36.00
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.207 min.
Rainfall intensity =      3.907(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.868
Subarea runoff =     33.906(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.140(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      639.000 to Point/Station      640.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel =     67.812(CFS)
Depth of flow =   0.867(Ft.), Average velocity =  18.062(Ft/s)
      ******* Irregular Channel Data ***********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              20.00
      2            100.00               0.00
      3            200.00              20.00
Manning's 'N' friction factor =   0.035
-------------------------------------------------------------------
Sub-Channel flow  =     67.812(CFS)
  '      '    flow top width =      8.665(Ft.)
  '      '    velocity=   18.062(Ft/s)
  '      '    area =      3.754(Sq.Ft)
  '      '    Froude number =     4.836

Upstream point elevation =  1540.000(Ft.)
Downstream point elevation =  1200.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    0.55 min.
Time of concentration =   10.76 min.
Depth of flow =   0.867(Ft.)
Average velocity =  18.062(Ft/s)
Total irregular channel flow =    67.812(CFS)
Irregular channel normal depth above invert elev. =   0.867(Ft.)
Average velocity of channel(s) =  18.062(Ft/s)
```

```
Sub-Channel No. 1 Critical depth =      1.625(Ft.)
  '     '       '     Critical flow top width =     16.250(Ft.)
  '     '       '     Critical flow velocity=    5.136(Ft/s)
  '     '       '     Critical flow area =     13.203(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      3.785(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.867
Subarea runoff =     64.521(CFS) for   20.000(Ac.)
Total runoff =     98.428(CFS)
Effective area this stream =       30.00(Ac.)
Total Study Area (Main Stream No. 1) =      760.63(Ac.)
Area averaged Fm value =    0.140(In/Hr)


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Process from Point/Station      640.000 to Point/Station      641.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    167.327(CFS)
Depth of flow =   0.702(Ft.), Average velocity =   6.790(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              4.00
      2            200.00              0.00
      3            400.00              4.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------------
Sub-Channel flow  =    167.327(CFS)
  '     '    flow top width =     70.202(Ft.)
  '     '    velocity=    6.790(Ft/s)
  '     '    area =     24.642(Sq.Ft)
  '     '    Froude number =     2.020

Upstream point elevation =  1200.000(Ft.)
Downstream point elevation =  1045.000(Ft.)
Flow length =  1500.000(Ft.)
Travel time  =    3.68 min.
Time of concentration =   14.44 min.
Depth of flow =   0.702(Ft.)
Average velocity =   6.790(Ft/s)
Total irregular channel flow =   167.327(CFS)
Irregular channel normal depth above invert elev. =   0.702(Ft.)
Average velocity of channel(s) =   6.790(Ft/s)

Sub-Channel No. 1 Critical depth =      0.930(Ft.)
  '     '       '     Critical flow top width =     92.969(Ft.)
  '     '       '     Critical flow velocity=    3.872(Ft/s)
  '     '       '     Critical flow area =     43.216(Sq.Ft)
```

```
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =      3.173(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.860
Subarea runoff =     98.096(CFS) for   42.000(Ac.)
Total runoff =    196.524(CFS)
Effective area this stream =       72.00(Ac.)
Total Study Area (Main Stream No. 1) =     802.63(Ac.)
Area averaged Fm value =    0.140(In/Hr)


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Process from Point/Station      641.000 to Point/Station       91.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1035.000(Ft.)
Downstream point/station elevation =  1015.400(Ft.)
Pipe length  =   450.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   196.524(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow  =   196.524(CFS)
Normal flow depth in pipe =   32.25(In.)
Flow top width inside pipe =   35.46(In.)
Critical depth could not be calculated.
Pipe flow velocity =     24.81(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =    14.74 min.


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Process from Point/Station       91.000 to Point/Station       91.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     72.000(Ac.)
Runoff from this stream =    196.524(CFS)
Time of concentration =   14.74 min.
Rainfall intensity =     3.134(In/Hr)
Area averaged loss rate (Fm) =    0.1400(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


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Process from Point/Station      642.000 to Point/Station      643.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
```

```
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1042.000(Ft.)
Bottom (of initial area) elevation =  1037.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff =     13.931(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


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Process from Point/Station      643.000 to Point/Station      644.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1037.000(Ft.)
End of street segment elevation =  1031.000(Ft.)
Length of street segment  =  1200.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     23.219(CFS)
Depth of flow =   0.518(Ft.), Average velocity =   2.560(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.56(Ft/s)
Travel time =    7.81 min.     TC =   25.60  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Rainfall intensity =      2.250(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.773
Subarea runoff =     10.410(CFS) for    8.000(Ac.)
Total runoff =     24.341(CFS)
Effective area this stream =       14.00(Ac.)
Total Study Area (Main Stream No. 1) =      816.63(Ac.)
```

```
Area averaged Fm value =    0.319(In/Hr)
Street flow at end of street =     24.341(CFS)
Half street flow at end of street =     12.170(CFS)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   10.00(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      644.000 to Point/Station      644.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 4
Stream flow area =     14.000(Ac.)
Runoff from this stream =     24.341(CFS)
Time of concentration =   25.60 min.
Rainfall intensity =     2.250(In/Hr)
Area averaged loss rate (Fm) =    0.3186(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      645.000 to Point/Station      646.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1042.000(Ft.)
Bottom (of initial area) elevation =  1037.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
Rainfall intensity =     2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.774
Subarea runoff =     12.999(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      646.000 to Point/Station      647.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1037.000(Ft.)
End of street segment elevation =  1031.000(Ft.)
Length of street segment  =  1200.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
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```
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     20.582(CFS)
Depth of flow =   0.502(Ft.), Average velocity =   2.440(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.44(Ft/s)
Travel time =    8.20 min.     TC =   25.99  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Rainfall intensity =      2.230(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.742
Subarea runoff =      8.504(CFS) for    7.000(Ac.)
Total runoff =     21.503(CFS)
Effective area this stream =       13.00(Ac.)
Total Study Area (Main Stream No. 1) =      829.63(Ac.)
Area averaged Fm value =    0.393(In/Hr)
Street flow at end of street =     21.503(CFS)
Half street flow at end of street =     10.751(CFS)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   10.00(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      647.000 to Point/Station      647.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 5
Stream flow area =     13.000(Ac.)
Runoff from this stream =     21.503(CFS)
Time of concentration =   25.99 min.
Rainfall intensity =     2.230(In/Hr)
Area averaged loss rate (Fm) =    0.3926(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1     2210.391     14.50              3.166
2      154.560     22.06              2.461
3      196.524     14.74              3.134
```

```
4       24.341     25.60                2.250
5       21.503     25.99                2.230
Qmax(1) =
          1.000 *    1.000 *  2210.391) +
          1.289 *    0.657 *   154.560) +
          1.011 *    0.983 *   196.524) +
          1.474 *    0.566 *    24.341) +
          1.509 *    0.558 *    21.503) + =    2575.011
Qmax(2) =
          0.777 *    1.000 *  2210.391) +
          1.000 *    1.000 *   154.560) +
          0.775 *    1.000 *   196.524) +
          1.109 *    0.862 *    24.341) +
          1.125 *    0.849 *    21.503) + =    2067.181
Qmax(3) =
          0.990 *    1.000 *  2210.391) +
          1.276 *    0.668 *   154.560) +
          1.000 *    1.000 *   196.524) +
          1.457 *    0.576 *    24.341) +
          1.491 *    0.567 *    21.503) + =    2554.859
Qmax(4) =
          0.710 *    1.000 *  2210.391) +
          0.914 *    1.000 *   154.560) +
          0.705 *    1.000 *   196.524) +
          1.000 *    1.000 *    24.341) +
          1.011 *    0.985 *    21.503) + =    1894.671
Qmax(5) =
          0.704 *    1.000 *  2210.391) +
          0.906 *    1.000 *   154.560) +
          0.698 *    1.000 *   196.524) +
          0.990 *    1.000 *    24.341) +
          1.000 *    1.000 *    21.503) + =    1877.927

Total of 5 streams to confluence:
Flow rates before confluence point:
    2210.391     154.560     196.524      24.341      21.503
Maximum flow rates at confluence using above data:
     2575.011     2067.181     2554.859     1894.671     1877.927
Area of streams before confluence:
      622.036       75.260       72.000       14.000       13.000
Effective area values after confluence:
      757.459      792.396      759.779      796.104      796.296
Results of confluence:
Total flow rate =   2575.011(CFS)
Time of concentration =    14.496 min.
Effective stream area after confluence =    757.459(Ac.)
Stream Area average Pervious fraction(Ap) =  0.510
Stream Area average soil loss rate(Fm) =    0.035(In/Hr)
Study area (this main stream) =     796.30(Ac.)


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Process from Point/Station       91.000 to Point/Station       92.000
**** IMPROVED CHANNEL TRAVEL TIME ****

------------------------------------------------------------------------------
Covered channel
Upstream point elevation =  1013.100(Ft.)
Downstream point elevation =  1006.400(Ft.)
Channel length thru subarea  =  1340.000(Ft.)
Channel base width      =   14.000(Ft.)
Slope or 'Z' of left channel bank =   0.000
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Slope or 'Z' of right channel bank =   0.000
Manning's 'N'    = 0.013
Maximum depth of channel  =    9.000(Ft.)
Flow(q) thru subarea =   2575.011(CFS)
Pressure flow condition in covered channel:
Wetted perimeter =   46.00(Ft.)  Flow area =  126.00(Sq.Ft)
Hydraulic grade line required at box inlet =     13.253(Ft.)
Friction loss =     19.953(Ft.)
Minor Friction loss =      0.000(Ft.)   K-Factor =  0.000
Flow Velocity =   20.44(Ft/s)
Travel time  =    1.09 min.
Time of concentration =   22.07 min.


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Process from Point/Station       92.000 to Point/Station       92.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    757.459(Ac.)
Runoff from this stream =   2575.011(CFS)
Time of concentration =   22.07 min.
Rainfall intensity =     2.460(In/Hr)
Area averaged loss rate (Fm) =    0.0351(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5096


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Process from Point/Station      650.000 to Point/Station      651.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1040.300(Ft.)
Bottom (of initial area) elevation =  1033.600(Ft.)
Difference in elevation =     6.700(Ft.)
Slope =    0.00670  s(%)=       0.67
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.778 min.
Rainfall intensity =      2.900(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.778
Subarea runoff =     11.283(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)


