DRAINAGE STUDY

FOR

JOSHUA SPRINGS CALVARY CHAPEL

New Gymnasium

Town of Yucca Valley, California

County of San Bernardino

Job No. 2750213-0PDB030600

October 2, 2024

Prepared by:

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Prepared for:

Joshua Springs Calvary Chapel

57373 Joshua Lane
Yucca Valley, CA 92284

PREPARED UNDER THE SUPERVISION OF:
NV5, INC.

_____ 10/2/24

VICKIE L. BRIDENSTINE, P.E. DATE

NV5
Beyond Engineering

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I. INTRODUCTION

A. Purpose of Study

The purpose of this study is to study the impacts that construction of a new gymnasium building on a now vacant graded pad south of the existing retention basin on the property owned by Joshua Springs Calvary Chapel. The retention basin was sized to handle the incremental increase in runoff due to the development of the site. The current basin size was determined by a drainage report by Warner Engineering dated October 26, 1999 (included in Appendix A). The proposed 9,720 square foot building and adjacent hardscape improvements will add additional impervious area to the overall site and the increased runoff will be directed to the retention basin.

B. Scope

A Unit Hydrograph was run to compare storm water runoff to the original Unit Hydrograph included in the Warner Report. The new Unit Hydrograph made adjustments for the increase in proposed impervious area. The offsite drainage basin from the 1999 report was analyzed and the 100 year, 3-hour storm was calculated for comparison purposes. Hydrologic and hydraulic calculations were performed using methodologies defined in the *San Bernardino County Flood Control District Hydrology Manual* (August 1986) and County of San Bernardino Hydrology Manual Addendum for Arid Regions (April 2010).

The CivilDesign Hydrology-Hydraulics software, Rational Hydrology program package was used to perform the hydrologic calculations.

II. SITE AREA

A. Area Characteristics

The Joshua Springs Calvary Chapel campus is approximately 23 acres located south of Joshua Lane, north of Nagles Street and east of Hardesty Drive. The site is presently disturbed or developed with buildings, desert landscaping or parking. The drainage area tributary to the site from the south is largely undeveloped covered with natural desert vegetation with occasional single-family homes on large lots. The natural terrain slopes down to the north at approximately 5%.

The site accepts runoff from approximately 18 acres to the south and conveys runoff through the site to Joshua Lane through natural drain courses on the eastern edge of the property.

The existing retention basin was designed to accept the runoff volume for the 100year, 3 hour storm. The basin capacity is 171,000c.f., which includes a 40% bulking factor. Per the Warner report, the previous development generates 122,400 c.f. runoff volume.

B. Proposed Development

The proposed gymnasium and associated hardscape is proposed to be constructed on an existing vacant graded pad directly south of the retention basin. The proposed construction adds an addition 15,500 sf. of impervious area to take into consideration during our analysis.

C. Soils Group

According to Plate C-2 of the San Bernardino County Flood Control District (SBCFCD) Hydrology Manual, the entirety of the watershed is within a Soil Type "B".

D. Land Use

The existing Land Use General Plan Designation for this site is RR-1 (Single Family Rural Residential, 1 acre minimum) and RR-2.5 (Single Family Rural Residential, 2.5 acre minimum). The existing land use is a church and school and accessory uses. The location of the proposed new gymnasium is a vacant existing graded pad directly south of the existing retention basin.

E. Rainfall Intensity

The rainfall data used in the study are per the San Bernardino County Isohyetals located in the Hydrology Manual as were the original study conducted in 1999. The NOAA Atlas 14, Volume 6, Version 2 rainfall information was reviewed as recommended for use by the San Bernardino County Hydrology Manual, Addendum for Arid Regions (April 2010) and it was determined that they are relatively the same as the Isohyetals from the hydrology manual. For comparison purposes, we used the same data as the original study. Data from the Yucca Valley Station ID: 79-9002 is included in Appendix I.

F. Antecedent Moisture Condition (AMC)

Per San Bernardino County Hydrology Manual, Addendum for Arid Regions (April 2010), this project lies within the area mapped as AMC2 on Figure ADD-1. However, in the interest of direct comparison, AMC 3 was used in our analysis to compare to the original study.

