HYDROLOGY STUDY

FOR

Tentative Tract 15821

IN

THE COUNTY OF SAN BERNARDINO
(AREA OF RANCHO CUCAMONGA)

PREPARED FOR:

BREDLAU FAMILY REVOCABLE TRUST
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May 12, 2004

04-030HYDRO_REPORT.doc

Introduction

Tentative Parcel Map No. 15821 is located on the southwest corner of Snow Drop Road and Haven Avenue in the unincorporated area of the city of Rancho Cucamonga. The site is currently vacant except for an existing concrete pad located in the northeast corner of the site. The site is divided into four proposed parcels that are approximately 5.0+/- gross acres each. The project is proposed as single family residential composing of 4 lots total (20.69 Acres). The site currently receives offsite flows from the north. The overall site drains from north to south. All offsite flows are to be contained within the 120' wide San Bernardino County Drainage Easement (S.B.C.D.E.) which runs north and south and is located near the middle of the site.

Hydrology

San Bernardino County Flood Control Manual (preliminary 1991). Civildesign Software (Rational Method). The above design references and computer software were used to perform calculations for this project.

Conclusions

The offsite runoff is primarily due to the natural drainage patterns from the mountains north of the proposed site as shown on the attached Hydrology Map. If the offsite drainage patterns are to remain in their current condition then the offsite flows will need to be handled by the development of Parcel Map 15821. If and when Snow Drop Road is improved by the County San Bernardino, culvert(s) will need to be sized and built to allow offsite flows through. Design of these culvert(s) is to be performed by others or done at a later date in conjunction with the improvement of Snow Drop Road.

The offsite flow that comes from the 52.0 acre tributary watershed, that will be diverted away from the building pads and kept within the S.B.C.D.E. is approximately 448.0 cfs. In order to keep the runoff from flooding the proposed homes, the building pads are to be located at least 3' above the high water level for a 100-year storm. In addition the S.B.C.D.E., should be utilized to handle the offsite and onsite flows (87.0 cfs) from the 100-year storm. Based on the attached calculations the normal depth of flow through the site is approximately 3' from flow line of the natural channel and the width of flow is approximately 35'. Therefore the 120' wide S.B.C.D.E. is more than adequate and the proposed locations of the building pads are elevated enough and are well above (greater than 3') the 100-year storm high water level.

The drainage patterns of the natural ground within the S.B.C.D.E. are to be left in a natural/unchanged state where possible. Grading for the construction of the single family residences on the site will only disturb the area of the building pad and the natural drainage patterns surrounding the proposed building pads will be left in an undisturbed state.

GENERAL INFORMATION

Site Plan

Rainfall & Hydrologic Soil Data

Rational Hydrology Calculations

S1/2, SEC. 14, T.1N., R.7W., S.B.B.&M.

COUNTY
OF
SAN
BERNARDINO

SNOWDROP RD

SITE

CHESTNUT ST.

ARCHIBALD AVE.

HILLSIDE AVE.

HERMOSA AVE.

AVE.

HAVEN AVE.