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Process from Point/Station      651.000 to Point/Station      652.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1033.600(Ft.)
End of street segment elevation =  1031.400(Ft.)
```

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Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     16.924(CFS)
Depth of flow =   0.454(Ft.), Average velocity =   2.568(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  17.955(Ft.)
Flow velocity =   2.57(Ft/s)
Travel time =    2.14 min.     TC =   18.92  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Rainfall intensity =      2.698(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.769
Subarea runoff =      9.468(CFS) for    5.000(Ac.)
Total runoff =     20.751(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =      839.63(Ac.)
Area averaged Fm value =    0.393(In/Hr)
Street flow at end of street =     20.751(CFS)
Half street flow at end of street =     10.376(CFS)
Depth of flow =   0.483(Ft.), Average velocity =   2.701(Ft/s)
Flow width (from curb towards crown)=  19.417(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      652.000 to Point/Station      653.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Top of street segment elevation =  1031.400(Ft.)
End of street segment elevation =  1026.000(Ft.)
Length of street segment  =   750.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
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 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     32.164(CFS)
Depth of flow =   0.539(Ft.), Average velocity =   3.252(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.25(Ft/s)
Travel time =    3.84 min.     TC =   22.76  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Rainfall intensity =      2.415(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.754
Subarea runoff =     17.470(CFS) for   11.000(Ac.)
Total runoff =     38.221(CFS)
Effective area this stream =       21.00(Ac.)
Total Study Area (Main Stream No. 1) =      850.63(Ac.)
Area averaged Fm value =    0.393(In/Hr)
Street flow at end of street =     38.221(CFS)
Half street flow at end of street =     19.110(CFS)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   10.00(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      653.000 to Point/Station      654.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1026.000(Ft.)
End of street segment elevation =  1023.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     48.231(CFS)
Depth of flow =   0.856(Ft.), Average velocity =   3.127(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    9.44(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  38.028(Ft.)
Flow velocity =   3.13(Ft/s)
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Travel time =    3.52 min.     TC =   26.28  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Rainfall intensity =      2.215(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.741
Subarea runoff =     14.275(CFS) for   11.000(Ac.)
Total runoff =     52.496(CFS)
Effective area this stream =       32.00(Ac.)
Total Study Area (Main Stream No. 1) =      861.63(Ac.)
Area averaged Fm value =    0.393(In/Hr)
Street flow at end of street =     52.496(CFS)
Half street flow at end of street =     52.496(CFS)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =   13.42(Ft.)
Flow width (from curb towards crown)=  42.000(Ft.)


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Process from Point/Station      654.000 to Point/Station      654.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     32.000(Ac.)
Runoff from this stream =     52.496(CFS)
Time of concentration =   26.28 min.
Rainfall intensity =     2.215(In/Hr)
Area averaged loss rate (Fm) =    0.3926(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1     2575.011     22.07              2.460
2       52.496     26.28              2.215
Qmax(1) =
          1.000 *    1.000 *  2575.011) +
          1.134 *    0.840 *    52.496) + =    2625.016
Qmax(2) =
          0.899 *    1.000 *  2575.011) +
          1.000 *    1.000 *    52.496) + =    2367.845

Total of 2 streams to confluence:
Flow rates before confluence point:
    2575.011      52.496
Maximum flow rates at confluence using above data:
     2625.016     2367.845
Area of streams before confluence:
      757.459       32.000
Effective area values after confluence:
      784.335      789.459
Results of confluence:
```

```
Total flow rate =   2625.016(CFS)
Time of concentration =    22.073 min.
Effective stream area after confluence =    784.335(Ac.)
Stream Area average Pervious fraction(Ap) =  0.509
Stream Area average soil loss rate(Fm) =    0.050(In/Hr)
Study area (this main stream) =     789.46(Ac.)


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Process from Point/Station       92.000 to Point/Station       93.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Covered channel
Upstream point elevation =  1006.400(Ft.)
Downstream point elevation =  1005.500(Ft.)
Channel length thru subarea  =   450.000(Ft.)
Channel base width       =   14.000(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Manning's 'N'    = 0.015
Maximum depth of channel  =    9.000(Ft.)
Flow(q) thru subarea =   2625.016(CFS)
Pressure flow condition in covered channel:
Wetted perimeter =   46.00(Ft.)  Flow area =  126.00(Sq.Ft)
Hydraulic grade line required at box inlet =      8.371(Ft.)
Friction loss =      9.271(Ft.)
Minor Friction loss =      0.000(Ft.)   K-Factor =  0.000
Flow Velocity =   20.83(Ft/s)
Travel time  =    0.36 min.
Time of concentration =   21.34 min.
End of computations, Total Study Area =          861.63 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.507
Area averaged SCS curve number =  90.5
```

LINE "DZ-6"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/06/05

FONTANA / LINE DZ-6 HYDROLOGY
100 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 714.000 to Point/Station 715.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1104.000(Ft.)
Bottom (of initial area) elevation = 1092.000(Ft.)
Difference in elevation = 12.000(Ft.)
Slope = 0.01200 s(%)= 1.20
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.669 min.
Rainfall intensity = 3.606(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.880
Subarea runoff = 22.222(CFS)
Total initial stream area = 7.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.079(In/Hr)

++
Process from Point/Station 715.000 to Point/Station 716.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1092.000(Ft.)
End of street segment elevation = 1089.000(Ft.)

```
Length of street segment  =   800.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     39.682(CFS)
Depth of flow =   0.633(Ft.), Average velocity =   2.903(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.90(Ft/s)
Travel time =    4.59 min.     TC =   16.26  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =      2.955(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.876
Subarea runoff =     24.374(CFS) for   11.000(Ac.)
Total runoff =     46.596(CFS)
Effective area this stream =       18.00(Ac.)
Total Study Area (Main Stream No. 1) =       18.00(Ac.)
Area averaged Fm value =    0.079(In/Hr)
Street flow at end of street =     46.596(CFS)
Half street flow at end of street =     23.298(CFS)
Depth of flow =   0.669(Ft.), Average velocity =   3.088(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    0.10(Ft.)
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      716.000 to Point/Station      717.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Top of street segment elevation =  1089.000(Ft.)
End of street segment elevation =  1081.500(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
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```
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     72.482(CFS)
Depth of flow =   0.842(Ft.), Average velocity =   4.900(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    8.77(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  37.352(Ft.)
Flow velocity =   4.90(Ft/s)
Travel time =    2.24 min.     TC =   18.51  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =      2.734(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.874
Subarea runoff =     44.229(CFS) for   20.000(Ac.)
Total runoff =     90.824(CFS)
Effective area this stream =       38.00(Ac.)
Total Study Area (Main Stream No. 1) =       38.00(Ac.)
Area averaged Fm value =    0.079(In/Hr)
Street flow at end of street =     90.824(CFS)
Half street flow at end of street =     90.824(CFS)
Depth of flow =   0.903(Ft.), Average velocity =   5.107(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =   11.81(Ft.)
Flow width (from curb towards crown)=  40.396(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      717.000 to Point/Station       33.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1075.000(Ft.)
Downstream point/station elevation =  1061.000(Ft.)
Pipe length  =   990.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    90.824(CFS)
Given pipe size =     36.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     8.197(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     18.351(Ft.)
 Minor friction loss =      3.845(Ft.)    K-factor =   1.50
Pipe flow velocity =     12.85(Ft/s)
Travel time through pipe =    1.28 min.
Time of concentration (TC) =    19.79 min.


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Process from Point/Station       33.000 to Point/Station       33.000
**** CONFLUENCE OF MINOR STREAMS ****
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```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     38.000(Ac.)
Runoff from this stream =     90.824(CFS)
Time of concentration =   19.79 min.
Rainfall intensity =     2.626(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      718.000 to Point/Station      719.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1082.000(Ft.)
Bottom (of initial area) elevation =  1075.000(Ft.)
Difference in elevation =     7.000(Ft.)
Slope =    0.00700  s(%)=       0.70
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.997 min.
Rainfall intensity =      3.380(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.879
Subarea runoff =     14.857(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


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Process from Point/Station      719.000 to Point/Station      720.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =  1075.000(Ft.)
End of street segment elevation =  1073.300(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     22.285(CFS)
Depth of flow =   0.511(Ft.), Average velocity =   2.541(Ft/s)
Note:  depth of flow exceeds top of street crown.
```

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Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.54(Ft/s)
Travel time =    2.16 min.     TC =   15.16  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =      3.082(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.877
Subarea runoff =     12.171(CFS) for    5.000(Ac.)
Total runoff =     27.028(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       48.00(Ac.)
Area averaged Fm value =    0.079(In/Hr)
Street flow at end of street =     27.028(CFS)
Half street flow at end of street =     13.514(CFS)
Depth of flow =   0.538(Ft.), Average velocity =   2.744(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      720.000 to Point/Station      721.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1073.300(Ft.)
End of street segment elevation =  1070.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     40.542(CFS)
Depth of flow =   0.609(Ft.), Average velocity =   3.194(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.19(Ft/s)
Travel time =    3.44 min.     TC =   18.61  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
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SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =      2.725(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.874
Subarea runoff =     20.617(CFS) for   10.000(Ac.)
Total runoff =     47.645(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       58.00(Ac.)
Area averaged Fm value =    0.079(In/Hr)
Street flow at end of street =     47.645(CFS)
Half street flow at end of street =     23.822(CFS)
Depth of flow =   0.641(Ft.), Average velocity =   3.405(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      721.000 to Point/Station      722.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1070.000(Ft.)
End of street segment elevation =  1068.000(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     59.556(CFS)
Depth of flow =   0.874(Ft.), Average velocity =   3.655(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =   10.34(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  38.928(Ft.)
Flow velocity =   3.65(Ft/s)
Travel time =    1.50 min.     TC =   20.11  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Rainfall intensity =      2.601(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.850
Subarea runoff =     18.700(CFS) for   10.000(Ac.)
Total runoff =     66.345(CFS)
Effective area this stream =       30.00(Ac.)
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Total Study Area (Main Stream No. 1) =       68.00(Ac.)
Area averaged Fm value =    0.144(In/Hr)
Street flow at end of street =     66.345(CFS)
Half street flow at end of street =     66.345(CFS)
Depth of flow =   0.903(Ft.), Average velocity =   3.730(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =   11.82(Ft.)
Flow width (from curb towards crown)=  40.400(Ft.)

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Process from Point/Station      722.000 to Point/Station      722.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     30.000(Ac.)
Runoff from this stream =     66.345(CFS)
Time of concentration =   20.11 min.
Rainfall intensity =     2.601(In/Hr)
Area averaged loss rate (Fm) =    0.1439(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1833
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                (In/Hr)


1        90.824      19.79                2.626
2        66.345      20.11                2.601
Qmax(1) =
          1.000 *    1.000 *    90.824) +
          1.010 *    0.984 *    66.345) + =     156.782
Qmax(2) =
          0.990 *    1.000 *    90.824) +
          1.000 *    1.000 *    66.345) + =     156.272

Total of 2 streams to confluence:
Flow rates before confluence point:
      90.824       66.345
Maximum flow rates at confluence using above data:
      156.782      156.272
Area of streams before confluence:
       38.000       30.000
Effective area values after confluence:
       67.523       68.000
Results of confluence:
Total flow rate =    156.782(CFS)
Time of concentration =    19.791 min.
Effective stream area after confluence =     67.523(Ac.)
Stream Area average Pervious fraction(Ap) =  0.137
Stream Area average soil loss rate(Fm) =    0.107(In/Hr)
Study area (this main stream) =      68.00(Ac.)

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Process from Point/Station       33.000 to Point/Station       34.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1061.000(Ft.)
Downstream point/station elevation =  1048.200(Ft.)
Pipe length  =   990.00(Ft.)   Manning's N = 0.013
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No. of pipes = 1  Required pipe flow  =   156.782(CFS)
Given pipe size =     39.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    31.202(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     35.683(Ft.)
 Minor friction loss =     8.319(Ft.)    K-factor =   1.50
Pipe flow velocity =     18.90(Ft/s)
Travel time through pipe =    0.87 min.
Time of concentration (TC) =    20.66 min.