III. SUMMARY

A. Results

The Unit Hydrograph calculation which includes the additional 15,500 s.f. of impervious area created by the proposed development of the new gymnasium generates 123,275 c.f. runoff volume. The existing retention basin has a capacity of 171,000 c.f., therefore the basin has the capacity to accept the additional runoff as a result of this proposed construction.

B. Conclusions

Development of the new gymnasium and associated hardscape can be accomplished in a manner that will maintain historical downstream flow patterns. The existing retention basin volume should be adequate to accommodate the additional volume of storm runoff due to the proposed development.

C. References

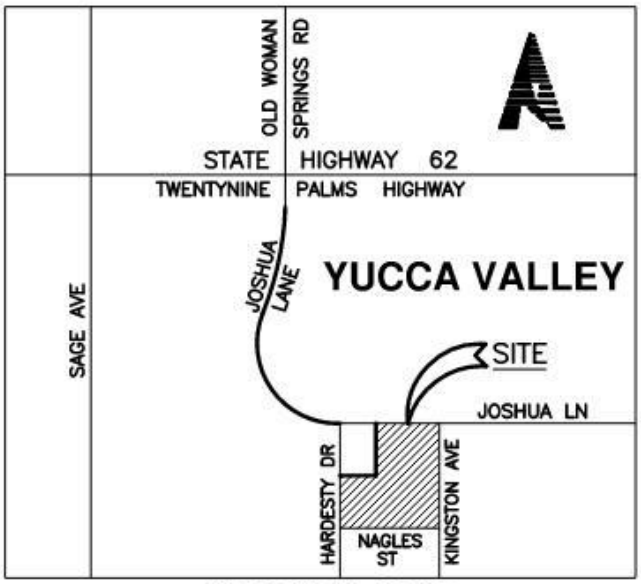
1. *CivilDesign Engineering Software*, Rational Method Hydrology System Model, © 1989-2001, Version 6.4.

2. County of San Bernardino, *Hydrology Manual,* ©August 1986.

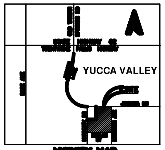
3. SB County Hydrology Manual, Addendum for Arid Regions (April, 2010)

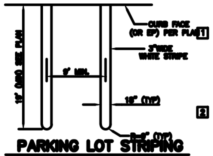
4. Drainage Study for Joshua Springs Calvary Chapel by Warner Engineering (October , 1999)

APPENDIX I



VICINITY MAP
(NO SCALE)





EASEMENTS

1. AN EASEMENT FOR ... [illegible]

2. AN EASEMENT FOR ... [illegible]

IN THE TOWN OF YUCCA VALLEY

JOSHUA SPRINGS CALVARY CHAPEL

CONDITIONAL USE PERMIT SITE PLAN

REVISED SEPTEMBER 11, 2024

1 inch = 60 ft.

PREPARED FOR (APPLICANT, OWNER):

JOSHUA SPRINGS CALVARY CHAPEL
57353 JOSHUA LANE
YUCCA VALLEY, CA 92284
(760) 365-0769
EMAIL: jerel@joshuasprings.org

PROJECT DESCRIPTION

JOSHUA SPRINGS CALVARY CHAPEL (JSCC) CURRENTLY OCCUPIES A PORTION OF THE 23± ACRE SITE AND OPERATES A CHURCH, CAFE (FOR PRIVATE USE), ADMINISTRATIVE OFFICES, A K-12 SCHOOL, RELATED PARKING AND OTHER FACILITIES. JSCC PROPOSES TO CONSTRUCT AN AMPHITHEATER, A CLASSROOM AND FOR A CONCESSION STAND AND ADDITIONAL PARKING SPACES.

THE TURFED PLAYFIELD LOCATED NEAR THE SOUTHERLY END OF THE SITE ACCOMMODATES VARIOUS ACTIVATES AND IS LIGHTED WITH LIGHTS ON EXISTING POLES.

KINDERGARTEN THROUGH 12TH GRADE STUDENTS UTILIZE THE EXISTING CLASSROOMS.

THE VARIOUS ACTIVITIES ARE EXPECTED TO CONTINUE TO OCCUR NON-CURRENTLY. PARKING IS PROVIDED ON THE SITE FOR EACH USE, AND TOTAL NUMBER OF PARKING SPACES HAVE BEEN FOUND TO ACCOMMODATE ALL ACTIVITIES OR USES WHEN IF OCCURRING NON-CONCURRENTLY.

