CEQA LEVEL
PRELIMINARY DRAINAGE ANALYSIS

HOSKINGS RANCH
TM 5312RPL3

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Revised: March 11, 2013

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INTRODUCTION

The Hoskins Ranch development is a proposed 28 lot subdivision on approximately 1,400 acres located south of Highway 78/79 and west of Pine Hills Road in Julian, California in the County of San Diego. Lot sizes range are greater that 40 acres (gross). This report has been prepared to provide a preliminary CEQA level evaluation of the potential impacts of storm water runoff from the proposed project.

SITE DESCRIPTION

The 1400-acre site is currently comprised of mostly undeveloped land with natural chaparral throughout the area. The overall watershed associated with the site is approximately 8 sq. miles (5,138 acres) encompassing 12 major drainage basins. Temescal Creek runs westerly through the southern portion of the site and joins the San Diego River west of the project boundary. Storm water runoff from drainage basins 1 through 10 discharge into Temescal Creek directly or into natural drainage tributaries of Temescal Creek. Drainage basin 11 located in the northwest corner of the site discharges runoff directly into the San Diego River. Basin 12 in the northerly portion of the site discharges runoff northeasterly into Sentenac Creek, which begins in the northern portion of the site around proposed lots 1 and 2 and flows westerly toward the San Diego River. All storm water runoff from the watershed eventually discharges into the San Diego River.

PROJECT DESCRIPTION

The proposed project consists of 24 parcels ranging from 40 acres to approximately 196 acres and will include driveways and roadways through the project site. The existing topography of a significant portion of the site will remain undisturbed permanent open space. The project roadways, driveways and individual building pads have been designed to follow the existing terrain to minimize cuts and fills. Through this approach it will be possible to maintain the existing drainage patterns throughout the project site. Where possible, drainage will be maintained within the existing drainage swales with minimal flows being conveyed within the proposed streets. Overall site soil disturbance is approximately 47 acres. This represents 3.3 % of the overall site.

METHODOLOGY

The hydrologic analysis utilized for this study is the Rational Method, as outlined within the San Diego's County Hydrology Manual (2003 edition). For this CEQA level analysis, the 100-year frequency storm has been used to determine the pre-development and post-development flows from the project. The hydrologic soil group existing on the site is soil type "B" and "C". Type "B" soils have moderate infiltration rates when thoroughly wetted, consisting chiefly of sandy loams. Type "C" soils have slow infiltration rates when thoroughly wetted. The runoff coefficients for the undeveloped land uses are as follows: Type "B" soils = 0.25, Type "C" soils = 0.30

Exhibit "A" illustrates existing drainage basins, including basin areas, flow paths, concentration points, and existing culvert crossings for the pre-development condition. The grading of the roads and pad areas for the project are insignificant when compared to the overall watershed. The overall drainage patterns under post-development conditions are the same as the existing condition. ***Exhibit "B"*** outlines post-development drainage basins, including basin areas, flow paths, proposed roadways, driveways, pad areas, concentration points and the locations of proposed culvert crossings. Construction of this project will not increase discharge leaving the site. ***Exhibit "C"*** represents a scale-up of drainage basin 12 for clarity. ***Exhibit "D"*** is a culvert location map depicting proposed culverts with the project boundaries only and includes data for each storm drain (or culvert).

HYDROLOGIC CALCULATIONS

CivilDesign® hydrology/hydraulics software was utilized to determine storm flows for the pre- and post-project conditions using the methodology outlined in the San Diego County Hydrology Manual (June 2003) as briefly described below:

Basin Areas:

Basin areas for Pre-development and Post-development conditions have been delineated on the Hydrology Maps included in the map pockets at the end of this report as ***Exhibit "A" Pre-Development Hydrology Map*** and ***Exhibit "B" Post-***

Development Hydrology Map, respectively. ***Exhibit "C" Post-Development Hydrology Map*** includes Basin 12 only for clarity.

Runoff Coefficient:

The runoff coefficient, which is determined by Land Use and the Soil Type, was obtained from Table 3-1 of the San Diego County Hydrology Manual for soil group B and C as stated above. Runoff coefficients for pre- and post-development conditions are roughly the same since the total development will only disturb less than 5.0% of the total site.

Rainfall Intensity:

Rainfall Intensity (I) is dependant on the 6-hour precipitation and time of concentration at various points within the drainage basin. The Rainfall Isopluvial maps in Appendix B of the Hydrology Manual indicate:

For 100-year precipitation

6-hour	24-hour
P_6 = 4.5 in/hr	P_{24} = 9.5 in/hr

The 6-hour precipitation is within 45% to 65% of the 24-hour precipitation so the 6-hour precipitation is used without adjustment. The rainfall intensity can be calculated at any point within the basin based on the adjusted 6-hour precipitation and the time of concentration at that point where:

$I_{100} = 7.44 \times P_6 \times D^{-.645}$, where D = time of concentration.

Time of Concentration:

The time of concentration is the time required for runoff to flow from the most remote point of the basin to the concentration point being considered and is the sum of the initial overland flow time and travel time through natural and/or manmade channels and conduits. The time of concentration for the pre- and post-development conditions has been evaluated as a natural watershed as the sum of initial overland time and travel time. For CEQA level analysis, travel time through the short conduits was not

considered, only travel time through natural channels for both pre- and post-project conditions.

Basin Runoff:

The peak runoff condition for the pre- and post-development conditions has been calculated for a 100-year storm event. ***Appendix B - Pre-Development Hydrology Calculations*** includes the CivilDesign output for each basin for pre-project conditions and ***Appendix C - Post-Development Hydrology Calculations*** includes CivilDesign output and Excel spreadsheet calculations for post-development conditions. Overall, the increase in runoff from pre- to post-project conditions is zero or insignificant due to increased travel time through the proposed house pads. This offsets the potential increase from impermeable surfaces of the proposed roads driveways and buildings. Additionally, all runoff from impermeable surfaces will be directed through hydro-modification basins that will further decrease the travel time and overall runoff.

HYDRAULICS

There are three existing culvert structures along the project frontage of Pine Hills Road that are currently undersized to convey the 100-year flood event based on hydraulic analysis of each culvert which can be found in ***Appendix D – Pre-Development Hydraulic Calculations***. These culverts drain the major basins upstream of Pine Hill Road and are represented in ***Exhibit "A" Pre-Development Hydrology Map*** as culvert # 1, 2, and 3 respectively.

Proposed on-site drainage structures include 46 culverts, catch basins and D-75 concrete ditches. Each culvert has been sized to convey the project conditions 100-year discharge utilizing Bentley CulvertMaster® v3.2 and/or Bentley FlowMaster v8. Preliminary capacity checks for standard D-75, Type "B" and Type "D" at 1% were done using FlowMaster. Preliminary capacity checks were also done on standard Type "F" catch basins and Brooks type inlets. All post-development hydraulic calculations are included in ***Appendix E - Post-Development Hydraulic Calculations.***

Exhibit D – Culvert Location Map – On Site Only includes the location of all on-site culverts as well as a data table identifying the size, type, and Q_{100} and velocity of each.

Since all peak flows exiting the project site are equal to those of the existing conditions, there will be no adverse effects on downstream drainage facilities. The approximate limits of 100-year inundation for basins having tributary areas over 25 acres are shown on both the pre-development hydrology map and the post-development hydrology map.

LID AND BMP APPLICATIONS

The Major Stormwater Management Plan (SWMP) developed for the Hoskings Ranch project identifies LID strategies and treatment BMP considerations for this CEQA level analysis. ***Attachment D – LID and BMP Location Map*** of the SWMP includes a site map.

SUMMARY AND RECOMMENDATIONS

The proposed project will disturb approximately 47 acres of the 1,416.5 acre site which is approximately 3.3% of the overall site area. This represents a disturbance of less than 0.01% of the total 8 square mile watershed. Based on the hydrologic analysis and the discussion above, runoff from the proposed development will not increase from the pre-development condition and the development of this site is not expected to create any adverse impacts to downstream drainage facilities. Existing culverts crossing Pine Hills Road that are currently insufficient will be upsized to convey the 100-year runoff. New culverts will be located on site where proposed streets and driveways cross natural drainage patterns.

APPENDICES

APPENDIX A

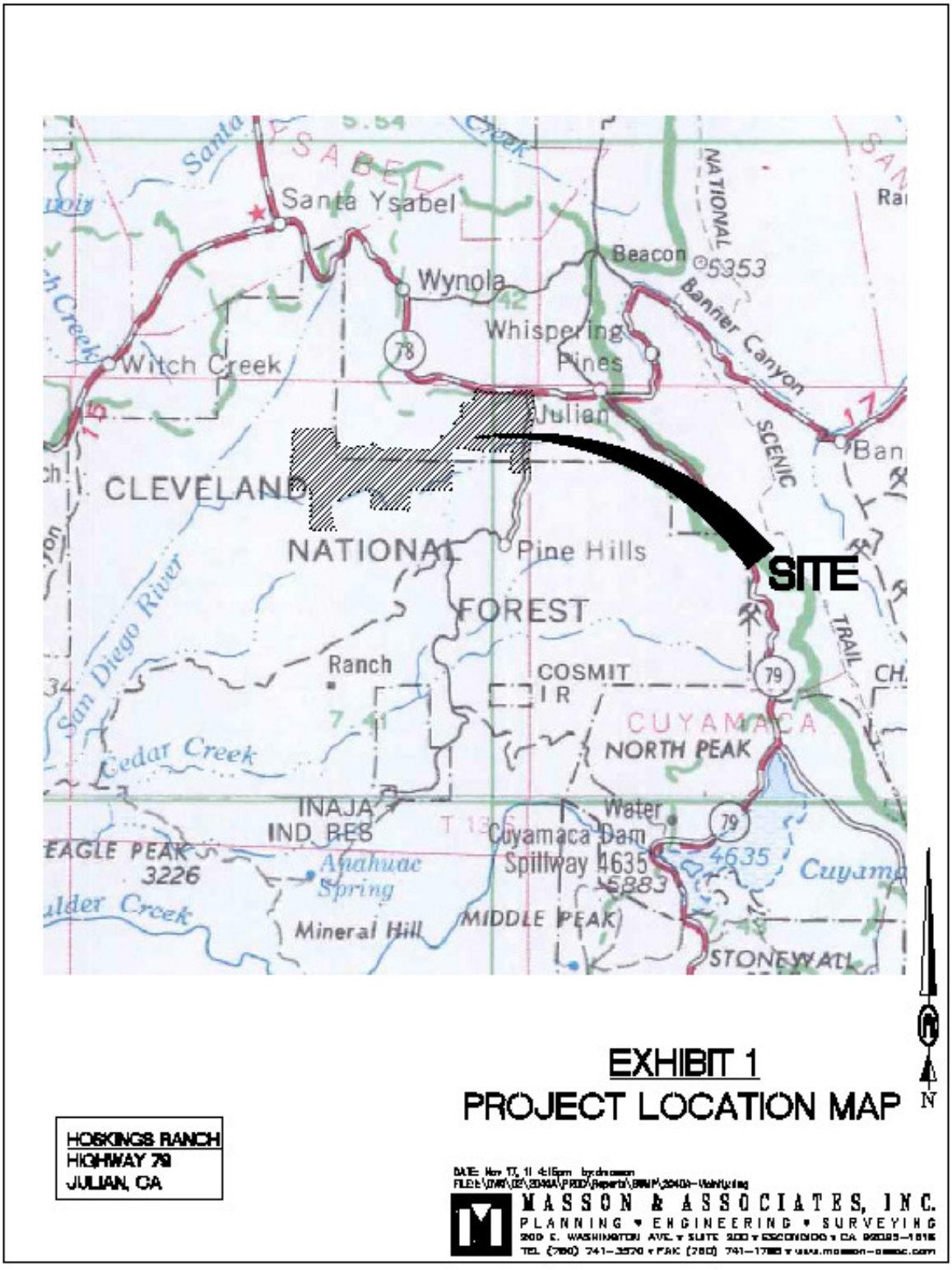
Santa Ysabel
Wynola
Beacon
5353
Witch Creek
Whispering Pines
Julian
CLEVELAND
NATIONAL
FOREST
Pine Hills
SITE
Ranch
COSMIT
IR
CUYAMACA
NORTH PEAK
Cedar Creek
San Diego River
INAJA
IND. RES
EAGLE PEAK
3226
Aguahuac
Spring
Mineral Hill
MIDDLE PEAK
Cuyamaca Dam
Spillway 4635
5883
STONEWALL
Banner Canyon
SCENIC
TRAIL
HOSKINGS RANCH
HIGHWAY 79
JULIAN, CA
EXHIBIT 1
PROJECT LOCATION MAP
N
MASSON & ASSOCIATES, INC.
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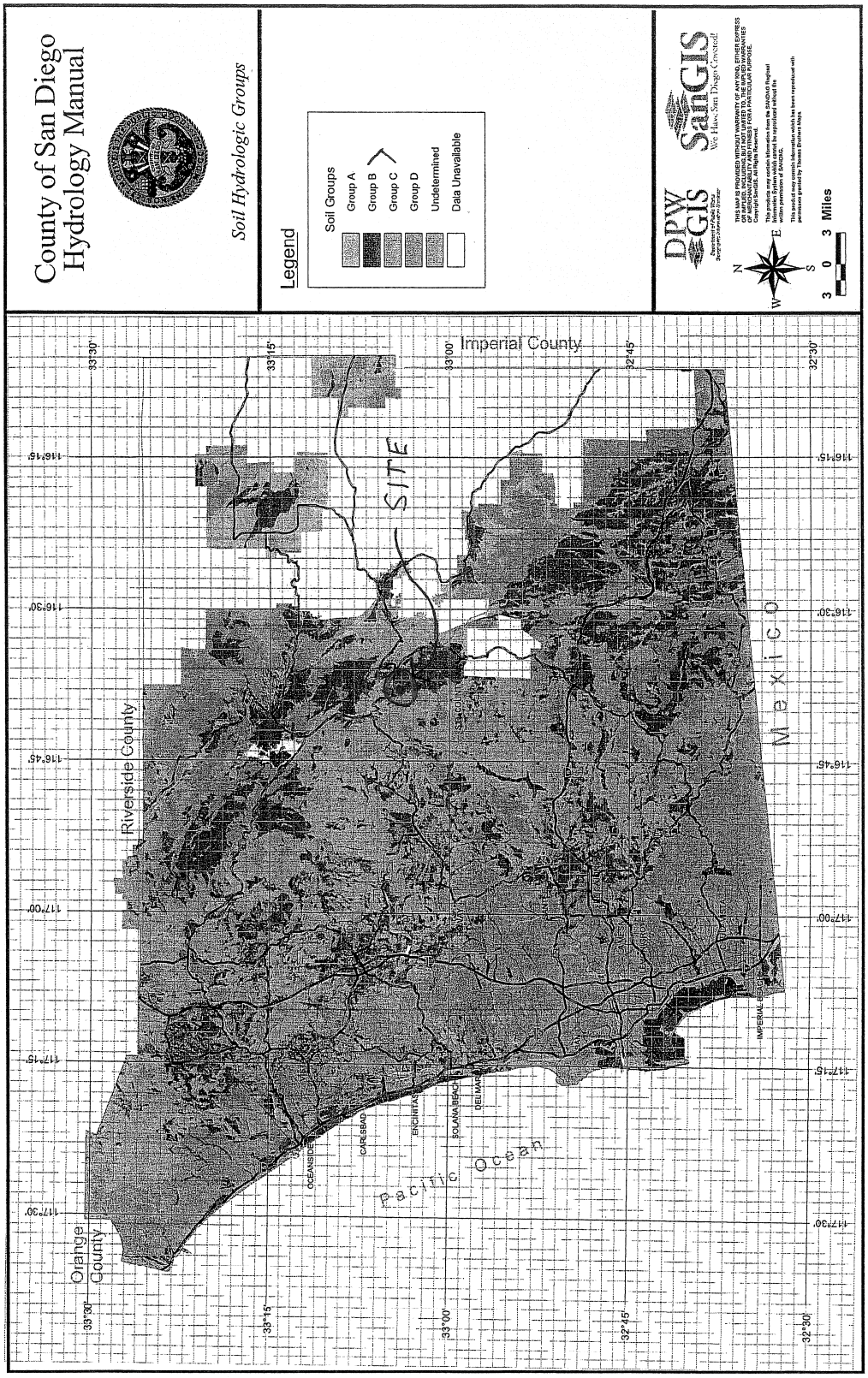
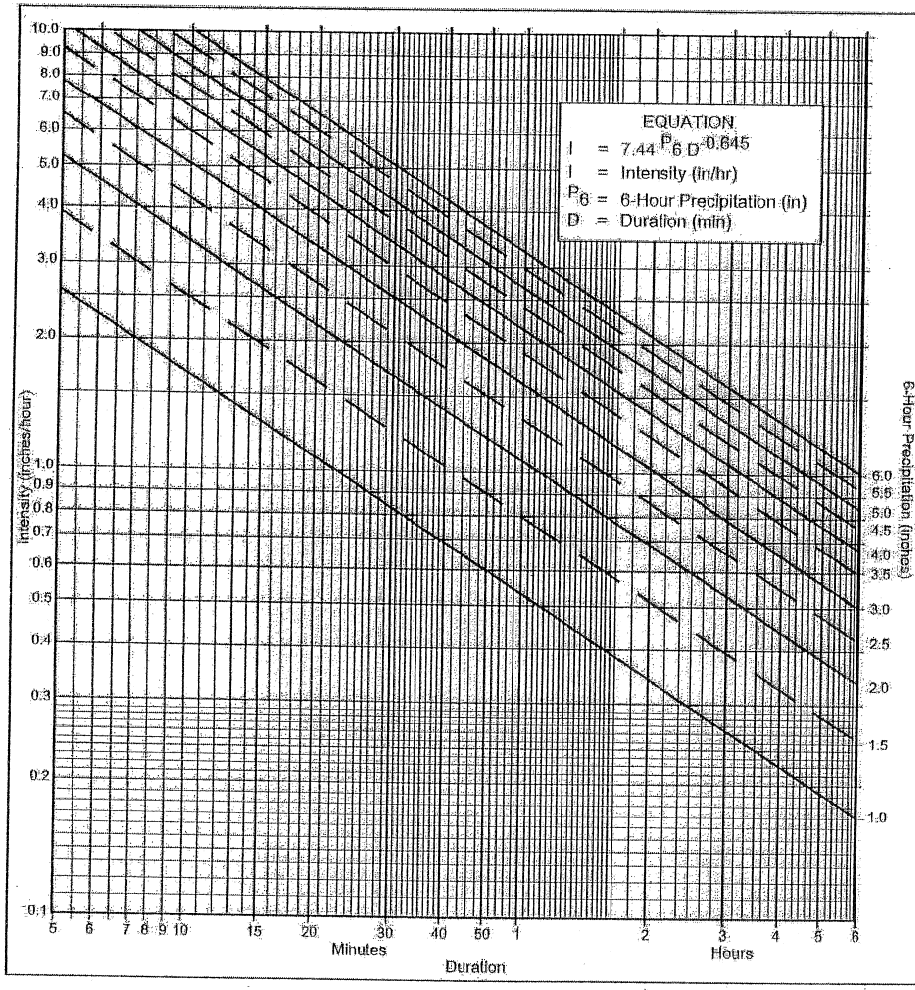
Figure 1

Figure 2


County of San Diego
Hydrology Manual
Soil Hydrologic Groups
Legend
Soil Groups
Group A
Group B
Group C
Group D
Undetermined
Data Unavailable
DPW GIS
SanGIS
We Have San Diego Covered!
N
S
E
W
3 0 3 Miles
SITE
Imperial County
Riverside County
Orange County
Mexico
Pacific Ocean
OCEANSIDE
CARLSBAD
ENCINITAS
SOLANA BEACH
DEL MAR
IMPERIAL BEACH
33°30'
33°15'
33°00'
32°45'
32°30'
116°15'
116°30'
116°45'
117°00'
117°15'
117°30'



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency _____ year

(b) P_6 = 4.5 in., P_{24} = 9.5 , $\frac{P_6}{P_{24}}$ = 47.4 %(2)

(c) Adjusted $P_6^{(2)}$ = 4.5 in.

(d) t_x = _____ min.

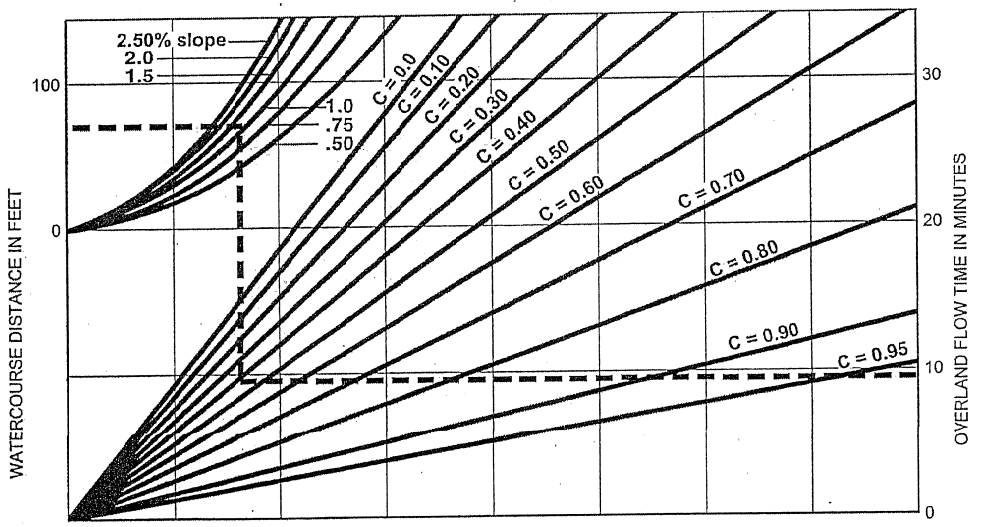
(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE
3-1



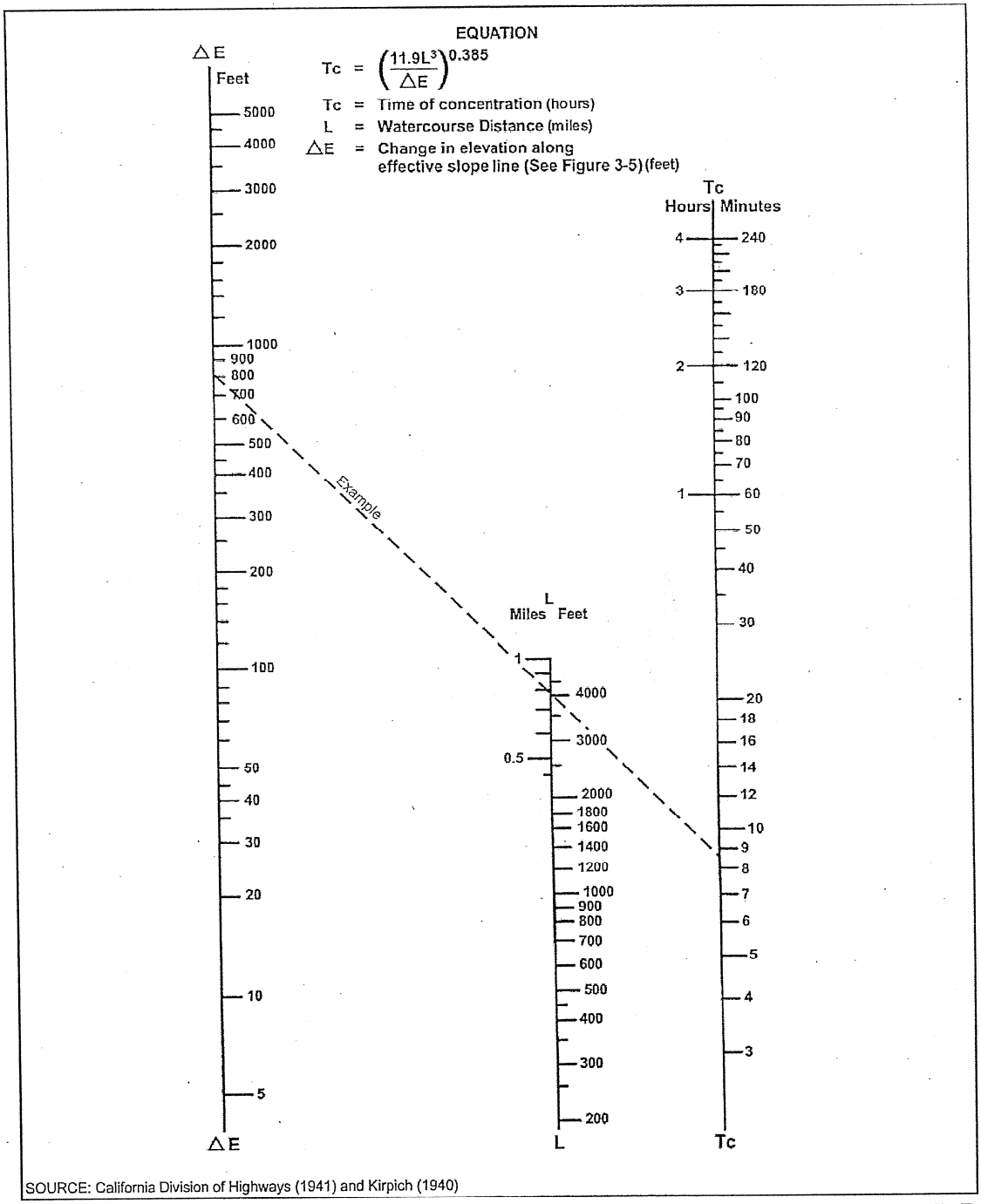
EXAMPLE:
Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE 3-3

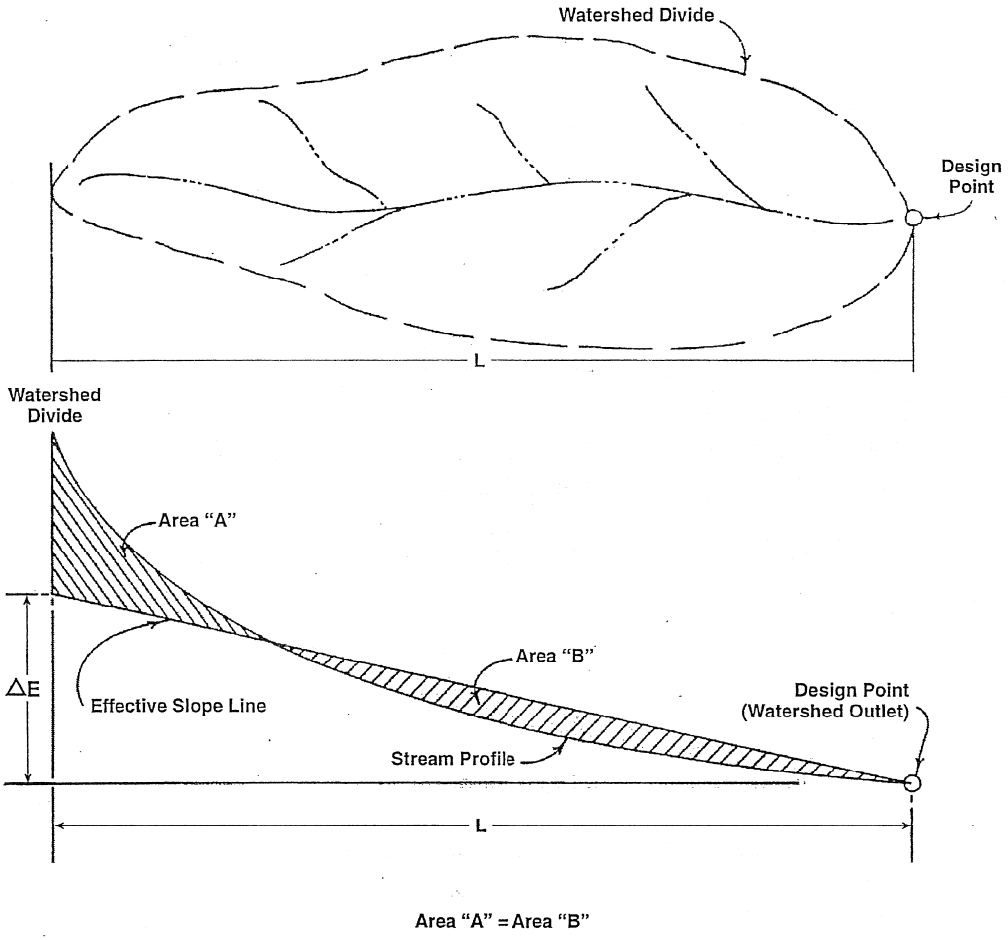
Rational Formula - Overland Time of Flow Nomograph



SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE 3-4

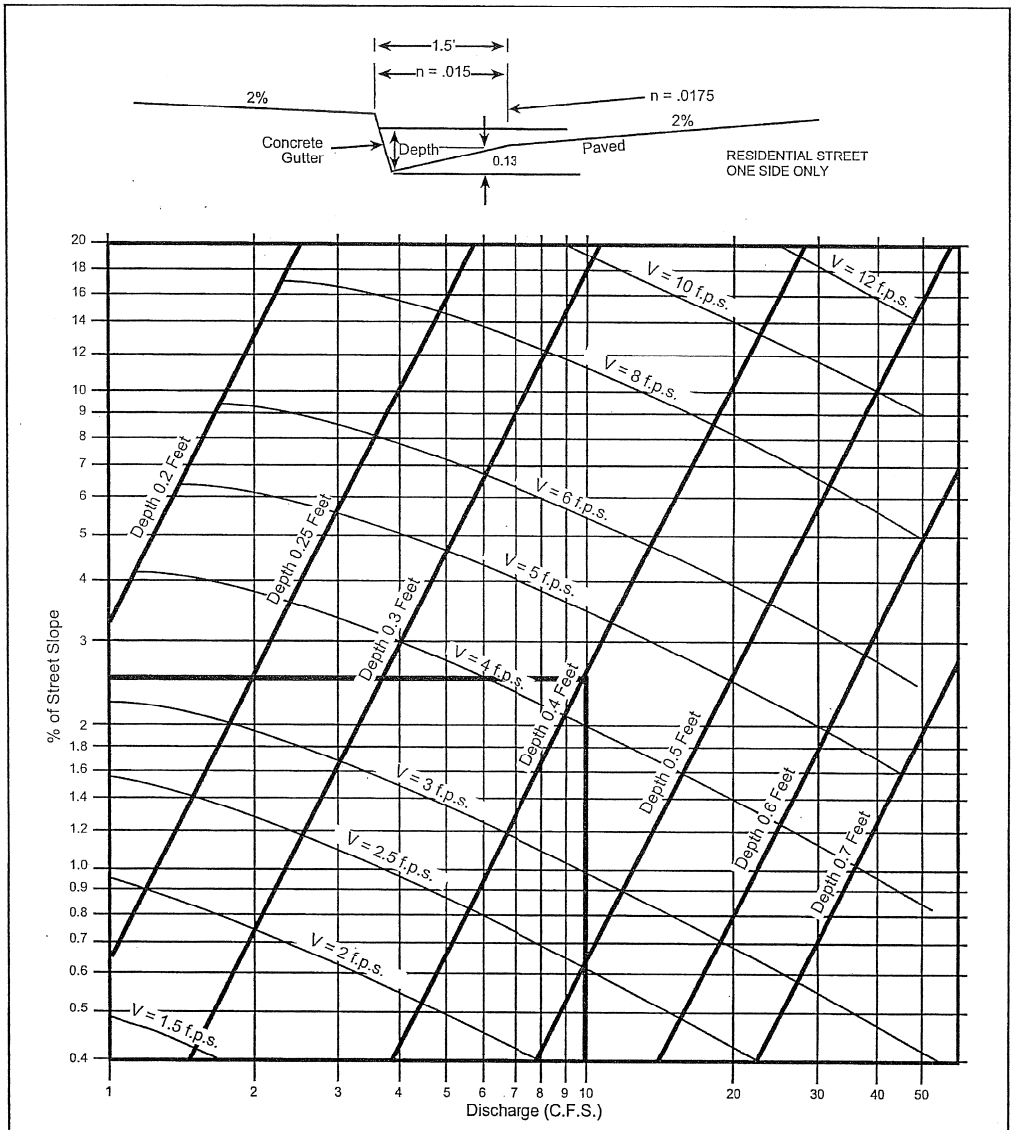
Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds



SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE 3-5

Computation of Effective Slope for Natural Watersheds

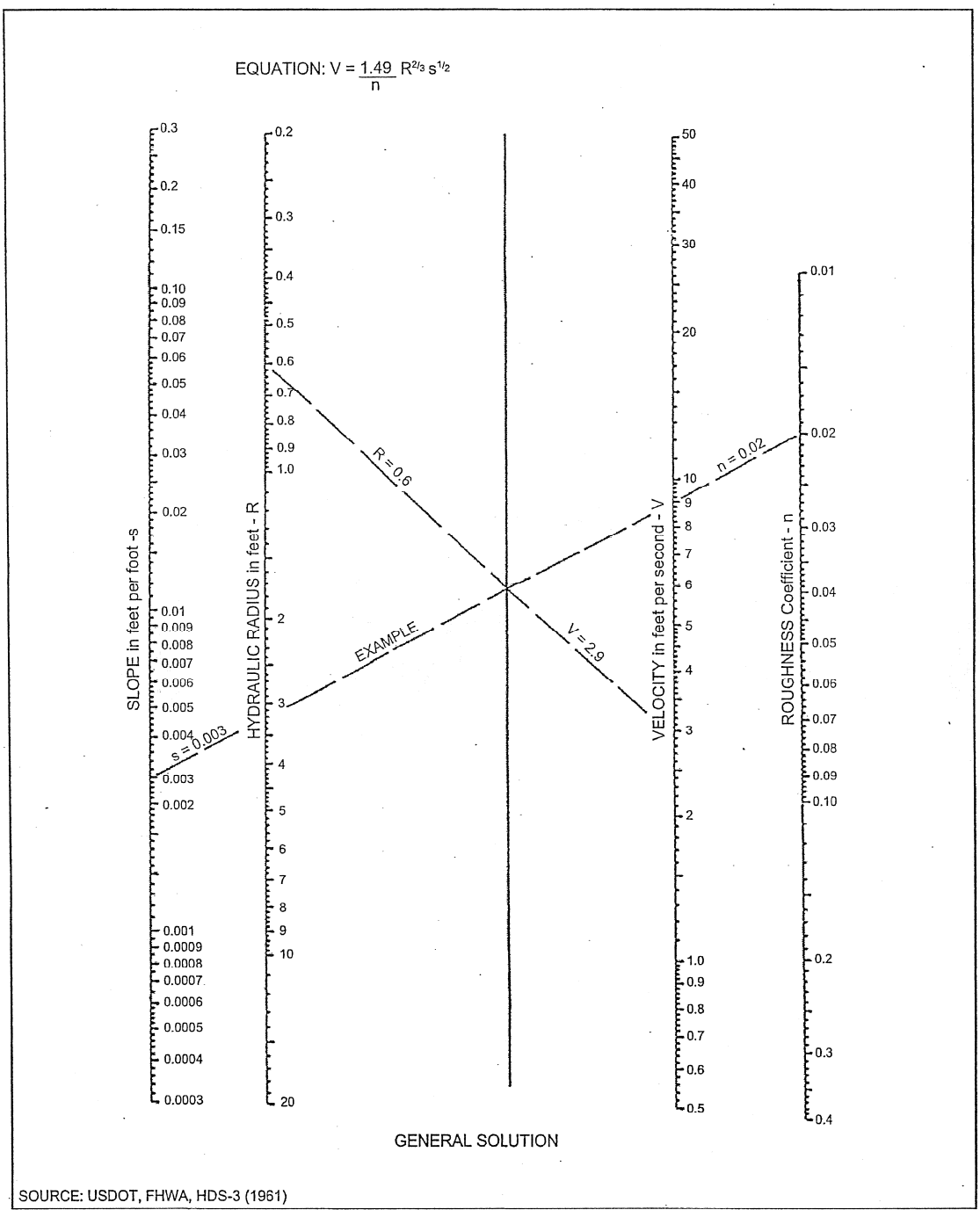


EXAMPLE:
Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

SOURCE: San Diego County Department of Special District Services Design Manual

FIGURE 3-6

Gutter and Roadway Discharge - Velocity Chart



SOURCE: USDOT, FHWA, HDS-3 (1961)

FIGURE 3-7

Manning's Equation Nomograph

County of San Diego
Hydrology Manual
Rainfall Isopluvials
100 Year Rainfall Event - 6 Hours
Isopluvial (Inches)
DPW GIS
SanGIS
Miles
Imperial County
Riverside County
Orange County
Mexico
Pacific Ocean
SITE

County of San Diego
Hydrology Manual
Rainfall Isopluvials
100 Year Rainfall Event - 24 Hours
Isopluvial (inches)
DPW GIS
SanGIS
We Have San Diego Covered!
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N
S
E
W
3 0 3 Miles
SITE
Imperial County
Riverside County
Orange County
Mexico
Pacific Ocean
OCEANSIDE
CARLSBAD
ENCINITAS
SOLANA BEACH
DEL MAR
SAN DIEGO
CORONADO
IMPERIAL BEACH
SAN MARCOS
ESCONDIDO
POWAY
SANTEE
LA MESA
LEMON GROVE
NATIONAL CITY
CHULA VISTA

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description

APPENDIX B

Pre- Development Hydrology Calculations

Basins 1.011 through 1.101

```
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

      Rational method hydrology  program based on
      San Diego County Flood Control Division 2003 hydrology manual
            Rational Hydrology Study        Date: 09/26/08
      ------------------------------------------------------------------------
-
       *********   Hydrology Study Control Information **********

      ------------------------------------------------------------------------
-


      Program License Serial Number 4065

      ------------------------------------------------------------------------
-
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  3.500
      24 hour precipitation(inches) =  6.000
      P6/P24 =    58.3%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        1.011 to Point/Station        1.021
      **** INITIAL AREA EVALUATION ****
      ________________________________________________________________________
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 1.000
      Decimal fraction soil group D = 0.000
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.300
      Initial subarea total flow distance  = 1034.000(Ft.)
      Highest elevation = 4753.500(Ft.)
      Lowest elevation = 4475.000(Ft.)
      Elevation difference =  278.500(Ft.) Slope = 26.934 %
      Top of Initial Area Slope adjusted by User to 15.500 %
      Bottom of Initial Area Slope adjusted by User to 28.100 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  15.50 %, in a development type of
       Permanent Open Space
      In Accordance With Figure 3-3
```

```
      Initial Area Time of Concentration =   5.78 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(  15.500^(1/3)]=   5.78
      The initial area total distance of 1034.00 (Ft.) entered leaves a
      remaining distance of  934.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   2.47 minutes
      for a distance of 934.00 (Ft.) and a slope of 28.10 %
      with an elevation difference of 262.45(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    2.466 Minutes
      Tt=[(11.9*0.1769^3)/(262.45)]^.385=  2.47
      Total initial area Ti =   5.78 minutes from Figure 3-3 formula plus
        2.47 minutes from the Figure 3-4 formula =   8.24 minutes
      Rainfall intensity (I) =      6.681(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
      Subarea runoff =     33.069(CFS)
      Total initial stream area =       16.500(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        1.021 to Point/Station        1.031
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ----------------------------------------------------------------------
      Estimated mean flow rate at midpoint of channel =    236.585(CFS)
      Depth of flow =   1.493(Ft.), Average velocity =  14.119(Ft/s)
            ******* Irregular Channel Data ***********
      ----------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              9.00
            2             11.00              4.00
            3             28.00              0.00
            4             34.00              0.00
            5             45.00              4.00
            6             60.00              9.00
      Manning's 'N' friction factor =   0.035
      ----------------------------------------------------------------
      Sub-Channel flow  =    236.585(CFS)
        '     '    flow top width =     16.449(Ft.)
        '     '    velocity=   14.119(Ft/s)
        '     '    area =     16.756(Sq.Ft)
        '     '    Froude number =     2.465

      Upstream point elevation =  4475.000(Ft.)
      Downstream point elevation =  4058.000(Ft.)
      Flow length =  3732.000(Ft.)
      Travel time  =    4.41 min.
      Time of concentration =   12.65 min.
      Depth of flow =   1.493(Ft.)
      Average velocity =  14.119(Ft/s)
      Total irregular channel flow =   236.585(CFS)
      Irregular channel normal depth above invert elev. =   1.493(Ft.)
      Average velocity of channel(s) =  14.119(Ft/s)
       Adding area flow to channel
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.500
```

```
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.275
Rainfall intensity =      5.068(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.276  CA =     86.818
Subarea runoff =    406.949(CFS) for    297.700(Ac.)
Total runoff =    440.018(CFS)      Total area =     314.200(Ac.)
Depth of flow =   2.020(Ft.), Average velocity =  16.673(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.031 to Point/Station        1.041
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    448.037(CFS)
Depth of flow =   2.288(Ft.), Average velocity =  12.662(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             25.00              0.00
      3             32.00              0.00
      4             44.00              5.00
Manning's 'N' friction factor =   0.035
----------------------------------------------------------------
Sub-Channel flow  =    448.038(CFS)
  '     '    flow top width =     23.931(Ft.)
  '     '    velocity=   12.662(Ft/s)
  '     '    area =     35.385(Sq.Ft)
  '     '    Froude number =     1.835

Upstream point elevation =  4058.000(Ft.)
Downstream point elevation =  3930.000(Ft.)
Flow length =  2335.000(Ft.)
Travel time  =    3.07 min.
Time of concentration =   15.72 min.
Depth of flow =   2.288(Ft.)
Average velocity =  12.662(Ft/s)
Total irregular channel flow =   448.037(CFS)
Irregular channel normal depth above invert elev. =   2.288(Ft.)
Average velocity of channel(s) =  12.662(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      4.405(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
```

```
(Q=KCIA) is C = 0.272  CA =    103.518
Subarea runoff =     15.952(CFS) for     66.800(Ac.)
Total runoff =    455.969(CFS)      Total area =     381.000(Ac.)
Depth of flow =   2.307(Ft.), Average velocity =  12.720(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.031 to Point/Station        1.041
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    381.000(Ac.)
Runoff from this stream =    455.969(CFS)
Time of concentration =   15.72 min.
Rainfall intensity =     4.405(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.011 to Point/Station        2.021
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance  = 1511.000(Ft.)
Highest elevation = 4473.000(Ft.)
Lowest elevation = 4265.000(Ft.)
Elevation difference =  208.000(Ft.) Slope = 13.766 %
Top of Initial Area Slope adjusted by User to  8.000 %
Bottom of Initial Area Slope adjusted by User to 14.200 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   8.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.65 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(   8.000^(1/3)]=   7.65
The initial area total distance of 1511.00 (Ft.) entered leaves a
remaining distance of 1411.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   4.41 minutes
for a distance of 1411.00 (Ft.) and a slope of 14.20 %
with an elevation difference of 200.36(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    4.407 Minutes
Tt=[(11.9*0.2672^3)/(200.36)]^.385=  4.41
Total initial area Ti =   7.65 minutes from Figure 3-3 formula plus
  4.41 minutes from the Figure 3-4 formula =  12.06 minutes
Rainfall intensity (I) =      5.227(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
Subarea runoff =     21.561(CFS)
```

```
Total initial stream area =       16.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.021 to Point/Station        1.041
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    117.240(CFS)
Depth of flow =   1.155(Ft.), Average velocity =  11.826(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             14.00              0.00
      3             19.00              0.00
      4             36.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------------
Sub-Channel flow  =    117.240(CFS)
  '     '    flow top width =     12.163(Ft.)
  '     '    velocity=   11.826(Ft/s)
  '     '    area =      9.914(Sq.Ft)
  '     '    Froude number =     2.308

Upstream point elevation =  4265.000(Ft.)
Downstream point elevation =  3930.000(Ft.)
Flow length =  3160.000(Ft.)
Travel time  =    4.45 min.
Time of concentration =   16.51 min.
Depth of flow =   1.155(Ft.)
Average velocity =  11.826(Ft/s)
Total irregular channel flow =   117.240(CFS)
Irregular channel normal depth above invert elev. =   1.155(Ft.)
Average velocity of channel(s) =  11.826(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      4.268(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.250  CA =     49.875
Subarea runoff =    191.290(CFS) for    183.000(Ac.)
Total runoff =    212.852(CFS)      Total area =     199.500(Ac.)
Depth of flow =   1.557(Ft.), Average velocity =  13.915(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.021 to Point/Station        1.041
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
```

```
Stream flow area =    199.500(Ac.)
Runoff from this stream =    212.852(CFS)
Time of concentration =   16.51 min.
Rainfall intensity =     4.268(In/Hr)
Summary of stream data:

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


1      455.969     15.72               4.405
2      212.852     16.51               4.268
Qmax(1) =
         1.000 *    1.000 *   455.969) +
         1.000 *    0.952 *   212.852) + =     658.641
Qmax(2) =
         0.969 *    1.000 *   455.969) +
         1.000 *    1.000 *   212.852) + =     654.634

Total of 2 streams to confluence:
Flow rates before confluence point:
     455.969     212.852
Maximum flow rates at confluence using above data:
      658.641      654.634
Area of streams before confluence:
      381.000      199.500
Results of confluence:
Total flow rate =    658.641(CFS)
Time of concentration =    15.720 min.
Effective stream area after confluence =    580.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.041 to Point/Station        1.051
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    658.670(CFS)
Depth of flow =   3.651(Ft.), Average velocity =   9.036(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             10.00
      2             37.00              5.00
      3             63.00              0.00
      4             68.00              0.00
      5             83.00              5.00
      6            137.00             10.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    658.670(CFS)
  '     '    flow top width =     34.935(Ft.)
  '     '    velocity=    9.036(Ft/s)
  '     '    area =     72.891(Sq.Ft)
  '     '    Froude number =     1.102

Upstream point elevation =  3930.000(Ft.)
```

```
Downstream point elevation =  3895.500(Ft.)
Flow length =  1960.000(Ft.)
Travel time  =    3.62 min.
Time of concentration =   19.34 min.
Depth of flow =   3.651(Ft.)
Average velocity =   9.036(Ft/s)
Total irregular channel flow =   658.670(CFS)
Irregular channel normal depth above invert elev. =   3.651(Ft.)
Average velocity of channel(s) =   9.036(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
The area added to the existing stream causes a
a lower flow rate of Q =    641.900(CFS)
therefore the upstream flow rate of Q =    658.641(CFS) is being used
Rainfall intensity =      3.854(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.263  CA =    166.543
Subarea runoff =      0.000(CFS) for     52.600(Ac.)
Total runoff =    658.641(CFS)      Total area =     633.100(Ac.)
Depth of flow =   3.650(Ft.), Average velocity =   9.036(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.041 to Point/Station        1.051
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    633.100(Ac.)
Runoff from this stream =    658.641(CFS)
Time of concentration =   19.34 min.
Rainfall intensity =     3.854(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.011 to Point/Station        3.021
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance  = 1041.000(Ft.)
Highest elevation = 4500.000(Ft.)
Lowest elevation = 4125.000(Ft.)
Elevation difference =  375.000(Ft.) Slope = 36.023 %
Top of Initial Area Slope adjusted by User to 30.000 %
```

```
      Bottom of Initial Area Slope adjusted by User to 30.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  30.00 %, in a development type of
       Permanent Open Space
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   4.92 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(  30.000^(1/3)]=   4.92
      The initial area total distance of 1041.00 (Ft.) entered leaves a
      remaining distance of  941.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   2.42 minutes
      for a distance of 941.00 (Ft.) and a slope of 30.00 %
      with an elevation difference of 282.30(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    2.419 Minutes
      Tt=[(11.9*0.1782^3)/(282.30)]^.385=  2.42
      Total initial area Ti =   4.92 minutes from Figure 3-3 formula plus
        2.42 minutes from the Figure 3-4 formula =   7.34 minutes
      Rainfall intensity (I) =      7.197(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
      Subarea runoff =     27.350(CFS)
      Total initial stream area =       15.200(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        3.021 to Point/Station        1.051
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ----------------------------------------------------------------------
      Estimated mean flow rate at midpoint of channel =     66.344(CFS)
      Depth of flow =   1.027(Ft.), Average velocity =   9.400(Ft/s)
            ******* Irregular Channel Data ***********
      ----------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00             10.00
            2             16.00              5.00
            3             31.00              0.00
            4             35.00              0.00
            5             48.00              5.00
            6             69.00             10.00
      Manning's 'N' friction factor =   0.035
      ----------------------------------------------------------------
      Sub-Channel flow  =     66.344(CFS)
        '     '    flow top width =      9.749(Ft.)
        '     '    velocity=    9.400(Ft/s)
        '     '    area =      7.058(Sq.Ft)
        '     '    Froude number =     1.947

      Upstream point elevation =  4125.000(Ft.)
      Downstream point elevation =  3895.500(Ft.)
      Flow length =  2901.000(Ft.)
      Travel time  =    5.14 min.
      Time of concentration =   12.49 min.
      Depth of flow =   1.027(Ft.)
      Average velocity =   9.400(Ft/s)
```

```
Total irregular channel flow =    66.344(CFS)
Irregular channel normal depth above invert elev. =   1.027(Ft.)
Average velocity of channel(s) =   9.400(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      5.110(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.250  CA =     20.600
Subarea runoff =     77.921(CFS) for     67.200(Ac.)
Total runoff =    105.271(CFS)      Total area =      82.400(Ac.)
Depth of flow =   1.295(Ft.), Average velocity =  10.663(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.021 to Point/Station        1.051
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     82.400(Ac.)
Runoff from this stream =    105.271(CFS)
Time of concentration =   12.49 min.
Rainfall intensity =     5.110(In/Hr)
Summary of stream data:

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


1      658.641     19.34               3.854
2      105.271     12.49               5.110
Qmax(1) =
         1.000 *    1.000 *   658.641) +
         0.754 *    1.000 *   105.271) + =     738.039
Qmax(2) =
         1.000 *    0.646 *   658.641) +
         1.000 *    1.000 *   105.271) + =     530.603

Total of 2 streams to confluence:
Flow rates before confluence point:
     658.641     105.271
Maximum flow rates at confluence using above data:
      738.039      530.603
Area of streams before confluence:
      633.100       82.400
Results of confluence:
Total flow rate =    738.039(CFS)
Time of concentration =    19.335 min.
Effective stream area after confluence =    715.500(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.051 to Point/Station        1.061
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
!!Warning: Water is above left or right bank elevations
Estimated mean flow rate at midpoint of channel =    738.081(CFS)
Depth of flow =   3.912(Ft.), Average velocity =   8.103(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              4.00
      2              9.00              2.00
      3             18.00              0.00
      4             22.00              0.00
      5             32.00              2.00
      6             45.00              4.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    738.081(CFS)
  '     '    flow top width =     44.033(Ft.)
  '     '    velocity=    8.103(Ft/s)
  '     '    area =     91.086(Sq.Ft)
  '     '    Froude number =     0.993

Upstream point elevation =  3895.500(Ft.)
Downstream point elevation =  3864.000(Ft.)
Flow length =  2227.000(Ft.)
Travel time  =    4.58 min.
Time of concentration =   23.92 min.
Depth of flow =   3.912(Ft.)
Average velocity =   8.103(Ft/s)
Total irregular channel flow =   738.081(CFS)
Irregular channel normal depth above invert elev. =   3.912(Ft.)
Average velocity of channel(s) =   8.103(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
The area added to the existing stream causes a
a lower flow rate of Q =    698.679(CFS)
therefore the upstream flow rate of Q =    738.039(CFS) is being used
Rainfall intensity =      3.360(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.260  CA =    207.918
Subarea runoff =      0.000(CFS) for     83.100(Ac.)
Total runoff =    738.039(CFS)      Total area =     798.600(Ac.)
Depth of flow =   3.912(Ft.), Average velocity =   8.103(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.051 to Point/Station        1.061
```

```
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    798.600(Ac.)
Runoff from this stream =    738.039(CFS)
Time of concentration =   23.92 min.
Rainfall intensity =     3.360(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.011 to Point/Station        4.021
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance  = 1172.000(Ft.)
Highest elevation = 4275.000(Ft.)
Lowest elevation = 4025.000(Ft.)
Elevation difference =  250.000(Ft.) Slope = 21.331 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  21.33 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.52 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(  21.331^(1/3)]=   5.52
The initial area total distance of 1172.00 (Ft.) entered leaves a
remaining distance of 1072.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   3.05 minutes
for a distance of 1072.00 (Ft.) and a slope of 21.33 %
with an elevation difference of 228.67(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    3.049 Minutes
Tt=[(11.9*0.2030^3)/(228.67)]^.385=  3.05
Total initial area Ti =   5.52 minutes from Figure 3-3 formula plus
  3.05 minutes from the Figure 3-4 formula =   8.57 minutes
Rainfall intensity (I) =      6.516(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
Subarea runoff =     15.476(CFS)
Total initial stream area =        9.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.021 to Point/Station        4.032
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     55.929(CFS)
```

```
Depth of flow =   0.759(Ft.), Average velocity =   6.024(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             10.00
      2             48.00              5.00
      3             90.00              0.00
      4             96.00              0.00
      5            136.00              5.00
      6            156.00             10.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     55.929(CFS)
  '     '    flow top width =     18.453(Ft.)
  '     '    velocity=    6.024(Ft/s)
  '     '    area =      9.284(Sq.Ft)
  '     '    Froude number =     1.497

Upstream point elevation =  4025.000(Ft.)
Downstream point elevation =  3872.000(Ft.)
Flow length =  3021.000(Ft.)
Travel time  =    8.36 min.
Time of concentration =   16.92 min.
Depth of flow =   0.759(Ft.)
Average velocity =   6.024(Ft/s)
Total irregular channel flow =    55.929(CFS)
Irregular channel normal depth above invert elev. =   0.759(Ft.)
Average velocity of channel(s) =   6.024(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      4.200(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.250  CA =     22.925
Subarea runoff =     80.810(CFS) for     82.200(Ac.)
Total runoff =     96.286(CFS)      Total area =      91.700(Ac.)
Depth of flow =   0.984(Ft.), Average velocity =   6.960(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.021 to Point/Station        4.032
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     91.700(Ac.)
Runoff from this stream =     96.286(CFS)
Time of concentration =   16.92 min.
Rainfall intensity =     4.200(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.031 to Point/Station        4.032
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance  = 2687.000(Ft.)
Highest elevation = 3968.000(Ft.)
Lowest elevation = 3872.000(Ft.)
Elevation difference =   96.000(Ft.) Slope =  3.573 %
Top of Initial Area Slope adjusted by User to  1.000 %
Bottom of Initial Area Slope adjusted by User to  3.700 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =  12.80 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2500)*(  70.000^.5)/(   1.000^(1/3)]=  12.80
The initial area total distance of 2687.00 (Ft.) entered leaves a
remaining distance of 2617.00 (Ft.)
Using Figure 3-4, the travel time for this distance is  11.90 minutes
for a distance of 2617.00 (Ft.) and a slope of  3.70 %
with an elevation difference of  96.83(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =   11.900 Minutes
Tt=[(11.9*0.4956^3)/( 96.83)]^.385= 11.90
Total initial area Ti =  12.80 minutes from Figure 3-3 formula plus
 11.90 minutes from the Figure 3-4 formula =  24.70 minutes
Rainfall intensity (I) =      3.291(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
Subarea runoff =     46.651(CFS)
Total initial stream area =       56.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.031 to Point/Station        4.032
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     56.700(Ac.)
Runoff from this stream =     46.651(CFS)
Time of concentration =   24.70 min.
Rainfall intensity =     3.291(In/Hr)
Summary of stream data:

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

```
1       96.286     16.92               4.200
2       46.651     24.70               3.291
Qmax(1) =
         1.000 *    1.000 *    96.286) +
         1.000 *    0.685 *    46.651) + =     128.250
Qmax(2) =
         0.784 *    1.000 *    96.286) +
         1.000 *    1.000 *    46.651) + =     122.100

Total of 2 streams to confluence:
Flow rates before confluence point:
      96.286      46.651
Maximum flow rates at confluence using above data:
      128.250      122.100
Area of streams before confluence:
       91.700       56.700
Results of confluence:
Total flow rate =    128.250(CFS)
Time of concentration =    16.924 min.
Effective stream area after confluence =    148.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.032 to Point/Station        4.051
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Depth of flow =   1.404(Ft.), Average velocity =   6.677(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              3.00
      2              8.00              1.00
      3             18.00              0.00
      4             20.00              0.00
      5             27.00              1.00
      6             44.00              3.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    128.250(CFS)
  '     '    flow top width =     24.055(Ft.)
  '     '    velocity=    6.677(Ft/s)
  '     '    area =     19.206(Sq.Ft)
  '     '    Froude number =     1.317