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Process from Point/Station       34.000 to Point/Station       34.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     67.523(Ac.)
Runoff from this stream =    156.782(CFS)
Time of concentration =   20.66 min.
Rainfall intensity =     2.559(In/Hr)
Area averaged loss rate (Fm) =    0.1074(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1368


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Process from Point/Station      723.000 to Point/Station      724.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1072.000(Ft.)
Bottom (of initial area) elevation =  1066.600(Ft.)
Difference in elevation =     5.400(Ft.)
Slope =    0.00540  s(%)=       0.54
TC = k(0.360)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.212 min.
Rainfall intensity =      2.960(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.816
Subarea runoff =     12.085(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.350
Initial area Fm value =    0.275(In/Hr)


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Process from Point/Station      724.000 to Point/Station      725.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1066.600(Ft.)
End of street segment elevation =  1063.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
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Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     18.127(CFS)
Depth of flow =   0.478(Ft.), Average velocity =   2.422(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.159(Ft.)
Flow velocity =   2.42(Ft/s)
Travel time =    4.54 min.     TC =   20.75  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Rainfall intensity =      2.553(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.803
Subarea runoff =      8.415(CFS) for    5.000(Ac.)
Total runoff =     20.500(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       78.00(Ac.)
Area averaged Fm value =    0.275(In/Hr)
Street flow at end of street =     20.500(CFS)
Half street flow at end of street =     10.250(CFS)
Depth of flow =   0.496(Ft.), Average velocity =   2.501(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      725.000 to Point/Station      729.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1063.000(Ft.)
End of street segment elevation =  1056.600(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
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 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     20.500(CFS)
Depth of flow =   0.564(Ft.), Average velocity =   3.681(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  23.446(Ft.)
Flow velocity =   3.68(Ft/s)
Travel time =    2.99 min.     TC =   23.74  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =      2.355(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.795
Subarea runoff =      0.000(CFS) for    0.000(Ac.)
Total runoff =     20.500(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       78.00(Ac.)
Area averaged Fm value =    0.275(In/Hr)
Street flow at end of street =     20.500(CFS)
Half street flow at end of street =     20.500(CFS)
Depth of flow =   0.564(Ft.), Average velocity =   3.681(Ft/s)
Flow width (from curb towards crown)=  23.446(Ft.)


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Process from Point/Station      729.000 to Point/Station      729.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     10.000(Ac.)
Runoff from this stream =     20.500(CFS)
Time of concentration =   23.74 min.
Rainfall intensity =     2.355(In/Hr)
Area averaged loss rate (Fm) =    0.2748(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      726.000 to Point/Station      727.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1069.200(Ft.)
Bottom (of initial area) elevation =  1062.000(Ft.)
Difference in elevation =     7.200(Ft.)
Slope =    0.00720  s(%)=       0.72
```

```
TC = k(0.360)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.305 min.
Rainfall intensity =      3.064(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.819
Subarea runoff =     12.552(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.350
Initial area Fm value =    0.275(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      727.000 to Point/Station      728.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1062.000(Ft.)
End of street segment elevation =  1060.000(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     18.829(CFS)
Depth of flow =   0.476(Ft.), Average velocity =   2.544(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.051(Ft.)
Flow velocity =   2.54(Ft/s)
Travel time =    2.16 min.     TC =   17.47  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Rainfall intensity =      2.831(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.813
Subarea runoff =     10.450(CFS) for    5.000(Ac.)
Total runoff =     23.003(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       88.00(Ac.)
Area averaged Fm value =    0.275(In/Hr)
Street flow at end of street =     23.003(CFS)
Half street flow at end of street =     11.501(CFS)
Depth of flow =   0.504(Ft.), Average velocity =   2.703(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      728.000 to Point/Station      729.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Top of street segment elevation =  1060.000(Ft.)
End of street segment elevation =  1056.600(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     34.504(CFS)
Depth of flow =   0.577(Ft.), Average velocity =   3.023(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.02(Ft/s)
Travel time =    3.64 min.     TC =   21.11  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Rainfall intensity =      2.527(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.802
Subarea runoff =     17.534(CFS) for   10.000(Ac.)
Total runoff =     40.537(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       98.00(Ac.)
Area averaged Fm value =    0.275(In/Hr)
Street flow at end of street =     40.537(CFS)
Half street flow at end of street =     20.269(CFS)
Depth of flow =   0.606(Ft.), Average velocity =   3.223(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      729.000 to Point/Station      729.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     20.000(Ac.)
Runoff from this stream =     40.537(CFS)
Time of concentration =   21.11 min.
Rainfall intensity =     2.527(In/Hr)
Area averaged loss rate (Fm) =    0.2748(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3500
```

```
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                 (In/Hr)


1       156.782      20.66                2.559
2        20.500      23.74                2.355
3        40.537      21.11                2.527
Qmax(1) =
          1.000 *     1.000 *    156.782) +
          1.098 *     0.870 *     20.500) +
          1.014 *     0.979 *     40.537) + =      216.636
Qmax(2) =
          0.917 *     1.000 *    156.782) +
          1.000 *     1.000 *     20.500) +
          0.924 *     1.000 *     40.537) + =      201.640
Qmax(3) =
          0.987 *     1.000 *    156.782) +
          1.083 *     0.889 *     20.500) +
          1.000 *     1.000 *     40.537) + =      214.987

Total of 3 streams to confluence:
Flow rates before confluence point:
     156.782       20.500       40.537
Maximum flow rates at confluence using above data:
      216.636       201.640       214.987
Area of streams before confluence:
       67.523        10.000        20.000
Effective area values after confluence:
       95.807        97.523        96.413
Results of confluence:
Total flow rate =     216.636(CFS)
Time of concentration =     20.664 min.
Effective stream area after confluence =      95.807(Ac.)
Stream Area average Pervious fraction(Ap) =  0.202
Stream Area average soil loss rate(Fm) =     0.159(In/Hr)
Study area (this main stream) =       97.52(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.000 to Point/Station       35.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1048.200(Ft.)
Downstream point/station elevation =  1042.000(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   216.636(CFS)
Given pipe size =     39.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    55.103(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     45.419(Ft.)
 Minor friction loss =     15.884(Ft.)    K-factor =   1.50
Pipe flow velocity =     26.11(Ft/s)
Travel time through pipe =    0.42 min.
Time of concentration (TC) =    21.08 min.


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Process from Point/Station       35.000 to Point/Station       35.000
```

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**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =     95.807(Ac.)
Runoff from this stream =    216.636(CFS)
Time of concentration =   21.08 min.
Rainfall intensity =     2.528(In/Hr)
Area averaged loss rate (Fm) =    0.1589(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2024


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Process from Point/Station      730.000 to Point/Station      731.000
**** INITIAL AREA EVALUATION ****

CONDOMINIUM subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.154(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1063.700(Ft.)
Bottom (of initial area) elevation =  1055.800(Ft.)
Difference in elevation =     7.900(Ft.)
Slope =    0.00790  s(%)=       0.79
TC = k(0.360)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.024 min.
Rainfall intensity =      3.099(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.855
Subarea runoff =     13.251(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.350
Initial area Fm value =    0.154(In/Hr)


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Process from Point/Station      731.000 to Point/Station      732.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =  1055.800(Ft.)
End of street segment elevation =  1053.600(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     19.876(CFS)
Depth of flow =   0.477(Ft.), Average velocity =   2.672(Ft/s)
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Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.099(Ft.)
Flow velocity =   2.67(Ft/s)
Travel time =    2.06 min.     TC =   17.08  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.154(In/Hr)
Rainfall intensity =      2.869(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.852
Subarea runoff =     11.183(CFS) for    5.000(Ac.)
Total runoff =     24.434(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =      108.00(Ac.)
Area averaged Fm value =    0.154(In/Hr)
Street flow at end of street =     24.434(CFS)
Half street flow at end of street =     12.217(CFS)
Depth of flow =   0.506(Ft.), Average velocity =   2.849(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      732.000 to Point/Station      733.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1053.600(Ft.)
End of street segment elevation =  1049.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     36.650(CFS)
Depth of flow =   0.728(Ft.), Average velocity =   3.604(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    3.05(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  31.632(Ft.)
Flow velocity =   3.60(Ft/s)
Travel time =    3.05 min.     TC =   20.13  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
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Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Rainfall intensity =      2.599(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.826
Subarea runoff =     18.495(CFS) for   10.000(Ac.)
Total runoff =     42.929(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =      118.00(Ac.)
Area averaged Fm value =    0.214(In/Hr)
Street flow at end of street =     42.929(CFS)
Half street flow at end of street =     42.929(CFS)
Depth of flow =   0.769(Ft.), Average velocity =   3.673(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    5.11(Ft.)
Flow width (from curb towards crown)=  33.697(Ft.)


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Process from Point/Station      733.000 to Point/Station      733.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     20.000(Ac.)
Runoff from this stream =     42.929(CFS)
Time of concentration =   20.13 min.
Rainfall intensity =     2.599(In/Hr)
Area averaged loss rate (Fm) =    0.2144(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3500
Summary of stream data:

Stream    Flow rate       TC             Rainfall Intensity
 No.        (CFS)        (min)                   (In/Hr)


1       216.636     21.08                2.528
2        42.929     20.13                2.599
Qmax(1) =
          1.000 *    1.000 *   216.636) +
          0.970 *    1.000 *    42.929) + =     258.288
Qmax(2) =
          1.030 *    0.955 *   216.636) +
          1.000 *    1.000 *    42.929) + =     255.994

Total of 2 streams to confluence:
Flow rates before confluence point:
     216.636      42.929
Maximum flow rates at confluence using above data:
      258.288      255.994
Area of streams before confluence:
       95.807       20.000
Effective area values after confluence:
      115.807      111.488
Results of confluence:
Total flow rate =    258.288(CFS)
Time of concentration =    21.085 min.
Effective stream area after confluence =    115.807(Ac.)
Stream Area average Pervious fraction(Ap) =  0.228
Stream Area average soil loss rate(Fm) =    0.168(In/Hr)
```

Study area (this main stream) = 115.81(Ac.)
End of computations, Total Study Area = 118.00 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.227
Area averaged SCS curve number = 34.0

LINE "DZ-7"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/07/05

FONTANA / LINE DZ-7 HYDROLOGY
100 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 800.000 to Point/Station 801.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1098.000(Ft.)
Bottom (of initial area) elevation = 1088.000(Ft.)
Difference in elevation = 10.000(Ft.)
Slope = 0.01000 s(%)= 1.00
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 12.102 min.
Rainfall intensity = 3.528(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.880
Subarea runoff = 18.626(CFS)
Total initial stream area = 6.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.079(In/Hr)