TABLES ON THE CUP SITE PLAN SHOW THE EXISTING AND PROPOSED LAND USES ALONG WITH REQUIRED AND PROPOSED PARKING TO ACCOMMODATE THOSE USES.

ASSESSOR'S PARCEL NO.'S

[illegible]

LEGAL DESCRIPTION

ALL THAT CERTAIN REAL PROPERTY SITUATED IN THE INCORPORATED TOWN OF YUCCA VALLEY, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

THE EAST HALF OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER AND THE SOUTH HALF OF THE WEST HALF OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 12, TOWNSHIP 1 SOUTH, RANGE 5 EAST, SAN BERNARDINO MERIDIAN, AS SHOWN IN GRANT DEED RECORDED AUGUST 26, 1999 AS DOCUMENT NO. [illegible];

TOGETHER WITH PARCELS 1 AND 3 OF PARCEL MAP [illegible] BOOK [illegible] OF PARCEL MAPS AT PAGES [illegible] THROUGH [illegible], INCLUSIVE, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, PURSUANT TO NOTICE OF MERGER RECORDED AUGUST 11, 1999 AS INSTRUMENT NO. [illegible], OFFICIAL RECORDS OF SAID COUNTY.

ALSO TOGETHER WITH A PORTION OF THE WEST HALF OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER OF SAID SECTION 12, AS SHOWN IN GRANT DEED RECORDED APRIL 12, 1991 AS DOCUMENT NO. [illegible], MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHEAST CORNER OF SAID WEST HALF OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER;

THENCE SOUTH [illegible] WEST ALONG THE SOUTH LINE OF SAID WEST HALF OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER, A DISTANCE OF [illegible] FEET;

THENCE NORTH 00°16'24" WEST A DISTANCE OF 124.37 FEET;

THENCE NORTH [illegible] EAST A DISTANCE OF 79.37 FEET TO THE EAST LINE OF SAID WEST HALF OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER;

THENCE SOUTH [illegible] WEST ALONG SAID EAST LINE OF THE WEST HALF OF THE NORTHWEST QUARTER OF THE NORTHWEST QUARTER OF THE SOUTHEAST, A DISTANCE OF 175.00 FEET TO THE POINT OF BEGINNING.

UTILITY COMPANIES

WATER	HI-DESERT WATER DISTRICT [illegible] YUCCA VALLEY, CALIFORNIA 92284 ATTENTION: MARK [illegible] PHONE: [illegible]
TELEPHONE	VERIZON [illegible] PALM SPRINGS, CALIFORNIA 92262 ATTENTION: LARRY MOORE PHONE: [illegible]
POWER	SOUTHERN CALIFORNIA EDISON [illegible] YUCCA VALLEY, CALIFORNIA 92284 ATTENTION: JOHN O'DELL PHONE: [illegible]
GAS	THE GAS COMPANY [illegible] YUCCA VALLEY, CALIFORNIA 92284 ATTENTION: [illegible] PHONE: [illegible]
CABLE	TIME WARNER CABLE [illegible] INDIO, CALIFORNIA [illegible] ATTENTION: [illegible] PHONE: [illegible]
SEWAGE DISPOSAL	SEPTIC TANKS AND SEEPAGE PITS

NOTES:

1. EXISTING AND PROPOSED LAND USE: CHURCH, SCHOOL AND VACANT.
2. EXISTING AND PROPOSED GENERAL PLAN LAND USE DESIGNATION: RURAL RESIDENTIAL 1 ACRE MIN. (RR-1) AND RURAL RESIDENTIAL 2.5 ACRE MINIMUM (RR-2.5)
3. LANDSCAPING CONSISTS OF DROUGHT TOLERANT LANDSCAPING PER LOCAL WATER DISTRICT ORDINANCE AND INCLUDES A DRIP IRRIGATION SYSTEM.
4. NO HILLY TERRAIN EXISTS ON-SITE.
5. DRAINAGE COURSES WILL BE MAINTAINED AS OPEN SPACE ONSITE STORMWATER DETENTION OR RETENTION BASINS EXIST.
6. DATE OF AERIAL TOPOGRAPHIC SURVEY: SEPTEMBER 4, 2015
7. EXISTING AND PROPOSED ZONING DESIGNATIONS: RURAL LIVING 1 ACRE MINIMUM (RL-1) AND RURAL LIVING 2.5 ACRE MINIMUM (RL 2.5).
8. THIS SITE DOES NOT LIE WITHIN A FEMA FLOOD ZONE.