CITY
OF
RANCHO
CUCAMONGA

VICINITY MAP
NO SCALE
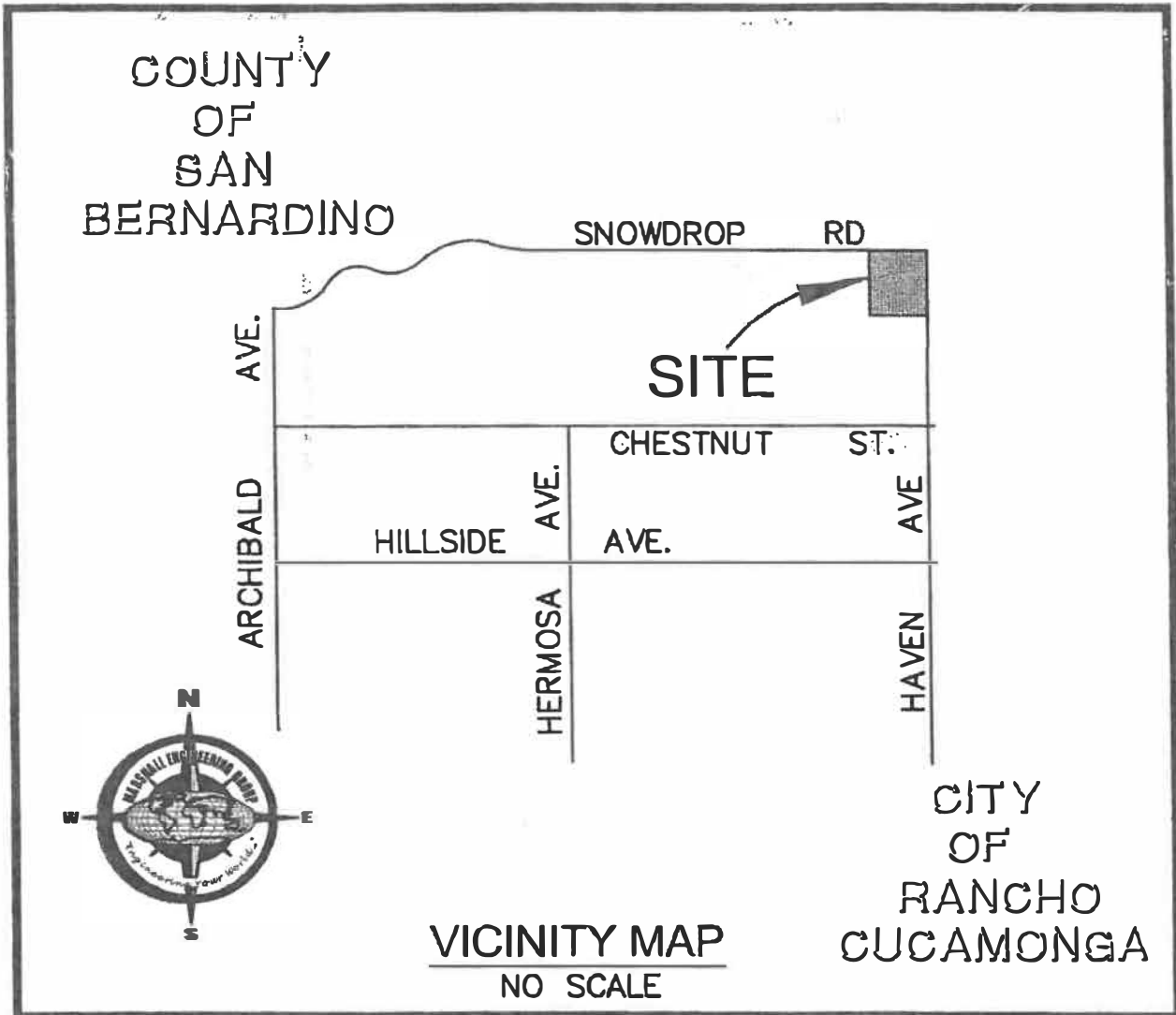
THE THOMAS GUIDE PG. 513, D7, 2002 EDITION

RAINFALL & HYDROLOGIC SOIL DATA

SITE

SAN BERNARDI

HYDROLOGY MAN

R3W   R2W   RIW   RIE   R2E   T4N

LUCERNE VALLEY

VALLEY AREA BOUNDARY

BERNARDINO

T3N

L ARROWHEAD

BIG BEAR L.

MOUNTAINS   T2N

BALDWIN (DRY)

ERWIN L.