++
Process from Point/Station 801.000 to Point/Station 802.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1088.000(Ft.)
End of street segment elevation = 1081.000(Ft.)

```
Length of street segment  =   820.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     34.148(CFS)
Depth of flow =   0.535(Ft.), Average velocity =   3.506(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.51(Ft/s)
Travel time =    3.90 min.     TC =   16.00  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =      2.984(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.876
Subarea runoff =     23.207(CFS) for   10.000(Ac.)
Total runoff =     41.833(CFS)
Effective area this stream =       16.00(Ac.)
Total Study Area (Main Stream No. 1) =       16.00(Ac.)
Area averaged Fm value =    0.079(In/Hr)
Street flow at end of street =     41.833(CFS)
Half street flow at end of street =     20.917(CFS)
Depth of flow =   0.567(Ft.), Average velocity =   3.800(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      802.000 to Point/Station      803.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1081.000(Ft.)
End of street segment elevation =  1075.000(Ft.)
Length of street segment  =   620.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
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Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     67.979(CFS)
Depth of flow =   0.846(Ft.), Average velocity =   4.535(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    8.98(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  37.567(Ft.)
Flow velocity =   4.53(Ft/s)
Travel time =    2.28 min.     TC =   18.28  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =      2.755(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.874
Subarea runoff =     44.869(CFS) for   20.000(Ac.)
Total runoff =     86.703(CFS)
Effective area this stream =       36.00(Ac.)
Total Study Area (Main Stream No. 1) =       36.00(Ac.)
Area averaged Fm value =    0.079(In/Hr)
Street flow at end of street =     86.703(CFS)
Half street flow at end of street =     86.703(CFS)
Depth of flow =   0.912(Ft.), Average velocity =   4.743(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =   12.28(Ft.)
Flow width (from curb towards crown)=  40.864(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      803.000 to Point/Station       36.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1069.000(Ft.)
Downstream point/station elevation =  1054.000(Ft.)
Pipe length =   990.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow =    86.703(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow =    86.703(CFS)
Normal flow depth in pipe =   31.78(In.)
Flow top width inside pipe =   23.16(In.)
Critical Depth =   33.89(In.)
Pipe flow velocity =     13.13(Ft/s)
Travel time through pipe =    1.26 min.
Time of concentration (TC) =    19.54 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       36.000 to Point/Station       36.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     36.000(Ac.)
```

```
Runoff from this stream =      86.703(CFS)
Time of concentration =   19.54 min.
Rainfall intensity =      2.647(In/Hr)
Area averaged loss rate (Fm) =     0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      804.000 to Point/Station      805.000
**** INITIAL AREA EVALUATION ****
-------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=      0.079(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1081.500(Ft.)
Bottom (of initial area) elevation =  1071.000(Ft.)
Difference in elevation =    10.500(Ft.)
Slope =    0.01050  s(%)=       1.05
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.985 min.
Rainfall intensity =      3.548(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.880
Subarea runoff =     15.615(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      805.000 to Point/Station      806.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------------
Top of street segment elevation =  1071.000(Ft.)
End of street segment elevation =  1069.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     31.230(CFS)
Depth of flow =   0.607(Ft.), Average velocity =   2.476(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.48(Ft/s)
```

```
Travel time =    4.44 min.     TC =   16.43  min.
 Adding area flow to street
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =      2.937(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.876
Subarea runoff =     22.972(CFS) for   10.000(Ac.)
Total runoff =     38.587(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       51.00(Ac.)
Area averaged Fm value =    0.079(In/Hr)
Street flow at end of street =     38.587(CFS)
Half street flow at end of street =     19.294(CFS)
Depth of flow =   0.650(Ft.), Average velocity =   2.692(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      806.000 to Point/Station      807.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1069.000(Ft.)
End of street segment elevation =  1065.000(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     45.018(CFS)
Depth of flow =   0.550(Ft.), Average velocity =   4.349(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   4.35(Ft/s)
Travel time =    1.26 min.     TC =   17.69  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
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Rainfall intensity =      2.809(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.850
Subarea runoff =      9.148(CFS) for    5.000(Ac.)
Total runoff =     47.735(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       56.00(Ac.)
Area averaged Fm value =    0.157(In/Hr)
Street flow at end of street =     47.735(CFS)
Half street flow at end of street =     23.868(CFS)
Depth of flow =   0.560(Ft.), Average velocity =   4.451(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      807.000 to Point/Station      808.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1065.000(Ft.)
End of street segment elevation =  1060.000(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     59.669(CFS)
Depth of flow =   0.754(Ft.), Average velocity =   5.374(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    4.35(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  32.929(Ft.)
Flow velocity =   5.37(Ft/s)
Travel time =    1.02 min.     TC =   18.72  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Rainfall intensity =      2.716(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff =     19.231(CFS) for   10.000(Ac.)
Total runoff =     66.967(CFS)
Effective area this stream =       30.00(Ac.)
Total Study Area (Main Stream No. 1) =       66.00(Ac.)
Area averaged Fm value =    0.236(In/Hr)
Street flow at end of street =     66.967(CFS)
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Half street flow at end of street =     66.967(CFS)
Depth of flow =   0.784(Ft.), Average velocity =   5.459(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    5.85(Ft.)
Flow width (from curb towards crown)=  34.430(Ft.)


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Process from Point/Station      808.000 to Point/Station      808.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     30.000(Ac.)
Runoff from this stream =     66.967(CFS)
Time of concentration =   18.72 min.
Rainfall intensity =     2.716(In/Hr)
Area averaged loss rate (Fm) =    0.2355(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3000
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                 (In/Hr)


1        86.703      19.54                2.647
2        66.967      18.72                2.716
Qmax(1) =
          1.000 *     1.000 *    86.703) +
          0.972 *     1.000 *    66.967) + =     151.806
Qmax(2) =
          1.027 *     0.958 *    86.703) +
          1.000 *     1.000 *    66.967) + =     152.261

Total of 2 streams to confluence:
Flow rates before confluence point:
      86.703      66.967
Maximum flow rates at confluence using above data:
     151.806      152.261
Area of streams before confluence:
      36.000      30.000
Effective area values after confluence:
      66.000      64.488
Results of confluence:
Total flow rate =    152.261(CFS)
Time of concentration =    18.716 min.
Effective stream area after confluence =     64.488(Ac.)
Stream Area average Pervious fraction(Ap) =  0.191
Stream Area average soil loss rate(Fm) =    0.150(In/Hr)
Study area (this main stream) =      66.00(Ac.)


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Process from Point/Station      36.000 to Point/Station      37.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =  1054.000(Ft.)
Downstream point/station elevation =  1043.500(Ft.)
Pipe length  =   990.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   152.261(CFS)
Given pipe size =     42.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
```

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The approximate hydraulic grade line above the pipe invert is
    18.000(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      22.667(Ft.)
 Minor friction loss =      5.834(Ft.)     K-factor =   1.50
Pipe flow velocity =      15.83(Ft/s)
Travel time through pipe =    1.04 min.
Time of concentration (TC) =    19.76 min.


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Process from Point/Station       37.000 to Point/Station       37.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      64.488(Ac.)
Runoff from this stream =    152.261(CFS)
Time of concentration =   19.76 min.
Rainfall intensity =     2.629(In/Hr)
Area averaged loss rate (Fm) =    0.1499(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1909


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Process from Point/Station      809.000 to Point/Station      810.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1068.000(Ft.)
Bottom (of initial area) elevation =  1061.000(Ft.)
Difference in elevation =     7.000(Ft.)
Slope =    0.00700  s(%)=       0.70
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.631 min.
Rainfall intensity =      2.915(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.779
Subarea runoff =     11.352(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)


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Process from Point/Station      810.000 to Point/Station      811.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1061.000(Ft.)
End of street segment elevation =  1057.000(Ft.)
Length of street segment   =   660.000(Ft.)
Height of curb above gutter flowline   =    8.0(In.)
Width of half street (curb to crown)   =  20.000(Ft.)
Distance from crown to crossfall grade break   =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
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Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     17.028(CFS)
Depth of flow =   0.462(Ft.), Average velocity =   2.481(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.330(Ft.)
Flow velocity =   2.48(Ft/s)
Travel time =    4.43 min.     TC =   21.06  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Rainfall intensity =      2.530(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.760
Subarea runoff =      7.884(CFS) for    5.000(Ac.)
Total runoff =     19.236(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       76.00(Ac.)
Area averaged Fm value =    0.393(In/Hr)
Street flow at end of street =     19.236(CFS)
Half street flow at end of street =      9.618(CFS)
Depth of flow =   0.479(Ft.), Average velocity =   2.557(Ft/s)
Flow width (from curb towards crown)=  19.208(Ft.)


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Process from Point/Station      811.000 to Point/Station      812.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1057.000(Ft.)
End of street segment elevation =  1051.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     38.471(CFS)
Depth of flow =   0.705(Ft.), Average velocity =   4.085(Ft/s)
Warning: depth of flow exceeds top of curb
```

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Distance that curb overflow reaches into property =     1.93(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  30.512(Ft.)
Flow velocity =   4.08(Ft/s)
Travel time =    2.69 min.      TC =   23.76  min.
 Adding area flow to street
SCHOOL subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.6000      Max loss rate(Fm)=      0.471(In/Hr)
Rainfall intensity =      2.354(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.730
Subarea runoff =     32.301(CFS) for   20.000(Ac.)
Total runoff =     51.536(CFS)
Effective area this stream =       30.00(Ac.)
Total Study Area (Main Stream No. 1) =       96.00(Ac.)
Area averaged Fm value =    0.445(In/Hr)
Street flow at end of street =     51.536(CFS)
Half street flow at end of street =     51.536(CFS)
Depth of flow =   0.782(Ft.), Average velocity =   4.224(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =     5.76(Ft.)
Flow width (from curb towards crown)=  34.346(Ft.)


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Process from Point/Station      812.000 to Point/Station      812.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     30.000(Ac.)
Runoff from this stream =     51.536(CFS)
Time of concentration =   23.76 min.
Rainfall intensity =     2.354(In/Hr)
Area averaged loss rate (Fm) =    0.4449(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5667
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      152.261     19.76                2.629
2       51.536     23.76                2.354
Qmax(1) =
         1.000 *    1.000 *   152.261) +
         1.144 *    0.832 *    51.536) + =     201.303
Qmax(2) =
         0.889 *    1.000 *   152.261) +
         1.000 *    1.000 *    51.536) + =     186.893

Total of 2 streams to confluence:
Flow rates before confluence point:
     152.261      51.536
Maximum flow rates at confluence using above data:
      201.303      186.893
```

```
Area of streams before confluence:
       64.488       30.000
Effective area values after confluence:
       89.439       94.488
Results of confluence:
Total flow rate =    201.303(CFS)
Time of concentration =    19.759 min.
Effective stream area after confluence =     89.439(Ac.)
Stream Area average Pervious fraction(Ap) =  0.310
Stream Area average soil loss rate(Fm) =    0.244(In/Hr)
Study area (this main stream) =      94.49(Ac.)


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Process from Point/Station       37.000 to Point/Station       38.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1043.500(Ft.)
Downstream point/station elevation =  1038.000(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   201.303(CFS)
Given pipe size =     42.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    31.110(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     26.413(Ft.)
 Minor friction loss =     10.197(Ft.)    K-factor =   1.50
Pipe flow velocity =     20.92(Ft/s)
Travel time through pipe =    0.53 min.
Time of concentration (TC) =    20.28 min.


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Process from Point/Station       38.000 to Point/Station       38.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     89.439(Ac.)
Runoff from this stream =    201.303(CFS)
Time of concentration =   20.28 min.
Rainfall intensity =     2.588(In/Hr)
Area averaged loss rate (Fm) =    0.2436(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3102


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Process from Point/Station      813.000 to Point/Station      814.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1056.600(Ft.)
Bottom (of initial area) elevation =  1048.500(Ft.)
```

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Difference in elevation =      8.100(Ft.)
Slope =    0.00810  s(%)=       0.81
TC = k(0.360)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.949 min.
Rainfall intensity =      3.108(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =     12.749(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.350
Initial area Fm value =    0.275(In/Hr)