AREA TABULATION

TOTAL NET C.U.P. SITE AREA = 1,013,760± S.F. (23± ACRES)

TOTAL BUILDING AREA = 87,040 ± S.F.

TOTAL IMPERVIOUS AREA = [illegible] ± S.F.

TOTAL PERVIOUS AREA = [illegible] ± S.F.

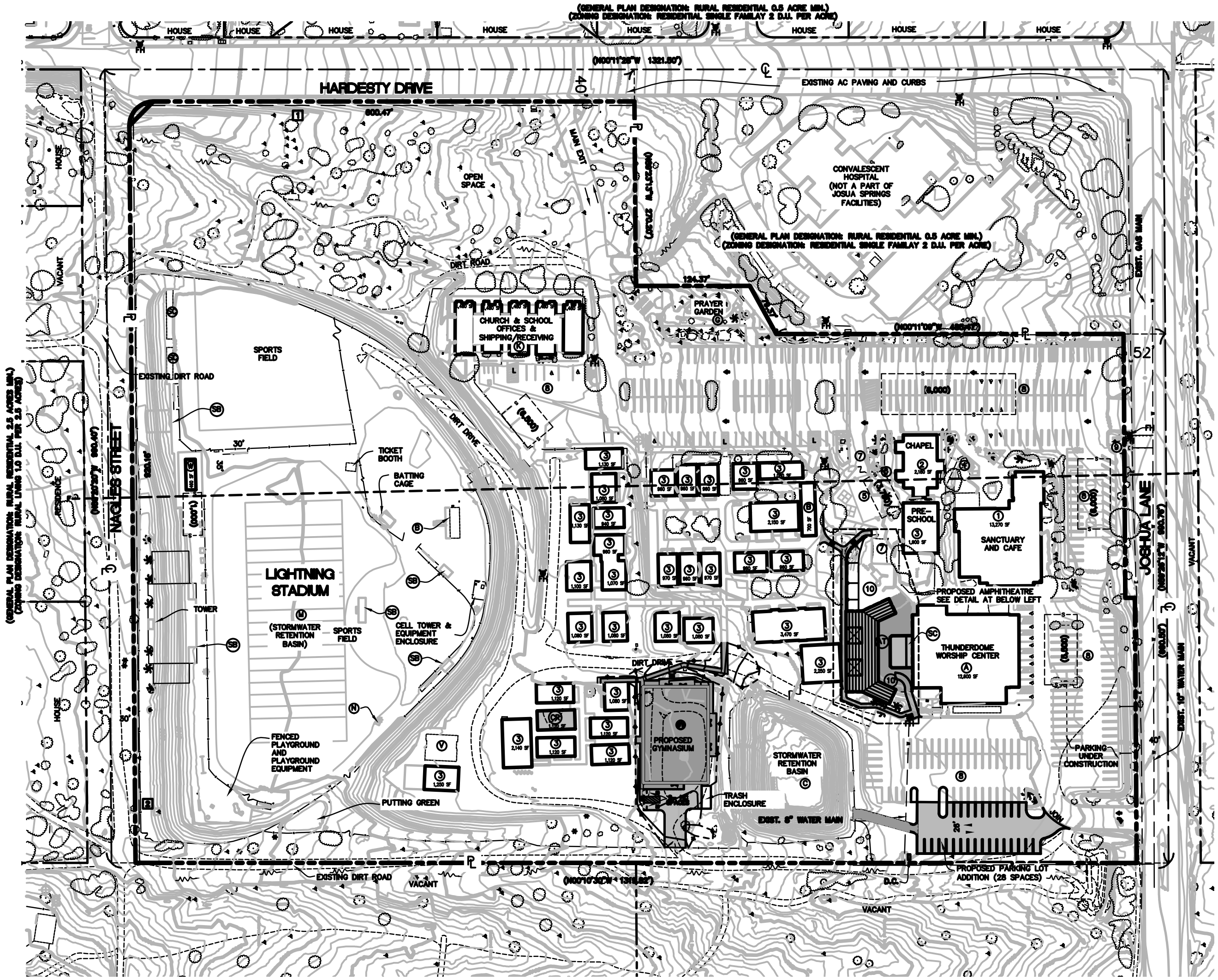
LEGEND

- INDICATES EXISTING BUILDING
- INDICATES PROPOSED BUILDING ADDITION OR OTHER FACILITY
- INDICATES EXISTING & PROPOSED PAVING & PARKING
- ♿ or HC INDICATES HANDICAP PARKING
- L INDICATES EXISTING LOADING ZONE
- INDICATES LOADING ZONE
- FH INDICATES FIRE HYDRANT (5 EXISTING)
- INDICATES DRAINAGE FLOW
- L.S. INDICATES LANDSCAPED AREAS
- FS INDICATES FINISHED SURFACE ELEVATION
- 1 EASEMENT LEGEND
- EXISTING PARCEL LINE
- EXISTING FENCE OR WALL
- EXISTING TREE OR BUSH
- Ⓐ BUILDING OR AREA DESIGNATION
- APPROX. EXISTING SEPTIC SYSTEM AREA (SEPTIC TANK VOLUME, GAL.)
- WESTERN LIMITS OF ALQUIST PRIOLO GEOLOGIC HAZARD STUDY ZONE
- VEGETATION
- —E—E— EXISTING OVERHEAD ELECTRIC
- —G—G— EXISTING GAS LINE
- —W—W— EXISTING WATER MAIN

LAND USES

SYMBOL	DESCRIPTION	PARKING FORMULA	SIZE	PARKING REQ'D
1	SANCTUARY INCLUDING WELCOME CENTER & CAFE	1 SPACE/30 SF	3780 SF / 6,600 SF	126 / 0
2	CHAPEL	1 SPACE/30 SF	2,180 SF	91
3	CLASSROOMS (K-12 & SUNDAY SCHOOL)	1 SPACE STAFF/CLASSROOM + 1 SPACE/4 STUDENTS 36 @ 10 STUDENTS/CLASSROOM		108