Upstream point elevation =  3872.000(Ft.)
Downstream point elevation =  3864.000(Ft.)
Flow length =   237.000(Ft.)
Travel time  =    0.59 min.
Time of concentration =   17.52 min.
Depth of flow =   1.404(Ft.)
Average velocity =   6.677(Ft/s)
Total irregular channel flow =   128.250(CFS)
Irregular channel normal depth above invert elev. =   1.404(Ft.)
Average velocity of channel(s) =   6.677(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.032 to Point/Station        4.051
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    148.400(Ac.)
Runoff from this stream =    128.250(CFS)
Time of concentration =   17.52 min.
Rainfall intensity =     4.108(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.041 to Point/Station        4.051
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance  = 1959.000(Ft.)
Highest elevation = 4054.000(Ft.)
Lowest elevation = 3864.000(Ft.)
Elevation difference =  190.000(Ft.) Slope =  9.699 %
Top of Initial Area Slope adjusted by User to 29.000 %
Bottom of Initial Area Slope adjusted by User to  8.700 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  29.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.98 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(  29.000^(1/3)]=   4.98
The initial area total distance of 1959.00 (Ft.) entered leaves a
remaining distance of 1859.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   6.58 minutes
for a distance of 1859.00 (Ft.) and a slope of  8.70 %
with an elevation difference of 161.73(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    6.580 Minutes
Tt=[(11.9*0.3521^3)/(161.73)]^.385=  6.58
Total initial area Ti =   4.98 minutes from Figure 3-3 formula plus
  6.58 minutes from the Figure 3-4 formula =  11.56 minutes
Rainfall intensity (I) =      5.371(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
Subarea runoff =     46.457(CFS)
Total initial stream area =       34.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.041 to Point/Station        4.051
```

```
**** CONFLUENCE OF MINOR STREAMS ****
--------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     34.600(Ac.)
Runoff from this stream =     46.457(CFS)
Time of concentration =   11.56 min.
Rainfall intensity =     5.371(In/Hr)
Summary of stream data:

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


1      128.250     17.52               4.108
2       46.457     11.56               5.371
Qmax(1) =
         1.000 *    1.000 *   128.250) +
         0.765 *    1.000 *    46.457) + =     163.784
Qmax(2) =
         1.000 *    0.660 *   128.250) +
         1.000 *    1.000 *    46.457) + =     131.099

Total of 2 streams to confluence:
Flow rates before confluence point:
     128.250      46.457
Maximum flow rates at confluence using above data:
      163.784      131.099
Area of streams before confluence:
      148.400       34.600
Results of confluence:
Total flow rate =    163.784(CFS)
Time of concentration =    17.516 min.
Effective stream area after confluence =    183.000(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.051 to Point/Station        1.061
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
--------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    176.120(CFS)
Depth of flow =   2.066(Ft.), Average velocity =   6.914(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              4.00
      2              6.00              2.00
      3             13.00              0.00
      4             15.00              0.00
      5             28.00              2.00
      6             43.00              4.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    176.120(CFS)
  '     '    flow top width =     22.692(Ft.)
  '     '    velocity=    6.914(Ft/s)
  '     '    area =     25.472(Sq.Ft)
```

```
  '     '    Froude number =     1.150

Upstream point elevation =  3864.000(Ft.)
Downstream point elevation =  3850.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.45 min.
Time of concentration =   18.96 min.
Depth of flow =   2.066(Ft.)
Average velocity =   6.914(Ft/s)
Total irregular channel flow =   176.120(CFS)
Irregular channel normal depth above invert elev. =   2.066(Ft.)
Average velocity of channel(s) =   6.914(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      3.903(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.250  CA =     48.300
Subarea runoff =     24.734(CFS) for     10.200(Ac.)
Total runoff =    188.519(CFS)      Total area =     193.200(Ac.)
Depth of flow =   2.124(Ft.), Average velocity =   7.029(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.051 to Point/Station        1.061
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    193.200(Ac.)
Runoff from this stream =    188.519(CFS)
Time of concentration =   18.96 min.
Rainfall intensity =     3.903(In/Hr)
Summary of stream data:

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


1      738.039     23.92               3.360
2      188.519     18.96               3.903
Qmax(1) =
         1.000 *    1.000 *   738.039) +
         0.861 *    1.000 *   188.519) + =     900.345
Qmax(2) =
         1.000 *    0.793 *   738.039) +
         1.000 *    1.000 *   188.519) + =     773.677

Total of 2 main streams to confluence:
Flow rates before confluence point:
     738.039     188.519
```

```
Maximum flow rates at confluence using above data:
      900.345      773.677
Area of streams before confluence:
      798.600      193.200


Results of confluence:
Total flow rate =    900.345(CFS)
Time of concentration =    23.916 min.
Effective stream area after confluence  =    991.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.061 to Point/Station        1.071
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
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!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
!!Warning: Water is above left or right bank elevations
Estimated mean flow rate at midpoint of channel =    900.378(CFS)
Depth of flow =   4.560(Ft.), Average velocity =   8.461(Ft/s)
!!Warning: Water is above left or right bank elevations
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              4.00
      2              7.00              2.00
      3             14.00              0.00
      4             16.00              0.00
      5             28.00              2.00
      6             40.00              4.00
Manning's 'N' friction factor =   0.035
----------------------------------------------------------------
Sub-Channel flow  =    900.378(CFS)
  '     '    flow top width =     40.000(Ft.)
  '     '    velocity=    8.461(Ft/s)
  '     '    area =    106.418(Sq.Ft)
  '     '    Froude number =     0.914

Upstream point elevation =  3850.000(Ft.)
Downstream point elevation =  3836.000(Ft.)
Flow length =  1262.000(Ft.)
Travel time  =    2.49 min.
Time of concentration =   26.40 min.
Depth of flow =   4.560(Ft.)
Average velocity =   8.461(Ft/s)
Total irregular channel flow =   900.378(CFS)
Irregular channel normal depth above invert elev. =   4.560(Ft.)
```

```
Average velocity of channel(s) =   8.461(Ft/s)
!!Warning: Water is above left or right bank elevations
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
The area added to the existing stream causes a
a lower flow rate of Q =    866.186(CFS)
therefore the upstream flow rate of Q =    900.345(CFS) is being used
Rainfall intensity =      3.153(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.258  CA =    274.743
Subarea runoff =      0.000(CFS) for     74.100(Ac.)
Total runoff =    900.345(CFS)      Total area =    1065.900(Ac.)
Depth of flow =   4.560(Ft.), Average velocity =   8.461(Ft/s)
!!Warning: Water is above left or right bank elevations


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.061 to Point/Station        1.071
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =   1065.900(Ac.)
Runoff from this stream =    900.345(CFS)
Time of concentration =   26.40 min.
Rainfall intensity =     3.153(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.011 to Point/Station        5.021
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance  =  677.000(Ft.)
Highest elevation = 4061.000(Ft.)
Lowest elevation = 3976.000(Ft.)
Elevation difference =   85.000(Ft.) Slope = 12.555 %
Top of Initial Area Slope adjusted by User to 13.000 %
Bottom of Initial Area Slope adjusted by User to 12.470 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  13.00 %, in a development type of
```

```
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.51 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(  13.000^(1/3)]=   6.51
The initial area total distance of  677.00 (Ft.) entered leaves a
remaining distance of  577.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   2.33 minutes
for a distance of 577.00 (Ft.) and a slope of 12.47 %
with an elevation difference of  71.95(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    2.327 Minutes
Tt=[(11.9*0.1093^3)/( 71.95)]^.385=  2.33
Total initial area Ti =   6.51 minutes from Figure 3-3 formula plus
  2.33 minutes from the Figure 3-4 formula =   8.83 minutes
Rainfall intensity (I) =      6.388(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
Subarea runoff =     18.526(CFS)
Total initial stream area =       11.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.021 to Point/Station        1.071
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     65.935(CFS)
Depth of flow =   1.177(Ft.), Average velocity =   8.006(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              4.00
      2             10.00              2.00
      3             17.00              0.00
      4             19.00              0.00
      5             29.00              2.00
      6             43.00              4.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     65.935(CFS)
  '     '    flow top width =     12.000(Ft.)
  '     '    velocity=    8.006(Ft/s)
  '     '    area =      8.236(Sq.Ft)
  '     '    Froude number =     1.703

Upstream point elevation =  3976.000(Ft.)
Downstream point elevation =  3836.000(Ft.)
Flow length =  2311.000(Ft.)
Travel time  =    4.81 min.
Time of concentration =   13.64 min.
Depth of flow =   1.177(Ft.)
Average velocity =   8.006(Ft/s)
Total irregular channel flow =    65.935(CFS)
Irregular channel normal depth above invert elev. =   1.177(Ft.)
Average velocity of channel(s) =   8.006(Ft/s)
 Adding area flow to channel
```

```
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      4.826(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.250  CA =     23.475
Subarea runoff =     94.764(CFS) for     82.300(Ac.)
Total runoff =    113.290(CFS)      Total area =      93.900(Ac.)
Depth of flow =   1.485(Ft.), Average velocity =   9.184(Ft/s)


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Process from Point/Station        5.021 to Point/Station        1.071
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     93.900(Ac.)
Runoff from this stream =    113.290(CFS)
Time of concentration =   13.64 min.
Rainfall intensity =     4.826(In/Hr)
Summary of stream data:

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


1      900.345     26.40               3.153
2      113.290     13.64               4.826
Qmax(1) =
         1.000 *    1.000 *   900.345) +
         0.653 *    1.000 *   113.290) + =     974.355
Qmax(2) =
         1.000 *    0.517 *   900.345) +
         1.000 *    1.000 *   113.290) + =     578.601

Total of 2 main streams to confluence:
Flow rates before confluence point:
     900.345     113.290
Maximum flow rates at confluence using above data:
      974.355      578.601
Area of streams before confluence:
     1065.900       93.900


Results of confluence:
Total flow rate =    974.355(CFS)
Time of concentration =    26.402 min.
Effective stream area after confluence  =   1159.800(Ac.)


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Process from Point/Station        1.071 to Point/Station        1.081
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    990.502(CFS)
Depth of flow =   4.647(Ft.), Average velocity =  17.079(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              8.00
      2              7.00              6.00
      3             14.00              4.00
      4             20.00              2.00
      5             26.00              0.00
      6             28.00              0.00
      7             31.00              2.00
      8             34.00              4.00
      9             37.00              6.00
      10             40.00              8.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    990.501(CFS)
  '     '    flow top width =     23.237(Ft.)
  '     '    velocity=   17.079(Ft/s)
  '     '    area =     57.996(Sq.Ft)
  '     '    Froude number =     1.905

Upstream point elevation =  3836.000(Ft.)
Downstream point elevation =  3625.000(Ft.)
Flow length =  3924.000(Ft.)
Travel time  =    3.83 min.
Time of concentration =   30.23 min.
Depth of flow =   4.647(Ft.)
Average velocity =  17.079(Ft/s)
Total irregular channel flow =   990.502(CFS)
Irregular channel normal depth above invert elev. =   4.647(Ft.)
Average velocity of channel(s) =  17.079(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      2.889(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.256  CA =    348.418
Subarea runoff =     32.220(CFS) for    200.800(Ac.)
Total runoff =   1006.575(CFS)      Total area =    1360.600(Ac.)
Depth of flow =   4.678(Ft.), Average velocity =  17.144(Ft/s)


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Process from Point/Station        1.071 to Point/Station        1.081
**** CONFLUENCE OF MAIN STREAMS ****
```

```
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =   1360.600(Ac.)
Runoff from this stream =   1006.575(CFS)
Time of concentration =   30.23 min.
Rainfall intensity =     2.889(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.011 to Point/Station        6.021
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  = 1028.000(Ft.)
Highest elevation = 4261.000(Ft.)
Lowest elevation = 4210.000(Ft.)
Elevation difference =   51.000(Ft.) Slope =  4.961 %
Top of Initial Area Slope adjusted by User to  1.000 %
Bottom of Initial Area Slope adjusted by User to  5.390 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =  12.05 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*(  70.000^.5)/(   1.000^(1/3)]=  12.05
The initial area total distance of 1028.00 (Ft.) entered leaves a
remaining distance of  958.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   4.75 minutes
for a distance of 958.00 (Ft.) and a slope of  5.39 %
with an elevation difference of  51.64(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    4.749 Minutes
Tt=[(11.9*0.1814^3)/( 51.64)]^.385=  4.75
Total initial area Ti =  12.05 minutes from Figure 3-3 formula plus
  4.75 minutes from the Figure 3-4 formula =  16.80 minutes
Rainfall intensity (I) =      4.221(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
Subarea runoff =     27.349(CFS)
Total initial stream area =       21.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.021 to Point/Station        6.031
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
```

```
Estimated mean flow rate at midpoint of channel =     75.155(CFS)
Depth of flow =   0.999(Ft.), Average velocity =  10.602(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             16.00              0.00
      3             20.00              0.00
      4             35.00              5.00
Manning's 'N' friction factor =   0.035
----------------------------------------------------------------
Sub-Channel flow  =     75.155(CFS)
  '     '    flow top width =     10.193(Ft.)
  '     '    velocity=   10.602(Ft/s)
  '     '    area =      7.089(Sq.Ft)
  '     '    Froude number =     2.241

Upstream point elevation =  4210.000(Ft.)
Downstream point elevation =  4005.000(Ft.)
Flow length =  1945.000(Ft.)
Travel time  =    3.06 min.
Time of concentration =   19.85 min.
Depth of flow =   0.999(Ft.)
Average velocity =  10.602(Ft/s)
Total irregular channel flow =    75.155(CFS)
Irregular channel normal depth above invert elev. =   0.999(Ft.)
Average velocity of channel(s) =  10.602(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      3.789(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.259  CA =     32.430
Subarea runoff =     95.528(CFS) for    103.800(Ac.)
Total runoff =    122.878(CFS)      Total area =     125.400(Ac.)
Depth of flow =   1.275(Ft.), Average velocity =  12.115(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.031 to Point/Station        6.051
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =    151.621(CFS)
Depth of flow =   1.548(Ft.), Average velocity =   9.189(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             15.00              0.00
```

```
      3             19.00              0.00
      4             47.00              5.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =    151.621(CFS)
  '     '    flow top width =     17.315(Ft.)
  '     '    velocity=    9.189(Ft/s)
  '     '    area =     16.500(Sq.Ft)
  '     '    Froude number =     1.659

Upstream point elevation =  4005.000(Ft.)
Downstream point elevation =  3913.000(Ft.)
Flow length =  1788.000(Ft.)
Travel time  =    3.24 min.
Time of concentration =   23.10 min.
Depth of flow =   1.548(Ft.)
Average velocity =   9.189(Ft/s)
Total irregular channel flow =   151.621(CFS)
Irregular channel normal depth above invert elev. =   1.548(Ft.)
Average velocity of channel(s) =   9.189(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      3.437(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.255  CA =     52.455
Subarea runoff =     57.396(CFS) for     80.100(Ac.)
Total runoff =    180.274(CFS)      Total area =     205.500(Ac.)
Depth of flow =   1.675(Ft.), Average velocity =   9.609(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.031 to Point/Station        6.051
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    205.500(Ac.)
Runoff from this stream =    180.274(CFS)
Time of concentration =   23.10 min.
Rainfall intensity =     3.437(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.041 to Point/Station        6.051
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
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
[UNDISTURBED NATURAL TERRAIN                ]
```

```
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance  = 3077.000(Ft.)
Highest elevation = 4246.000(Ft.)
Lowest elevation = 3913.000(Ft.)
Elevation difference =  333.000(Ft.) Slope = 10.822 %
Top of Initial Area Slope adjusted by User to  6.000 %
Bottom of Initial Area Slope adjusted by User to 10.900 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   6.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   8.42 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(   6.000^(1/3)]=   8.42
The initial area total distance of 3077.00 (Ft.) entered leaves a
remaining distance of 2977.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   8.67 minutes
for a distance of 2977.00 (Ft.) and a slope of 10.90 %
with an elevation difference of 324.49(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    8.670 Minutes
Tt=[(11.9*0.5638^3)/(324.49)]^.385=  8.67
Total initial area Ti =   8.42 minutes from Figure 3-3 formula plus
  8.67 minutes from the Figure 3-4 formula =  17.09 minutes
Rainfall intensity (I) =      4.174(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
Subarea runoff =     70.329(CFS)
Total initial stream area =       67.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.041 to Point/Station        6.051
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     67.400(Ac.)
Runoff from this stream =     70.329(CFS)
Time of concentration =   17.09 min.
Rainfall intensity =     4.174(In/Hr)
Summary of stream data:

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


1      180.274     23.10               3.437
2       70.329     17.09               4.174
Qmax(1) =
          1.000 *    1.000 *   180.274) +
          0.823 *    1.000 *    70.329) + =     238.183
Qmax(2) =
          1.000 *    0.740 *   180.274) +
          1.000 *    1.000 *    70.329) + =     203.712
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
     180.274      70.329
Maximum flow rates at confluence using above data:
      238.183      203.712
Area of streams before confluence:
      205.500       67.400
Results of confluence:
Total flow rate =    238.183(CFS)
Time of concentration =    23.097 min.
Effective stream area after confluence =    272.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.051 to Point/Station        6.111
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    253.166(CFS)
Depth of flow =   1.699(Ft.), Average velocity =   8.253(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             36.00              0.00
      3             42.00              0.00
      4             77.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    253.166(CFS)
  '     '    flow top width =     30.120(Ft.)
  '     '    velocity=    8.253(Ft/s)
  '     '    area =     30.676(Sq.Ft)
  '     '    Froude number =     1.441

Upstream point elevation =  3913.000(Ft.)
Downstream point elevation =  3840.000(Ft.)
Flow length =  1959.000(Ft.)
Travel time  =    3.96 min.
Time of concentration =   27.05 min.
Depth of flow =   1.699(Ft.)
Average velocity =   8.253(Ft/s)
Total irregular channel flow =   253.166(CFS)
Irregular channel normal depth above invert elev. =   1.699(Ft.)
Average velocity of channel(s) =   8.253(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      3.104(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
```

```
(Q=KCIA) is C = 0.253  CA =     86.380
Subarea runoff =     29.902(CFS) for     68.300(Ac.)
Total runoff =    268.085(CFS)      Total area =     341.200(Ac.)
Depth of flow =   1.742(Ft.), Average velocity =   8.375(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.051 to Point/Station        6.111
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    341.200(Ac.)
Runoff from this stream =    268.085(CFS)
Time of concentration =   27.05 min.
Rainfall intensity =     3.104(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.061 to Point/Station        6.071
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  =  970.000(Ft.)
Highest elevation = 4436.000(Ft.)
Lowest elevation = 4375.000(Ft.)
Elevation difference =   61.000(Ft.) Slope =  6.289 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   6.29 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.80 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(   6.289^(1/3)]=   7.80
The initial area total distance of  970.00 (Ft.) entered leaves a
remaining distance of  870.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   4.15 minutes
for a distance of 870.00 (Ft.) and a slope of  6.29 %
with an elevation difference of  54.71(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    4.155 Minutes
Tt=[(11.9*0.1648^3)/( 54.71)]^.385=  4.15
Total initial area Ti =   7.80 minutes from Figure 3-3 formula plus
  4.15 minutes from the Figure 3-4 formula =  11.96 minutes
Rainfall intensity (I) =      5.255(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
Subarea runoff =     35.473(CFS)
Total initial stream area =       22.500(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.071 to Point/Station        6.081
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     79.467(CFS)
Depth of flow =   0.868(Ft.), Average velocity =   5.410(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             54.00              0.00
      3             60.00              0.00
      4            132.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     79.467(CFS)
  '     '    flow top width =     27.862(Ft.)
  '     '    velocity=    5.410(Ft/s)
  '     '    area =     14.688(Sq.Ft)
  '     '    Froude number =     1.313

Upstream point elevation =  4375.000(Ft.)
Downstream point elevation =  4260.000(Ft.)
Flow length =  3006.000(Ft.)
Travel time  =    9.26 min.
Time of concentration =   21.22 min.
Depth of flow =   0.868(Ft.)
Average velocity =   5.410(Ft/s)
Total irregular channel flow =    79.467(CFS)
Irregular channel normal depth above invert elev. =   0.868(Ft.)
Average velocity of channel(s) =   5.410(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.400
Decimal fraction soil group C = 0.600
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.280
Rainfall intensity =      3.630(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.284  CA =     33.994
Subarea runoff =     87.934(CFS) for     97.300(Ac.)
Total runoff =    123.406(CFS)      Total area =     119.800(Ac.)
Depth of flow =   1.055(Ft.), Average velocity =   6.059(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.081 to Point/Station        6.091
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    147.761(CFS)
Depth of flow =   1.257(Ft.), Average velocity =   4.955(Ft/s)
      ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2            112.00              0.00
      3            116.00              0.00
      4            161.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    147.761(CFS)
  '     '    flow top width =     43.458(Ft.)
  '     '    velocity=    4.955(Ft/s)
  '     '    area =     29.819(Sq.Ft)
  '     '    Froude number =     1.054

Upstream point elevation =  4260.000(Ft.)
Downstream point elevation =  4185.500(Ft.)
Flow length =  3300.000(Ft.)
Travel time  =   11.10 min.
Time of concentration =   32.32 min.
Depth of flow =   1.257(Ft.)
Average velocity =   4.955(Ft/s)
Total irregular channel flow =   147.761(CFS)
Irregular channel normal depth above invert elev. =   1.257(Ft.)
Average velocity of channel(s) =   4.955(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.850
Decimal fraction soil group C = 0.150
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.258
Rainfall intensity =      2.767(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.271  CA =     62.165
Subarea runoff =     48.626(CFS) for    109.400(Ac.)
Total runoff =    172.032(CFS)      Total area =     229.200(Ac.)
Depth of flow =   1.337(Ft.), Average velocity =   5.148(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.091 to Point/Station        6.101
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    222.002(CFS)
Depth of flow =   1.846(Ft.), Average velocity =  12.968(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             16.00              0.00
      3             19.00              0.00
      4             37.00              5.00
Manning's 'N' friction factor =   0.035
```

```
------------------------------------------------------------------
Sub-Channel flow  =    222.002(CFS)
  '     '    flow top width =     15.551(Ft.)
  '     '    velocity=   12.968(Ft/s)
  '     '    area =     17.120(Sq.Ft)
  '     '    Froude number =     2.178

Upstream point elevation =  4185.500(Ft.)
Downstream point elevation =  3960.000(Ft.)
Flow length =  2627.000(Ft.)
Travel time  =    3.38 min.
Time of concentration =   35.69 min.
Depth of flow =   1.846(Ft.)
Average velocity =  12.968(Ft/s)
Total irregular channel flow =   222.002(CFS)
Irregular channel normal depth above invert elev. =   1.846(Ft.)
Average velocity of channel(s) =  12.968(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.700
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.265
Rainfall intensity =      2.596(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.269  CA =    104.750
Subarea runoff =     99.852(CFS) for    160.700(Ac.)
Total runoff =    271.885(CFS)      Total area =     389.900(Ac.)
Depth of flow =   2.019(Ft.), Average velocity =  13.656(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.101 to Point/Station        6.111
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________
Estimated mean flow rate at midpoint of channel =    278.623(CFS)
Depth of flow =   2.159(Ft.), Average velocity =  11.978(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             10.00
      2             16.00              5.00
      3             36.00              0.00
      4             39.00              0.00
      5             55.00              5.00
      6             73.00             10.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    278.623(CFS)
  '     '    flow top width =     18.546(Ft.)
  '     '    velocity=   11.978(Ft/s)
  '     '    area =     23.260(Sq.Ft)
  '     '    Froude number =     1.885
```

```
Upstream point elevation =  3960.000(Ft.)
Downstream point elevation =  3840.000(Ft.)
Flow length =  1955.000(Ft.)
Travel time  =    2.72 min.
Time of concentration =   38.41 min.
Depth of flow =   2.159(Ft.)
Average velocity =  11.978(Ft/s)
Total irregular channel flow =   278.623(CFS)
Irregular channel normal depth above invert elev. =   2.159(Ft.)
Average velocity of channel(s) =  11.978(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      2.475(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.267  CA =    115.250
Subarea runoff =     13.413(CFS) for     42.000(Ac.)
Total runoff =    285.297(CFS)      Total area =     431.900(Ac.)
Depth of flow =   2.181(Ft.), Average velocity =  12.051(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.101 to Point/Station        6.111
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =    431.900(Ac.)
Runoff from this stream =    285.297(CFS)
Time of concentration =   38.41 min.
Rainfall intensity =     2.475(In/Hr)
Summary of stream data:

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


1      268.085     27.05               3.104
2      285.297     38.41               2.475
Qmax(1) =
         1.000 *    1.000 *   268.085) +
         1.000 *    0.704 *   285.297) + =     469.016
Qmax(2) =
         0.798 *    1.000 *   268.085) +
         1.000 *    1.000 *   285.297) + =     499.128

Total of 2 streams to confluence:
Flow rates before confluence point:
     268.085     285.297
Maximum flow rates at confluence using above data:
      469.016      499.128
```

```
Area of streams before confluence:
      341.200      431.900
Results of confluence:
Total flow rate =    499.128(CFS)
Time of concentration =    38.412 min.
Effective stream area after confluence =    773.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.111 to Point/Station        6.131
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    500.077(CFS)
Depth of flow =   3.793(Ft.), Average velocity =  10.564(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             10.00
      2              7.00              5.00
      3             22.00              0.00
      4             25.00              0.00
      5             35.00              5.00
      6             44.00             10.00
Manning's 'N' friction factor =   0.035
----------------------------------------------------------------
Sub-Channel flow  =    500.077(CFS)
  '     '    flow top width =     21.963(Ft.)
  '     '    velocity=   10.564(Ft/s)
  '     '    area =     47.338(Sq.Ft)
  '     '    Froude number =     1.268

Upstream point elevation =  3840.000(Ft.)
Downstream point elevation =  3827.000(Ft.)
Flow length =   535.000(Ft.)
Travel time  =    0.84 min.
Time of concentration =   39.26 min.
Depth of flow =   3.793(Ft.)
Average velocity =  10.564(Ft/s)
Total irregular channel flow =   500.077(CFS)
Irregular channel normal depth above invert elev. =   3.793(Ft.)
Average velocity of channel(s) =  10.564(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      2.441(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.261  CA =    205.230
Subarea runoff =      1.839(CFS) for     14.400(Ac.)
Total runoff =    500.967(CFS)      Total area =     787.500(Ac.)
Depth of flow =   3.795(Ft.), Average velocity =  10.569(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.111 to Point/Station        6.131
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    787.500(Ac.)
Runoff from this stream =    500.967(CFS)
Time of concentration =   39.26 min.
Rainfall intensity =     2.441(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.121 to Point/Station        6.131
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.900
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.255
Initial subarea total flow distance  = 4269.000(Ft.)
Highest elevation = 4462.000(Ft.)
Lowest elevation = 3827.000(Ft.)
Elevation difference =  635.000(Ft.) Slope = 14.875 %
Top of Initial Area Slope adjusted by User to  8.000 %
Bottom of Initial Area Slope adjusted by User to 15.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   8.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.61 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2550)*( 100.000^.5)/(   8.000^(1/3)]=   7.61
The initial area total distance of 4269.00 (Ft.) entered leaves a
remaining distance of 4169.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   9.94 minutes
for a distance of 4169.00 (Ft.) and a slope of 15.00 %
with an elevation difference of 625.35(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    9.936 Minutes
Tt=[(11.9*0.7896^3)/(625.35)]^.385=  9.94
Total initial area Ti =   7.61 minutes from Figure 3-3 formula plus
  9.94 minutes from the Figure 3-4 formula =  17.54 minutes
Rainfall intensity (I) =      4.104(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.255
Subarea runoff =     86.131(CFS)
Total initial stream area =       82.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
Process from Point/Station        6.121 to Point/Station        6.131
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     82.300(Ac.)
Runoff from this stream =     86.131(CFS)
Time of concentration =   17.54 min.
Rainfall intensity =     4.104(In/Hr)
Summary of stream data:

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


1      500.967     39.26               2.441
2       86.131     17.54               4.104
Qmax(1) =
         1.000 *    1.000 *   500.967) +
         0.595 *    1.000 *    86.131) + =     552.195
Qmax(2) =
         1.000 *    0.447 *   500.967) +
         1.000 *    1.000 *    86.131) + =     309.983

Total of 2 streams to confluence:
Flow rates before confluence point:
     500.967      86.131
Maximum flow rates at confluence using above data:
      552.195      309.983
Area of streams before confluence:
      787.500       82.300
Results of confluence:
Total flow rate =    552.195(CFS)
Time of concentration =    39.256 min.
Effective stream area after confluence =    869.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.131 to Point/Station        1.081
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    575.460(CFS)
Depth of flow =   2.677(Ft.), Average velocity =  15.994(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              10.00
      2             14.00               5.00
      3             39.00               0.00
      4             42.00               0.00
      5             56.00               5.00
      6            101.00              10.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    575.459(CFS)
  '     '    flow top width =     23.881(Ft.)
  '     '    velocity=   15.994(Ft/s)
```

```
  '     '    area =     35.980(Sq.Ft)
  '     '    Froude number =     2.296

Upstream point elevation =  3827.000(Ft.)
Downstream point elevation =  3625.000(Ft.)
Flow length =  2362.000(Ft.)
Travel time  =    2.46 min.
Time of concentration =   41.72 min.
Depth of flow =   2.677(Ft.)
Average velocity =  15.994(Ft/s)
Total irregular channel flow =   575.460(CFS)
Irregular channel normal depth above invert elev. =   2.677(Ft.)
Average velocity of channel(s) =  15.994(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      2.347(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.259  CA =    255.066
Subarea runoff =     46.474(CFS) for    115.400(Ac.)
Total runoff =    598.669(CFS)      Total area =     985.200(Ac.)
Depth of flow =   2.722(Ft.), Average velocity =  16.154(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.131 to Point/Station        1.081
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    985.200(Ac.)
Runoff from this stream =    598.669(CFS)
Time of concentration =   41.72 min.
Rainfall intensity =     2.347(In/Hr)
Summary of stream data:

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


1     1006.575     30.23               2.889
2      598.669     41.72               2.347
Qmax(1) =
         1.000 *    1.000 *  1006.575) +
         1.000 *    0.725 *   598.669) + =    1440.408
Qmax(2) =
         0.812 *    1.000 *  1006.575) +
         1.000 *    1.000 *   598.669) + =    1416.444

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

```
    1006.575     598.669
Maximum flow rates at confluence using above data:
     1440.408     1416.444
Area of streams before confluence:
     1360.600      985.200


Results of confluence:
Total flow rate =   1440.408(CFS)
Time of concentration =    30.231 min.
Effective stream area after confluence  =   2345.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.081 to Point/Station        1.091
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =   1601.402(CFS)
Depth of flow =   5.031(Ft.), Average velocity =  15.000(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              6.00
      2              6.00              4.00
      3             12.00              2.00
      4             18.00              0.00
      5             20.00              0.00
      6             29.00              2.00
      7             39.00              4.00
      8             47.00              6.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =   1601.401(CFS)
  '     '    flow top width =     40.220(Ft.)
  '     '    velocity=   15.000(Ft/s)
  '     '    area =    106.763(Sq.Ft)
  '     '    Froude number =     1.622

Upstream point elevation =  3625.000(Ft.)
Downstream point elevation =  3560.000(Ft.)
Flow length =  1831.000(Ft.)
Travel time  =    2.03 min.
Time of concentration =   32.27 min.
Depth of flow =   5.031(Ft.)
Average velocity =  15.000(Ft/s)
Total irregular channel flow =  1601.402(CFS)
Irregular channel normal depth above invert elev. =   5.031(Ft.)
Average velocity of channel(s) =  15.000(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
```

```
Sub-Area C Value = 0.250
Rainfall intensity =      2.770(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.257  CA =    636.234
Subarea runoff =    322.050(CFS) for    131.000(Ac.)
Total runoff =   1762.458(CFS)      Total area =    2476.800(Ac.)
Depth of flow =   5.223(Ft.), Average velocity =  15.382(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.081 to Point/Station        1.091
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =   2476.800(Ac.)
Runoff from this stream =   1762.458(CFS)
Time of concentration =   32.27 min.
Rainfall intensity =     2.770(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.071 to Point/Station        1.072
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  = 1263.000(Ft.)
Highest elevation = 4058.000(Ft.)
Lowest elevation = 3985.000(Ft.)
Elevation difference =   73.000(Ft.) Slope =  5.780 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   5.78 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   8.02 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(   5.780^(1/3)]=   8.02
The initial area total distance of 1263.00 (Ft.) entered leaves a
remaining distance of 1163.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   5.37 minutes
for a distance of 1163.00 (Ft.) and a slope of  5.78 %
with an elevation difference of  67.22(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    5.367 Minutes
Tt=[(11.9*0.2203^3)/( 67.22)]^.385=  5.37
Total initial area Ti =   8.02 minutes from Figure 3-3 formula plus
  5.37 minutes from the Figure 3-4 formula =  13.39 minutes
```

```
Rainfall intensity (I) =      4.885(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
Subarea runoff =     44.696(CFS)
Total initial stream area =       30.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.072 to Point/Station        1.073
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    127.793(CFS)
Depth of flow =   1.393(Ft.), Average velocity =   8.276(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             44.00              0.00
      3             47.00              0.00
      4             61.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    127.793(CFS)
  '     '    flow top width =     19.163(Ft.)
  '     '    velocity=    8.276(Ft/s)
  '     '    area =     15.441(Sq.Ft)
  '     '    Froude number =     1.625

Upstream point elevation =  3985.000(Ft.)
Downstream point elevation =  3905.000(Ft.)
Flow length =  1544.000(Ft.)
Travel time  =    3.11 min.
Time of concentration =   16.50 min.
Depth of flow =   1.393(Ft.)
Average velocity =   8.276(Ft/s)
Total irregular channel flow =   127.793(CFS)
Irregular channel normal depth above invert elev. =   1.393(Ft.)
Average velocity of channel(s) =   8.276(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Rainfall intensity =      4.269(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.300  CA =     49.380
Subarea runoff =    166.123(CFS) for    134.100(Ac.)
Total runoff =    210.818(CFS)      Total area =     164.600(Ac.)
Depth of flow =   1.725(Ft.), Average velocity =   9.395(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.031 to Point/Station        1.091
```

```
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    237.432(CFS)
Depth of flow =   1.461(Ft.), Average velocity =  14.170(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             24.00              0.00
      3             27.00              0.00
      4             61.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    237.432(CFS)
  '     '    flow top width =     19.944(Ft.)
  '     '    velocity=   14.170(Ft/s)
  '     '    area =     16.756(Sq.Ft)
  '     '    Froude number =     2.724

Upstream point elevation =  3905.000(Ft.)
Downstream point elevation =  3560.000(Ft.)
Flow length =  2414.000(Ft.)
Travel time  =    2.84 min.
Time of concentration =   19.34 min.
Depth of flow =   1.461(Ft.)
Average velocity =  14.170(Ft/s)
Total irregular channel flow =   237.432(CFS)
Irregular channel normal depth above invert elev. =   1.461(Ft.)
Average velocity of channel(s) =  14.170(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.600
Decimal fraction soil group C = 0.400
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.270
Rainfall intensity =      3.854(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.291  CA =     68.496
Subarea runoff =     53.146(CFS) for     70.800(Ac.)
Total runoff =    263.964(CFS)      Total area =     235.400(Ac.)
Depth of flow =   1.528(Ft.), Average velocity =  14.556(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.031 to Point/Station        1.091
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    235.400(Ac.)
Runoff from this stream =    263.964(CFS)
Time of concentration =   19.34 min.
Rainfall intensity =     3.854(In/Hr)
```

```
Summary of stream data:

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


1     1762.458     32.27               2.770
2      263.964     19.34               3.854
Qmax(1) =
         1.000 *    1.000 *  1762.458) +
         0.719 *    1.000 *   263.964) + =    1952.202
Qmax(2) =
         1.000 *    0.599 *  1762.458) +
         1.000 *    1.000 *   263.964) + =    1320.361

Total of 2 main streams to confluence:
Flow rates before confluence point:
    1762.458     263.964
Maximum flow rates at confluence using above data:
     1952.202     1320.361
Area of streams before confluence:
     2476.800      235.400


Results of confluence:
Total flow rate =   1952.202(CFS)
Time of concentration =    32.266 min.
Effective stream area after confluence  =   2712.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.091 to Point/Station        1.101
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =   2009.598(CFS)
Depth of flow =   5.118(Ft.), Average velocity =  19.389(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              6.00
      2              6.00              4.00
      3             11.00              2.00
      4             16.00              0.00
      5             19.00              0.00
      6             28.00              2.00
      7             36.00              4.00
      8             40.00              6.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =   2009.600(CFS)
  '     '    flow top width =     35.588(Ft.)
  '     '    velocity=   19.389(Ft/s)
  '     '    area =    103.647(Sq.Ft)
  '     '    Froude number =     2.002

Upstream point elevation =  3560.000(Ft.)
```

```
Downstream point elevation =  3268.000(Ft.)
Flow length =  5476.000(Ft.)
Travel time  =    4.71 min.
Time of concentration =   36.97 min.
Depth of flow =   5.118(Ft.)
Average velocity =  19.389(Ft/s)
Total irregular channel flow =  2009.598(CFS)
Irregular channel normal depth above invert elev. =   5.118(Ft.)
Average velocity of channel(s) =  19.389(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.600
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.400
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.290
Rainfall intensity =      2.537(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.264  CA =    814.640
Subarea runoff =    114.706(CFS) for    379.000(Ac.)
Total runoff =   2066.908(CFS)      Total area =    3091.200(Ac.)
Depth of flow =   5.177(Ft.), Average velocity =  19.541(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.091 to Point/Station        1.101
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =   3091.200(Ac.)
Runoff from this stream =   2066.908(CFS)
Time of concentration =   36.97 min.
Rainfall intensity =     2.537(In/Hr)
Program is now starting with Main Stream No. 2
End of computations, total study area =        3091.200 (Ac.)
```

Basins 1-10

```
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

      Rational method hydrology program based on
      San Diego County Flood Control Division 2003 hydrology manual
      Rational Hydrology Study        Date: 03/19/09
      --------------------------------------------------------------------------
-
      HOSKINGS RANCH
      Pre-Development Hydrology Calculations
      100-year Frequency
      Basin 1 through Basin 10
      --------------------------------------------------------------------------
-
       *********   Hydrology Study Control Information **********

      --------------------------------------------------------------------------
-


      Program License Serial Number 4065

      --------------------------------------------------------------------------
-
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  4.500
      24 hour precipitation(inches) =  9.500
      P6/P24 =    47.4%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        1.011 to Point/Station        1.021
      **** INITIAL AREA EVALUATION ****
      ________________________________________________________________________
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 1.000
      Decimal fraction soil group D = 0.000
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.300
      Initial subarea total flow distance  = 1034.000(Ft.)
      Highest elevation = 4753.500(Ft.)
      Lowest elevation = 4475.000(Ft.)
      Elevation difference =  278.500(Ft.) Slope = 26.934 %
      Top of Initial Area Slope adjusted by User to 15.500 %
      Bottom of Initial Area Slope adjusted by User to 28.100 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  15.50 %, in a development type of
       Permanent Open Space
```

```
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   5.78 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(  15.500^(1/3)]=   5.78
      The initial area total distance of 1034.00 (Ft.) entered leaves a
      remaining distance of  934.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   2.47 minutes
      for a distance of 934.00 (Ft.) and a slope of 28.10 %
      with an elevation difference of 262.45(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    2.466 Minutes
      Tt=[(11.9*0.1769^3)/(262.45)]^.385=  2.47
      Total initial area Ti =   5.78 minutes from Figure 3-3 formula plus
        2.47 minutes from the Figure 3-4 formula =   8.24 minutes
      Rainfall intensity (I) =      8.589(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
      Subarea runoff =     42.517(CFS)
      Total initial stream area =       16.500(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        1.021 to Point/Station        1.031
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ----------------------------------------------------------------------
      Estimated mean flow rate at midpoint of channel =    308.671(CFS)
      Depth of flow =   1.702(Ft.), Average velocity =  15.171(Ft/s)
            ******* Irregular Channel Data ***********
      ----------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              9.00
            2             11.00              4.00
            3             28.00              0.00
            4             34.00              0.00
            5             45.00              4.00
            6             60.00              9.00
      Manning's 'N' friction factor =   0.035
      ----------------------------------------------------------------
      Sub-Channel flow  =    308.671(CFS)
        '     '    flow top width =     17.912(Ft.)
        '     '    velocity=   15.171(Ft/s)
        '     '    area =     20.346(Sq.Ft)
        '     '    Froude number =     2.508

      Upstream point elevation =  4475.000(Ft.)
      Downstream point elevation =  4058.000(Ft.)
      Flow length =  3732.000(Ft.)
      Travel time  =    4.10 min.
      Time of concentration =   12.34 min.
      Depth of flow =   1.702(Ft.)
      Average velocity =  15.171(Ft/s)
      Total irregular channel flow =   308.671(CFS)
      Irregular channel normal depth above invert elev. =   1.702(Ft.)
      Average velocity of channel(s) =  15.171(Ft/s)
       Adding area flow to channel
      Decimal fraction soil group A = 0.000
```

```
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.275
Rainfall intensity =      6.620(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.276  CA =     86.818
Subarea runoff =    532.208(CFS) for    297.700(Ac.)
Total runoff =    574.725(CFS)      Total area =     314.200(Ac.)
Depth of flow =   2.292(Ft.), Average velocity =  17.886(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.031 to Point/Station        1.041
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    586.887(CFS)
Depth of flow =   2.599(Ft.), Average velocity =  13.592(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             25.00              0.00
      3             32.00              0.00
      4             44.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    586.888(CFS)
  '     '    flow top width =     26.231(Ft.)
  '     '    velocity=   13.592(Ft/s)
  '     '    area =     43.180(Sq.Ft)
  '     '    Froude number =     1.867

Upstream point elevation =  4058.000(Ft.)
Downstream point elevation =  3930.000(Ft.)
Flow length =  2335.000(Ft.)
Travel time  =    2.86 min.
Time of concentration =   15.20 min.
Depth of flow =   2.599(Ft.)
Average velocity =  13.592(Ft/s)
Total irregular channel flow =   586.887(CFS)
Irregular channel normal depth above invert elev. =   2.599(Ft.)
Average velocity of channel(s) =  13.592(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      5.786(In/Hr) for a   100.0 year storm
```

```
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.272  CA =    103.518
      Subarea runoff =     24.268(CFS) for     66.800(Ac.)
      Total runoff =    598.993(CFS)      Total area =     381.000(Ac.)
      Depth of flow =   2.624(Ft.), Average velocity =  13.664(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        1.031 to Point/Station        1.041
      **** CONFLUENCE OF MINOR STREAMS ****
      ------------------------------------------------------------------------
      Along Main Stream number: 1 in normal stream number 1
      Stream flow area =    381.000(Ac.)
      Runoff from this stream =    598.993(CFS)
      Time of concentration =   15.20 min.
      Rainfall intensity =     5.786(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        2.011 to Point/Station        2.021
      **** INITIAL AREA EVALUATION ****
      ------------------------------------------------------------------------
      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
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.250
      Initial subarea total flow distance  = 1511.000(Ft.)
      Highest elevation = 4473.000(Ft.)
      Lowest elevation = 4265.000(Ft.)
      Elevation difference =  208.000(Ft.) Slope = 13.766 %
      Top of Initial Area Slope adjusted by User to  8.000 %
      Bottom of Initial Area Slope adjusted by User to 14.200 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of   8.00 %, in a development type of
       Permanent Open Space
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   7.65 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(   8.000^(1/3)]=   7.65
      The initial area total distance of 1511.00 (Ft.) entered leaves a
      remaining distance of 1411.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   4.41 minutes
      for a distance of 1411.00 (Ft.) and a slope of 14.20 %
      with an elevation difference of 200.36(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    4.407 Minutes
      Tt=[(11.9*0.2672^3)/(200.36)]^.385=  4.41
      Total initial area Ti =   7.65 minutes from Figure 3-3 formula plus
        4.41 minutes from the Figure 3-4 formula =  12.06 minutes
      Rainfall intensity (I) =      6.720(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
```

```
Subarea runoff =     27.722(CFS)
Total initial stream area =       16.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.021 to Point/Station        1.041
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    152.420(CFS)
Depth of flow =   1.319(Ft.), Average velocity =  12.712(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             14.00              0.00
      3             19.00              0.00
      4             36.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    152.420(CFS)
  '     '    flow top width =     13.179(Ft.)
  '     '    velocity=   12.712(Ft/s)
  '     '    area =     11.990(Sq.Ft)
  '     '    Froude number =     2.349

Upstream point elevation =  4265.000(Ft.)
Downstream point elevation =  3930.000(Ft.)
Flow length =  3160.000(Ft.)
Travel time  =    4.14 min.
Time of concentration =   16.20 min.
Depth of flow =   1.319(Ft.)
Average velocity =  12.712(Ft/s)
Total irregular channel flow =   152.420(CFS)
Irregular channel normal depth above invert elev. =   1.319(Ft.)
Average velocity of channel(s) =  12.712(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      5.555(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.250  CA =     49.875
Subarea runoff =    249.315(CFS) for    183.000(Ac.)
Total runoff =    277.037(CFS)      Total area =     199.500(Ac.)
Depth of flow =   1.770(Ft.), Average velocity =  14.930(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.021 to Point/Station        1.041
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
```

```
Along Main Stream number: 1 in normal stream number 2
Stream flow area =    199.500(Ac.)
Runoff from this stream =    277.037(CFS)
Time of concentration =   16.20 min.
Rainfall intensity =     5.555(In/Hr)
Summary of stream data:

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


1      598.993     15.20               5.786
2      277.037     16.20               5.555
Qmax(1) =
         1.000 *    1.000 *   598.993) +
         1.000 *    0.939 *   277.037) + =     859.017
Qmax(2) =
         0.960 *    1.000 *   598.993) +
         1.000 *    1.000 *   277.037) + =     852.038

Total of 2 streams to confluence:
Flow rates before confluence point:
     598.993     277.037
Maximum flow rates at confluence using above data:
      859.017      852.038
Area of streams before confluence:
      381.000      199.500
Results of confluence:
Total flow rate =    859.017(CFS)
Time of concentration =    15.205 min.
Effective stream area after confluence =    580.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.041 to Point/Station        1.051
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =    859.055(CFS)
Depth of flow =   4.086(Ft.), Average velocity =   9.664(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             10.00
      2             37.00              5.00
      3             63.00              0.00
      4             68.00              0.00
      5             83.00              5.00
      6            137.00             10.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    859.055(CFS)
  '     '    flow top width =     38.508(Ft.)
  '     '    velocity=    9.664(Ft/s)
  '     '    area =     88.895(Sq.Ft)
  '     '    Froude number =     1.121
```

```
Upstream point elevation =  3930.000(Ft.)
Downstream point elevation =  3895.500(Ft.)
Flow length =  1960.000(Ft.)
Travel time  =    3.38 min.
Time of concentration =   18.59 min.
Depth of flow =   4.086(Ft.)
Average velocity =   9.664(Ft/s)
Total irregular channel flow =   859.055(CFS)
Irregular channel normal depth above invert elev. =   4.086(Ft.)
Average velocity of channel(s) =   9.664(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
The area added to the existing stream causes a
a lower flow rate of Q =    846.639(CFS)
therefore the upstream flow rate of Q =    859.017(CFS) is being used
Rainfall intensity =      5.084(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.263  CA =    166.543
Subarea runoff =      0.000(CFS) for     52.600(Ac.)
Total runoff =    859.017(CFS)      Total area =     633.100(Ac.)
Depth of flow =   4.086(Ft.), Average velocity =   9.664(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.041 to Point/Station        1.051
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    633.100(Ac.)
Runoff from this stream =    859.017(CFS)
Time of concentration =   18.59 min.
Rainfall intensity =     5.084(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.011 to Point/Station        3.021
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance  = 1041.000(Ft.)
Highest elevation = 4500.000(Ft.)
Lowest elevation = 4125.000(Ft.)
Elevation difference =  375.000(Ft.) Slope = 36.023 %
```

```
      Top of Initial Area Slope adjusted by User to 30.000 %
      Bottom of Initial Area Slope adjusted by User to 30.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  30.00 %, in a development type of
       Permanent Open Space
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   4.92 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(  30.000^(1/3)]=   4.92
      The initial area total distance of 1041.00 (Ft.) entered leaves a
      remaining distance of  941.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   2.42 minutes
      for a distance of 941.00 (Ft.) and a slope of 30.00 %
      with an elevation difference of 282.30(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    2.419 Minutes
      Tt=[(11.9*0.1782^3)/(282.30)]^.385=  2.42
      Total initial area Ti =   4.92 minutes from Figure 3-3 formula plus
        2.42 minutes from the Figure 3-4 formula =   7.34 minutes
      Rainfall intensity (I) =      9.254(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
      Subarea runoff =     35.164(CFS)
      Total initial stream area =       15.200(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        3.021 to Point/Station        1.051
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ----------------------------------------------------------------------
      Estimated mean flow rate at midpoint of channel =     86.596(CFS)
      Depth of flow =   1.175(Ft.), Average velocity =  10.113(Ft/s)
            ******* Irregular Channel Data ***********
      ----------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00             10.00
            2             16.00              5.00
            3             31.00              0.00
            4             35.00              0.00
            5             48.00              5.00
            6             69.00             10.00
      Manning's 'N' friction factor =   0.035
      ----------------------------------------------------------------------
      Sub-Channel flow  =     86.596(CFS)
        '     '    flow top width =     10.578(Ft.)
        '     '    velocity=   10.113(Ft/s)
        '     '    area =      8.563(Sq.Ft)
        '     '    Froude number =     1.981

      Upstream point elevation =  4125.000(Ft.)
      Downstream point elevation =  3895.500(Ft.)
      Flow length =  2901.000(Ft.)
      Travel time  =    4.78 min.
      Time of concentration =   12.12 min.
      Depth of flow =   1.175(Ft.)
```

```
Average velocity =  10.113(Ft/s)
Total irregular channel flow =    86.596(CFS)
Irregular channel normal depth above invert elev. =   1.175(Ft.)
Average velocity of channel(s) =  10.113(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      6.696(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.250  CA =     20.600
Subarea runoff =    102.783(CFS) for     67.200(Ac.)
Total runoff =    137.947(CFS)      Total area =      82.400(Ac.)
Depth of flow =   1.478(Ft.), Average velocity =  11.464(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.021 to Point/Station        1.051
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     82.400(Ac.)
Runoff from this stream =    137.947(CFS)
Time of concentration =   12.12 min.
Rainfall intensity =     6.696(In/Hr)
Summary of stream data:

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


1      859.017     18.59               5.084
2      137.947     12.12               6.696
Qmax(1) =
         1.000 *    1.000 *   859.017) +
         0.759 *    1.000 *   137.947) + =     963.740
Qmax(2) =
         1.000 *    0.652 *   859.017) +
         1.000 *    1.000 *   137.947) + =     698.303

Total of 2 streams to confluence:
Flow rates before confluence point:
     859.017     137.947
Maximum flow rates at confluence using above data:
      963.740      698.303
Area of streams before confluence:
      633.100       82.400
Results of confluence:
Total flow rate =    963.740(CFS)
Time of concentration =    18.585 min.
Effective stream area after confluence =    715.500(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.051 to Point/Station        1.061
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    963.767(CFS)
Depth of flow =   4.341(Ft.), Average velocity =   8.692(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              6.00
      2              9.00              4.00
      3             18.00              2.00
      4             27.00              0.00
      5             31.00              0.00
      6             41.00              2.00
      7             54.00              4.00
      8             64.00              6.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    963.767(CFS)
  '     '    flow top width =     48.236(Ft.)
  '     '    velocity=    8.692(Ft/s)
  '     '    area =    110.882(Sq.Ft)
  '     '    Froude number =     1.010

Upstream point elevation =  3895.500(Ft.)
Downstream point elevation =  3864.000(Ft.)
Flow length =  2227.000(Ft.)
Travel time  =    4.27 min.
Time of concentration =   22.86 min.
Depth of flow =   4.341(Ft.)
Average velocity =   8.692(Ft/s)
Total irregular channel flow =   963.767(CFS)
Irregular channel normal depth above invert elev. =   4.341(Ft.)
Average velocity of channel(s) =   8.692(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
The area added to the existing stream causes a
a lower flow rate of Q =    924.971(CFS)
therefore the upstream flow rate of Q =    963.740(CFS) is being used
Rainfall intensity =      4.449(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.260  CA =    207.918
Subarea runoff =      0.000(CFS) for     83.100(Ac.)
Total runoff =    963.740(CFS)      Total area =     798.600(Ac.)
Depth of flow =   4.341(Ft.), Average velocity =   8.692(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.051 to Point/Station        1.061
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    798.600(Ac.)
Runoff from this stream =    963.740(CFS)
Time of concentration =   22.86 min.
Rainfall intensity =     4.449(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.011 to Point/Station        4.021
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance  = 1172.000(Ft.)
Highest elevation = 4275.000(Ft.)
Lowest elevation = 4025.000(Ft.)
Elevation difference =  250.000(Ft.) Slope = 21.331 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  21.33 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.52 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(  21.331^(1/3)]=   5.52
The initial area total distance of 1172.00 (Ft.) entered leaves a
remaining distance of 1072.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   3.05 minutes
for a distance of 1072.00 (Ft.) and a slope of 21.33 %
with an elevation difference of 228.67(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    3.049 Minutes
Tt=[(11.9*0.2030^3)/(228.67)]^.385=  3.05
Total initial area Ti =   5.52 minutes from Figure 3-3 formula plus
  3.05 minutes from the Figure 3-4 formula =   8.57 minutes
Rainfall intensity (I) =      8.378(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
Subarea runoff =     19.898(CFS)
Total initial stream area =        9.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.021 to Point/Station        4.032
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

```
Estimated mean flow rate at midpoint of channel =     73.293(CFS)
Depth of flow =   0.865(Ft.), Average velocity =   6.476(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             10.00
      2             48.00              5.00
      3             90.00              0.00
      4             96.00              0.00
      5            136.00              5.00
      6            156.00             10.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =     73.293(CFS)
  '     '    flow top width =     20.180(Ft.)
  '     '    velocity=    6.476(Ft/s)
  '     '    area =     11.318(Sq.Ft)
  '     '    Froude number =     1.524