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Process from Point/Station      814.000 to Point/Station      815.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1048.500(Ft.)
End of street segment elevation =  1047.300(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     19.123(CFS)
Depth of flow =   0.513(Ft.), Average velocity =   2.153(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.15(Ft/s)
Travel time =    2.55 min.     TC =   17.50  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Rainfall intensity =      2.827(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.813
Subarea runoff =     10.223(CFS) for    5.000(Ac.)
Total runoff =     22.971(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =      106.00(Ac.)
Area averaged Fm value =    0.275(In/Hr)
Street flow at end of street =     22.971(CFS)
Half street flow at end of street =     11.486(CFS)
Depth of flow =   0.539(Ft.), Average velocity =   2.316(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      815.000 to Point/Station      816.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1047.300(Ft.)
End of street segment elevation =  1045.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     34.457(CFS)
Depth of flow =   0.612(Ft.), Average velocity =   2.685(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.69(Ft/s)
Travel time =    4.10 min.     TC =   21.60  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Rainfall intensity =      2.492(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.801
Subarea runoff =     16.939(CFS) for   10.000(Ac.)
Total runoff =     39.910(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =      116.00(Ac.)
Area averaged Fm value =    0.275(In/Hr)
Street flow at end of street =     39.910(CFS)
Half street flow at end of street =     19.955(CFS)
Depth of flow =   0.642(Ft.), Average velocity =   2.846(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      816.000 to Point/Station      816.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     20.000(Ac.)
Runoff from this stream =     39.910(CFS)
Time of concentration =   21.60 min.
```

Rainfall intensity = 2.492(In/Hr)
Area averaged loss rate (Fm) = 0.2748(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3500
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	201.303	20.28	2.588
2	39.910	21.60	2.492

Qmax(1) =
1.000 * 1.000 * 201.303) +
1.043 * 0.939 * 39.910) + = 240.401
Qmax(2) =
0.959 * 1.000 * 201.303) +
1.000 * 1.000 * 39.910) + = 232.992

Total of 2 streams to confluence:
Flow rates before confluence point:
201.303 39.910
Maximum flow rates at confluence using above data:
240.401 232.992
Area of streams before confluence:
89.439 20.000
Effective area values after confluence:
108.221 109.439
Results of confluence:
Total flow rate = 240.401(CFS)
Time of concentration = 20.284 min.
Effective stream area after confluence = 108.221(Ac.)
Stream Area average Pervious fraction(Ap) = 0.317
Stream Area average soil loss rate(Fm) = 0.249(In/Hr)
Study area (this main stream) = 109.44(Ac.)
End of computations, Total Study Area = 116.00 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.316
Area averaged SCS curve number = 32.0

LINE "DZ-5"

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/07/05

FONTANA / LINE DZ-5 HYDROLOGY
100 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 700.000 to Point/Station 701.000
**** INITIAL AREA EVALUATION ****

CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500 Max loss rate(Fm)= 0.275(In/Hr)
Initial subarea data:
Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1104.000(Ft.)
Bottom (of initial area) elevation = 1096.700(Ft.)
Difference in elevation = 7.300(Ft.)
Slope = 0.00730 s(%)= 0.73
TC = k(0.360)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 15.263 min.
Rainfall intensity = 3.069(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.819
Subarea runoff = 12.575(CFS)
Total initial stream area = 5.000(Ac.)
Pervious area fraction = 0.350
Initial area Fm value = 0.275(In/Hr)

++
Process from Point/Station 701.000 to Point/Station 702.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1096.700(Ft.)
End of street segment elevation = 1095.000(Ft.)

```
Length of street segment   =   330.000(Ft.)
Height of curb above gutter flowline   =    8.0(In.)
Width of half street (curb to crown)   =  20.000(Ft.)
Distance from crown to crossfall grade break   =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line   =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     18.863(CFS)
Depth of flow =   0.488(Ft.), Average velocity =   2.394(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.668(Ft.)
Flow velocity =   2.39(Ft/s)
Travel time =    2.30 min.     TC =   17.56  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Rainfall intensity =      2.822(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.812
Subarea runoff =     10.346(CFS) for    5.000(Ac.)
Total runoff =     22.922(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =       10.00(Ac.)
Area averaged Fm value =    0.275(In/Hr)
Street flow at end of street =     22.922(CFS)
Half street flow at end of street =     11.461(CFS)
Depth of flow =   0.514(Ft.), Average velocity =   2.570(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      702.000 to Point/Station      703.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1095.000(Ft.)
End of street segment elevation =  1092.000(Ft.)
Length of street segment   =   660.000(Ft.)
Height of curb above gutter flowline   =    8.0(In.)
Width of half street (curb to crown)   =  20.000(Ft.)
Distance from crown to crossfall grade break   =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line   =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
```

```
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     34.383(CFS)
Depth of flow =   0.587(Ft.), Average velocity =   2.907(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.91(Ft/s)
Travel time =    3.78 min.     TC =   21.34  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Rainfall intensity =      2.510(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.801
Subarea runoff =     17.310(CFS) for   10.000(Ac.)
Total runoff =     40.232(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =       20.00(Ac.)
Area averaged Fm value =    0.275(In/Hr)
Street flow at end of street =     40.232(CFS)
Half street flow at end of street =     20.116(CFS)
Depth of flow =   0.617(Ft.), Average velocity =   3.094(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      703.000 to Point/Station      704.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1092.000(Ft.)
End of street segment elevation =  1082.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     60.347(CFS)
Depth of flow =   0.757(Ft.), Average velocity =   5.382(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    4.49(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  33.076(Ft.)
Flow velocity =   5.38(Ft/s)
```

```
Travel time =    2.04 min.     TC =   23.39  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Rainfall intensity =      2.376(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.796
Subarea runoff =     35.407(CFS) for   20.000(Ac.)
Total runoff =     75.639(CFS)
Effective area this stream =       40.00(Ac.)
Total Study Area (Main Stream No. 1) =       40.00(Ac.)
Area averaged Fm value =    0.275(In/Hr)
Street flow at end of street =     75.639(CFS)
Half street flow at end of street =     75.639(CFS)
Depth of flow =   0.815(Ft.), Average velocity =   5.563(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    7.44(Ft.)
Flow width (from curb towards crown)=  36.019(Ft.)


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Process from Point/Station      704.000 to Point/Station       30.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1076.000(Ft.)
Downstream point/station elevation =  1066.000(Ft.)
Pipe length  =  1000.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    75.639(CFS)
Given pipe size =     36.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     5.523(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     12.856(Ft.)
 Minor friction loss =      2.667(Ft.)    K-factor =   1.50
Pipe flow velocity =     10.70(Ft/s)
Travel time through pipe =    1.56 min.
Time of concentration (TC) =    24.95 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       30.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     40.000(Ac.)
Runoff from this stream =     75.639(CFS)
Time of concentration =   24.95 min.
Rainfall intensity =     2.286(In/Hr)
Area averaged loss rate (Fm) =    0.2748(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      705.000 to Point/Station      706.000
**** INITIAL AREA EVALUATION ****
```

```
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1085.700(Ft.)
Bottom (of initial area) elevation =  1075.300(Ft.)
Difference in elevation =    10.400(Ft.)
Slope =    0.01040  s(%)=       1.04
TC = k(0.360)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.220 min.
Rainfall intensity =      3.202(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.823
Subarea runoff =     26.349(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 0.350
Initial area Fm value =    0.275(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      706.000 to Point/Station      707.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
-------------------------------------------------------------------------------
Top of street segment elevation =  1075.300(Ft.)
End of street segment elevation =  1072.000(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     36.230(CFS)
Depth of flow =   0.532(Ft.), Average velocity =   3.765(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   3.76(Ft/s)
Travel time =    1.46 min.     TC =   15.68  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
```

Rainfall intensity = 3.020(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.825
Subarea runoff = 17.257(CFS) for 7.500(Ac.)
Total runoff = 43.607(CFS)
Effective area this stream = 17.50(Ac.)
Total Study Area (Main Stream No. 1) = 57.50(Ac.)
Area averaged Fm value = 0.251(In/Hr)
Street flow at end of street = 43.607(CFS)
Half street flow at end of street = 21.803(CFS)
Depth of flow = 0.560(Ft.), Average velocity = 4.052(Ft/s)
Note: depth of flow exceeds top of street crown.
Flow width (from curb towards crown)= 20.000(Ft.)

++
Process from Point/Station 707.000 to Point/Station 707.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 17.500(Ac.)
Runoff from this stream = 43.607(CFS)
Time of concentration = 15.68 min.
Rainfall intensity = 3.020(In/Hr)
Area averaged loss rate (Fm) = 0.2513(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4143
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	75.639	24.95	2.286
2	43.607	15.68	3.020

Qmax(1) =
1.000 * 1.000 * 75.639) +
0.735 * 1.000 * 43.607) + = 107.681
Qmax(2) =
1.365 * 0.629 * 75.639) +
1.000 * 1.000 * 43.607) + = 108.513

Total of 2 streams to confluence:
Flow rates before confluence point:
75.639 43.607
Maximum flow rates at confluence using above data:
107.681 108.513
Area of streams before confluence:
40.000 17.500
Effective area values after confluence:
57.500 42.644
Results of confluence:
Total flow rate = 108.513(CFS)
Time of concentration = 15.681 min.
Effective stream area after confluence = 42.644(Ac.)
Stream Area average Pervious fraction(Ap) = 0.370
Stream Area average soil loss rate(Fm) = 0.268(In/Hr)
Study area (this main stream) = 57.50(Ac.)

++
Process from Point/Station 30.000 to Point/Station 31.000

```
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1066.000(Ft.)
Downstream point/station elevation =  1062.200(Ft.)
Pipe length  =   990.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   108.513(CFS)
Given pipe size =     39.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    17.279(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     17.093(Ft.)
 Minor friction loss =     3.985(Ft.)    K-factor =   1.50
Pipe flow velocity =     13.08(Ft/s)
Travel time through pipe =    1.26 min.
Time of concentration (TC) =    16.94 min.


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Process from Point/Station       31.000 to Point/Station       31.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     42.644(Ac.)
Runoff from this stream =    108.513(CFS)
Time of concentration =   16.94 min.
Rainfall intensity =     2.883(In/Hr)
Area averaged loss rate (Fm) =    0.2676(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3696


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Process from Point/Station      708.000 to Point/Station      709.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1072.000(Ft.)
Bottom (of initial area) elevation =  1069.200(Ft.)
Difference in elevation =     2.800(Ft.)
Slope =    0.00280  s(%)=       0.28
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   19.976 min.
Rainfall intensity =      2.612(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.824
Subarea runoff =     16.144(CFS)
Total initial stream area =        7.500(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