4	GAZEBO	N/A		–
5	BASKETBALL COURT	N/A	30X55	–
6	RESERVED	N/A		–
7	CANOPY	N/A	20X20	–
8	PAVED PARKING LOT	N/A		–
9	MONUMENT SIGN	N/A		–
10	PLAYGROUND	N/A		–
11	RESERVED	N/A		–
A	GYMNASIUM/THUNDERDOME	1 SPACE/30 SF	90' X 120' (10,800 SF)	360
B	RESTROOMS	N/A	11.67' X 60.17'	0
C	STORMWATER RETENTION BASIN	N/A	15,700 SF	0
D	PRAYER GARDEN	–	60' X 105'	
E	RESERVED	–		
F	CHURCH AND SCHOOL OFFICES, SHIPPING AND RECEIVING	1 SP/250SF	7,400 SF	31
[illegible]	RESERVED	–		
[illegible]	SPORT FIELDS (BASEBALL, FOOTBALL, OTHER)		REGULATION	
[illegible]	SPORT FIELD LIGHT TOWERS (12)	N/A	(35 FT. MAX)	0
[illegible]	STORAGE CONTAINERS	1 SP/1000 SF	1000 SF	1
[illegible]	CONCESSION STAND/EQUIPMENT BUILDING	1 SP/1000 SF	12' X 35'	1
[illegible]	SPORTS BLEACHERS	1 SP/24" SEATING	1600 LF SEATING	225
[illegible]	STORAGE CONTAINER	1 SP/1000 SF	2000 SF	2
[illegible]	TRASH BINS (3)		3 @ 8'X8'	0
[illegible]	AMPHITHEATRE (OUTDOOR) 400 SEATS	1 SP/24" SEATING	1200 LF SEATING	156
[illegible]	INDICATES PROPOSED CLASSROOM BUILDING (REPLACES FORMER BUILDING DESTROYED IN 2007 FIRE.)			
[illegible]	GYMNASIUM			
			TOTAL:	1,100

(GENERAL PLAN DESIGNATION: RURAL RESIDENTIAL 0.5 ACRE MIN.)
(ZONING DESIGNATION: RESIDENTIAL SINGLE FAMILY 2 D.U. PER ACRE)