Upstream point elevation =  4025.000(Ft.)
Downstream point elevation =  3872.000(Ft.)
Flow length =  3021.000(Ft.)
Travel time  =    7.78 min.
Time of concentration =   16.34 min.
Depth of flow =   0.865(Ft.)
Average velocity =   6.476(Ft/s)
Total irregular channel flow =    73.293(CFS)
Irregular channel normal depth above invert elev. =   0.865(Ft.)
Average velocity of channel(s) =   6.476(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      5.524(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.250  CA =     22.925
Subarea runoff =    106.729(CFS) for     82.200(Ac.)
Total runoff =    126.627(CFS)      Total area =      91.700(Ac.)
Depth of flow =   1.117(Ft.), Average velocity =   7.478(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.021 to Point/Station        4.032
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     91.700(Ac.)
Runoff from this stream =    126.627(CFS)
Time of concentration =   16.34 min.
Rainfall intensity =     5.524(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.031 to Point/Station        4.032
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance  = 2687.000(Ft.)
Highest elevation = 3968.000(Ft.)
Lowest elevation = 3872.000(Ft.)
Elevation difference =   96.000(Ft.) Slope =  3.573 %
Top of Initial Area Slope adjusted by User to  1.000 %
Bottom of Initial Area Slope adjusted by User to  3.700 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =  12.80 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2500)*(  70.000^.5)/(   1.000^(1/3)]=  12.80
The initial area total distance of 2687.00 (Ft.) entered leaves a
remaining distance of 2617.00 (Ft.)
Using Figure 3-4, the travel time for this distance is  11.90 minutes
for a distance of 2617.00 (Ft.) and a slope of  3.70 %
with an elevation difference of  96.83(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =   11.900 Minutes
Tt=[(11.9*0.4956^3)/( 96.83)]^.385= 11.90
Total initial area Ti =  12.80 minutes from Figure 3-3 formula plus
 11.90 minutes from the Figure 3-4 formula =  24.70 minutes
Rainfall intensity (I) =      4.231(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
Subarea runoff =     59.980(CFS)
Total initial stream area =       56.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.031 to Point/Station        4.032
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     56.700(Ac.)
Runoff from this stream =     59.980(CFS)
Time of concentration =   24.70 min.
Rainfall intensity =     4.231(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
```

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


1      126.627     16.34                5.524
2       59.980     24.70                4.231
Qmax(1) =
         1.000 *    1.000 *   126.627) +
         1.000 *    0.662 *    59.980) + =     166.308
Qmax(2) =
         0.766 *    1.000 *   126.627) +
         1.000 *    1.000 *    59.980) + =     156.986

Total of 2 streams to confluence:
Flow rates before confluence point:
     126.627      59.980
Maximum flow rates at confluence using above data:
      166.308      156.986
Area of streams before confluence:
       91.700       56.700
Results of confluence:
Total flow rate =    166.308(CFS)
Time of concentration =    16.341 min.
Effective stream area after confluence =    148.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.032 to Point/Station        4.051
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   1.563(Ft.), Average velocity =   7.177(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              3.00
      2              8.00              1.00
      3             18.00              0.00
      4             20.00              0.00
      5             27.00              1.00
      6             44.00              3.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    166.308(CFS)
  '     '    flow top width =     26.035(Ft.)
  '     '    velocity=    7.177(Ft/s)
  '     '    area =     23.173(Sq.Ft)
  '     '    Froude number =     1.341

Upstream point elevation =  3872.000(Ft.)
Downstream point elevation =  3864.000(Ft.)
Flow length =   237.000(Ft.)
Travel time  =    0.55 min.
Time of concentration =   16.89 min.
Depth of flow =   1.563(Ft.)
Average velocity =   7.177(Ft/s)
Total irregular channel flow =   166.308(CFS)
Irregular channel normal depth above invert elev. =   1.563(Ft.)
```

```
      Average velocity of channel(s) =   7.177(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        4.032 to Point/Station        4.051
      **** CONFLUENCE OF MINOR STREAMS ****
      ----------------------------------------------------------------------
      Along Main Stream number: 2 in normal stream number 1
      Stream flow area =    148.400(Ac.)
      Runoff from this stream =    166.308(CFS)
      Time of concentration =   16.89 min.
      Rainfall intensity =     5.407(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        4.041 to Point/Station        4.051
      **** INITIAL AREA EVALUATION ****
      ----------------------------------------------------------------------
      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
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.250
      Initial subarea total flow distance  = 1959.000(Ft.)
      Highest elevation = 4054.000(Ft.)
      Lowest elevation = 3864.000(Ft.)
      Elevation difference =  190.000(Ft.) Slope =  9.699 %
      Top of Initial Area Slope adjusted by User to 29.000 %
      Bottom of Initial Area Slope adjusted by User to  8.700 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  29.00 %, in a development type of
       Permanent Open Space
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   4.98 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(  29.000^(1/3)]=   4.98
      The initial area total distance of 1959.00 (Ft.) entered leaves a
      remaining distance of 1859.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   6.58 minutes
      for a distance of 1859.00 (Ft.) and a slope of  8.70 %
      with an elevation difference of 161.73(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    6.580 Minutes
      Tt=[(11.9*0.3521^3)/(161.73)]^.385=  6.58
      Total initial area Ti =   4.98 minutes from Figure 3-3 formula plus
        6.58 minutes from the Figure 3-4 formula =  11.56 minutes
      Rainfall intensity (I) =      6.905(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
      Subarea runoff =     59.730(CFS)
      Total initial stream area =       34.600(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.041 to Point/Station        4.051
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     34.600(Ac.)
Runoff from this stream =     59.730(CFS)
Time of concentration =   11.56 min.
Rainfall intensity =     6.905(In/Hr)
Summary of stream data:

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


1      166.308     16.89               5.407
2       59.730     11.56               6.905
Qmax(1) =
         1.000 *    1.000 *   166.308) +
         0.783 *    1.000 *    59.730) + =     213.077
Qmax(2) =
         1.000 *    0.684 *   166.308) +
         1.000 *    1.000 *    59.730) + =     173.545

Total of 2 streams to confluence:
Flow rates before confluence point:
     166.308      59.730
Maximum flow rates at confluence using above data:
      213.077      173.545
Area of streams before confluence:
      148.400       34.600
Results of confluence:
Total flow rate =    213.077(CFS)
Time of concentration =    16.892 min.
Effective stream area after confluence =    183.000(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.051 to Point/Station        1.061
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    230.727(CFS)
Depth of flow =   2.307(Ft.), Average velocity =   7.383(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00               4.00
      2              6.00               2.00
      3             13.00               0.00
      4             15.00               0.00
      5             28.00               2.00
      6             43.00               4.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    230.727(CFS)
  '     '    flow top width =     25.224(Ft.)
```

```
  '     '    velocity=    7.383(Ft/s)
  '     '    area =     31.250(Sq.Ft)
  '     '    Froude number =     1.169

Upstream point elevation =  3864.000(Ft.)
Downstream point elevation =  3850.000(Ft.)
Flow length =   600.000(Ft.)
Travel time  =    1.35 min.
Time of concentration =   18.25 min.
Depth of flow =   2.307(Ft.)
Average velocity =   7.383(Ft/s)
Total irregular channel flow =   230.727(CFS)
Irregular channel normal depth above invert elev. =   2.307(Ft.)
Average velocity of channel(s) =   7.383(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      5.144(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.250  CA =     48.300
Subarea runoff =     35.397(CFS) for     10.200(Ac.)
Total runoff =    248.473(CFS)      Total area =     193.200(Ac.)
Depth of flow =   2.377(Ft.), Average velocity =   7.518(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.051 to Point/Station        1.061
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    193.200(Ac.)
Runoff from this stream =    248.473(CFS)
Time of concentration =   18.25 min.
Rainfall intensity =     5.144(In/Hr)
Summary of stream data:

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


1      963.740     22.86               4.449
2      248.473     18.25               5.144
Qmax(1) =
         1.000 *    1.000 *   963.740) +
         0.865 *    1.000 *   248.473) + =    1178.614
Qmax(2) =
         1.000 *    0.798 *   963.740) +
         1.000 *    1.000 *   248.473) + =    1017.847

Total of 2 main streams to confluence:
```

```
Flow rates before confluence point:
     963.740     248.473
Maximum flow rates at confluence using above data:
     1178.614     1017.847
Area of streams before confluence:
      798.600      193.200


Results of confluence:
Total flow rate =   1178.614(CFS)
Time of concentration =    22.855 min.
Effective stream area after confluence  =    991.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.061 to Point/Station        1.071
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =   1178.657(CFS)
Depth of flow =   5.187(Ft.), Average velocity =   8.531(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              6.00
      2              7.00              4.00
      3             14.00              2.00
      4             21.00              0.00
      5             23.00              0.00
      6             35.00              2.00
      7             47.00              4.00
      8             59.00              6.00
Manning's 'N' friction factor =   0.035
----------------------------------------------------------------
Sub-Channel flow  =   1178.656(CFS)
  '     '    flow top width =     51.273(Ft.)
  '     '    velocity=    8.531(Ft/s)
  '     '    area =    138.156(Sq.Ft)
  '     '    Froude number =     0.916

Upstream point elevation =  3850.000(Ft.)
Downstream point elevation =  3836.000(Ft.)
Flow length =  1262.000(Ft.)
Travel time  =    2.47 min.
Time of concentration =   25.32 min.
Depth of flow =   5.187(Ft.)
Average velocity =   8.531(Ft/s)
Total irregular channel flow =  1178.657(CFS)
Irregular channel normal depth above invert elev. =   5.187(Ft.)
Average velocity of channel(s) =   8.531(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
```

```
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
The area added to the existing stream causes a
a lower flow rate of Q =   1144.110(CFS)
therefore the upstream flow rate of Q =   1178.614(CFS) is being used
Rainfall intensity =      4.164(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.258  CA =    274.743
Subarea runoff =      0.000(CFS) for     74.100(Ac.)
Total runoff =   1178.614(CFS)      Total area =    1065.900(Ac.)
Depth of flow =   5.187(Ft.), Average velocity =   8.531(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.061 to Point/Station        1.071
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =   1065.900(Ac.)
Runoff from this stream =   1178.614(CFS)
Time of concentration =   25.32 min.
Rainfall intensity =     4.164(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.011 to Point/Station        5.021
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance  =  677.000(Ft.)
Highest elevation = 4061.000(Ft.)
Lowest elevation = 3976.000(Ft.)
Elevation difference =   85.000(Ft.) Slope = 12.555 %
Top of Initial Area Slope adjusted by User to 13.000 %
Bottom of Initial Area Slope adjusted by User to 12.470 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  13.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.51 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(  13.000^(1/3)]=   6.51
The initial area total distance of  677.00 (Ft.) entered leaves a
remaining distance of  577.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   2.33 minutes
for a distance of 577.00 (Ft.) and a slope of 12.47 %
```

```
      with an elevation difference of  71.95(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    2.327 Minutes
      Tt=[(11.9*0.1093^3)/( 71.95)]^.385=  2.33
      Total initial area Ti =   6.51 minutes from Figure 3-3 formula plus
        2.33 minutes from the Figure 3-4 formula =   8.83 minutes
      Rainfall intensity (I) =      8.213(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
      Subarea runoff =     18.069(CFS)
      Total initial stream area =        8.800(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        5.021 to Point/Station        1.071
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ------------------------------------------------------------------------
      Estimated mean flow rate at midpoint of channel =     82.846(CFS)
      Depth of flow =   1.299(Ft.), Average velocity =   8.484(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              4.00
            2             10.00              2.00
            3             17.00              0.00
            4             19.00              0.00
            5             29.00              2.00
            6             43.00              4.00
      Manning's 'N' friction factor =   0.035
      ------------------------------------------------------------------
      Sub-Channel flow  =     82.846(CFS)
        '     '    flow top width =     13.039(Ft.)
        '     '    velocity=    8.484(Ft/s)
        '     '    area =      9.765(Sq.Ft)
        '     '    Froude number =     1.728

      Upstream point elevation =  3976.000(Ft.)
      Downstream point elevation =  3836.000(Ft.)
      Flow length =  2311.000(Ft.)
      Travel time  =    4.54 min.
      Time of concentration =   13.37 min.
      Depth of flow =   1.299(Ft.)
      Average velocity =   8.484(Ft/s)
      Total irregular channel flow =    82.846(CFS)
      Irregular channel normal depth above invert elev. =   1.299(Ft.)
      Average velocity of channel(s) =   8.484(Ft/s)
       Adding area flow to channel
      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
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.250
      Rainfall intensity =      6.286(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.250  CA =     23.475
Subarea runoff =    129.486(CFS) for     85.100(Ac.)
Total runoff =    147.555(CFS)      Total area =      93.900(Ac.)
Depth of flow =   1.660(Ft.), Average velocity =   9.817(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.021 to Point/Station        1.071
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     93.900(Ac.)
Runoff from this stream =    147.555(CFS)
Time of concentration =   13.37 min.
Rainfall intensity =     6.286(In/Hr)
Summary of stream data:

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


1     1178.614     25.32               4.164
2      147.555     13.37               6.286
Qmax(1) =
         1.000 *    1.000 *  1178.614) +
         0.663 *    1.000 *   147.555) + =    1276.371
Qmax(2) =
         1.000 *    0.528 *  1178.614) +
         1.000 *    1.000 *   147.555) + =     770.072

Total of 2 main streams to confluence:
Flow rates before confluence point:
    1178.614     147.555
Maximum flow rates at confluence using above data:
     1276.371      770.072
Area of streams before confluence:
     1065.900       93.900


Results of confluence:
Total flow rate =   1276.371(CFS)
Time of concentration =    25.321 min.
Effective stream area after confluence  =   1159.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.071 to Point/Station        1.081
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =   1304.277(CFS)
Depth of flow =   5.197(Ft.), Average velocity =  18.235(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
```

```
      1              0.00              8.00
      2              7.00              6.00
      3             14.00              4.00
      4             20.00              2.00
      5             26.00              0.00
      6             28.00              0.00
      7             31.00              2.00
      8             34.00              4.00
      9             37.00              6.00
      10             40.00              8.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =   1304.277(CFS)
  '     '    flow top width =     25.986(Ft.)
  '     '    velocity=   18.235(Ft/s)
  '     '    area =     71.527(Sq.Ft)
  '     '    Froude number =     1.937

Upstream point elevation =  3836.000(Ft.)
Downstream point elevation =  3625.000(Ft.)
Flow length =  3924.000(Ft.)
Travel time  =    3.59 min.
Time of concentration =   28.91 min.
Depth of flow =   5.197(Ft.)
Average velocity =  18.235(Ft/s)
Total irregular channel flow =  1304.277(CFS)
Irregular channel normal depth above invert elev. =   5.197(Ft.)
Average velocity of channel(s) =  18.235(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      3.823(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.256  CA =    348.418
Subarea runoff =     55.722(CFS) for    200.800(Ac.)
Total runoff =   1332.094(CFS)      Total area =    1360.600(Ac.)
Depth of flow =   5.242(Ft.), Average velocity =  18.327(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.071 to Point/Station        1.081
**** CONFLUENCE OF MAIN STREAMS ****
_________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =   1360.600(Ac.)
Runoff from this stream =   1332.094(CFS)
Time of concentration =   28.91 min.
Rainfall intensity =     3.823(In/Hr)
Program is now starting with Main Stream No. 2
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.011 to Point/Station        6.021
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  = 1028.000(Ft.)
Highest elevation = 4261.000(Ft.)
Lowest elevation = 4210.000(Ft.)
Elevation difference =   51.000(Ft.) Slope =  4.961 %
Top of Initial Area Slope adjusted by User to  1.000 %
Bottom of Initial Area Slope adjusted by User to  5.390 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =  12.05 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*(  70.000^.5)/(   1.000^(1/3)]=  12.05
The initial area total distance of 1028.00 (Ft.) entered leaves a
remaining distance of  958.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   4.75 minutes
for a distance of 958.00 (Ft.) and a slope of  5.39 %
with an elevation difference of  51.64(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    4.749 Minutes
Tt=[(11.9*0.1814^3)/( 51.64)]^.385=  4.75
Total initial area Ti =  12.05 minutes from Figure 3-3 formula plus
  4.75 minutes from the Figure 3-4 formula =  16.80 minutes
Rainfall intensity (I) =      5.426(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
Subarea runoff =     35.163(CFS)
Total initial stream area =       21.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.021 to Point/Station        6.031
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =     97.136(CFS)
Depth of flow =   1.136(Ft.), Average velocity =  11.372(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             16.00              0.00
      3             20.00              0.00
```

```
      4             35.00              5.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =     97.136(CFS)
  '     '    flow top width =     11.042(Ft.)
  '     '    velocity=   11.372(Ft/s)
  '     '    area =      8.542(Sq.Ft)
  '     '    Froude number =     2.278

Upstream point elevation =  4210.000(Ft.)
Downstream point elevation =  4005.000(Ft.)
Flow length =  1945.000(Ft.)
Travel time  =    2.85 min.
Time of concentration =   19.65 min.
Depth of flow =   1.136(Ft.)
Average velocity =  11.372(Ft/s)
Total irregular channel flow =    97.136(CFS)
Irregular channel normal depth above invert elev. =   1.136(Ft.)
Average velocity of channel(s) =  11.372(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      4.905(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.259  CA =     32.430
Subarea runoff =    123.893(CFS) for    103.800(Ac.)
Total runoff =    159.056(CFS)      Total area =     125.400(Ac.)
Depth of flow =   1.445(Ft.), Average velocity =  12.978(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.031 to Point/Station        6.051
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________________
Estimated mean flow rate at midpoint of channel =    196.820(CFS)
Depth of flow =   1.742(Ft.), Average velocity =   9.829(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             15.00              0.00
      3             19.00              0.00
      4             47.00              5.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =    196.820(CFS)
  '     '    flow top width =     18.985(Ft.)
  '     '    velocity=    9.829(Ft/s)
  '     '    area =     20.024(Sq.Ft)
  '     '    Froude number =     1.687
```

```
Upstream point elevation =  4005.000(Ft.)
Downstream point elevation =  3913.000(Ft.)
Flow length =  1788.000(Ft.)
Travel time  =    3.03 min.
Time of concentration =   22.68 min.
Depth of flow =   1.742(Ft.)
Average velocity =   9.829(Ft/s)
Total irregular channel flow =   196.820(CFS)
Irregular channel normal depth above invert elev. =   1.742(Ft.)
Average velocity of channel(s) =   9.829(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      4.471(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.255  CA =     52.455
Subarea runoff =     75.470(CFS) for     80.100(Ac.)
Total runoff =    234.526(CFS)      Total area =     205.500(Ac.)
Depth of flow =   1.885(Ft.), Average velocity =  10.281(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.031 to Point/Station        6.051
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    205.500(Ac.)
Runoff from this stream =    234.526(CFS)
Time of concentration =   22.68 min.
Rainfall intensity =     4.471(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.041 to Point/Station        6.051
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance  = 3077.000(Ft.)
Highest elevation = 4246.000(Ft.)
Lowest elevation = 3913.000(Ft.)
Elevation difference =  333.000(Ft.) Slope = 10.822 %
Top of Initial Area Slope adjusted by User to  6.000 %
Bottom of Initial Area Slope adjusted by User to 10.900 %
```

```
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of   6.00 %, in a development type of
       Permanent Open Space
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   8.42 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(   6.000^(1/3)]=   8.42
      The initial area total distance of 3077.00 (Ft.) entered leaves a
      remaining distance of 2977.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   8.67 minutes
      for a distance of 2977.00 (Ft.) and a slope of 10.90 %
      with an elevation difference of 324.49(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    8.670 Minutes
      Tt=[(11.9*0.5638^3)/(324.49)]^.385=  8.67
      Total initial area Ti =   8.42 minutes from Figure 3-3 formula plus
        8.67 minutes from the Figure 3-4 formula =  17.09 minutes
      Rainfall intensity (I) =      5.366(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
      Subarea runoff =     90.422(CFS)
      Total initial stream area =       67.400(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        6.041 to Point/Station        6.051
      **** CONFLUENCE OF MINOR STREAMS ****
      ------------------------------------------------------------------------
      Along Main Stream number: 2 in normal stream number 2
      Stream flow area =     67.400(Ac.)
      Runoff from this stream =     90.422(CFS)
      Time of concentration =   17.09 min.
      Rainfall intensity =     5.366(In/Hr)
      Summary of stream data:

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


      1      234.526     22.68               4.471
      2       90.422     17.09               5.366
      Qmax(1) =
                1.000 *    1.000 *   234.526) +
                0.833 *    1.000 *    90.422) + =     309.863
      Qmax(2) =
                1.000 *    0.754 *   234.526) +
                1.000 *    1.000 *    90.422) + =     267.145

      Total of 2 streams to confluence:
      Flow rates before confluence point:
           234.526      90.422
      Maximum flow rates at confluence using above data:
            309.863      267.145
      Area of streams before confluence:
            205.500       67.400
      Results of confluence:
```

```
Total flow rate =    309.863(CFS)
Time of concentration =    22.679 min.
Effective stream area after confluence =    272.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.051 to Point/Station        6.111
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =    330.157(CFS)
Depth of flow =   1.910(Ft.), Average velocity =   8.834(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             36.00              0.00
      3             42.00              0.00
      4             77.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    330.157(CFS)
  '     '    flow top width =     33.126(Ft.)
  '     '    velocity=    8.834(Ft/s)
  '     '    area =     37.372(Sq.Ft)
  '     '    Froude number =     1.466

Upstream point elevation =  3913.000(Ft.)
Downstream point elevation =  3840.000(Ft.)
Flow length =  1959.000(Ft.)
Travel time  =    3.70 min.
Time of concentration =   26.38 min.
Depth of flow =   1.910(Ft.)
Average velocity =   8.834(Ft/s)
Total irregular channel flow =   330.157(CFS)
Irregular channel normal depth above invert elev. =   1.910(Ft.)
Average velocity of channel(s) =   8.834(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      4.056(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.253  CA =     86.380
Subarea runoff =     40.509(CFS) for     68.300(Ac.)
Total runoff =    350.372(CFS)      Total area =     341.200(Ac.)
Depth of flow =   1.961(Ft.), Average velocity =   8.970(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.051 to Point/Station        6.111
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    341.200(Ac.)
Runoff from this stream =    350.372(CFS)
Time of concentration =   26.38 min.
Rainfall intensity =     4.056(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.061 to Point/Station        6.071
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  =  970.000(Ft.)
Highest elevation = 4436.000(Ft.)
Lowest elevation = 4375.000(Ft.)
Elevation difference =   61.000(Ft.) Slope =  6.289 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   6.29 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.80 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(   6.289^(1/3)]=   7.80
The initial area total distance of  970.00 (Ft.) entered leaves a
remaining distance of  870.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   4.15 minutes
for a distance of 870.00 (Ft.) and a slope of  6.29 %
with an elevation difference of  54.71(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    4.155 Minutes
Tt=[(11.9*0.1648^3)/( 54.71)]^.385=  4.15
Total initial area Ti =   7.80 minutes from Figure 3-3 formula plus
  4.15 minutes from the Figure 3-4 formula =  11.96 minutes
Rainfall intensity (I) =      6.757(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
Subarea runoff =     45.608(CFS)
Total initial stream area =       22.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.071 to Point/Station        6.081
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    103.685(CFS)
Depth of flow =   0.977(Ft.), Average velocity =   5.794(Ft/s)
      ******* Irregular Channel Data ***********
-------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             54.00              0.00
      3             60.00              0.00
      4            132.00              5.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =    103.685(CFS)
  '     '    flow top width =     30.625(Ft.)
  '     '    velocity=    5.794(Ft/s)
  '     '    area =     17.895(Sq.Ft)
  '     '    Froude number =     1.336

Upstream point elevation =  4375.000(Ft.)
Downstream point elevation =  4260.000(Ft.)
Flow length =  3006.000(Ft.)
Travel time  =    8.65 min.
Time of concentration =   20.60 min.
Depth of flow =   0.977(Ft.)
Average velocity =   5.794(Ft/s)
Total irregular channel flow =   103.685(CFS)
Irregular channel normal depth above invert elev. =   0.977(Ft.)
Average velocity of channel(s) =   5.794(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.400
Decimal fraction soil group C = 0.600
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.280
Rainfall intensity =      4.757(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.284  CA =     33.994
Subarea runoff =    116.090(CFS) for     97.300(Ac.)
Total runoff =    161.698(CFS)      Total area =     119.800(Ac.)
Depth of flow =   1.188(Ft.), Average velocity =   6.492(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.081 to Point/Station        6.091
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________________
Estimated mean flow rate at midpoint of channel =    194.567(CFS)
Depth of flow =   1.406(Ft.), Average velocity =   5.310(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2            112.00              0.00
      3            116.00              0.00
      4            161.00              5.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
```

```
Sub-Channel flow  =    194.567(CFS)
  '     '    flow top width =     48.135(Ft.)
  '     '    velocity=    5.310(Ft/s)
  '     '    area =     36.640(Sq.Ft)
  '     '    Froude number =     1.073

Upstream point elevation =  4260.000(Ft.)
Downstream point elevation =  4185.500(Ft.)
Flow length =  3300.000(Ft.)
Travel time  =   10.36 min.
Time of concentration =   30.96 min.
Depth of flow =   1.406(Ft.)
Average velocity =   5.310(Ft/s)
Total irregular channel flow =   194.567(CFS)
Irregular channel normal depth above invert elev. =   1.406(Ft.)
Average velocity of channel(s) =   5.310(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.850
Decimal fraction soil group C = 0.150
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.258
Rainfall intensity =      3.658(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.271  CA =     62.165
Subarea runoff =     65.686(CFS) for    109.400(Ac.)
Total runoff =    227.383(CFS)      Total area =     229.200(Ac.)
Depth of flow =   1.497(Ft.), Average velocity =   5.522(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.091 to Point/Station        6.101
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =    293.710(CFS)
Depth of flow =   2.088(Ft.), Average velocity =  13.927(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             16.00              0.00
      3             19.00              0.00
      4             37.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    293.710(CFS)
  '     '    flow top width =     17.199(Ft.)
  '     '    velocity=   13.927(Ft/s)
  '     '    area =     21.090(Sq.Ft)
  '     '    Froude number =     2.216

Upstream point elevation =  4185.500(Ft.)
Downstream point elevation =  3960.000(Ft.)
```

```
Flow length =  2627.000(Ft.)
Travel time  =    3.14 min.
Time of concentration =   34.10 min.
Depth of flow =   2.088(Ft.)
Average velocity =  13.927(Ft/s)
Total irregular channel flow =   293.710(CFS)
Irregular channel normal depth above invert elev. =   2.088(Ft.)
Average velocity of channel(s) =  13.927(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.700
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.265
Rainfall intensity =      3.437(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.269  CA =    104.750
Subarea runoff =    132.597(CFS) for    160.700(Ac.)
Total runoff =    359.980(CFS)      Total area =     389.900(Ac.)
Depth of flow =   2.282(Ft.), Average velocity =  14.665(Ft/s)


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Process from Point/Station        6.101 to Point/Station        6.111
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =    369.121(CFS)
Depth of flow =   2.437(Ft.), Average velocity =  12.863(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             10.00
      2             16.00              5.00
      3             36.00              0.00
      4             39.00              0.00
      5             55.00              5.00
      6             73.00             10.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    369.121(CFS)
  '     '    flow top width =     20.548(Ft.)
  '     '    velocity=   12.863(Ft/s)
  '     '    area =     28.696(Sq.Ft)
  '     '    Froude number =     1.918

Upstream point elevation =  3960.000(Ft.)
Downstream point elevation =  3840.000(Ft.)
Flow length =  1955.000(Ft.)
Travel time  =    2.53 min.
Time of concentration =   36.64 min.
Depth of flow =   2.437(Ft.)
Average velocity =  12.863(Ft/s)
Total irregular channel flow =   369.121(CFS)
```

```
Irregular channel normal depth above invert elev. =   2.437(Ft.)
Average velocity of channel(s) =  12.863(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      3.281(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.267  CA =    115.250
Subarea runoff =     18.198(CFS) for     42.000(Ac.)
Total runoff =    378.178(CFS)      Total area =     431.900(Ac.)
Depth of flow =   2.463(Ft.), Average velocity =  12.942(Ft/s)


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Process from Point/Station        6.101 to Point/Station        6.111
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =    431.900(Ac.)
Runoff from this stream =    378.178(CFS)
Time of concentration =   36.64 min.
Rainfall intensity =     3.281(In/Hr)
Summary of stream data:

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


1      350.372     26.38               4.056
2      378.178     36.64               3.281
Qmax(1) =
         1.000 *    1.000 *   350.372) +
         1.000 *    0.720 *   378.178) + =     622.621
Qmax(2) =
         0.809 *    1.000 *   350.372) +
         1.000 *    1.000 *   378.178) + =     661.623

Total of 2 streams to confluence:
Flow rates before confluence point:
     350.372     378.178
Maximum flow rates at confluence using above data:
      622.621      661.623
Area of streams before confluence:
      341.200      431.900
Results of confluence:
Total flow rate =    661.623(CFS)
Time of concentration =    36.637 min.
Effective stream area after confluence =    773.100(Ac.)


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```

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Process from Point/Station        6.111 to Point/Station        6.131
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    662.987(CFS)
Depth of flow =   4.273(Ft.), Average velocity =  11.340(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             10.00
      2              7.00              5.00
      3             22.00              0.00
      4             25.00              0.00
      5             35.00              5.00
      6             44.00             10.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------------
Sub-Channel flow  =    662.988(CFS)
  '     '    flow top width =     24.365(Ft.)
  '     '    velocity=   11.340(Ft/s)
  '     '    area =     58.464(Sq.Ft)
  '     '    Froude number =     1.290

Upstream point elevation =  3840.000(Ft.)
Downstream point elevation =  3827.000(Ft.)
Flow length =   535.000(Ft.)
Travel time  =    0.79 min.
Time of concentration =   37.42 min.
Depth of flow =   4.273(Ft.)
Average velocity =  11.340(Ft/s)
Total irregular channel flow =   662.987(CFS)
Irregular channel normal depth above invert elev. =   4.273(Ft.)
Average velocity of channel(s) =  11.340(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      3.237(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.261  CA =    205.230
Subarea runoff =      2.652(CFS) for     14.400(Ac.)
Total runoff =    664.275(CFS)      Total area =     787.500(Ac.)
Depth of flow =   4.276(Ft.), Average velocity =  11.346(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.111 to Point/Station        6.131
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    787.500(Ac.)
Runoff from this stream =    664.275(CFS)
```

```
Time of concentration =   37.42 min.
Rainfall intensity =     3.237(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.121 to Point/Station        6.131
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.900
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.255
Initial subarea total flow distance  = 4269.000(Ft.)
Highest elevation = 4462.000(Ft.)
Lowest elevation = 3827.000(Ft.)
Elevation difference =  635.000(Ft.) Slope = 14.875 %
Top of Initial Area Slope adjusted by User to  8.000 %
Bottom of Initial Area Slope adjusted by User to 15.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   8.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.61 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2550)*( 100.000^.5)/(   8.000^(1/3)]=   7.61
The initial area total distance of 4269.00 (Ft.) entered leaves a
remaining distance of 4169.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   9.94 minutes
for a distance of 4169.00 (Ft.) and a slope of 15.00 %
with an elevation difference of 625.35(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    9.936 Minutes
Tt=[(11.9*0.7896^3)/(625.35)]^.385=  9.94
Total initial area Ti =   7.61 minutes from Figure 3-3 formula plus
  9.94 minutes from the Figure 3-4 formula =  17.54 minutes
Rainfall intensity (I) =      5.277(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.255
Subarea runoff =    110.740(CFS)
Total initial stream area =       82.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.121 to Point/Station        6.131
**** CONFLUENCE OF MINOR STREAMS ****
----------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     82.300(Ac.)
Runoff from this stream =    110.740(CFS)
Time of concentration =   17.54 min.
Rainfall intensity =     5.277(In/Hr)
Summary of stream data:
```

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


1      664.275     37.42               3.237
2      110.740     17.54               5.277
Qmax(1) =
         1.000 *    1.000 *   664.275) +
         0.613 *    1.000 *   110.740) + =     732.203
Qmax(2) =
         1.000 *    0.469 *   664.275) +
         1.000 *    1.000 *   110.740) + =     422.102