BIG BEAR LAKE VILLAGE

RUNNING SPRINGS

CITY CREEK

SUGARLOAF MTN

BARTON FLATS

TIN

SAN BERNARDINO

FOREST HOME

T-IS

REDLANDS

LINDA

TUCAIPA

OAK GLEN

SAN BERNARDINO COUNTY
RIVERSIDE COUNTY

RIE   R2E

SAN BERNARDINO COUNTY
RIVERSIDE COUNTY

R3W   R2W   RIW
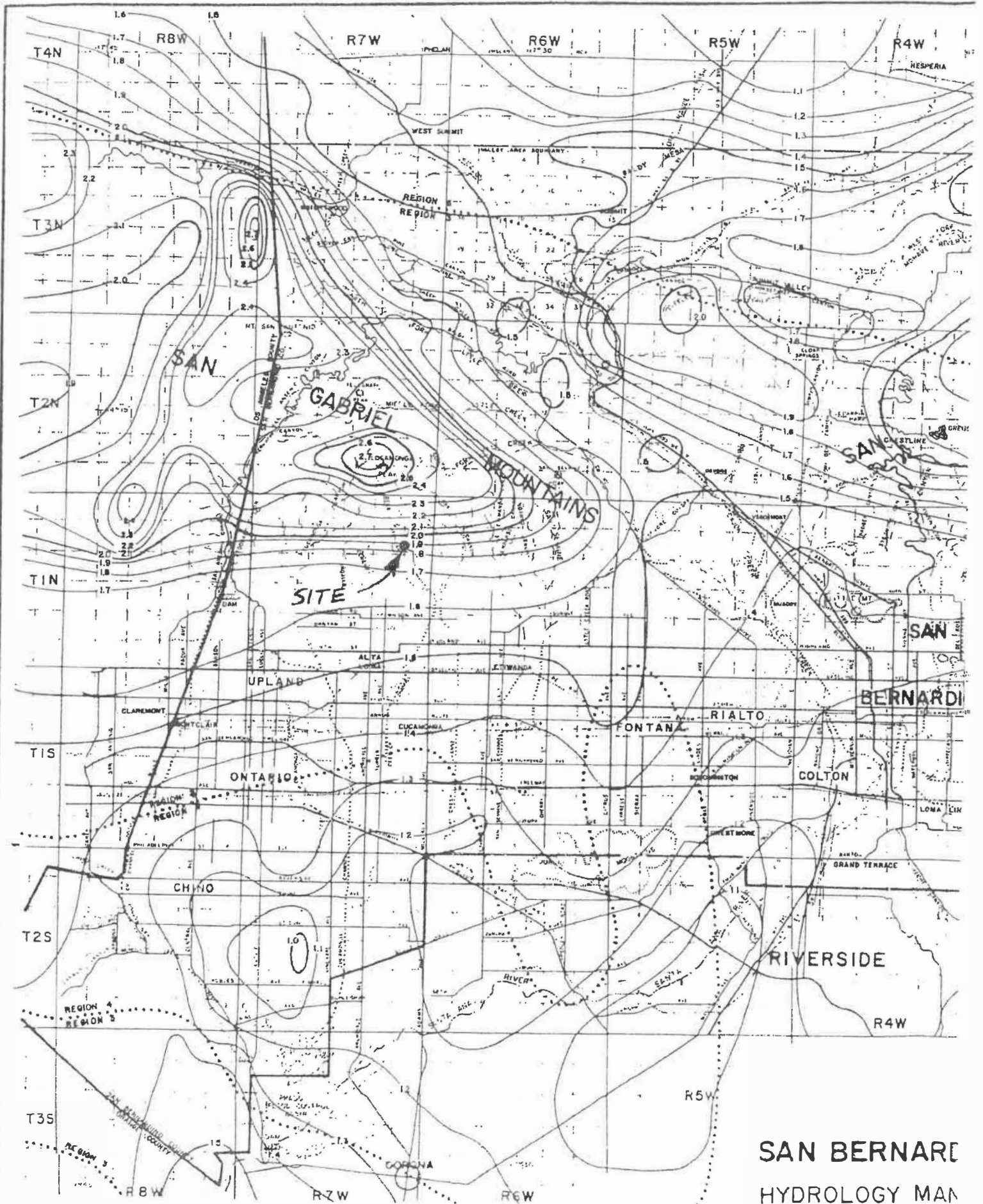
N
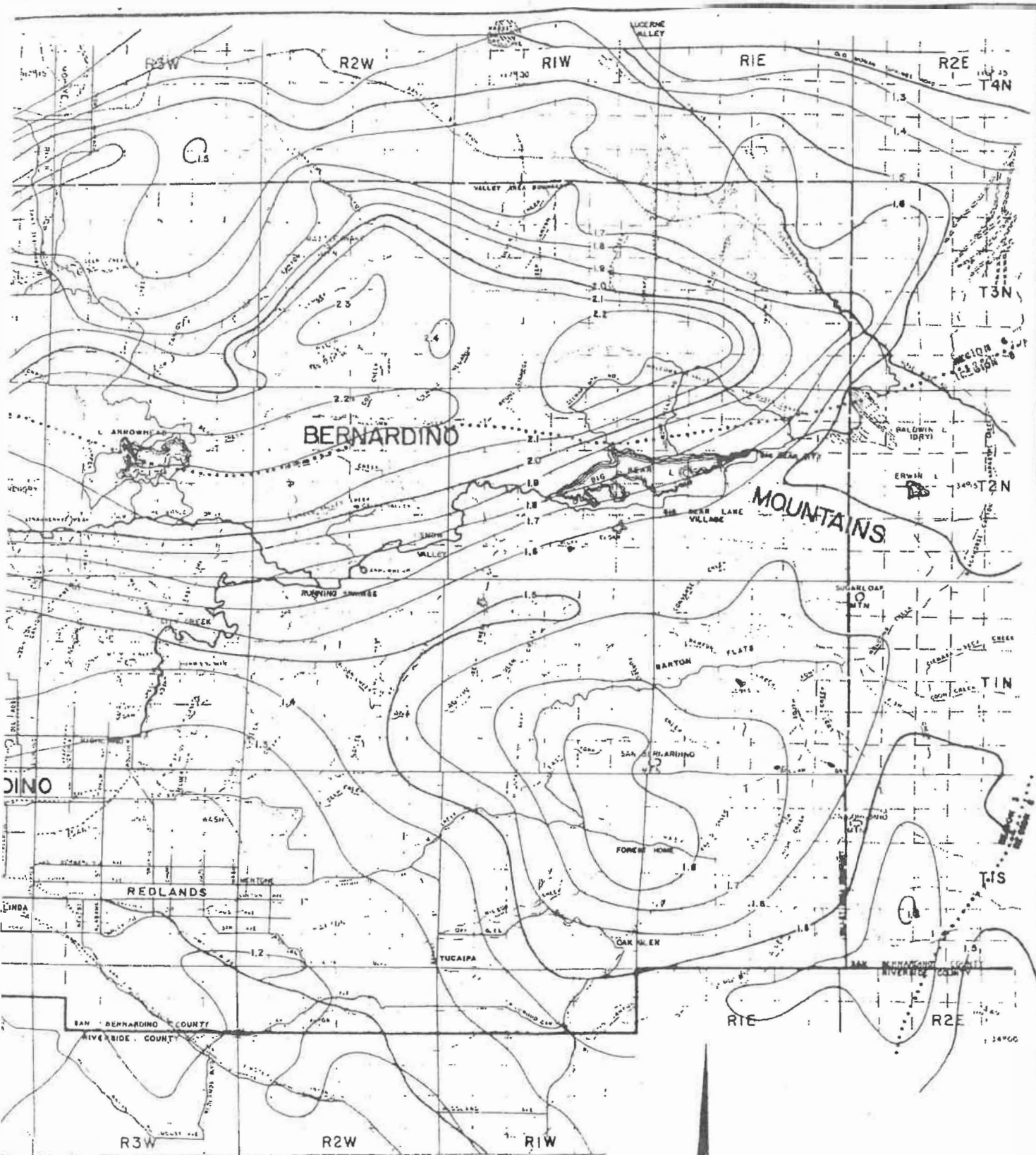
REDUCED DRAWING
SCALE 1" = 4 MILES