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Process from Point/Station      709.000 to Point/Station      710.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

```
Top of street segment elevation =  1069.200(Ft.)
End of street segment elevation =  1062.600(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     37.669(CFS)
Depth of flow =   0.687(Ft.), Average velocity =   4.266(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    1.00(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  29.579(Ft.)
Flow velocity =   4.27(Ft/s)
Travel time =    2.58 min.     TC =   22.56  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.428(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.818
Subarea runoff =     38.509(CFS) for   20.000(Ac.)
Total runoff =     54.653(CFS)
Effective area this stream =       27.50(Ac.)
Total Study Area (Main Stream No. 1) =       85.00(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     54.653(CFS)
Half street flow at end of street =     54.653(CFS)
Depth of flow =   0.785(Ft.), Average velocity =   4.438(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    5.91(Ft.)
Flow width (from curb towards crown)=  34.489(Ft.)


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Process from Point/Station      710.000 to Point/Station      710.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =     27.500(Ac.)
Runoff from this stream =     54.653(CFS)
Time of concentration =   22.56 min.
Rainfall intensity =     2.428(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
```

```
Summary of stream data:

Stream    Flow rate       TC              Rainfall Intensity
 No.        (CFS)        (min)                 (In/Hr)

1       108.513      16.94                2.883
2        54.653      22.56                2.428
Qmax(1) =
          1.000 *     1.000 *   108.513) +
          1.206 *     0.751 *    54.653) + =     158.021
Qmax(2) =
          0.826 *     1.000 *   108.513) +
          1.000 *     1.000 *    54.653) + =     144.295

Total of 2 streams to confluence:
Flow rates before confluence point:
     108.513      54.653
Maximum flow rates at confluence using above data:
      158.021      144.295
Area of streams before confluence:
       42.644       27.500
Effective area values after confluence:
       63.300       70.144
Results of confluence:
Total flow rate =    158.021(CFS)
Time of concentration =    16.942 min.
Effective stream area after confluence =     63.300(Ac.)
Stream Area average Pervious fraction(Ap) =  0.421
Stream Area average soil loss rate(Fm) =    0.249(In/Hr)
Study area (this main stream) =      70.14(Ac.)


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Process from Point/Station       31.000 to Point/Station       32.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1056.600(Ft.)
Downstream point/station elevation =  1052.000(Ft.)
Pipe length  =   660.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   158.021(CFS)
Given pipe size =     39.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    28.017(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     24.166(Ft.)
 Minor friction loss =      8.451(Ft.)    K-factor =   1.50
Pipe flow velocity =     19.05(Ft/s)
Travel time through pipe =    0.58 min.
Time of concentration (TC) =    17.52 min.


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Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     63.300(Ac.)
Runoff from this stream =    158.021(CFS)
Time of concentration =   17.52 min.
Rainfall intensity =     2.826(In/Hr)
```

```
Area averaged loss rate (Fm) =    0.2490(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4207


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Process from Point/Station      711.000 to Point/Station      712.000
**** INITIAL AREA EVALUATION ****

-------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1069.600(Ft.)
Bottom (of initial area) elevation =  1062.100(Ft.)
Difference in elevation =     7.500(Ft.)
Slope =    0.00750  s(%)=       0.75
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.404 min.
Rainfall intensity =      2.939(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.833
Subarea runoff =     12.238(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.220(In/Hr)


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Process from Point/Station      712.000 to Point/Station      713.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

-------------------------------------------------------------------------------
Top of street segment elevation =  1062.100(Ft.)
End of street segment elevation =  1058.000(Ft.)
Length of street segment  =   990.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     30.594(CFS)
Depth of flow =   0.749(Ft.), Average velocity =   2.803(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    4.09(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  32.675(Ft.)
Flow velocity =   2.80(Ft/s)
Travel time =    5.89 min.     TC =   22.29  min.
 Adding area flow to street
```

```
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.220(In/Hr)
Rainfall intensity =      2.445(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.819
Subarea runoff =     27.821(CFS) for   15.000(Ac.)
Total runoff =     40.058(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =      105.00(Ac.)
Area averaged Fm value =    0.220(In/Hr)
Street flow at end of street =     40.058(CFS)
Half street flow at end of street =     40.058(CFS)
Depth of flow =   0.819(Ft.), Average velocity =   2.914(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    7.60(Ft.)
Flow width (from curb towards crown)=  36.188(Ft.)


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Process from Point/Station      713.000 to Point/Station      713.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     20.000(Ac.)
Runoff from this stream =     40.058(CFS)
Time of concentration =   22.29 min.
Rainfall intensity =     2.445(In/Hr)
Area averaged loss rate (Fm) =    0.2200(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                 (In/Hr)


1       158.021     17.52                2.826
2        40.058     22.29                2.445
Qmax(1) =
          1.000 *    1.000 *   158.021) +
          1.171 *    0.786 *    40.058) + =     194.884
Qmax(2) =
          0.852 *    1.000 *   158.021) +
          1.000 *    1.000 *    40.058) + =     174.764

Total of 2 streams to confluence:
Flow rates before confluence point:
     158.021      40.058
Maximum flow rates at confluence using above data:
      194.884      174.764
Area of streams before confluence:
       63.300       20.000
Effective area values after confluence:
       79.020       83.300
Results of confluence:
Total flow rate =    194.884(CFS)
```

```
Time of concentration =    17.520 min.
Effective stream area after confluence =     79.020(Ac.)
Stream Area average Pervious fraction(Ap) =  0.440
Stream Area average soil loss rate(Fm) =    0.242(In/Hr)
Study area (this main stream) =      83.30(Ac.)


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Process from Point/Station       32.000 to Point/Station       35.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1052.000(Ft.)
Downstream point/station elevation =  1041.000(Ft.)
Pipe length  =  1320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   194.884(CFS)
Given pipe size =     51.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    10.975(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     17.579(Ft.)
 Minor friction loss =      4.396(Ft.)    K-factor =   1.50
Pipe flow velocity =     13.74(Ft/s)
Travel time through pipe =    1.60 min.
Time of concentration (TC) =    19.12 min.


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Process from Point/Station       35.000 to Point/Station       35.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     79.020(Ac.)
Runoff from this stream =    194.884(CFS)
Time of concentration =   19.12 min.
Rainfall intensity =     2.681(In/Hr)
Area averaged loss rate (Fm) =    0.2420(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4397


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Process from Point/Station       35.000 to Point/Station       35.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 75.62
Adjusted SCS curve number for AMC 3 = 91.37
Pervious ratio(Ap) = 0.2280     Max loss rate(Fm)=     0.038(In/Hr)
Rainfall intensity =      2.528(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  21.09 min.  Rain intensity =       2.53(In/Hr)
Total area this stream =       115.81(Ac.)
Total Study Area (Main Stream No. 1) =      220.81(Ac.)
Total runoff =    258.29(CFS)


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Process from Point/Station       35.000 to Point/Station       35.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
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Stream flow area =    115.810(Ac.)
Runoff from this stream =    258.290(CFS)
Time of concentration =   21.09 min.
Rainfall intensity =     2.528(In/Hr)
Area averaged loss rate (Fm) =    0.0380(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2280
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      194.884     19.12                2.681
2      258.290     21.09                2.528
Qmax(1) =
         1.000 *    1.000 *   194.884) +
         1.061 *    0.907 *   258.290) + =     443.461
Qmax(2) =
         0.937 *    1.000 *   194.884) +
         1.000 *    1.000 *   258.290) + =     440.941

Total of 2 streams to confluence:
Flow rates before confluence point:
     194.884     258.290
Maximum flow rates at confluence using above data:
      443.461      440.941
Area of streams before confluence:
       79.020      115.810
Effective area values after confluence:
      184.019      194.830
Results of confluence:
Total flow rate =    443.461(CFS)
Time of concentration =    19.121 min.
Effective stream area after confluence =    184.019(Ac.)
Stream Area average Pervious fraction(Ap) =  0.314
Stream Area average soil loss rate(Fm) =    0.121(In/Hr)
Study area (this main stream) =     194.83(Ac.)


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Process from Point/Station       35.000 to Point/Station       38.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1041.000(Ft.)
Downstream point/station elevation =  1035.000(Ft.)
Pipe length  =  1320.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   443.461(CFS)
Given pipe size =     84.00(In.)
Calculated individual pipe flow  =   443.461(CFS)
Normal flow depth in pipe =   71.25(In.)
Flow top width inside pipe =   60.28(In.)
Critical Depth =   66.41(In.)
Pipe flow velocity =     12.73(Ft/s)
Travel time through pipe =    1.73 min.
Time of concentration (TC) =    20.85 min.


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Process from Point/Station       38.000 to Point/Station       38.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
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Along Main Stream number: 1 in normal stream number 1
Stream flow area =     184.019(Ac.)
Runoff from this stream =     443.461(CFS)
Time of concentration =   20.85 min.
Rainfall intensity =     2.545(In/Hr)
Area averaged loss rate (Fm) =    0.1208(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3139

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Process from Point/Station       38.000 to Point/Station       38.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 71.97
Adjusted SCS curve number for AMC 3 = 88.58
Pervious ratio(Ap) = 0.3170     Max loss rate(Fm)=     0.069(In/Hr)
Rainfall intensity =      2.588(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  20.28 min.  Rain intensity =       2.59(In/Hr)
Total area this stream =       108.22(Ac.)
Total Study Area (Main Stream No. 1) =      329.03(Ac.)
Total runoff =    240.40(CFS)

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Process from Point/Station       38.000 to Point/Station       38.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     108.220(Ac.)
Runoff from this stream =     240.400(CFS)
Time of concentration =   20.28 min.
Rainfall intensity =     2.588(In/Hr)
Area averaged loss rate (Fm) =    0.0693(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3170
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      443.461     20.85               2.545
2      240.400     20.28               2.588
Qmax(1) =
          1.000 *    1.000 *   443.461) +
          0.983 *    1.000 *   240.400) + =     679.794
Qmax(2) =
          1.018 *    0.973 *   443.461) +
          1.000 *    1.000 *   240.400) + =     679.339

Total of 2 streams to confluence:
Flow rates before confluence point:
     443.461     240.400
Maximum flow rates at confluence using above data:
      679.794      679.339
Area of streams before confluence:
      184.019      108.220
Effective area values after confluence:
      292.239      287.216
```

```
Results of confluence:
Total flow rate =     679.794(CFS)
Time of concentration =    20.849 min.
Effective stream area after confluence =     292.239(Ac.)
Stream Area average Pervious fraction(Ap) =  0.315
Stream Area average soil loss rate(Fm) =     0.102(In/Hr)
Study area (this main stream) =      292.24(Ac.)


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Process from Point/Station       38.000 to Point/Station       39.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1035.000(Ft.)
Downstream point/station elevation =  1026.600(Ft.)
Pipe length  =   990.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   679.794(CFS)
Given pipe size =     84.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    10.074(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     11.207(Ft.)
 Minor friction loss =     7.268(Ft.)    K-factor =   1.50
Pipe flow velocity =     17.66(Ft/s)
Travel time through pipe =    0.93 min.
Time of concentration (TC) =    21.78 min.


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Process from Point/Station       39.000 to Point/Station       39.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    292.239(Ac.)
Runoff from this stream =    679.794(CFS)
Time of concentration =   21.78 min.
Rainfall intensity =     2.479(In/Hr)
Area averaged loss rate (Fm) =    0.1017(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3150


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Process from Point/Station      817.000 to Point/Station      818.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1049.000(Ft.)
Bottom (of initial area) elevation =  1044.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00500  s(%)=       0.50
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.789 min.
```

```
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.774
Subarea runoff =     10.833(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)


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Process from Point/Station      818.000 to Point/Station      819.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1044.000(Ft.)
End of street segment elevation =  1042.300(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     16.249(CFS)
Depth of flow =   0.466(Ft.), Average velocity =   2.307(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  18.574(Ft.)
Flow velocity =   2.31(Ft/s)
Travel time =    2.38 min.     TC =   20.17  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Rainfall intensity =      2.596(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.764
Subarea runoff =      9.001(CFS) for    5.000(Ac.)
Total runoff =     19.834(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =      339.03(Ac.)
Area averaged Fm value =    0.393(In/Hr)
Street flow at end of street =     19.834(CFS)
Half street flow at end of street =      9.917(CFS)
Depth of flow =   0.496(Ft.), Average velocity =   2.426(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      819.000 to Point/Station      820.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
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Top of street segment elevation =  1042.300(Ft.)
End of street segment elevation =  1039.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     29.751(CFS)
Depth of flow =   0.555(Ft.), Average velocity =   2.825(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.000(Ft.)
Flow velocity =   2.82(Ft/s)
Travel time =    3.89 min.     TC =   24.07  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Rainfall intensity =      2.335(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.749
Subarea runoff =     15.138(CFS) for   10.000(Ac.)
Total runoff =     34.972(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =      349.03(Ac.)
Area averaged Fm value =    0.393(In/Hr)
Street flow at end of street =     34.972(CFS)
Half street flow at end of street =     17.486(CFS)
Depth of flow =   0.582(Ft.), Average velocity =   3.012(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      820.000 to Point/Station      821.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =  1039.000(Ft.)
End of street segment elevation =  1037.000(Ft.)
Length of street segment  =   330.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
```

```
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     43.715(CFS)
Depth of flow =   0.792(Ft.), Average velocity =   3.469(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    6.26(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  34.842(Ft.)
Flow velocity =   3.47(Ft/s)
Travel time =    1.59 min.     TC =   25.65  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Rainfall intensity =      2.248(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.743
Subarea runoff =     15.118(CFS) for   10.000(Ac.)
Total runoff =     50.090(CFS)
Effective area this stream =       30.00(Ac.)
Total Study Area (Main Stream No. 1) =      359.03(Ac.)
Area averaged Fm value =    0.393(In/Hr)
Street flow at end of street =     50.090(CFS)
Half street flow at end of street =     50.090(CFS)
Depth of flow =   0.827(Ft.), Average velocity =   3.545(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    8.04(Ft.)
Flow width (from curb towards crown)=  36.623(Ft.)


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Process from Point/Station      821.000 to Point/Station      821.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     30.000(Ac.)
Runoff from this stream =     50.090(CFS)
Time of concentration =   25.65 min.
Rainfall intensity =     2.248(In/Hr)
Area averaged loss rate (Fm) =    0.3926(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      679.794     21.78                2.479
2       50.090     25.65                2.248
Qmax(1) =
         1.000 *    1.000 *   679.794) +
```

```
          1.125 *    0.849 *    50.090) + =     727.640
Qmax(2) =
          0.903 *    1.000 *   679.794) +
          1.000 *    1.000 *    50.090) + =     663.645

Total of 2 streams to confluence:
Flow rates before confluence point:
     679.794      50.090
Maximum flow rates at confluence using above data:
      727.640      663.645
Area of streams before confluence:
      292.239       30.000
Effective area values after confluence:
      317.714      322.239
Results of confluence:
Total flow rate =    727.640(CFS)
Time of concentration =    21.783 min.
Effective stream area after confluence =    317.714(Ac.)
Stream Area average Pervious fraction(Ap) =  0.332
Stream Area average soil loss rate(Fm) =    0.129(In/Hr)
Study area (this main stream) =     322.24(Ac.)


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Process from Point/Station       39.000 to Point/Station       40.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1026.600(Ft.)
Downstream point/station elevation =  1012.800(Ft.)
Pipe length  =  1720.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   727.640(CFS)
Given pipe size =     84.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
    16.834(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     22.307(Ft.)
 Minor friction loss =      8.327(Ft.)    K-factor =   1.50
Pipe flow velocity =     18.91(Ft/s)
Travel time through pipe =    1.52 min.
Time of concentration (TC) =    23.30 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       40.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    317.714(Ac.)
Runoff from this stream =    727.640(CFS)
Time of concentration =   23.30 min.
Rainfall intensity =     2.381(In/Hr)
Area averaged loss rate (Fm) =    0.1288(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3323


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Process from Point/Station      822.000 to Point/Station      823.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
```

```
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1037.700(Ft.)
Bottom (of initial area) elevation =  1034.300(Ft.)
Difference in elevation =     3.400(Ft.)
Slope =    0.00340  s(%)=       0.34
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   19.216 min.
Rainfall intensity =      2.673(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.768
Subarea runoff =     10.263(CFS)
Total initial stream area =        5.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      823.000 to Point/Station      824.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1034.300(Ft.)
End of street segment elevation =  1032.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     15.394(CFS)
Depth of flow =   0.487(Ft.), Average velocity =   1.965(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  19.610(Ft.)
Flow velocity =   1.97(Ft/s)
Travel time =    5.60 min.     TC =   24.81  min.
 Adding area flow to street
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Rainfall intensity =      2.293(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.746
Subarea runoff =      6.842(CFS) for    5.000(Ac.)
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Total runoff =     17.105(CFS)
Effective area this stream =       10.00(Ac.)
Total Study Area (Main Stream No. 1) =      369.03(Ac.)
Area averaged Fm value =    0.393(In/Hr)
Street flow at end of street =     17.105(CFS)
Half street flow at end of street =      8.552(CFS)
Depth of flow =   0.502(Ft.), Average velocity =   2.034(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  20.000(Ft.)


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Process from Point/Station      824.000 to Point/Station      825.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1032.000(Ft.)
End of street segment elevation =  1027.000(Ft.)
Length of street segment  =   660.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     25.657(CFS)
Depth of flow =   0.630(Ft.), Average velocity =   3.548(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  26.759(Ft.)
Flow velocity =   3.55(Ft/s)
Travel time =    3.10 min.     TC =   27.91  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Rainfall intensity =      2.137(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.759
Subarea runoff =     15.349(CFS) for   10.000(Ac.)
Total runoff =     32.454(CFS)
Effective area this stream =       20.00(Ac.)
Total Study Area (Main Stream No. 1) =      379.03(Ac.)
Area averaged Fm value =    0.334(In/Hr)
Street flow at end of street =     32.454(CFS)
Half street flow at end of street =     32.454(CFS)
Depth of flow =   0.684(Ft.), Average velocity =   3.711(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    0.86(Ft.)
Flow width (from curb towards crown)=  29.439(Ft.)
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Process from Point/Station      825.000 to Point/Station      826.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1027.000(Ft.)
End of street segment elevation =  1023.000(Ft.)
Length of street segment  =   750.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  42.000(Ft.)
Distance from crown to crossfall grade break  =  40.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  13.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     37.322(CFS)
Depth of flow =   0.767(Ft.), Average velocity =   3.210(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    5.03(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  33.617(Ft.)
Flow velocity =   3.21(Ft/s)
Travel time =    3.89 min.     TC =   31.81  min.
 Adding area flow to street
CONDOMINIUM subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.275(In/Hr)
Rainfall intensity =      1.976(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.754
Subarea runoff =      6.286(CFS) for    6.000(Ac.)
Total runoff =     38.740(CFS)
Effective area this stream =       26.00(Ac.)
Total Study Area (Main Stream No. 1) =      385.03(Ac.)
Area averaged Fm value =    0.320(In/Hr)
Street flow at end of street =     38.740(CFS)
Half street flow at end of street =     38.740(CFS)
Depth of flow =   0.777(Ft.), Average velocity =   3.227(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    5.52(Ft.)
Flow width (from curb towards crown)=  34.101(Ft.)


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Process from Point/Station      826.000 to Point/Station      826.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     26.000(Ac.)
Runoff from this stream =     38.740(CFS)
```

```
Time of concentration =   31.81 min.
Rainfall intensity =     1.976(In/Hr)
Area averaged loss rate (Fm) =    0.3201(In/Hr)
Area averaged Pervious ratio (Ap) = 0.4077
Summary of stream data:

Stream    Flow rate      TC            Rainfall Intensity
 No.        (CFS)       (min)                 (In/Hr)


1       727.640     23.30                2.381
2        38.740     31.81                1.976
Qmax(1) =
          1.000 *    1.000 *   727.640) +
          1.245 *    0.733 *    38.740) + =     762.972
Qmax(2) =
          0.820 *    1.000 *   727.640) +
          1.000 *    1.000 *    38.740) + =     635.338

Total of 2 streams to confluence:
Flow rates before confluence point:
     727.640      38.740
Maximum flow rates at confluence using above data:
      762.972      635.338
Area of streams before confluence:
      317.714       26.000
Effective area values after confluence:
      336.759      343.714
Results of confluence:
Total flow rate =    762.972(CFS)
Time of concentration =    23.299 min.
Effective stream area after confluence =    336.759(Ac.)
Stream Area average Pervious fraction(Ap) =  0.338
Stream Area average soil loss rate(Fm) =    0.143(In/Hr)
Study area (this main stream) =     343.71(Ac.)


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Process from Point/Station       40.000 to Point/Station       94.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1011.300(Ft.)
Downstream point/station elevation =  1004.000(Ft.)
Pipe length  =   900.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   762.972(CFS)
Given pipe size =    102.00(In.)
Calculated individual pipe flow  =   762.972(CFS)
Normal flow depth in pipe =   68.44(In.)
Flow top width inside pipe =   95.85(In.)
Critical Depth =   82.80(In.)
Pipe flow velocity =     18.87(Ft/s)
Travel time through pipe =    0.80 min.
Time of concentration (TC) =    24.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       94.000 to Point/Station       94.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    336.759(Ac.)
```

```
Runoff from this stream =    762.972(CFS)
Time of concentration =   24.09 min.
Rainfall intensity =     2.334(In/Hr)
Area averaged loss rate (Fm) =    0.1432(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3380


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      827.000 to Point/Station      828.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
RESIDENTIAL(5 - 7 dwl/acre)
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.393(In/Hr)
Initial subarea data:
Initial area flow distance =   900.000(Ft.)
Top (of initial area) elevation =  1023.000(Ft.)
Bottom (of initial area) elevation =  1014.000(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.01000  s(%)=       1.00
TC = k(0.389)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.847 min.
Rainfall intensity =      3.121(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.787
Subarea runoff =     14.731(CFS)
Total initial stream area =        6.000(Ac.)
Pervious area fraction = 0.500
Initial area Fm value =    0.393(In/Hr)


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Process from Point/Station      828.000 to Point/Station      828.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      6.000(Ac.)
Runoff from this stream =     14.731(CFS)
Time of concentration =   14.85 min.
Rainfall intensity =     3.121(In/Hr)
Area averaged loss rate (Fm) =    0.3926(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1      762.972     24.09              2.334
2       14.731     14.85              3.121
Qmax(1) =
          1.000 *    1.000 *   762.972) +
          0.712 *    1.000 *    14.731) + =     773.454
Qmax(2) =
          1.359 *    0.616 *   762.972) +
          1.000 *    1.000 *    14.731) + =     653.732
```