Total of 2 streams to confluence:
Flow rates before confluence point:
     664.275     110.740
Maximum flow rates at confluence using above data:
      732.203      422.102
Area of streams before confluence:
      787.500       82.300
Results of confluence:
Total flow rate =    732.203(CFS)
Time of concentration =    37.424 min.
Effective stream area after confluence =    869.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.131 to Point/Station        1.081
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    763.400(CFS)
Depth of flow =   3.013(Ft.), Average velocity =  17.174(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             10.00
      2             14.00              5.00
      3             39.00              0.00
      4             42.00              0.00
      5             56.00              5.00
      6            101.00             10.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    763.399(CFS)
  '     '    flow top width =     26.503(Ft.)
  '     '    velocity=   17.174(Ft/s)
  '     '    area =     44.450(Sq.Ft)
  '     '    Froude number =     2.337

Upstream point elevation =  3827.000(Ft.)
Downstream point elevation =  3625.000(Ft.)
Flow length =  2362.000(Ft.)
Travel time  =    2.29 min.
Time of concentration =   39.72 min.
Depth of flow =   3.013(Ft.)
```

```
Average velocity =  17.174(Ft/s)
Total irregular channel flow =   763.400(CFS)
Irregular channel normal depth above invert elev. =   3.013(Ft.)
Average velocity of channel(s) =  17.174(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      3.115(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.259  CA =    255.066
Subarea runoff =     62.323(CFS) for    115.400(Ac.)
Total runoff =    794.526(CFS)      Total area =     985.200(Ac.)
Depth of flow =   3.064(Ft.), Average velocity =  17.348(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.131 to Point/Station        1.081
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    985.200(Ac.)
Runoff from this stream =    794.526(CFS)
Time of concentration =   39.72 min.
Rainfall intensity =     3.115(In/Hr)
Summary of stream data:

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


1     1332.094     28.91               3.823
2      794.526     39.72               3.115
Qmax(1) =
         1.000 *    1.000 *  1332.094) +
         1.000 *    0.728 *   794.526) + =    1910.395
Qmax(2) =
         0.815 *    1.000 *  1332.094) +
         1.000 *    1.000 *   794.526) + =    1879.838

Total of 2 main streams to confluence:
Flow rates before confluence point:
    1332.094     794.526
Maximum flow rates at confluence using above data:
     1910.395     1879.838
Area of streams before confluence:
     1360.600      985.200


Results of confluence:
Total flow rate =   1910.395(CFS)
```

```
Time of concentration =    28.907 min.
Effective stream area after confluence  =   2345.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.081 to Point/Station        1.091
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =   2122.724(CFS)
Depth of flow =   5.616(Ft.), Average velocity =  16.147(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              6.00
      2              6.00              4.00
      3             12.00              2.00
      4             18.00              0.00
      5             20.00              0.00
      6             29.00              2.00
      7             39.00              4.00
      8             47.00              6.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =   2122.725(CFS)
  '     '    flow top width =     44.311(Ft.)
  '     '    velocity=   16.147(Ft/s)
  '     '    area =    131.459(Sq.Ft)
  '     '    Froude number =     1.652

Upstream point elevation =  3625.000(Ft.)
Downstream point elevation =  3560.000(Ft.)
Flow length =  1831.000(Ft.)
Travel time  =    1.89 min.
Time of concentration =   30.80 min.
Depth of flow =   5.616(Ft.)
Average velocity =  16.147(Ft/s)
Total irregular channel flow =  2122.724(CFS)
Irregular channel normal depth above invert elev. =   5.616(Ft.)
Average velocity of channel(s) =  16.147(Ft/s)
 Adding area flow to channel
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      3.670(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.257  CA =    636.234
Subarea runoff =    424.740(CFS) for    131.000(Ac.)
Total runoff =   2335.135(CFS)      Total area =    2476.800(Ac.)
Depth of flow =   5.829(Ft.), Average velocity =  16.553(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.081 to Point/Station        1.091
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =   2476.800(Ac.)
Runoff from this stream =   2335.135(CFS)
Time of concentration =   30.80 min.
Rainfall intensity =     3.670(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.011 to Point/Station        7.021
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  = 1263.000(Ft.)
Highest elevation = 4058.000(Ft.)
Lowest elevation = 3985.000(Ft.)
Elevation difference =   73.000(Ft.) Slope =  5.780 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   5.78 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   8.02 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(   5.780^(1/3)]=   8.02
The initial area total distance of 1263.00 (Ft.) entered leaves a
remaining distance of 1163.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   5.37 minutes
for a distance of 1163.00 (Ft.) and a slope of  5.78 %
with an elevation difference of  67.22(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    5.367 Minutes
Tt=[(11.9*0.2203^3)/( 67.22)]^.385=  5.37
Total initial area Ti =   8.02 minutes from Figure 3-3 formula plus
  5.37 minutes from the Figure 3-4 formula =  13.39 minutes
Rainfall intensity (I) =      6.280(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
Subarea runoff =     57.466(CFS)
Total initial stream area =       30.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.021 to Point/Station        7.031
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

```
Estimated mean flow rate at midpoint of channel =    165.355(CFS)
Depth of flow =   1.556(Ft.), Average velocity =   8.835(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             44.00              0.00
      3             47.00              0.00
      4             61.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    165.355(CFS)
  '     '    flow top width =     21.052(Ft.)
  '     '    velocity=    8.835(Ft/s)
  '     '    area =     18.715(Sq.Ft)
  '     '    Froude number =     1.651

Upstream point elevation =  3985.000(Ft.)
Downstream point elevation =  3905.000(Ft.)
Flow length =  1544.000(Ft.)
Travel time  =    2.91 min.
Time of concentration =   16.30 min.
Depth of flow =   1.556(Ft.)
Average velocity =   8.835(Ft/s)
Total irregular channel flow =   165.355(CFS)
Irregular channel normal depth above invert elev. =   1.556(Ft.)
Average velocity of channel(s) =   8.835(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Rainfall intensity =      5.532(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.300  CA =     49.380
Subarea runoff =    215.691(CFS) for    134.100(Ac.)
Total runoff =    273.157(CFS)      Total area =     164.600(Ac.)
Depth of flow =   1.924(Ft.), Average velocity =  10.030(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.031 to Point/Station        1.091
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    308.476(CFS)
Depth of flow =   1.633(Ft.), Average velocity =  15.142(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
```

```
      2             24.00              0.00
      3             27.00              0.00
      4             61.00              5.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =    308.476(CFS)
  '     '    flow top width =     21.946(Ft.)
  '     '    velocity=   15.142(Ft/s)
  '     '    area =     20.373(Sq.Ft)
  '     '    Froude number =     2.770

Upstream point elevation =  3905.000(Ft.)
Downstream point elevation =  3560.000(Ft.)
Flow length =  2414.000(Ft.)
Travel time  =    2.66 min.
Time of concentration =   18.96 min.
Depth of flow =   1.633(Ft.)
Average velocity =  15.142(Ft/s)
Total irregular channel flow =   308.476(CFS)
Irregular channel normal depth above invert elev. =   1.633(Ft.)
Average velocity of channel(s) =  15.142(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.600
Decimal fraction soil group C = 0.400
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.270
Rainfall intensity =      5.018(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.291  CA =     68.496
Subarea runoff =     70.585(CFS) for     70.800(Ac.)
Total runoff =    343.743(CFS)      Total area =     235.400(Ac.)
Depth of flow =   1.710(Ft.), Average velocity =  15.562(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.031 to Point/Station        1.091
**** CONFLUENCE OF MAIN STREAMS ****
_________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    235.400(Ac.)
Runoff from this stream =    343.743(CFS)
Time of concentration =   18.96 min.
Rainfall intensity =     5.018(In/Hr)
Summary of stream data:

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


1     2335.135     30.80              3.670
2      343.743     18.96              5.018
Qmax(1) =
```

```
         1.000 *    1.000 *  2335.135) +
         0.731 *    1.000 *   343.743) + =    2586.532
Qmax(2) =
         1.000 *    0.616 *  2335.135) +
         1.000 *    1.000 *   343.743) + =    1781.402

Total of 2 main streams to confluence:
Flow rates before confluence point:
    2335.135     343.743
Maximum flow rates at confluence using above data:
     2586.532     1781.402
Area of streams before confluence:
     2476.800      235.400


Results of confluence:
Total flow rate =   2586.532(CFS)
Time of concentration =    30.797 min.
Effective stream area after confluence  =   2712.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.091 to Point/Station        1.101
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =   2666.032(CFS)
Depth of flow =   5.751(Ft.), Average velocity =  20.961(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              6.00
      2              6.00              4.00
      3             11.00              2.00
      4             16.00              0.00
      5             19.00              0.00
      6             28.00              2.00
      7             36.00              4.00
      8             40.00              6.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =   2666.033(CFS)
  '     '    flow top width =     38.755(Ft.)
  '     '    velocity=   20.961(Ft/s)
  '     '    area =    127.192(Sq.Ft)
  '     '    Froude number =     2.039

Upstream point elevation =  3560.000(Ft.)
Downstream point elevation =  3268.000(Ft.)
Flow length =  5476.000(Ft.)
Travel time  =    4.35 min.
Time of concentration =   35.15 min.
Depth of flow =   5.751(Ft.)
Average velocity =  20.961(Ft/s)
Total irregular channel flow =  2666.032(CFS)
Irregular channel normal depth above invert elev. =   5.751(Ft.)
Average velocity of channel(s) =  20.961(Ft/s)
```

```
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.600
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.400
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.290
Rainfall intensity =      3.370(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.264  CA =    814.640
Subarea runoff =    158.945(CFS) for    379.000(Ac.)
Total runoff =   2745.477(CFS)      Total area =    3091.200(Ac.)
Depth of flow =   5.821(Ft.), Average velocity =  21.129(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.091 to Point/Station        1.101
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =   3091.200(Ac.)
Runoff from this stream =   2745.477(CFS)
Time of concentration =   35.15 min.
Rainfall intensity =     3.370(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.011 to Point/Station        8.031
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  = 2457.000(Ft.)
Highest elevation = 4094.000(Ft.)
Lowest elevation = 3571.000(Ft.)
Elevation difference =  523.000(Ft.) Slope = 21.286 %
Top of Initial Area Slope adjusted by User to  6.000 %
Bottom of Initial Area Slope adjusted by User to 21.900 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   6.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.92 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(   6.000^(1/3)]=   7.92
The initial area total distance of 2457.00 (Ft.) entered leaves a
```

```
      remaining distance of 2357.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   5.54 minutes
      for a distance of 2357.00 (Ft.) and a slope of 21.90 %
      with an elevation difference of 516.18(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    5.537 Minutes
      Tt=[(11.9*0.4464^3)/(516.18)]^.385=  5.54
      Total initial area Ti =   7.92 minutes from Figure 3-3 formula plus
        5.54 minutes from the Figure 3-4 formula =  13.46 minutes
      Rainfall intensity (I) =      6.259(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
      Subarea runoff =    109.288(CFS)
      Total initial stream area =       58.200(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        8.011 to Point/Station        8.031
      **** CONFLUENCE OF MINOR STREAMS ****
      ------------------------------------------------------------------------
      Along Main Stream number: 2 in normal stream number 1
      Stream flow area =     58.200(Ac.)
      Runoff from this stream =    109.288(CFS)
      Time of concentration =   13.46 min.
      Rainfall intensity =     6.259(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        8.021 to Point/Station        8.031
      **** INITIAL AREA EVALUATION ****
      ------------------------------------------------------------------------
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 1.000
      Decimal fraction soil group D = 0.000
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.300
      Initial subarea total flow distance  = 2756.000(Ft.)
      Highest elevation = 4065.000(Ft.)
      Lowest elevation = 3571.000(Ft.)
      Elevation difference =  494.000(Ft.) Slope = 17.925 %
      Top of Initial Area Slope adjusted by User to 15.000 %
      Bottom of Initial Area Slope adjusted by User to 18.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  15.00 %, in a development type of
       Permanent Open Space
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   5.84 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(  15.000^(1/3)]=   5.84
      The initial area total distance of 2756.00 (Ft.) entered leaves a
      remaining distance of 2656.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   6.55 minutes
      for a distance of 2656.00 (Ft.) and a slope of 18.00 %
```

```
      with an elevation difference of 478.08(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    6.546 Minutes
      Tt=[(11.9*0.5030^3)/(478.08)]^.385=  6.55
      Total initial area Ti =   5.84 minutes from Figure 3-3 formula plus
        6.55 minutes from the Figure 3-4 formula =  12.38 minutes
      Rainfall intensity (I) =      6.605(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
      Subarea runoff =     71.730(CFS)
      Total initial stream area =       36.200(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        8.021 to Point/Station        8.031
      **** CONFLUENCE OF MINOR STREAMS ****
      ------------------------------------------------------------------------
      Along Main Stream number: 2 in normal stream number 2
      Stream flow area =     36.200(Ac.)
      Runoff from this stream =     71.730(CFS)
      Time of concentration =   12.38 min.
      Rainfall intensity =     6.605(In/Hr)
      Summary of stream data:

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


      1      109.288     13.46               6.259
      2       71.730     12.38               6.605
      Qmax(1) =
                1.000 *    1.000 *   109.288) +
                0.948 *    1.000 *    71.730) + =     177.264
      Qmax(2) =
                1.000 *    0.920 *   109.288) +
                1.000 *    1.000 *    71.730) + =     172.279

      Total of 2 streams to confluence:
      Flow rates before confluence point:
           109.288      71.730
      Maximum flow rates at confluence using above data:
            177.264      172.279
      Area of streams before confluence:
             58.200       36.200
      Results of confluence:
      Total flow rate =    177.264(CFS)
      Time of concentration =    13.461 min.
      Effective stream area after confluence =     94.400(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        8.031 to Point/Station        8.042
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ------------------------------------------------------------------------
      Estimated mean flow rate at midpoint of channel =    197.407(CFS)
      Depth of flow =   1.755(Ft.), Average velocity =  19.719(Ft/s)
            ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             25.00
      2             41.00              0.00
      3             44.00              0.00
      4             80.00             25.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    197.407(CFS)
  '     '    flow top width =      8.406(Ft.)
  '     '    velocity=   19.719(Ft/s)
  '     '    area =     10.011(Sq.Ft)
  '     '    Froude number =     3.184

Upstream point elevation =  3571.000(Ft.)
Downstream point elevation =  3290.000(Ft.)
Flow length =  1407.000(Ft.)
Travel time  =    1.19 min.
Time of concentration =   14.65 min.
Depth of flow =   1.755(Ft.)
Average velocity =  19.719(Ft/s)
Total irregular channel flow =   197.407(CFS)
Irregular channel normal depth above invert elev. =   1.755(Ft.)
Average velocity of channel(s) =  19.719(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Rainfall intensity =      5.927(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.300  CA =     36.690
Subarea runoff =     40.187(CFS) for     27.900(Ac.)
Total runoff =    217.450(CFS)      Total area =     122.300(Ac.)
Depth of flow =   1.842(Ft.), Average velocity =  20.227(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.031 to Point/Station        8.042
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    122.300(Ac.)
Runoff from this stream =    217.450(CFS)
Time of concentration =   14.65 min.
Rainfall intensity =     5.927(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.041 to Point/Station        8.042
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  = 2179.000(Ft.)
Highest elevation = 3617.000(Ft.)
Lowest elevation = 3290.000(Ft.)
Elevation difference =  327.000(Ft.) Slope = 15.007 %
Top of Initial Area Slope adjusted by User to  9.000 %
Bottom of Initial Area Slope adjusted by User to 15.300 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.92 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(   9.000^(1/3)]=   6.92
The initial area total distance of 2179.00 (Ft.) entered leaves a
remaining distance of 2079.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   5.77 minutes
for a distance of 2079.00 (Ft.) and a slope of 15.30 %
with an elevation difference of 318.09(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    5.771 Minutes
Tt=[(11.9*0.3937^3)/(318.09)]^.385=  5.77
Total initial area Ti =   6.92 minutes from Figure 3-3 formula plus
  5.77 minutes from the Figure 3-4 formula =  12.69 minutes
Rainfall intensity (I) =      6.501(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
Subarea runoff =    141.785(CFS)
Total initial stream area =       72.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.041 to Point/Station        8.042
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     72.700(Ac.)
Runoff from this stream =    141.785(CFS)
Time of concentration =   12.69 min.
Rainfall intensity =     6.501(In/Hr)
Summary of stream data:

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


1      217.450     14.65              5.927
2      141.785     12.69              6.501
Qmax(1) =
```

```
         1.000 *    1.000 *   217.450) +
         0.912 *    1.000 *   141.785) + =     346.712
Qmax(2) =
         1.000 *    0.866 *   217.450) +
         1.000 *    1.000 *   141.785) + =     330.191

Total of 2 streams to confluence:
Flow rates before confluence point:
     217.450     141.785
Maximum flow rates at confluence using above data:
      346.712      330.191
Area of streams before confluence:
      122.300       72.700
Results of confluence:
Total flow rate =    346.712(CFS)
Time of concentration =    14.650 min.
Effective stream area after confluence =    195.000(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.042 to Point/Station        1.101
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   2.775(Ft.), Average velocity =  18.758(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             25.00
      2             42.00              0.00
      3             44.00              0.00
      4             86.00             25.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    346.711(CFS)
  '     '    flow top width =     11.323(Ft.)
  '     '    velocity=   18.758(Ft/s)
  '     '    area =     18.483(Sq.Ft)
  '     '    Froude number =     2.587

Upstream point elevation =  3290.000(Ft.)
Downstream point elevation =  3268.000(Ft.)
Flow length =   183.000(Ft.)
Travel time  =    0.16 min.
Time of concentration =   14.81 min.
Depth of flow =   2.775(Ft.)
Average velocity =  18.758(Ft/s)
Total irregular channel flow =   346.712(CFS)
Irregular channel normal depth above invert elev. =   2.775(Ft.)
Average velocity of channel(s) =  18.758(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.042 to Point/Station        1.101
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
```

```
In Main Stream number: 2
Stream flow area =    195.000(Ac.)
Runoff from this stream =    346.712(CFS)
Time of concentration =   14.81 min.
Rainfall intensity =     5.885(In/Hr)
Summary of stream data:

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


1     2745.477     35.15               3.370
2      346.712     14.81               5.885
Qmax(1) =
         1.000 *    1.000 *  2745.477) +
         0.573 *    1.000 *   346.712) + =    2944.040
Qmax(2) =
         1.000 *    0.421 *  2745.477) +
         1.000 *    1.000 *   346.712) + =    1503.669

Total of 2 main streams to confluence:
Flow rates before confluence point:
    2745.477     346.712
Maximum flow rates at confluence using above data:
     2944.040     1503.669
Area of streams before confluence:
     3091.200      195.000


Results of confluence:
Total flow rate =   2944.040(CFS)
Time of concentration =    35.151 min.
Effective stream area after confluence  =   3286.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.101 to Point/Station        1.111
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =   2944.081(CFS)
Depth of flow =   5.775(Ft.), Average velocity =  18.953(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              10.00
      2              4.00               8.00
      3              7.00               6.00
      4             12.00               4.00
      5             19.00               2.00
      6             26.00               0.00
      7             28.00               0.00
      8             39.00               2.00
      9             50.00               4.00
      10             55.00               6.00
      11             59.00               8.00
      12             63.00              10.00
```

```
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =   2944.081(CFS)
  '     '    flow top width =     46.876(Ft.)
  '     '    velocity=   18.953(Ft/s)
  '     '    area =    155.337(Sq.Ft)
  '     '    Froude number =     1.835

Upstream point elevation =  3268.000(Ft.)
Downstream point elevation =  3082.000(Ft.)
Flow length =  4409.000(Ft.)
Travel time  =    3.88 min.
Time of concentration =   39.03 min.
Depth of flow =   5.775(Ft.)
Average velocity =  18.953(Ft/s)
Total irregular channel flow =  2944.081(CFS)
Irregular channel normal depth above invert elev. =   5.775(Ft.)
Average velocity of channel(s) =  18.953(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
The area added to the existing stream causes a
a lower flow rate of Q =   2927.988(CFS)
therefore the upstream flow rate of Q =   2944.040(CFS) is being used
Rainfall intensity =      3.150(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.268  CA =    929.450
Subarea runoff =      0.000(CFS) for    187.700(Ac.)
Total runoff =   2944.040(CFS)      Total area =    3473.900(Ac.)
Depth of flow =   5.775(Ft.), Average velocity =  18.953(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.101 to Point/Station        1.111
**** CONFLUENCE OF MAIN STREAMS ****
_________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =   3473.900(Ac.)
Runoff from this stream =   2944.040(CFS)
Time of concentration =   39.03 min.
Rainfall intensity =     3.150(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.011 to Point/Station        9.021
**** INITIAL AREA EVALUATION ****
_________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
      Decimal fraction soil group C = 1.000
      Decimal fraction soil group D = 0.000
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.300
      Initial subarea total flow distance  = 1036.000(Ft.)
      Highest elevation = 3906.000(Ft.)
      Lowest elevation = 3786.000(Ft.)
      Elevation difference =  120.000(Ft.) Slope = 11.583 %
      Top of Initial Area Slope adjusted by User to  8.000 %
      Bottom of Initial Area Slope adjusted by User to 12.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of   8.00 %, in a development type of
       Permanent Open Space
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   7.20 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(   8.000^(1/3)]=   7.20
      The initial area total distance of 1036.00 (Ft.) entered leaves a
      remaining distance of  936.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   3.43 minutes
      for a distance of 936.00 (Ft.) and a slope of 12.00 %
      with an elevation difference of 112.32(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    3.428 Minutes
      Tt=[(11.9*0.1773^3)/(112.32)]^.385=  3.43
      Total initial area Ti =   7.20 minutes from Figure 3-3 formula plus
        3.43 minutes from the Figure 3-4 formula =  10.63 minutes
      Rainfall intensity (I) =      7.290(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
      Subarea runoff =     37.180(CFS)
      Total initial stream area =       17.000(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        9.021 to Point/Station        9.041
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ----------------------------------------------------------------------
      Estimated mean flow rate at midpoint of channel =    125.008(CFS)
      Depth of flow =   2.201(Ft.), Average velocity =  17.209(Ft/s)
            ******* Irregular Channel Data ***********
      ----------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              6.00
            2              3.00              4.00
            3              6.00              2.00
            4              9.00              0.00
            5             12.00              2.00
            6             15.00              4.00
            7             18.00              6.00
      Manning's 'N' friction factor =   0.035
      ----------------------------------------------------------------
      Sub-Channel flow  =    125.007(CFS)
```

```
  '     '    flow top width =      6.602(Ft.)
  '     '    velocity=   17.209(Ft/s)
  '     '    area =      7.264(Sq.Ft)
  '     '    Froude number =     2.891

Upstream point elevation =  3786.000(Ft.)
Downstream point elevation =  3136.000(Ft.)
Flow length =  3517.000(Ft.)
Travel time  =    3.41 min.
Time of concentration =   14.03 min.
Depth of flow =   2.201(Ft.)
Average velocity =  17.209(Ft/s)
Total irregular channel flow =   125.008(CFS)
Irregular channel normal depth above invert elev. =   2.201(Ft.)
Average velocity of channel(s) =  17.209(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Rainfall intensity =      6.093(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.300  CA =     34.920
Subarea runoff =    175.602(CFS) for     99.400(Ac.)
Total runoff =    212.781(CFS)      Total area =     116.400(Ac.)
Depth of flow =   2.686(Ft.), Average velocity =  19.657(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.021 to Point/Station        9.041
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    116.400(Ac.)
Runoff from this stream =    212.781(CFS)
Time of concentration =   14.03 min.
Rainfall intensity =     6.093(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.031 to Point/Station        9.041
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  = 3692.000(Ft.)
Highest elevation = 3698.000(Ft.)
```

```
Lowest elevation = 3136.000(Ft.)
Elevation difference =  562.000(Ft.) Slope = 15.222 %
Top of Initial Area Slope adjusted by User to 22.000 %
Bottom of Initial Area Slope adjusted by User to 15.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  22.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.14 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(  22.000^(1/3)]=   5.14
The initial area total distance of 3692.00 (Ft.) entered leaves a
remaining distance of 3592.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   8.86 minutes
for a distance of 3592.00 (Ft.) and a slope of 15.00 %
with an elevation difference of 538.80(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    8.859 Minutes
Tt=[(11.9*0.6803^3)/(538.80)]^.385=  8.86
Total initial area Ti =   5.14 minutes from Figure 3-3 formula plus
  8.86 minutes from the Figure 3-4 formula =  14.00 minutes
Rainfall intensity (I) =      6.103(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
Subarea runoff =    158.379(CFS)
Total initial stream area =       86.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.031 to Point/Station        9.041
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     86.500(Ac.)
Runoff from this stream =    158.379(CFS)
Time of concentration =   14.00 min.
Rainfall intensity =     6.103(In/Hr)
Summary of stream data:

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


1      212.781     14.03               6.093
2      158.379     14.00               6.103
Qmax(1) =
         1.000 *    1.000 *   212.781) +
         0.998 *    1.000 *   158.379) + =     370.905
Qmax(2) =
         1.000 *    0.997 *   212.781) +
         1.000 *    1.000 *   158.379) + =     370.628

Total of 2 streams to confluence:
Flow rates before confluence point:
     212.781     158.379
Maximum flow rates at confluence using above data:
```

```
      370.905      370.628
Area of streams before confluence:
      116.400       86.500
Results of confluence:
Total flow rate =    370.905(CFS)
Time of concentration =    14.034 min.
Effective stream area after confluence =    202.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.041 to Point/Station        1.111
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    391.618(CFS)
Depth of flow =   2.981(Ft.), Average velocity =  10.511(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              6.00
      2              6.00              4.00
      3             12.00              2.00
      4             19.00              0.00
      5             20.00              0.00
      6             28.00              2.00
      7             41.00              4.00
      8             55.00              6.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    391.617(CFS)
  '     '    flow top width =     25.317(Ft.)
  '     '    velocity=   10.511(Ft/s)
  '     '    area =     37.259(Sq.Ft)
  '     '    Froude number =     1.527

Upstream point elevation =  3136.000(Ft.)
Downstream point elevation =  3082.000(Ft.)
Flow length =  1418.000(Ft.)
Travel time  =    2.25 min.
Time of concentration =   16.28 min.
Depth of flow =   2.981(Ft.)
Average velocity =  10.511(Ft/s)
Total irregular channel flow =   391.618(CFS)
Irregular channel normal depth above invert elev. =   2.981(Ft.)
Average velocity of channel(s) =  10.511(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Rainfall intensity =      5.536(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.300  CA =     74.460
```

```
Subarea runoff =     41.338(CFS) for     45.300(Ac.)
Total runoff =    412.242(CFS)      Total area =     248.200(Ac.)
Depth of flow =   3.039(Ft.), Average velocity =  10.636(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.041 to Point/Station        1.111
**** CONFLUENCE OF MAIN STREAMS ****
----------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    248.200(Ac.)
Runoff from this stream =    412.242(CFS)
Time of concentration =   16.28 min.
Rainfall intensity =     5.536(In/Hr)
Summary of stream data:

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


1     2944.040     39.03               3.150
2      412.242     16.28               5.536
Qmax(1) =
         1.000 *    1.000 *  2944.040) +
         0.569 *    1.000 *   412.242) + =    3178.607
Qmax(2) =
         1.000 *    0.417 *  2944.040) +
         1.000 *    1.000 *   412.242) + =    1640.459

Total of 2 main streams to confluence:
Flow rates before confluence point:
    2944.040     412.242
Maximum flow rates at confluence using above data:
     3178.607     1640.459
Area of streams before confluence:
     3473.900      248.200


Results of confluence:
Total flow rate =   3178.607(CFS)
Time of concentration =    39.029 min.
Effective stream area after confluence  =   3722.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.111 to Point/Station        1.121
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
----------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =   3178.638(CFS)
Depth of flow =   7.489(Ft.), Average velocity =  10.140(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00               8.00
      2              7.00               6.00
```

```
      3             14.00              4.00
      4             21.00              2.00
      5             29.00              0.00
      6             31.00              0.00
      7             42.00              2.00
      8             53.00              4.00
      9             69.00              6.00
      10            129.00              8.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =   3178.636(CFS)
  '     '    flow top width =    111.884(Ft.)
  '     '    velocity=   10.140(Ft/s)
  '     '    area =    313.462(Sq.Ft)
  '     '    Froude number =     1.068

Upstream point elevation =  3082.000(Ft.)
Downstream point elevation =  3066.000(Ft.)
Flow length =  1088.000(Ft.)
Travel time  =    1.79 min.
Time of concentration =   40.82 min.
Depth of flow =   7.489(Ft.)
Average velocity =  10.140(Ft/s)
Total irregular channel flow =  3178.638(CFS)
Irregular channel normal depth above invert elev. =   7.489(Ft.)
Average velocity of channel(s) =  10.140(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
The area added to the existing stream causes a
a lower flow rate of Q =   3106.634(CFS)
therefore the upstream flow rate of Q =   3178.607(CFS) is being used
Rainfall intensity =      3.061(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.270  CA =   1015.070
Subarea runoff =      0.000(CFS) for     37.200(Ac.)
Total runoff =   3178.607(CFS)      Total area =    3759.300(Ac.)
Depth of flow =   7.489(Ft.), Average velocity =  10.140(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.111 to Point/Station        1.121
**** CONFLUENCE OF MAIN STREAMS ****
_________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =   3759.300(Ac.)
Runoff from this stream =   3178.607(CFS)
Time of concentration =   40.82 min.
Rainfall intensity =     3.061(In/Hr)
Program is now starting with Main Stream No. 2
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.011 to Point/Station       10.031
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  = 2639.000(Ft.)
Highest elevation = 3943.000(Ft.)
Lowest elevation = 3570.000(Ft.)
Elevation difference =  373.000(Ft.) Slope = 14.134 %
Top of Initial Area Slope adjusted by User to 18.000 %
Bottom of Initial Area Slope adjusted by User to 14.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  18.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.49 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(  18.000^(1/3)]=   5.49
The initial area total distance of 2639.00 (Ft.) entered leaves a
remaining distance of 2539.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   6.97 minutes
for a distance of 2539.00 (Ft.) and a slope of 14.00 %
with an elevation difference of 355.46(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    6.965 Minutes
Tt=[(11.9*0.4809^3)/(355.46)]^.385=  6.97
Total initial area Ti =   5.49 minutes from Figure 3-3 formula plus
  6.97 minutes from the Figure 3-4 formula =  12.46 minutes
Rainfall intensity (I) =      6.579(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
Subarea runoff =     99.480(CFS)
Total initial stream area =       50.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.011 to Point/Station       10.031
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     50.400(Ac.)
Runoff from this stream =     99.480(CFS)
Time of concentration =   12.46 min.
Rainfall intensity =     6.579(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
      Process from Point/Station       10.021 to Point/Station       10.031
      **** INITIAL AREA EVALUATION ****
      ----------------------------------------------------------------------
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 1.000
      Decimal fraction soil group D = 0.000
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.300
      Initial subarea total flow distance  = 1951.000(Ft.)
      Highest elevation = 3818.000(Ft.)
      Lowest elevation = 3570.000(Ft.)
      Elevation difference =  248.000(Ft.) Slope = 12.711 %
      Top of Initial Area Slope adjusted by User to  6.000 %
      Bottom of Initial Area Slope adjusted by User to 13.100 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of   6.00 %, in a development type of
       Permanent Open Space
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   7.92 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(   6.000^(1/3)]=   7.92
      The initial area total distance of 1951.00 (Ft.) entered leaves a
      remaining distance of 1851.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   5.60 minutes
      for a distance of 1851.00 (Ft.) and a slope of 13.10 %
      with an elevation difference of 242.48(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    5.602 Minutes
      Tt=[(11.9*0.3506^3)/(242.48)]^.385=  5.60
      Total initial area Ti =   7.92 minutes from Figure 3-3 formula plus
        5.60 minutes from the Figure 3-4 formula =  13.53 minutes
      Rainfall intensity (I) =      6.240(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
      Subarea runoff =     81.990(CFS)
      Total initial stream area =       43.800(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station       10.021 to Point/Station       10.031
      **** CONFLUENCE OF MINOR STREAMS ****
      ----------------------------------------------------------------------
      Along Main Stream number: 2 in normal stream number 2
      Stream flow area =     43.800(Ac.)
      Runoff from this stream =     81.990(CFS)
      Time of concentration =   13.53 min.
      Rainfall intensity =     6.240(In/Hr)
      Summary of stream data:

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