LEGEND
1.8 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

VALLEY AREA
ISOHYETALS
Y₁₀₀ -100 YEAR 1 HOUR
BASED ON U.S.D.C. NOAA ATLAS 2, 1973

APPROVED BY

FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1"= 2 MI.	WRD-1	4 of 12

SOURCE GEOLOGY MAP

SOURCE GEOLOGY MAP
SOURCE 1971 SCS SURVEY

SITE

SCALE 1:48,000
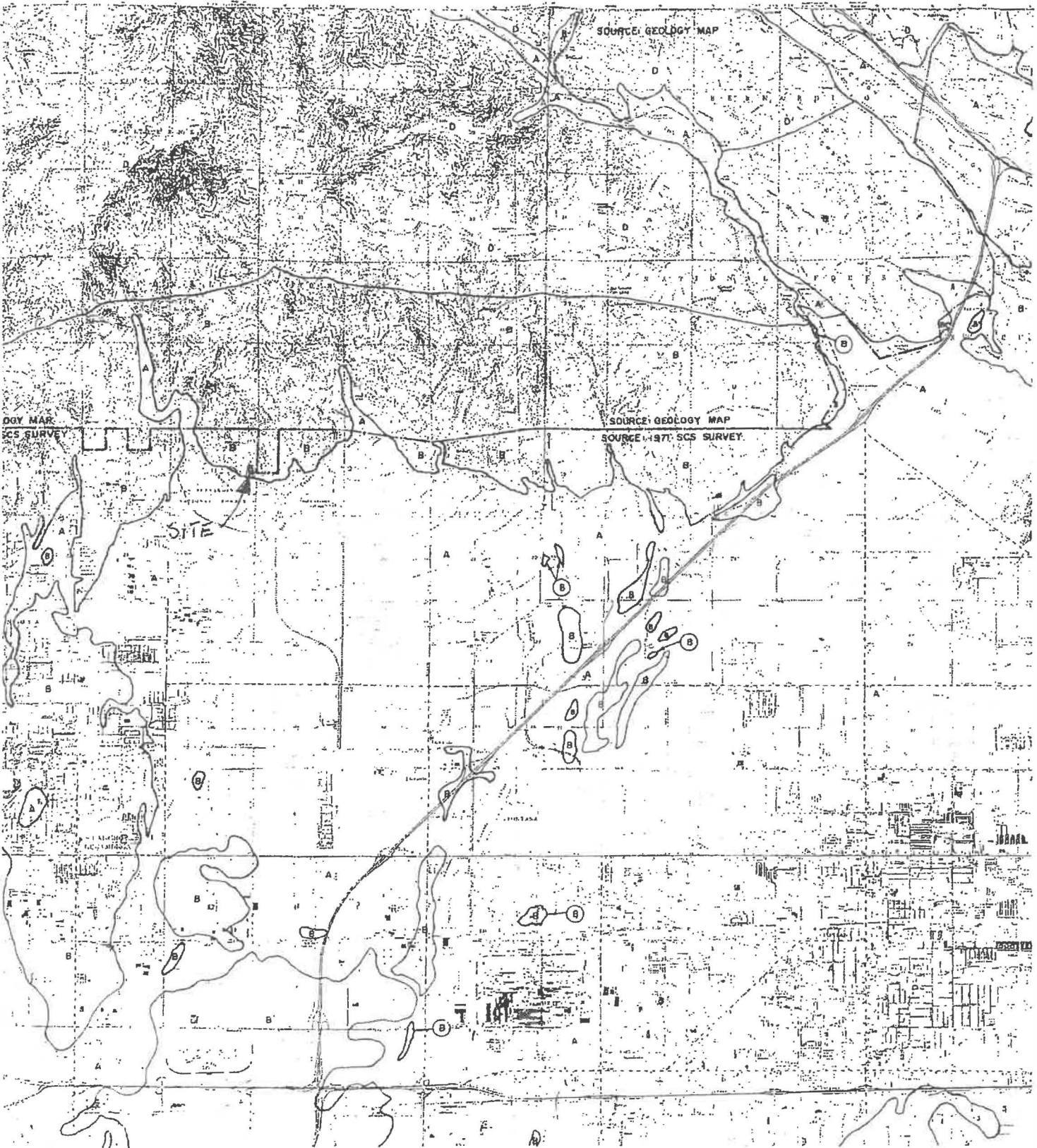
SCALE REDUCED BY 1/2

HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHWEST—A AREA
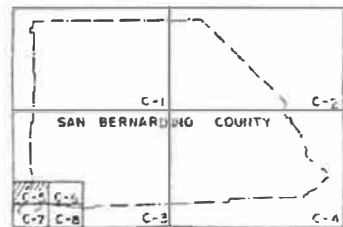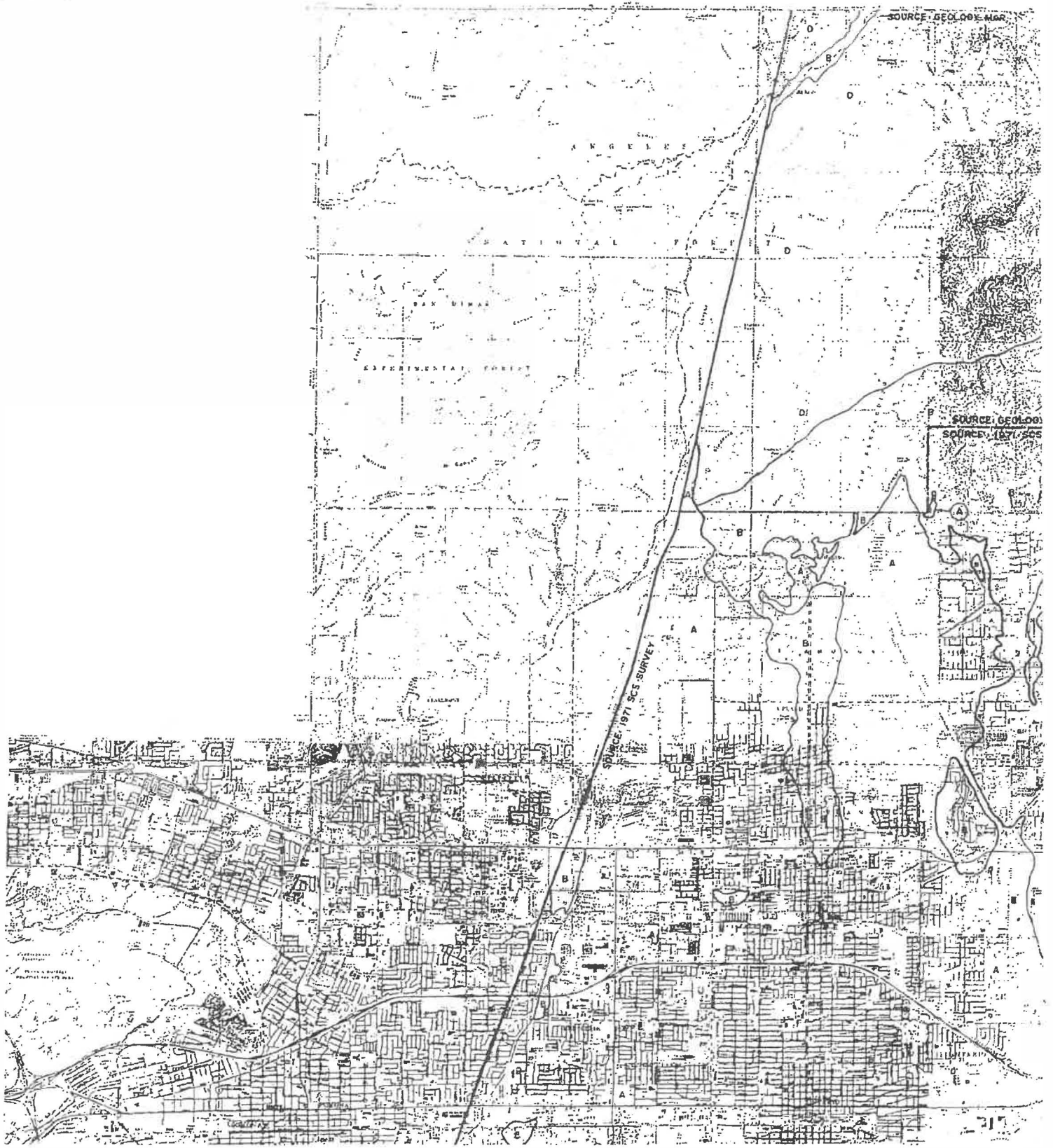
SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

SAN BERNARDINO COUNTY

	C-1		C-2
	SAN BERNARDINO COUNTY		
C-6			
C-7	C-8	C-3	C-4

INDEX MAP

RATIONAL HYDROLOGY CALCULATIONS

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2001 Version 6.4
       Rational Hydrology Study   Date: 05/10/04

TENTATIVE TRACT MAP NO. 15821
Q100 - BEFORE CONDITION
MAY 2004

Marshall Engineering Group, Glendora, CA - S/N   862

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

Rational hydrology study storm event year is   100.0
Computed rainfall intensity:
Storm year =   100.00   1 hour rainfall =   1.900 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 3

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Process from Point/Station   1.000 to Point/Station   2.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000   Max loss rate(Fm)=   0.140(In/Hr)
Initial subarea data:
Initial area flow distance =   262.400(Ft.)
Top (of initial area) elevation = 3845.000(Ft.)
Bottom (of initial area) elevation = 3750.000(Ft.)
Difference in elevation =   95.000(Ft.)
Slope =   0.36204 s(%)=   36.20
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   5.970 min.
Rainfall intensity =   9.556(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.887
Subarea runoff =   7.118(CFS)
Total initial stream area =   0.840(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =   0.140(In/Hr)