Total of 2 streams to confluence:
Flow rates before confluence point:
762.972 14.731
Maximum flow rates at confluence using above data:
773.454 653.732
Area of streams before confluence:
336.759 6.000
Effective area values after confluence:
342.759 213.515
Results of confluence:
Total flow rate = 773.454(CFS)
Time of concentration = 24.094 min.
Effective stream area after confluence = 342.759(Ac.)
Stream Area average Pervious fraction(Ap) = 0.341
Stream Area average soil loss rate(Fm) = 0.148(In/Hr)
Study area (this main stream) = 342.76(Ac.)
End of computations, Total Study Area = 391.03 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.343
Area averaged SCS curve number = 59.4

DECLEZ CHL.

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/12/05

FONTANA / DECLEZ CHANNEL HYDROLOGY
100 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 93.000 to Point/Station 93.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 99.00
Adjusted SCS curve number for AMC 3 = 99.80
Pervious ratio(Ap) = 0.5090 Max loss rate(Fm)= 0.002(In/Hr)
Rainfall intensity = 2.989(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 15.95 min. Rain intensity = 2.99(In/Hr)
Total area this stream = 784.34(Ac.)
Total Study Area (Main Stream No. 1) = 784.34(Ac.)
Total runoff = 2625.02(CFS)

++
Process from Point/Station 93.000 to Point/Station 94.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 1005.500(Ft.)
Downstream point elevation = 1004.000(Ft.)
Channel length thru subarea = 500.000(Ft.)
Channel base width = 24.000(Ft.)
Slope or 'Z' of left channel bank = 0.000
Slope or 'Z' of right channel bank = 0.000
Manning's 'N' = 0.015
Maximum depth of channel = 9.000(Ft.)
Flow(q) thru subarea = 2625.020(CFS)
Depth of flow = 7.337(Ft.), Average velocity = 14.906(Ft/s)
Channel flow top width = 24.000(Ft.)
Flow Velocity = 14.91(Ft/s)
Travel time = 0.56 min.

Time of concentration = 16.51 min.
Critical depth = 7.188(Ft.)