```
1       99.480     12.46               6.579
2       81.990     13.53               6.240
Qmax(1) =
         1.000 *    1.000 *    99.480) +
         1.000 *    0.921 *    81.990) + =     175.003
Qmax(2) =
         0.948 *    1.000 *    99.480) +
         1.000 *    1.000 *    81.990) + =     176.335

Total of 2 streams to confluence:
Flow rates before confluence point:
      99.480      81.990
Maximum flow rates at confluence using above data:
      175.003      176.335
Area of streams before confluence:
       50.400       43.800
Results of confluence:
Total flow rate =    176.335(CFS)
Time of concentration =    13.527 min.
Effective stream area after confluence =     94.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.031 to Point/Station       10.051
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    212.751(CFS)
Depth of flow =   2.032(Ft.), Average velocity =  10.341(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00             10.00
      2             16.00              5.00
      3             32.00              0.00
      4             34.00              0.00
      5             58.00              5.00
      6             91.00             10.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    212.751(CFS)
  '     '    flow top width =     18.253(Ft.)
  '     '    velocity=   10.341(Ft/s)
  '     '    area =     20.573(Sq.Ft)
  '     '    Froude number =     1.717

Upstream point elevation =  3570.000(Ft.)
Downstream point elevation =  3503.000(Ft.)
Flow length =  1276.000(Ft.)
Travel time  =    2.06 min.
Time of concentration =   15.58 min.
Depth of flow =   2.032(Ft.)
Average velocity =  10.341(Ft/s)
Total irregular channel flow =   212.751(CFS)
Irregular channel normal depth above invert elev. =   2.032(Ft.)
Average velocity of channel(s) =  10.341(Ft/s)
 Adding area flow to channel
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Rainfall intensity =      5.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.300  CA =     43.740
Subarea runoff =     72.781(CFS) for     51.600(Ac.)
Total runoff =    249.116(CFS)      Total area =     145.800(Ac.)
Depth of flow =   2.169(Ft.), Average velocity =  10.760(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.031 to Point/Station       10.051
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    145.800(Ac.)
Runoff from this stream =    249.116(CFS)
Time of concentration =   15.58 min.
Rainfall intensity =     5.695(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.041 to Point/Station       10.051
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  = 3154.000(Ft.)
Highest elevation = 3756.000(Ft.)
Lowest elevation = 3503.000(Ft.)
Elevation difference =  253.000(Ft.) Slope =  8.022 %
Top of Initial Area Slope adjusted by User to  3.000 %
Bottom of Initial Area Slope adjusted by User to  8.200 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   3.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   9.98 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(   3.000^(1/3)]=   9.98
The initial area total distance of 3154.00 (Ft.) entered leaves a
remaining distance of 3054.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   9.87 minutes
for a distance of 3054.00 (Ft.) and a slope of  8.20 %
```

```
      with an elevation difference of 250.43(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    9.866 Minutes
      Tt=[(11.9*0.5784^3)/(250.43)]^.385=  9.87
      Total initial area Ti =   9.98 minutes from Figure 3-3 formula plus
        9.87 minutes from the Figure 3-4 formula =  19.85 minutes
      Rainfall intensity (I) =      4.872(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
      Subarea runoff =    168.677(CFS)
      Total initial stream area =      115.400(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station       10.041 to Point/Station       10.051
      **** CONFLUENCE OF MINOR STREAMS ****
      ------------------------------------------------------------------------
      Along Main Stream number: 2 in normal stream number 2
      Stream flow area =    115.400(Ac.)
      Runoff from this stream =    168.677(CFS)
      Time of concentration =   19.85 min.
      Rainfall intensity =     4.872(In/Hr)
      Summary of stream data:

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


      1      249.116     15.58               5.695
      2      168.677     19.85               4.872
      Qmax(1) =
                1.000 *    1.000 *   249.116) +
                1.000 *    0.785 *   168.677) + =     381.535
      Qmax(2) =
                0.855 *    1.000 *   249.116) +
                1.000 *    1.000 *   168.677) + =     381.789

      Total of 2 streams to confluence:
      Flow rates before confluence point:
           249.116     168.677
      Maximum flow rates at confluence using above data:
            381.535      381.789
      Area of streams before confluence:
            145.800      115.400
      Results of confluence:
      Total flow rate =    381.789(CFS)
      Time of concentration =    19.850 min.
      Effective stream area after confluence =    261.200(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station       10.051 to Point/Station       10.071
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ------------------------------------------------------------------------
      Estimated mean flow rate at midpoint of channel =    456.916(CFS)
      Depth of flow =   2.457(Ft.), Average velocity =  11.432(Ft/s)
            ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             38.00              0.00
      3             41.00              0.00
      4             57.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    456.916(CFS)
  '     '    flow top width =     29.536(Ft.)
  '     '    velocity=   11.432(Ft/s)
  '     '    area =     39.970(Sq.Ft)
  '     '    Froude number =     1.732

Upstream point elevation =  3503.000(Ft.)
Downstream point elevation =  3440.000(Ft.)
Flow length =  1270.000(Ft.)
Travel time  =    1.85 min.
Time of concentration =   21.70 min.
Depth of flow =   2.457(Ft.)
Average velocity =  11.432(Ft/s)
Total irregular channel flow =   456.916(CFS)
Irregular channel normal depth above invert elev. =   2.457(Ft.)
Average velocity of channel(s) =  11.432(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Rainfall intensity =      4.600(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.300  CA =    115.650
Subarea runoff =    150.188(CFS) for    124.300(Ac.)
Total runoff =    531.977(CFS)      Total area =     385.500(Ac.)
Depth of flow =   2.616(Ft.), Average velocity =  11.877(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.051 to Point/Station       10.071
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    385.500(Ac.)
Runoff from this stream =    531.977(CFS)
Time of concentration =   21.70 min.
Rainfall intensity =     4.600(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.061 to Point/Station       10.071
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  = 5991.000(Ft.)
Highest elevation = 4070.000(Ft.)
Lowest elevation = 3440.000(Ft.)
Elevation difference =  630.000(Ft.) Slope = 10.516 %
Top of Initial Area Slope adjusted by User to  3.000 %
Bottom of Initial Area Slope adjusted by User to 10.600 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   3.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   9.98 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(   3.000^(1/3)]=   9.98
The initial area total distance of 5991.00 (Ft.) entered leaves a
remaining distance of 5891.00 (Ft.)
Using Figure 3-4, the travel time for this distance is  14.82 minutes
for a distance of 5891.00 (Ft.) and a slope of 10.60 %
with an elevation difference of 624.45(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =   14.822 Minutes
Tt=[(11.9*1.1157^3)/(624.45)]^.385= 14.82
Total initial area Ti =   9.98 minutes from Figure 3-3 formula plus
 14.82 minutes from the Figure 3-4 formula =  24.81 minutes
Rainfall intensity (I) =      4.220(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
Subarea runoff =    208.249(CFS)
Total initial stream area =      164.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.061 to Point/Station       10.071
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =    164.500(Ac.)
Runoff from this stream =    208.249(CFS)
Time of concentration =   24.81 min.
Rainfall intensity =     4.220(In/Hr)
Summary of stream data:

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


1      531.977     21.70               4.600
2      208.249     24.81               4.220
Qmax(1) =
```

```
         1.000 *    1.000 *   531.977) +
         1.000 *    0.875 *   208.249) + =     714.164
Qmax(2) =
         0.917 *    1.000 *   531.977) +
         1.000 *    1.000 *   208.249) + =     696.273

Total of 2 streams to confluence:
Flow rates before confluence point:
     531.977     208.249
Maximum flow rates at confluence using above data:
      714.164      696.273
Area of streams before confluence:
      385.500      164.500
Results of confluence:
Total flow rate =    714.164(CFS)
Time of concentration =    21.702 min.
Effective stream area after confluence =    550.000(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.071 to Point/Station       10.091
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =    758.512(CFS)
Depth of flow =   2.307(Ft.), Average velocity =  11.283(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             81.00              0.00
      3             85.00              0.00
      4            113.00              5.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------------
Sub-Channel flow  =    758.511(CFS)
  '     '    flow top width =     54.287(Ft.)
  '     '    velocity=   11.283(Ft/s)
  '     '    area =     67.226(Sq.Ft)
  '     '    Froude number =     1.787

Upstream point elevation =  3440.000(Ft.)
Downstream point elevation =  3403.000(Ft.)
Flow length =   692.000(Ft.)
Travel time  =    1.02 min.
Time of concentration =   22.72 min.
Depth of flow =   2.307(Ft.)
Average velocity =  11.283(Ft/s)
Total irregular channel flow =   758.512(CFS)
Irregular channel normal depth above invert elev. =   2.307(Ft.)
Average velocity of channel(s) =  11.283(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
```

```
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Rainfall intensity =      4.465(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.300  CA =    179.820
Subarea runoff =     88.794(CFS) for     49.400(Ac.)
Total runoff =    802.958(CFS)      Total area =     599.400(Ac.)
Depth of flow =   2.360(Ft.), Average velocity =  11.445(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.071 to Point/Station       10.091
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    599.400(Ac.)
Runoff from this stream =    802.958(CFS)
Time of concentration =   22.72 min.
Rainfall intensity =     4.465(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.081 to Point/Station       10.091
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  = 2234.000(Ft.)
Highest elevation = 3617.000(Ft.)
Lowest elevation = 3403.000(Ft.)
Elevation difference =  214.000(Ft.) Slope =  9.579 %
Top of Initial Area Slope adjusted by User to  7.000 %
Bottom of Initial Area Slope adjusted by User to  9.300 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   7.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.53 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(   7.000^(1/3)]=   7.53
The initial area total distance of 2234.00 (Ft.) entered leaves a
remaining distance of 2134.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   7.13 minutes
for a distance of 2134.00 (Ft.) and a slope of  9.30 %
with an elevation difference of 198.46(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    7.132 Minutes
Tt=[(11.9*0.4042^3)/(198.46)]^.385=  7.13
```

```
Total initial area Ti =   7.53 minutes from Figure 3-3 formula plus
  7.13 minutes from the Figure 3-4 formula =  14.66 minutes
Rainfall intensity (I) =      5.924(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
Subarea runoff =     99.350(CFS)
Total initial stream area =       55.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.081 to Point/Station       10.091
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     55.900(Ac.)
Runoff from this stream =     99.350(CFS)
Time of concentration =   14.66 min.
Rainfall intensity =     5.924(In/Hr)
Summary of stream data:

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


1      802.958     22.72               4.465
2       99.350     14.66               5.924
Qmax(1) =
         1.000 *    1.000 *   802.958) +
         0.754 *    1.000 *    99.350) + =     877.842
Qmax(2) =
         1.000 *    0.645 *   802.958) +
         1.000 *    1.000 *    99.350) + =     617.357

Total of 2 streams to confluence:
Flow rates before confluence point:
     802.958      99.350
Maximum flow rates at confluence using above data:
      877.842      617.357
Area of streams before confluence:
      599.400       55.900
Results of confluence:
Total flow rate =    877.842(CFS)
Time of concentration =    22.724 min.
Effective stream area after confluence =    655.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.091 to Point/Station       10.101
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =    950.391(CFS)
Depth of flow =   3.201(Ft.), Average velocity =  18.056(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              5.00
      2             13.00              0.00
```

```
      3             16.00              0.00
      4             45.00              5.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
Sub-Channel flow  =    950.392(CFS)
  '     '    flow top width =     29.887(Ft.)
  '     '    velocity=   18.056(Ft/s)
  '     '    area =     52.634(Sq.Ft)
  '     '    Froude number =     2.398

Upstream point elevation =  3403.000(Ft.)
Downstream point elevation =  3145.000(Ft.)
Flow length =  2920.000(Ft.)
Travel time  =    2.70 min.
Time of concentration =   25.42 min.
Depth of flow =   3.201(Ft.)
Average velocity =  18.056(Ft/s)
Total irregular channel flow =   950.391(CFS)
Irregular channel normal depth above invert elev. =   3.201(Ft.)
Average velocity of channel(s) =  18.056(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Rainfall intensity =      4.154(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.300  CA =    246.240
Subarea runoff =    145.018(CFS) for    165.500(Ac.)
Total runoff =   1022.859(CFS)      Total area =     820.800(Ac.)
Depth of flow =   3.299(Ft.), Average velocity =  18.393(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.101 to Point/Station        1.121
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =   1060.344(CFS)
Depth of flow =   3.792(Ft.), Average velocity =  12.921(Ft/s)
      ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00               6.00
      2             14.00               4.00
      3             25.00               2.00
      4             34.00               0.00
      5             37.00               0.00
      6             49.00               2.00
      7             53.00               4.00
      8             57.00               6.00
Manning's 'N' friction factor =   0.035
-----------------------------------------------------------------
```

```
Sub-Channel flow  =   1060.345(CFS)
  '     '    flow top width =     37.443(Ft.)
  '     '    velocity=   12.921(Ft/s)
  '     '    area =     82.064(Sq.Ft)
  '     '    Froude number =     1.538

Upstream point elevation =  3145.000(Ft.)
Downstream point elevation =  3066.000(Ft.)
Flow length =  2347.000(Ft.)
Travel time  =    3.03 min.
Time of concentration =   28.45 min.
Depth of flow =   3.792(Ft.)
Average velocity =  12.921(Ft/s)
Total irregular channel flow =  1060.344(CFS)
Irregular channel normal depth above invert elev. =   3.792(Ft.)
Average velocity of channel(s) =  12.921(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Rainfall intensity =      3.863(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.300  CA =    284.160
Subarea runoff =     74.882(CFS) for    126.400(Ac.)
Total runoff =   1097.741(CFS)      Total area =     947.200(Ac.)
Depth of flow =   3.848(Ft.), Average velocity =  13.042(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.101 to Point/Station        1.121
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    947.200(Ac.)
Runoff from this stream =   1097.741(CFS)
Time of concentration =   28.45 min.
Rainfall intensity =     3.863(In/Hr)
Summary of stream data:

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


1     3178.607     40.82               3.061
2     1097.741     28.45               3.863
Qmax(1) =
         1.000 *    1.000 *  3178.607) +
         0.792 *    1.000 *  1097.741) + =    4048.282
Qmax(2) =
         1.000 *    0.697 *  3178.607) +
         1.000 *    1.000 *  1097.741) + =    3313.007
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
    3178.607    1097.741
Maximum flow rates at confluence using above data:
     4048.282     3313.007
Area of streams before confluence:
     3759.300      947.200


Results of confluence:
Total flow rate =   4048.282(CFS)
Time of concentration =    40.817 min.
Effective stream area after confluence  =   4706.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.121 to Point/Station        1.122
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =   4048.322(CFS)
Depth of flow =   6.835(Ft.), Average velocity =  14.844(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              8.00
      2              9.00              6.00
      3             22.00              4.00
      4             36.00              2.00
      5             50.00              0.00
      6             53.00              0.00
      7             62.00              2.00
      8             69.00              4.00
      9             75.00              6.00
      10             81.00              8.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =   4048.323(CFS)
  '     '    flow top width =     72.262(Ft.)
  '     '    velocity=   14.844(Ft/s)
  '     '    area =    272.717(Sq.Ft)
  '     '    Froude number =     1.347

Upstream point elevation =  3066.000(Ft.)
Downstream point elevation =  3048.000(Ft.)
Flow length =   842.000(Ft.)
Travel time  =    0.95 min.
Time of concentration =   41.76 min.
Depth of flow =   6.835(Ft.)
Average velocity =  14.844(Ft/s)
Total irregular channel flow =  4048.322(CFS)
Irregular channel normal depth above invert elev. =   6.835(Ft.)
Average velocity of channel(s) =  14.844(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```

```
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
The area added to the existing stream causes a
a lower flow rate of Q =   3960.989(CFS)
therefore the upstream flow rate of Q =   4048.282(CFS) is being used
Rainfall intensity =      3.016(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.276  CA =   1313.480
Subarea runoff =      0.000(CFS) for     47.500(Ac.)
Total runoff =   4048.282(CFS)      Total area =    4754.000(Ac.)
Depth of flow =   6.835(Ft.), Average velocity =  14.844(Ft/s)
End of computations, total study area =        4754.000 (Ac.)
```

Basin 11

```
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

      Rational method hydrology program based on
      San Diego County Flood Control Division 2003 hydrology manual
      Rational Hydrology Study        Date: 01/08/09
      ------------------------------------------------------------------------
-
      HOSKINGS RANCH
      Pre-Development Hydrology Calculations
      100-Year Frequency Storm
      Basin 11
      ------------------------------------------------------------------------
-
       *********   Hydrology Study Control Information **********

      ------------------------------------------------------------------------
-


      Program License Serial Number 4065

      ------------------------------------------------------------------------
-
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  4.500
      24 hour precipitation(inches) =  9.500
      P6/P24 =    47.4%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station       11.011 to Point/Station       11.021
      **** INITIAL AREA EVALUATION ****
      ________________________________________________________________________
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 1.000
      Decimal fraction soil group D = 0.000
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.300
      Initial subarea total flow distance  = 1667.000(Ft.)
      Highest elevation = 3906.000(Ft.)
      Lowest elevation = 3534.000(Ft.)
      Elevation difference =  372.000(Ft.) Slope = 22.316 %
      Top of Initial Area Slope adjusted by User to 10.000 %
      Bottom of Initial Area Slope adjusted by User to 23.100 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  10.00 %, in a development type of
       Permanent Open Space
```

```
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   6.68 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(  10.000^(1/3)]=   6.68
      The initial area total distance of 1667.00 (Ft.) entered leaves a
      remaining distance of 1567.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   3.96 minutes
      for a distance of 1567.00 (Ft.) and a slope of 23.10 %
      with an elevation difference of 361.98(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    3.961 Minutes
      Tt=[(11.9*0.2968^3)/(361.98)]^.385=  3.96
      Total initial area Ti =   6.68 minutes from Figure 3-3 formula plus
        3.96 minutes from the Figure 3-4 formula =  10.64 minutes
      Rainfall intensity (I) =      7.282(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
      Subarea runoff =     66.635(CFS)
      Total initial stream area =       30.500(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station       11.021 to Point/Station       11.041
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ----------------------------------------------------------------------
      Estimated mean flow rate at midpoint of channel =    164.342(CFS)
      Depth of flow =   1.465(Ft.), Average velocity =  16.595(Ft/s)
            ******* Irregular Channel Data ***********
      ----------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              4.00
            2              6.00              2.00
            3             14.00              0.00
            4             16.00              0.00
            5             21.00              2.00
            6             26.00              4.00
      Manning's 'N' friction factor =   0.035
      ----------------------------------------------------------------
      Sub-Channel flow  =    164.342(CFS)
        '     '    flow top width =     11.521(Ft.)
        '     '    velocity=   16.595(Ft/s)
        '     '    area =      9.903(Sq.Ft)
        '     '    Froude number =     3.154

      Upstream point elevation =  3534.000(Ft.)
      Downstream point elevation =  2994.000(Ft.)
      Flow length =  2741.000(Ft.)
      Travel time  =    2.75 min.
      Time of concentration =   13.40 min.
      Depth of flow =   1.465(Ft.)
      Average velocity =  16.595(Ft/s)
      Total irregular channel flow =   164.342(CFS)
      Irregular channel normal depth above invert elev. =   1.465(Ft.)
      Average velocity of channel(s) =  16.595(Ft/s)
       Adding area flow to channel
      Decimal fraction soil group A = 0.000
```

```
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Rainfall intensity =      6.278(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.300  CA =     41.730
Subarea runoff =    195.364(CFS) for    108.600(Ac.)
Total runoff =    261.998(CFS)      Total area =     139.100(Ac.)
Depth of flow =   1.793(Ft.), Average velocity =  18.677(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.021 to Point/Station       11.041
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    139.100(Ac.)
Runoff from this stream =    261.998(CFS)
Time of concentration =   13.40 min.
Rainfall intensity =     6.278(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.031 to Point/Station       11.041
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  = 3032.000(Ft.)
Highest elevation = 3288.000(Ft.)
Lowest elevation = 2994.000(Ft.)
Elevation difference =  294.000(Ft.) Slope =  9.697 %
Top of Initial Area Slope adjusted by User to  3.000 %
Bottom of Initial Area Slope adjusted by User to 10.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   3.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   9.98 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(   3.000^(1/3)]=   9.98
The initial area total distance of 3032.00 (Ft.) entered leaves a
remaining distance of 2932.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   8.86 minutes
for a distance of 2932.00 (Ft.) and a slope of 10.00 %
```

```
      with an elevation difference of 293.20(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    8.857 Minutes
      Tt=[(11.9*0.5553^3)/(293.20)]^.385=  8.86
      Total initial area Ti =   9.98 minutes from Figure 3-3 formula plus
        8.86 minutes from the Figure 3-4 formula =  18.84 minutes
      Rainfall intensity (I) =      5.039(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
      Subarea runoff =    144.967(CFS)
      Total initial stream area =       95.900(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station       11.031 to Point/Station       11.041
      **** CONFLUENCE OF MINOR STREAMS ****
      ------------------------------------------------------------------------
      Along Main Stream number: 1 in normal stream number 2
      Stream flow area =     95.900(Ac.)
      Runoff from this stream =    144.967(CFS)
      Time of concentration =   18.84 min.
      Rainfall intensity =     5.039(In/Hr)
      Summary of stream data:

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


      1      261.998     13.40               6.278
      2      144.967     18.84               5.039
      Qmax(1) =
                1.000 *    1.000 *   261.998) +
                1.000 *    0.711 *   144.967) + =     365.079
      Qmax(2) =
                0.803 *    1.000 *   261.998) +
                1.000 *    1.000 *   144.967) + =     355.238

      Total of 2 streams to confluence:
      Flow rates before confluence point:
           261.998     144.967
      Maximum flow rates at confluence using above data:
            365.079      355.238
      Area of streams before confluence:
            139.100       95.900
      Results of confluence:
      Total flow rate =    365.079(CFS)
      Time of concentration =    13.398 min.
      Effective stream area after confluence =    235.000(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station       11.041 to Point/Station       11.042
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ------------------------------------------------------------------------
      Estimated mean flow rate at midpoint of channel =    422.922(CFS)
      Depth of flow =   2.767(Ft.), Average velocity =  16.934(Ft/s)
            ******* Irregular Channel Data ***********
```

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              4.00
      2              7.00              2.00
      3             13.00              0.00
      4             15.00              0.00
      5             19.00              2.00
      6             24.00              4.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =    422.922(CFS)
  '     '    flow top width =     16.604(Ft.)
  '     '    velocity=   16.934(Ft/s)
  '     '    area =     24.975(Sq.Ft)
  '     '    Froude number =     2.433

Upstream point elevation =  2994.000(Ft.)
Downstream point elevation =  2938.000(Ft.)
Flow length =   559.000(Ft.)
Travel time  =    0.55 min.
Time of concentration =   13.95 min.
Depth of flow =   2.767(Ft.)
Average velocity =  16.934(Ft/s)
Total irregular channel flow =   422.922(CFS)
Irregular channel normal depth above invert elev. =   2.767(Ft.)
Average velocity of channel(s) =  16.934(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Rainfall intensity =      6.118(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.300  CA =     78.600
Subarea runoff =    115.760(CFS) for     27.000(Ac.)
Total runoff =    480.839(CFS)      Total area =     262.000(Ac.)
Depth of flow =   2.918(Ft.), Average velocity =  17.454(Ft/s)
End of computations, total study area =         262.000 (Ac.)
```

Basin 12.01

```
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

      Rational method hydrology program based on
      San Diego County Flood Control Division 2003 hydrology manual
      Rational Hydrology Study        Date: 01/08/09
      --------------------------------------------------------------------------
-
      HOSKINGS RANCH
      Pre-Development Hydrology Calculations
      100-year Frequency Storm
      Basin 12.01
      --------------------------------------------------------------------------
-
       *********   Hydrology Study Control Information **********

      --------------------------------------------------------------------------
-


      Program License Serial Number 4065

      --------------------------------------------------------------------------
-
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  4.500
      24 hour precipitation(inches) =  9.500
      P6/P24 =    47.4%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station       12.011 to Point/Station       12.012
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________________
      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
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.250
      Initial subarea total flow distance  = 2202.000(Ft.)
      Highest elevation = 4010.000(Ft.)
      Lowest elevation = 3900.000(Ft.)
      Elevation difference =  110.000(Ft.) Slope =  4.995 %
      Top of Initial Area Slope adjusted by User to  7.000 %
      Bottom of Initial Area Slope adjusted by User to  4.900 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of   7.00 %, in a development type of
       Permanent Open Space
```

```
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   8.00 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(   7.000^(1/3)]=   8.00
      The initial area total distance of 2202.00 (Ft.) entered leaves a
      remaining distance of 2102.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   9.02 minutes
      for a distance of 2102.00 (Ft.) and a slope of  4.90 %
      with an elevation difference of 103.00(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    9.022 Minutes
      Tt=[(11.9*0.3981^3)/(103.00)]^.385=  9.02
      Total initial area Ti =   8.00 minutes from Figure 3-3 formula plus
        9.02 minutes from the Figure 3-4 formula =  17.02 minutes
      Rainfall intensity (I) =      5.380(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
      Subarea runoff =     75.729(CFS)
      Total initial stream area =       56.300(Ac.)
      End of computations, total study area =          56.300 (Ac.)
```

Basin 12.02

```
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

      Rational method hydrology program based on
      San Diego County Flood Control Division 2003 hydrology manual
      Rational Hydrology Study        Date: 03/17/09
      --------------------------------------------------------------------------
-
      HOSKINGS RANCH
      Pre-Development Hydrology Calculations
      100-year Frequency Storm
      Basin 12.02
      --------------------------------------------------------------------------
-
       *********   Hydrology Study Control Information **********