++
Process from Point/Station   2.000 to Point/Station   3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel =   23.685(CFS)
Depth of flow =   0.469(Ft.), Average velocity =   9.721(Ft/s)
       ******* Irregular Channel Data **********

```
        2              456.00            0.00
        3             1063.40           75.00
Manning's 'N' friction factor =    0.050
------------------------------------------------------------------
Sub-Channel flow  =      73.351(CFS)
    '       '       flow top width =      12.033(Ft.)
    '       '       velocity=    14.365(Ft/s)
    '       '       area =        5.106(Sq.Ft)
    '       '       Froude number =     3.886

Upstream point elevation =  3550.000(Ft.)
Downstream point elevation =  3325.000(Ft.)
Flow length =    303.000(Ft.)
Travel time  =      0.35 min.
Time of concentration =     6.78 min.
Depth of flow =   0.849(Ft.)
Average velocity =   14.365(Ft/s)
Total irregular channel flow =      73.351(CFS)
Irregular channel normal depth above invert elev. =    0.849(Ft.)
Average velocity of channel(s) =   14.365(Ft/s)

Sub-Channel No. 1 Critical depth =        1.461(Ft.)
    '       '       '       Critical flow top width =      20.714(Ft.)
    '       '       '       Critical flow velocity=    4.848(Ft/s)
    '       '       '       Critical flow area =      15.131(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000    Max loss rate(Fm)=      0.140(In/Hr)
Rainfall intensity =      8.740(In/Hr) for a  100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.886
Subarea runoff =      66.305(CFS) for    8.750(Ac.)
Total runoff =    104.488(CFS)
Effective area this stream =       13.50(Ac.)
Total Study Area (Main Stream No. 1) =       13.50(Ac.)
Area averaged Fm value =    0.140(In/Hr)


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Process from Point/Station       4.000 to Point/Station       5.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel =    137.111(CFS)
Depth of flow =   1.275(Ft.), Average velocity =  16.065(Ft/s)
     ******* Irregular Channel Data **********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate      'Y' coordinate
        1            0.00           100.00
        2          485.00             0.00
        3         1050.00           100.00
Manning's 'N' friction factor =    0.050
------------------------------------------------------------------
```

```
    '        '      Froude number =      3.886

Upstream point elevation =  3175.000(Ft.)
Downstream point elevation =  2975.000(Ft.)
Flow length =   324.000(Ft.)
Travel time  =    0.27 min.
Time of concentration =     7.34 min.
Depth of flow =   1.666(Ft.)
Average velocity =  20.123(Ft/s)
Total irregular channel flow =   194.256(CFS)
Irregular channel normal depth above invert elev. =   1.666(Ft.)
Average velocity of channel(s) =  20.123(Ft/s)

Sub-Channel No. 1 Critical depth =       2.875(Ft.)
    '       '       '       Critical flow top width =      20.010(Ft.)
    '       '       '       Critical flow velocity=    6.753(Ft/s)
    '       '       '       Critical flow area =      28.764(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000      Max loss rate(Fm)=      0.140(In/Hr)
Rainfall intensity =       8.273(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.885
Subarea runoff =      52.996(CFS) for    7.830(Ac.)
Total runoff =    217.826(CFS)
Effective area this stream =        29.76(Ac.)
Total Study Area (Main Stream No. 1) =       29.76(Ac.)
Area averaged Fm value = ·  0.140(In/Hr)


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Process from Point/Station         6.000 to Point/Station        7.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel =    241.906(CFS)
Depth of flow =   3.135(Ft.), Average velocity =  20.179(Ft/s)
      ******* Irregular Channel Data **********
-------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number     'X' coordinate     'Y' coordinate
     1             0.00            169.00
     2           412.30             0.00
    ·3·          353.50           169.00
Manning's 'N' friction factor =   0.050
-------------------------------------------------------------------
Sub-Channel flow =    241.906(CFS)
    '    '      flow top width =      7.648(Ft.)
    '    '      velocity=   20.179(Ft/s)
    '    '      area =     11.988(Sq.Ft)
    '    '      Froude number =     2.840

Upstream point elevation =  2975.000(Ft.)
Downstream point elevation =  2756.000(Ft.)
```