++
Process from Point/Station 94.000 to Point/Station 94.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 784.340(Ac.)
Runoff from this stream = 2625.020(CFS)
Time of concentration = 16.51 min.
Rainfall intensity = 2.928(In/Hr)
Area averaged loss rate (Fm) = 0.0020(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5090

++
Process from Point/Station 94.000 to Point/Station 94.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 91.70
Adjusted SCS curve number for AMC 3 = 98.34
Pervious ratio(Ap) = 0.3410 Max loss rate(Fm)= 0.011(In/Hr)
Rainfall intensity = 2.334(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 24.09 min. Rain intensity = 2.33(In/Hr)
Total area this stream = 342.76(Ac.)
Total Study Area (Main Stream No. 1) = 1127.10(Ac.)
Total runoff = 773.45(CFS)

++
Process from Point/Station 94.000 to Point/Station 94.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 342.760(Ac.)
Runoff from this stream = 773.450(CFS)
Time of concentration = 24.09 min.
Rainfall intensity = 2.334(In/Hr)
Area averaged loss rate (Fm) = 0.0113(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3410
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	2625.020	16.51	2.928
2	773.450	24.09	2.334

Qmax(1) =
1.000 * 1.000 * 2625.020) +
1.256 * 0.685 * 773.450) + = 3290.619

Qmax(2) =
0.797 * 1.000 * 2625.020) +
1.000 * 1.000 * 773.450) + = 2865.570

Total of 2 streams to confluence:

Flow rates before confluence point:
2625.020 773.450
Maximum flow rates at confluence using above data:
3290.619 2865.570
Area of streams before confluence:
784.340 342.760
Effective area values after confluence:
1019.236 1127.100
Results of confluence:
Total flow rate = 3290.619(CFS)
Time of concentration = 16.509 min.
Effective stream area after confluence = 1019.236(Ac.)
Stream Area average Pervious fraction(Ap) = 0.458
Stream Area average soil loss rate(Fm) = 0.005(In/Hr)
Study area (this main stream) = 1127.10(Ac.)
End of computations, Total Study Area = 1127.10 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.458
Area averaged SCS curve number = 96.8

LINE "14'×9' RCB"

AFTER

DETENTION

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
Rational Hydrology Study Date: 01/13/05

FONTANA / LINE JURUPA AVE. 14'x 9' RCB HDROLOGY W/DET. @ SIERRA AVE.
100 YEAR STORM
JN 04339

Hall & Forman, Inc. - S/N 950

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.930(In.)
100 Year storm 1 hour rainfall = 1.350(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 71.000 to Point/Station 71.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 98.86
Adjusted SCS curve number for AMC 3 = 99.77
Pervious ratio(Ap) = 0.2610 Max loss rate(Fm)= 0.001(In/Hr)
Rainfall intensity = 2.394(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 23.09 min. Rain intensity = 2.39(In/Hr)
Total area this stream = 192.55(Ac.)
Total Study Area (Main Stream No. 1) = 192.55(Ac.)
Total runoff = 450.00(CFS)

++
Process from Point/Station 71.000 to Point/Station 89.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 1030.000(Ft.)
Downstream point/station elevation = 1025.000(Ft.)
Pipe length = 680.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 450.000(CFS)
Given pipe size = 54.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
49.243(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 35.596(Ft.)
Minor friction loss = 18.647(Ft.) K-factor = 1.50
Pipe flow velocity = 28.29(Ft/s)
Travel time through pipe = 0.40 min.
Time of concentration (TC) = 23.49 min.

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       89.000 to Point/Station       89.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    192.550(Ac.)
Runoff from this stream =    450.000(CFS)
Time of concentration =   23.49 min.
Rainfall intensity =     2.370(In/Hr)
Area averaged loss rate (Fm) =    0.0012(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2610


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       89.000 to Point/Station       89.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
----------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 99.51
Adjusted SCS curve number for AMC 3 = 99.90
Pervious ratio(Ap) = 0.8280     Max loss rate(Fm)=     0.002(In/Hr)
Rainfall intensity =      3.539(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.04 min.  Rain intensity =       3.54(In/Hr)
Total area this stream =       284.04(Ac.)
Total Study Area (Main Stream No. 1) =      476.59(Ac.)
Total runoff =   1063.00(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       89.000 to Point/Station       89.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    284.040(Ac.)
Runoff from this stream =   1063.000(CFS)
Time of concentration =   12.04 min.
Rainfall intensity =     3.539(In/Hr)
Area averaged loss rate (Fm) =    0.0016(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8280
Summary of stream data:

Stream    Flow rate       TC            Rainfall Intensity
 No.        (CFS)        (min)                 (In/Hr)


1       450.000      23.49                2.370
2      1063.000      12.04                3.539
Qmax(1) =
         1.000 *     1.000 *   450.000) +
         0.669 *     1.000 *  1063.000) + =    1161.665
Qmax(2) =
         1.494 *     0.513 *   450.000) +
         1.000 *     1.000 *  1063.000) + =    1407.491

Total of 2 streams to confluence:
Flow rates before confluence point:
     450.000    1063.000
```

```
Maximum flow rates at confluence using above data:
     1161.665     1407.491
Area of streams before confluence:
      192.550      284.040
Effective area values after confluence:
      476.590      382.731
Results of confluence:
Total flow rate =   1407.491(CFS)
Time of concentration =    12.040 min.
Effective stream area after confluence =    382.731(Ac.)
Stream Area average Pervious fraction(Ap) =  0.599
Stream Area average soil loss rate(Fm) =    0.001(In/Hr)
Study area (this main stream) =     476.59(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       89.000 to Point/Station       90.000
**** IMPROVED CHANNEL TRAVEL TIME ****

------------------------------------------------------------------------------
Covered channel
Upstream point elevation =  1028.200(Ft.)
Downstream point elevation =  1022.300(Ft.)
Channel length thru subarea  =  1320.000(Ft.)
Channel base width       =   14.000(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Manning's 'N'    = 0.013
Maximum depth of channel  =    9.000(Ft.)
Flow(q) thru subarea =   1407.491(CFS)
Depth of flow =   6.014(Ft.), Average velocity =  16.716(Ft/s)
Channel flow top width =   14.000(Ft.)
Flow Velocity =   16.72(Ft/s)
Travel time  =    1.32 min.
Time of concentration =   13.36 min.
Critical depth =      6.813(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       90.000 to Point/Station       90.000
**** CONFLUENCE OF MINOR STREAMS ****

------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    382.731(Ac.)
Runoff from this stream =   1407.491(CFS)
Time of concentration =   13.36 min.
Rainfall intensity =     3.325(In/Hr)
Area averaged loss rate (Fm) =    0.0014(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5989


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       90.000 to Point/Station       90.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

------------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 91.44
Adjusted SCS curve number for AMC 3 = 98.29
Pervious ratio(Ap) = 0.1950     Max loss rate(Fm)=     0.007(In/Hr)
Rainfall intensity =      2.536(In/Hr) for a   100.0 year storm
User specified values are as follows:
```

```
TC =  20.98 min.  Rain intensity =       2.54(In/Hr)
Total area this stream =        76.70(Ac.)
Total Study Area (Main Stream No. 1) =      553.29(Ac.)
Total runoff =    178.54(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       90.000 to Point/Station       90.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     76.700(Ac.)
Runoff from this stream =    178.540(CFS)
Time of concentration =   20.98 min.
Rainfall intensity =     2.536(In/Hr)
Area averaged loss rate (Fm) =    0.0066(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1950


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       90.000 to Point/Station       90.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
----------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 98.56
Adjusted SCS curve number for AMC 3 = 99.71
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.006(In/Hr)
Rainfall intensity =      3.334(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  13.30 min.  Rain intensity =       3.33(In/Hr)
Total area this stream =        25.00(Ac.)
Total Study Area (Main Stream No. 1) =      578.29(Ac.)
Total runoff =     73.53(CFS)


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Process from Point/Station       90.000 to Point/Station       90.000
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 3
Stream flow area =     25.000(Ac.)
Runoff from this stream =     73.530(CFS)
Time of concentration =   13.30 min.
Rainfall intensity =     3.334(In/Hr)
Area averaged loss rate (Fm) =    0.0058(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       90.000 to Point/Station       90.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
----------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 91.48
Adjusted SCS curve number for AMC 3 = 98.30
Pervious ratio(Ap) = 0.5000     Max loss rate(Fm)=     0.017(In/Hr)
Rainfall intensity =      2.281(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  25.03 min.  Rain intensity =       2.28(In/Hr)
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Total area this stream =        12.00(Ac.)
Total Study Area (Main Stream No. 1) =      590.29(Ac.)
Total runoff =     22.26(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       90.000 to Point/Station       90.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 4
Stream flow area =     12.000(Ac.)
Runoff from this stream =     22.260(CFS)
Time of concentration =   25.03 min.
Rainfall intensity =     2.281(In/Hr)
Area averaged loss rate (Fm) =    0.0169(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5000
Summary of stream data:

Stream    Flow rate       TC            Rainfall Intensity
 No.        (CFS)        (min)                 (In/Hr)


1      1407.491      13.36                3.325
2       178.540      20.98                2.536
3        73.530      13.30                3.334
4        22.260      25.03                2.281
Qmax(1) =
          1.000 *     1.000 *  1407.491) +
          1.312 *     0.637 *   178.540) +
          0.997 *     1.000 *    73.530) +
          1.461 *     0.534 *    22.260) + =    1647.317
Qmax(2) =
          0.763 *     1.000 *  1407.491) +
          1.000 *     1.000 *   178.540) +
          0.760 *     1.000 *    73.530) +
          1.113 *     0.838 *    22.260) + =    1328.481
Qmax(3) =
          1.003 *     0.996 *  1407.491) +
          1.315 *     0.634 *   178.540) +
          1.000 *     1.000 *    73.530) +
          1.465 *     0.531 *    22.260) + =    1644.856
Qmax(4) =
          0.686 *     1.000 *  1407.491) +
          0.899 *     1.000 *   178.540) +
          0.684 *     1.000 *    73.530) +
          1.000 *     1.000 *    22.260) + =    1198.451

Total of 4 streams to confluence:
Flow rates before confluence point:
    1407.491     178.540      73.530      22.260
Maximum flow rates at confluence using above data:
     1647.317     1328.481     1644.856     1198.451
Area of streams before confluence:
      382.731       76.700       25.000       12.000
Effective area values after confluence:
      462.962      494.489      461.122      496.431
Results of confluence:
Total flow rate =   1647.317(CFS)
Time of concentration =    13.356 min.
Effective stream area after confluence =    462.962(Ac.)
Stream Area average Pervious fraction(Ap) =  0.554
```

```
Stream Area average soil loss rate(Fm) =    0.003(In/Hr)
Study area (this main stream) =     496.43(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       90.000 to Point/Station       91.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------------
Covered channel
Upstream point elevation =  1022.300(Ft.)
Downstream point elevation =  1013.100(Ft.)
Channel length thru subarea  =  1320.000(Ft.)
Channel base width       =   14.000(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Manning's 'N'    = 0.130
Maximum depth of channel  =    9.000(Ft.)
Flow(q) thru subarea =   1647.317(CFS)
Pressure flow condition in covered channel:
Wetted perimeter =   46.00(Ft.)  Flow area =  126.00(Sq.Ft)
Hydraulic grade line required at box inlet =    799.184(Ft.)
Friction loss =    804.402(Ft.)
Minor Friction loss =      3.981(Ft.)   K-Factor =  1.500
Flow Velocity =   13.07(Ft/s)
Travel time  =    1.68 min.
Time of concentration =   16.72 min.


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Process from Point/Station       91.000 to Point/Station       91.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------------
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 99.95
Adjusted SCS curve number for AMC 3 = 99.99
Pervious ratio(Ap) = 0.5540     Max loss rate(Fm)=     0.000(In/Hr)
Rainfall intensity =      3.097(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  15.04 min.  Rain intensity =       3.10(In/Hr)
Total area this stream =       462.96(Ac.)
Total Study Area (Main Stream No. 1) =     1053.25(Ac.)
Total runoff =   1647.79(CFS)


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Process from Point/Station       91.000 to Point/Station       91.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    462.960(Ac.)
Runoff from this stream =   1647.790(CFS)
Time of concentration =   15.04 min.
Rainfall intensity =     3.097(In/Hr)
Area averaged loss rate (Fm) =    0.0001(In/Hr)
Area averaged Pervious ratio (Ap) = 0.5540


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Process from Point/Station       91.000 to Point/Station       91.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
```