      --------------------------------------------------------------------------
-


      Program License Serial Number 4065

      --------------------------------------------------------------------------
-
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  4.500
      24 hour precipitation(inches) =  9.500
      P6/P24 =    47.4%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station       12.021 to Point/Station       12.022
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________________
      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
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.250
      Initial subarea total flow distance  = 1247.000(Ft.)
      Highest elevation = 4058.000(Ft.)
      Lowest elevation = 3930.000(Ft.)
      Elevation difference =  128.000(Ft.) Slope = 10.265 %
      Top of Initial Area Slope adjusted by User to  9.000 %
      Bottom of Initial Area Slope adjusted by User to 10.400 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of   9.00 %, in a development type of
       Permanent Open Space
```

```
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   7.36 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(   9.000^(1/3)]=   7.36
      The initial area total distance of 1247.00 (Ft.) entered leaves a
      remaining distance of 1147.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   4.24 minutes
      for a distance of 1147.00 (Ft.) and a slope of 10.40 %
      with an elevation difference of 119.29(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    4.235 Minutes
      Tt=[(11.9*0.2172^3)/(119.29)]^.385=  4.24
      Total initial area Ti =   7.36 minutes from Figure 3-3 formula plus
        4.24 minutes from the Figure 3-4 formula =  11.59 minutes
      Rainfall intensity (I) =      6.893(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
      Subarea runoff =     29.469(CFS)
      Total initial stream area =       17.100(Ac.)
      End of computations, total study area =          17.100 (Ac.)
```

Basin 12.03

```
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

      Rational method hydrology program based on
      San Diego County Flood Control Division 2003 hydrology manual
      Rational Hydrology Study        Date: 03/17/09
      --------------------------------------------------------------------------
-
      HOSKINGS RANCH
      Pre-Development Hydrology Calculations
      100-year Frequency Storm
      Basin 12.03
      --------------------------------------------------------------------------
-
       *********   Hydrology Study Control Information **********

      --------------------------------------------------------------------------
-


      Program License Serial Number 4065

      --------------------------------------------------------------------------
-
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  4.500
      24 hour precipitation(inches) =  9.500
      P6/P24 =    47.4%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station       12.031 to Point/Station       12.032
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________________
      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
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.250
      Initial subarea total flow distance  = 1037.000(Ft.)
      Highest elevation = 4074.000(Ft.)
      Lowest elevation = 3924.000(Ft.)
      Elevation difference =  150.000(Ft.) Slope = 14.465 %
      Top of Initial Area Slope adjusted by User to 11.000 %
      Bottom of Initial Area Slope adjusted by User to 14.800 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  11.00 %, in a development type of
       Permanent Open Space
```

```
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   6.88 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(  11.000^(1/3)]=   6.88
      The initial area total distance of 1037.00 (Ft.) entered leaves a
      remaining distance of  937.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   3.16 minutes
      for a distance of 937.00 (Ft.) and a slope of 14.80 %
      with an elevation difference of 138.68(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    3.164 Minutes
      Tt=[(11.9*0.1775^3)/(138.68)]^.385=  3.16
      Total initial area Ti =   6.88 minutes from Figure 3-3 formula plus
        3.16 minutes from the Figure 3-4 formula =  10.04 minutes
      Rainfall intensity (I) =      7.561(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
      Subarea runoff =     13.420(CFS)
      Total initial stream area =        7.100(Ac.)
      End of computations, total study area =          7.100 (Ac.)
```

Basin 12.04

```
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

      Rational method hydrology program based on
      San Diego County Flood Control Division 2003 hydrology manual
      Rational Hydrology Study        Date: 03/17/09
      --------------------------------------------------------------------
-
      HOSKINGS RANCH
      Pre-Development Hydrology Calculations
      100-year Frequency Storm
      Basin 12.04
      --------------------------------------------------------------------
-
       *********   Hydrology Study Control Information **********

      --------------------------------------------------------------------
-


      Program License Serial Number 4065

      --------------------------------------------------------------------
-
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  4.500
      24 hour precipitation(inches) =  9.500
      P6/P24 =    47.4%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station       12.041 to Point/Station       12.042
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 1.000
      Decimal fraction soil group D = 0.000
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.300
      Initial subarea total flow distance  =  720.000(Ft.)
      Highest elevation = 4095.000(Ft.)
      Lowest elevation = 3946.000(Ft.)
      Elevation difference =  149.000(Ft.) Slope = 20.694 %
      Top of Initial Area Slope adjusted by User to 10.000 %
      Bottom of Initial Area Slope adjusted by User to 22.400 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  10.00 %, in a development type of
```

```
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.68 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(  10.000^(1/3)]=   6.68
The initial area total distance of  720.00 (Ft.) entered leaves a
remaining distance of  620.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   1.96 minutes
for a distance of 620.00 (Ft.) and a slope of 22.40 %
with an elevation difference of 138.88(Ft.) from the end of the top
area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 =    1.963 Minutes
Tt=[(11.9*0.1174^3)/(138.88)]^.385=  1.96
Total initial area Ti =   6.68 minutes from Figure 3-3 formula plus
  1.96 minutes from the Figure 3-4 formula =   8.65 minutes
Rainfall intensity (I) =      8.328(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
Subarea runoff =     20.236(CFS)
Total initial stream area =        8.100(Ac.)
End of computations, total study area =          8.100 (Ac.)
```

Basin 12.05

```
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

      Rational method hydrology program based on
      San Diego County Flood Control Division 2003 hydrology manual
      Rational Hydrology Study        Date: 03/17/09
      --------------------------------------------------------------------------
-
      HOSKINGS RANCH
      Pre-Development Hydrology Calculations
      100-year Frequency Storm
      Basin 12.05
      --------------------------------------------------------------------------
-
       *********   Hydrology Study Control Information **********

      --------------------------------------------------------------------------
-


      Program License Serial Number 4065

      --------------------------------------------------------------------------
-
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  4.500
      24 hour precipitation(inches) =  9.500
      P6/P24 =    47.4%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station       12.051 to Point/Station       12.052
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________________
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 1.000
      Decimal fraction soil group D = 0.000
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.300
      Initial subarea total flow distance  =  580.000(Ft.)
      Highest elevation = 4096.000(Ft.)
      Lowest elevation = 3954.000(Ft.)
      Elevation difference =  142.000(Ft.) Slope = 24.483 %
      Top of Initial Area Slope adjusted by User to 14.000 %
      Bottom of Initial Area Slope adjusted by User to 26.700 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  14.00 %, in a development type of
       Permanent Open Space
```

```
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   5.97 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(  14.000^(1/3)]=   5.97
      The initial area total distance of  580.00 (Ft.) entered leaves a
      remaining distance of  480.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   1.51 minutes
      for a distance of 480.00 (Ft.) and a slope of 26.70 %
      with an elevation difference of 128.16(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    1.506 Minutes
      Tt=[(11.9*0.0909^3)/(128.16)]^.385=  1.51
      Total initial area Ti =   5.97 minutes from Figure 3-3 formula plus
        1.51 minutes from the Figure 3-4 formula =   7.48 minutes
      Rainfall intensity (I) =      9.143(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
      Subarea runoff =     13.440(CFS)
      Total initial stream area =        4.900(Ac.)
      End of computations, total study area =          4.900 (Ac.)
```

Basin 12.06

```
San Diego County Rational Hydrology Program

      CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

      Rational method hydrology program based on
      San Diego County Flood Control Division 2003 hydrology manual
      Rational Hydrology Study        Date: 03/18/09
      --------------------------------------------------------------------------
-
      HOSKINGS RANCH
      Pre-Development Hydrology Calculations
      100-year Frequency Storm
      Basin 12.06
      --------------------------------------------------------------------------
-
       *********   Hydrology Study Control Information **********

      --------------------------------------------------------------------------
-


      Program License Serial Number 4065

      --------------------------------------------------------------------------
-
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  4.500
      24 hour precipitation(inches) =  9.500
      P6/P24 =    47.4%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station       12.061 to Point/Station       12.062
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________________
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 1.000
      Decimal fraction soil group D = 0.000
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.300
      Initial subarea total flow distance  =  574.000(Ft.)
      Highest elevation = 4072.000(Ft.)
      Lowest elevation = 3930.000(Ft.)
      Elevation difference =  142.000(Ft.) Slope = 24.739 %
      Top of Initial Area Slope adjusted by User to 18.000 %
      Bottom of Initial Area Slope adjusted by User to 26.100 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
```

```
      for the top area slope value of  18.00 %, in a development type of
       Permanent Open Space
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   5.49 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(  18.000^(1/3)]=   5.49
      The initial area total distance of  574.00 (Ft.) entered leaves a
      remaining distance of  474.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   1.51 minutes
      for a distance of 474.00 (Ft.) and a slope of 26.10 %
      with an elevation difference of 123.71(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    1.505 Minutes
      Tt=[(11.9*0.0898^3)/(123.71)]^.385=  1.51
      Total initial area Ti =   5.49 minutes from Figure 3-3 formula plus
        1.51 minutes from the Figure 3-4 formula =   7.00 minutes
      Rainfall intensity (I) =      9.544(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
      Subarea runoff =     28.631(CFS)
      Total initial stream area =       10.000(Ac.)
      End of computations, total study area =          10.000 (Ac.)
```

Basin 12.07

```
      CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

      Rational method hydrology program based on
      San Diego County Flood Control Division 2003 hydrology manual
      Rational Hydrology Study        Date: 03/18/09
      --------------------------------------------------------------------------
-
      HOSKINGS RANCH
      Pre-Development Hydrology Calculations
      100-year Frequency Storm
      Basin 12.07
      --------------------------------------------------------------------------
-
       *********   Hydrology Study Control Information **********

      --------------------------------------------------------------------------
-


      Program License Serial Number 4065

      --------------------------------------------------------------------------
-
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  4.500
      24 hour precipitation(inches) =  9.500
      P6/P24 =    47.4%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station       12.071 to Point/Station       12.072
      **** INITIAL AREA EVALUATION ****
      ________________________________________________________________________
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 1.000
      Decimal fraction soil group D = 0.000
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.300
      Initial subarea total flow distance  =  617.000(Ft.)
      Highest elevation = 4010.000(Ft.)
      Lowest elevation = 3886.000(Ft.)
      Elevation difference =  124.000(Ft.) Slope = 20.097 %
      Top of Initial Area Slope adjusted by User to 26.000 %
      Bottom of Initial Area Slope adjusted by User to 19.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  26.00 %, in a development type of
       Permanent Open Space
```

```
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   4.86 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(  26.000^(1/3)]=   4.86
      The initial area total distance of  617.00 (Ft.) entered leaves a
      remaining distance of  517.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   1.82 minutes
      for a distance of 517.00 (Ft.) and a slope of 19.00 %
      with an elevation difference of  98.23(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    1.818 Minutes
      Tt=[(11.9*0.0979^3)/( 98.23)]^.385=  1.82
      Total initial area Ti =   4.86 minutes from Figure 3-3 formula plus
        1.82 minutes from the Figure 3-4 formula =   6.68 minutes
      Rainfall intensity (I) =      9.837(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
      Subarea runoff =     27.739(CFS)
      Total initial stream area =        9.400(Ac.)
      End of computations, total study area =          9.400 (Ac.)
```

Basin 12.08

```
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

      Rational method hydrology program based on
      San Diego County Flood Control Division 2003 hydrology manual
      Rational Hydrology Study        Date: 03/18/09
      --------------------------------------------------------------------------
-
      HOSKINGS RANCH
      Pre-Development Hydrology Calculations
      100-year Frequency Storm
      Basin 12.08
      --------------------------------------------------------------------------
-
       *********   Hydrology Study Control Information **********

      --------------------------------------------------------------------------
-


      Program License Serial Number 4065

      --------------------------------------------------------------------------
-
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  4.500
      24 hour precipitation(inches) =  9.500
      P6/P24 =    47.4%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station       12.081 to Point/Station       12.082
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________________
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 1.000
      Decimal fraction soil group D = 0.000
      [UNDISTURBED NATURAL TERRAIN                ]
      (Permanent Open Space   )
      Impervious value, Ai = 0.000
      Sub-Area C Value = 0.300
      Initial subarea total flow distance  =  484.000(Ft.)
      Highest elevation = 3964.000(Ft.)
      Lowest elevation = 3864.000(Ft.)
      Elevation difference =  100.000(Ft.) Slope = 20.661 %
      Top of Initial Area Slope adjusted by User to 16.000 %
      Bottom of Initial Area Slope adjusted by User to 21.900 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 100.00 (Ft)
      for the top area slope value of  16.00 %, in a development type of
       Permanent Open Space
```

```
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   5.71 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(  16.000^(1/3)]=   5.71
      The initial area total distance of  484.00 (Ft.) entered leaves a
      remaining distance of  384.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   1.37 minutes
      for a distance of 384.00 (Ft.) and a slope of 21.90 %
      with an elevation difference of  84.10(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    1.369 Minutes
      Tt=[(11.9*0.0727^3)/( 84.10)]^.385=  1.37
      Total initial area Ti =   5.71 minutes from Figure 3-3 formula plus
        1.37 minutes from the Figure 3-4 formula =   7.08 minutes
      Rainfall intensity (I) =      9.470(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.300
      Subarea runoff =     25.854(CFS)
      Total initial stream area =        9.100(Ac.)
      End of computations, total study area =          9.100 (Ac.)
```

APPENDIX C

```
            San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study        Date: 03/18/09
--------------------------------------------------------------------------
HOSKINGS RANCH
Post-Development Hydrology Calculations
100-year Frequency Storm
Basin 12.09
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4065

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  4.500
24 hour precipitation(inches) =  9.500
P6/P24 =    47.4%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.091 to Point/Station       12.092
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  =  129.000(Ft.)
Highest elevation = 3966.000(Ft.)
Lowest elevation = 3954.000(Ft.)
Elevation difference =   12.000(Ft.) Slope =  9.302 %
Top of Initial Area Slope adjusted by User to  7.000 %
Bottom of Initial Area Slope adjusted by User to 17.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   7.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.53 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
```

```
            San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study        Date: 03/19/09
--------------------------------------------------------------------------
HOSKINGS RANCH
Post-Development Hydrology Calculations
100-year Frequency
Basin 1 through Basin 10
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4065

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  4.500
24 hour precipitation(inches) =  9.500
P6/P24 =    47.4%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.011 to Point/Station        1.021
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  = 1034.000(Ft.)
Highest elevation = 4753.500(Ft.)
Lowest elevation = 4475.000(Ft.)
Elevation difference =  278.500(Ft.) Slope = 26.934 %
Top of Initial Area Slope adjusted by User to 15.500 %
Bottom of Initial Area Slope adjusted by User to 28.100 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  15.50 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.78 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(  15.500^(1/3)]=   5.78
```

```
            San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study        Date: 03/18/09
--------------------------------------------------------------------------
HOSKINGS RANCH
Post-Development Hydrology Calculations
100-year Frequency Storm
Basin 11
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4065

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  4.500
24 hour precipitation(inches) =  9.500
P6/P24 =    47.4%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.011 to Point/Station       11.021
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  = 1667.000(Ft.)
Highest elevation = 3906.000(Ft.)
Lowest elevation = 3534.000(Ft.)
Elevation difference =  372.000(Ft.) Slope = 22.316 %
Top of Initial Area Slope adjusted by User to 10.000 %
Bottom of Initial Area Slope adjusted by User to 23.100 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  10.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.68 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
```

```
      San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study        Date: 03/24/09
--------------------------------------------------------------------------
HOSKINGS RANCH
Post-Development Hydrology Calculations
100-year Frequency Storm
Basin 12.01
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4065

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  4.500
24 hour precipitation(inches) =  9.500
P6/P24 =    47.4%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.011 to Point/Station       12.012
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance  = 2202.000(Ft.)
Highest elevation = 4010.000(Ft.)
Lowest elevation = 3900.000(Ft.)
Elevation difference =  110.000(Ft.) Slope =  4.995 %
Top of Initial Area Slope adjusted by User to  7.000 %
Bottom of Initial Area Slope adjusted by User to  4.900 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   7.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   8.00 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(   7.000^(1/3)]=   8.00
```

```
            San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study        Date: 03/24/09
--------------------------------------------------------------------------
HOSKINGS RANCH
Post-Development Hydrology Calculations
100-year Frequency Storm
Basin 12.02
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4065

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  4.500
24 hour precipitation(inches) =  9.500
P6/P24 =    47.4%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.021 to Point/Station       12.022
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance  =  365.000(Ft.)
Highest elevation = 4058.000(Ft.)
Lowest elevation = 4004.000(Ft.)
Elevation difference =   54.000(Ft.) Slope = 14.795 %
Top of Initial Area Slope adjusted by User to  9.000 %
Bottom of Initial Area Slope adjusted by User to 17.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   9.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.36 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2500)*( 100.000^.5)/(   9.000^(1/3)]=   7.36
```

```
            San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study        Date: 03/18/09
--------------------------------------------------------------------------
HOSKINGS RANCH
Post-Development Hydrology Calculations
100-year Frequency Storm
Basin 12.03
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4065

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  4.500
24 hour precipitation(inches) =  9.500
P6/P24 =    47.4%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.031 to Point/Station       12.032
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
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
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance  =  426.000(Ft.)
Highest elevation = 4074.000(Ft.)
Lowest elevation = 4002.000(Ft.)
Elevation difference =   72.000(Ft.) Slope = 16.901 %
Top of Initial Area Slope adjusted by User to 11.000 %
Bottom of Initial Area Slope adjusted by User to 18.700 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  11.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   6.88 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
```

```
            San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study        Date: 03/18/09
--------------------------------------------------------------------------
HOSKINGS RANCH
Post-Development Hydrology Calculations
100-year Frequency Storm
Basin 12.04
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4065

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  4.500
24 hour precipitation(inches) =  9.500
P6/P24 =    47.4%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.041 to Point/Station       12.042
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.360
Initial subarea total flow distance  =  174.000(Ft.)
Highest elevation = 4090.700(Ft.)
Lowest elevation = 4089.000(Ft.)
Elevation difference =    1.700(Ft.) Slope =  0.977 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   0.98 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =  11.23 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3600)*(  70.000^.5)/(   0.977^(1/3)]=  11.23
The initial area total distance of  174.00 (Ft.) entered leaves a
```

```
      San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study        Date: 03/18/09
--------------------------------------------------------------------------
HOSKINGS RANCH
Post-Development Hydrology Calculations
100-year Frequency Storm
Basin 12.05
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4065

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  4.500
24 hour precipitation(inches) =  9.500
P6/P24 =    47.4%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.051 to Point/Station       12.052
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  =  550.000(Ft.)
Highest elevation = 4096.000(Ft.)
Lowest elevation = 3960.000(Ft.)
Elevation difference =  136.000(Ft.) Slope = 24.727 %
Top of Initial Area Slope adjusted by User to 14.000 %
Bottom of Initial Area Slope adjusted by User to 27.100 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  14.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.97 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(  14.000^(1/3)]=   5.97
```

```
      San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study        Date: 03/18/09
--------------------------------------------------------------------------
HOSKINGS RANCH
Post-Development Hydrology Calculations
100-year Frequency Storm
Basin 12.06
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4065

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  4.500
24 hour precipitation(inches) =  9.500
P6/P24 =    47.4%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.061 to Point/Station       12.062
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  =  543.000(Ft.)
Highest elevation = 4072.000(Ft.)
Lowest elevation = 3934.000(Ft.)
Elevation difference =  138.000(Ft.) Slope = 25.414 %
Top of Initial Area Slope adjusted by User to 18.000 %
Bottom of Initial Area Slope adjusted by User to 27.100 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  18.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   5.49 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(  18.000^(1/3)]=   5.49
```

```
      San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study        Date: 03/18/09
--------------------------------------------------------------------------
HOSKINGS RANCH
Post-Development Hydrology Calculations
100-year Frequency Storm
Basin 12.07
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4065

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  4.500
24 hour precipitation(inches) =  9.500
P6/P24 =    47.4%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.071 to Point/Station       12.072
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.360
Initial subarea total flow distance  =   82.000(Ft.)
Highest elevation = 4019.700(Ft.)
Lowest elevation = 4018.900(Ft.)
Elevation difference =    0.800(Ft.) Slope =  0.976 %
Top of Initial Area Slope adjusted by User to  1.000 %
Bottom of Initial Area Slope adjusted by User to  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =  11.14 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3600)*(  70.000^.5)/(   1.000^(1/3)]=  11.14
```

```
      San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study        Date: 03/18/09
--------------------------------------------------------------------------
HOSKINGS RANCH
Post-Development Hydrology Calculations
100-year Frequency Storm
Basin 12.08
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 4065

--------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  4.500
24 hour precipitation(inches) =  9.500
P6/P24 =    47.4%
San Diego hydrology manual 'C' values used


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.081 to Point/Station       12.082
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.300
Initial subarea total flow distance  =  154.000(Ft.)
Highest elevation = 4010.000(Ft.)
Lowest elevation = 3966.000(Ft.)
Elevation difference =   44.000(Ft.) Slope = 28.571 %
Top of Initial Area Slope adjusted by User to 26.000 %
Bottom of Initial Area Slope adjusted by User to 30.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  26.00 %, in a development type of
 Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.86 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3000)*( 100.000^.5)/(  26.000^(1/3)]=   4.86
```

APPENDIX D

EXISTING STORM DRAIN DATA TABLE SUMMARY

Pipe #	AREA (ac)	C Factor	Intensity (in/hr)	Q_{100} (cfs)	Req'dCulvert Size	No. of Pipes	Material	Length (ft)	Slope (%)	Velocity (ft/s)	Existing Size
1	791	0.26	4.69	964	10' x 5'	2	RCB	40.00	2.50	15.99	Dbl 7.75' x 4' Box
2	33.20	0.25	6.91	57.31	30"	2	RCP	75.00	1.33	9.72	42" x 27" CMP
3	55.88	0.25	6.61	92.33	36"	2	RCP	54.00	0.93	9.54	Dbl 23" x 14" CMP

APPENDIX E

POST DEVELOPMENT HYDRAULIC CALCULATIONS

PROPOSED STORM DRAIN DATA TABLE SUMMARY

Pipe #	AREA (ac)	C Factor	Intensity (in/hr)	Q_{100} (cfs)	Culvert Size	No. of Pipes	Material	Length (ft)	Slope (%)	Velocity (ft/s)
4	Deleted									
5	10.64	0.30	5.81	18.53	24"	1	RCP	50.00	8.00	17.63
6	184	Q from Civil Cadd		164.00	36"	2	RCP		2.00	11.60
7	1.47	0.25	7.58	2.79	12"	1	RCP	60.00	6.67	10.27
8	29.00	0.25	7.13	51.69	36"	1	RCP	60.00	0.83	9.55
9	22.00	0.25	7.58	41.70	24"	2	RCP		2.00	6.60
10	3.89	0.25	6.24	6.07	18"	1	RCP	55.00	4.00	10.28
11	2.60	0.25	8.43	5.48	18"	1	RCP	50.00	10.00	7.66
12	2.00	0.25	8.64	4.32	12"	1	RCP	52.00	1.92	7.09
13	8.00	0.36	5.78	16.65	18"	1	RCP	46.00	10.87	17.16
14	2.10	0.30	9.21	5.80	12"	1	RCP	46.00	6.52	12.28
15	2.80	0.30	9.21	7.73	18"	1	RCP	65.00	1.54	7.69
16	9.80	0.30	9.63	28.31	24"	1	RCP	75.00	9.33	19.05
17	4.00	0.36	6.65	9.58	18"	1	RCP	64.00	14.06	18.08
18	1.34	0.30	11.11	4.47	12"	1	RCP	70.00	12.86	14.82
19	0.50	0.30	8.95	1.34	12"	1	RCP	65.00	16.92	11.62
20	2.96	0.30	9.54	8.47	18"	1	RCP	50.00	1.00	6.61
21	0.93	0.30	10.54	2.94	12"	1	RCP	50.00	4.00	8.63
22	1.17	0.30	9.54	3.35	12"	1	RCP	53.00	1.00	5.16
23	0.80	0.30	7.13	1.71	12"	1	RCP	55.00	1.00	4.49
24	4.49	0.30	8.76	11.79	24"	1	RCP	65.00	1.00	7.28
25	4.11	0.30	8.76	10.80	24"	1	RCP	45.00	1.00	7.12
26	2.97	0.30	9.54	8.50	24"	1	RCP	55.00	0.50	5.17
27	0.58	0.30	11.11	1.93	12"	1	RCP	65.00	1.00	4.63
28	2.52	0.30	8.76	6.62	18"	1	RCP		2.00	2.10
29 - 34	Deleted									
35	3.18	0.30	7.27	6.94	12"	1	RCP	52.00	11.54	15.41
36	1.18	0.30	10.54	3.73	12"	1	RCP	40.00	12.50	13.68
37	3.63	0.25	6.13	5.56	18"	1	RCP	46.00	4.00	10.04
38	0.67	0.30	6.71	1.35	12"	1	RCP	45.00	2.00	5.23
39	6.36	0.25	8.42	13.39	24"	1	RCP		1.22	4.30
40	1.17	0.25	8.42	2.46	12"	1	RCP	35.00	1.00	4.89
41	8.80	0.25	8.21	18.07	18"	1	RCP	76.00	10.53	18.61
42	34.48	0.25	5.31	45.78	36"	1	RCP	60.00	2.00	13.24
43	0.51	0.25	6.70	0.85	12"	1	RCP	60.00	0.83	3.48
44	3.81	0.25	10.00	9.53	24"	1	RCP		2.00	5.40
45	4.95	0.25	8.76	10.84	18"	1	RCP	45.00	1.00	6.83
46	1.61	0.36	6.64	3.85	12"	1	RCP	53.00	15.09	15.09
47	2.51	0.30	10.90	8.20	18"	1	RCP	45.00	17.78	18.18

Pipe #	AREA (ac)	C Factor	Intensity (in/hr)	Q_{100} (cfs)	Culvert Size	No. of Pipes	Material	Length (ft)	Slope (%)	Velocity (ft/s)
48	0.40	0.30	11.15	1.34	12"	1	RCP	36.00	11.11	10.02
49	1.12	0.30	9.54	3.21	18"	1	RCP		1.00	1.80
50	0.97	0.30	7.58	2.21	12"	1	RCP	44.00	1.00	4.78
51	0.76	0.36	7.58	2.07	12"	1	RCP	34.00	5.88	8.91
52	4.36	0.30	7.58	9.92	24"	1	RCP		1.43	5.60
53	4.20	0.30	7.30	9.20	24"	1	RCP		2.00	5.20

INLET HYDRAULICS

Type 'F' Catch Basin:

Orifice Flow: $Q_{cap}= 0.67A(2gh)^{1/2}$

g = Gravitational Acceleration = 32.17 ft/s^2
h = Flow depth above inlet = 1 ft (Typical w/ Brow Ditch)
A = Flow area = 1.94 ft^2 (Typical Type 'F' catch basin w/ 1 opening)

Q_{cap} = 0.67*1.94*(2*32.17*1)$^{1/2}$ = **10.42 cfs**

12" x 12" Catch Basin: (Brooks 1212 Product or Equal)

Orifice Flow: $Q_{cap}= 0.67A_e(2gh)^{1/2}$

g = Gravitational Acceleration = 32.17 ft/s^2
h = Flow depth above inlet = 1 ft (Typical w/ Brow Ditch)
A_e = Effective flow area = 138.9 in^2 = 0.9646 ft^2 * .5 = .4823 ft^2

Q_{cap} = 0.67*0.4823*(2*32.17*1)$^{1/2}$ = **2.59 cfs**

18" x 18" Catch Basin: (Brooks 1818 Product or Equal)

Orifice Flow: $Q_{cap}= 0.67A_e(2gh)^{1/2}$

g = Gravitational Acceleration = 32.17 ft/s^2
h = Flow depth above inlet = 1 ft (Typical w/ Brow Ditch)
A_e = Effective flow area = 261.8 in^2 = 1.8182 ft^2 * .5 = .909 ft^2

Q_{cap} = 0.67*0.909*(2*32.17*1)$^{1/2}$ = **4.89 cfs**

24" x 24" Catch Basin: (Brooks 2424 Product or Equal)

Orifice Flow: $Q_{cap}= 0.67A_e(2gh)^{1/2}$

g = Gravitational Acceleration = 32.17 ft/s^2
h = Flow depth above inlet = 1 ft (Typical w/ Brow Ditch)
A_e = Effective flow area = 424.86 in^2 = 2.95 ft^2 * .5 = 1.475 ft^2

Q_{cap} = 0.67*1.475*(2*32.17*1)$^{1/2}$ = **7.93 cfs**

EXHIBITS

EXHIBIT A

EXHIBIT B

EXHIBIT C

EXHIBIT D