Estimated mean flow rate at midpoint of channel =   401.493(CFS)
Depth of flow =   2.771(Ft.), Average velocity = 12.673(Ft/s)
      ******* Irregular Channel Data **********

Information entered for subchannel number 1 :
Point number   'X' coordinate   'Y' coordinate
      1   0.00   60.00
      2   290.00   0.00
      3   495.00   60.00
Manning's 'N' friction factor =   0.050

Sub-Channel flow =   401.493(CFS)
   '   '   flow top width =   22.864(Ft.)
   '   '   velocity=   12.673(Ft/s)
   '   '   area =   31.682(Sq.Ft)
   '   '   Froude number =   1.897

Upstream point elevation = 2756.000(Ft.)
Downstream point elevation = 2715.000(Ft.)
Flow length =   335.000(Ft.)
Travel time =   0.44 min.
Time of concentration =   8.20 min.
Depth of flow =   2.771(Ft.)
Average velocity = .12.673(Ft/s)
Total irregular channel flow =   401.493(CFS)
Irregular channel normal depth above invert elev. =   2.771(Ft.)
Average velocity of channel(s) = 12.673(Ft/s)

Sub-Channel No. 1 Critical depth =   3.594(Ft.)
   '   '   '   Critical flow top width =   29.648(Ft.)
   '   '   '   Critical flow velocity=   7.536(Ft/s)
   '   '   '   Critical flow area =   53.275(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000   Max loss rate(Fm)=   0.140(In/Hr)
Rainfall intensity =   7.655(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.884
Subarea runoff =   26.166(CFS) for   6.040(Ac.)
Total runoff =   406.413(CFS)
Effective area this stream =   60.09(Ac.)
Total Study Area (Main Stream No. 1) =   60.09(Ac.)
Area averaged Fm value =   0.140(In/Hr)

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Process from Point/Station   8.000 to Point/Station   9.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel =   420.819(CFS)
Depth of flow =   2.311(Ft.), Average velocity = 15.831(Ft/s)
      ******* Irregular Channel Data **********

```
        3              690.00              35.00
Manning's 'N' friction factor =   0.050
----------------------------------------------------------------
Sub-Channel flow  =    438.236(CFS)
   '      '         flow top width =  '    39.887(Ft.)
   '      '         velocity=    9.926(Ft/s)
   '      '         area =      44.151(Sq.Ft)
   '      '         Froude number =     1.663

Upstream point elevation =  2644.000(Ft.)
Downstream point elevation =  2615.000(Ft.)
Flow length =    295.000(Ft.)
Travel time  =     0.50 min.
Time of concentration =     9.00 min.
Depth of flow =    2.214(Ft.)
Average velocity =    9.926(Ft/s)
Total irregular channel flow =   438.236(CFS)
Irregular channel normal depth above invert elev. =    2.214(Ft.)
Average velocity of channel(s) =    9.926(Ft/s)

Sub-Channel No. 1 Critical depth =       2.719(Ft.)
   '      '        '         Critical flow top width =     48.986(Ft.)
   '      '        '         Critical flow velocity=    6.581(Ft/s)
   '      '        '         Critical flow area =    66.590(Sq.Ft)

 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000    Max loss rate(Fm)=     0.140(In/Hr)
Rainfall intensity =     7.168(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.882
Subarea runoff  =    10.928(CFS) for     4.380(Ac.)
Total runoff =    434.741(CFS)
Effective area this stream =       68.73(Ac.)
Total Study Area (Main Stream No. 1) =       68.73(Ac.)
Area averaged Fm value =    0.140(In/Hr)


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Process from Point/Station        10.000 to Point/Station     11.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel =    447.297(CFS)
Depth of flow =    2.268(Ft.), Average velocity =  12.211(Ft/s)
       ******* Irregular Channel Data **********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number        'X' coordinate       'Y' coordinate
     1               0.00               60.00
     2             400.00                0.00
     3             650.00               33.00
Manning's 'N' friction factor =   0.050
------------------------------------------------------------------
Sub-Channel flow  =    447.297(CFS)
```