GENERAL PLAN DESIGNATION: LOW DENSITY RESIDENTIAL 2.1 – 5.0 DU/ACRE
ZONING DESIGNATION: RM 4 (SP)

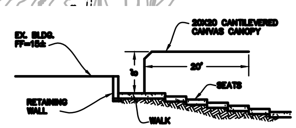
(GENERAL PLAN DESIGNATION: RURAL RESIDENTIAL 2.5 ACRES MIN.) (ZONING DESIGNATION: RURAL LIVING 1.0 D.U. PER 2.5 ACRES)

(ZONING DESIGNATION: RURAL RESIDENTIAL 0.5 ACRE MIN.) (GENERAL PLAN DESIGNATION: RESIDENTIAL SINGLE FAMILY 2 D.U. PER ACRE)

PARKING SUMMARY

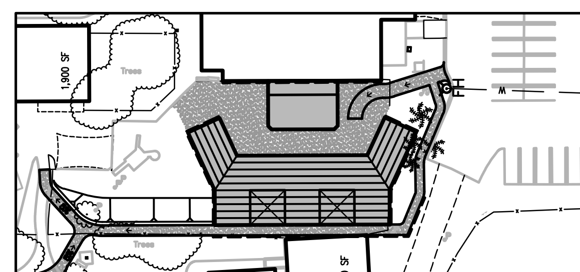
DESCRIPTION	REQUIRED	SHOWN
TOTAL STANDARD SPACES	1,100	350
TOTAL HANDICAP SPACES	12	20
	1,112	* 370
TOTAL LOADING SPACES	2	4

* SHARED SPACES BASED UPON NON-CONCURRENT USES



CANOPY SECTION

SCALE: 1" = 10'



AMPHITHEATRE DETAIL

SCALE: 1" = 30'

BENCH MARK NO.	REVISIONS	PLANS PREPARED BY	APPROVED BY:	TOWN OF YUCCA VALLEY	SHEET
TOP OF 1" PIPE AT CENTERLINE INTERSECTION OF JOSHUA LANE AND HARDESTY DRIVE. ELEVATION:		NV5 42-829 COOK STREET, SUITE 104 (760) 341-3101 FAX (760) 341-5999, EMAIL: VICKIE.BRIDENSTINE@NV5.COM PREPARED UNDER THE SUPERVISION OF: VICKIE L. BRIDENSTINE 57142 12/31/17 - RCE - DATE	RECOMMENDED BY:	JOSHUA SPRINGS CALVARY CHAPEL CONDITIONAL USE PERMIT SITE PLAN REVISED AUGUST 15, 2017 SW 1/4, SEC. 35, T.S.I N.R.5, E.S.B.B.&M.	1 OF 1 SHEETS P08030600

NOAA Atlas 14, Volume 6, Version 2 YUCCA VALLEY C.D.F.
Station ID: 79-9002
Location name: Yucca Valley, California, USA*
Latitude: 34.1238°, Longitude: -116.4093°
Elevation:
Elevation (station metadata): 3420 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.078 (0.065-0.095)	0.116 (0.096-0.142)	0.175 (0.145-0.215)	0.231 (0.189-0.285)	0.318 (0.252-0.406)	0.397 (0.308-0.517)	0.488 (0.369-0.651)	0.594 (0.437-0.816)	0.865 (0.611-1.24)	1.17 (0.800-1.74)
10-min	0.112 (0.093-0.136)	0.167 (0.138-0.204)	0.251 (0.207-0.308)	0.331 (0.271-0.408)	0.456 (0.361-0.582)	0.569 (0.441-0.741)	0.699 (0.529-0.934)	0.852 (0.627-1.17)	1.24 (0.876-1.77)	1.68 (1.15-2.49)
15-min	0.135 (0.112-0.165)	0.202 (0.167-0.246)	0.304 (0.251-0.372)	0.400 (0.327-0.494)	0.552 (0.437-0.704)	0.688 (0.533-0.897)	0.846 (0.640-1.13)	1.03 (0.758-1.41)	1.50 (1.06-2.14)	2.03 (1.39-3.01)
30-min	0.207 (0.172-0.253)	0.309 (0.256-0.378)	0.466 (0.384-0.571)	0.613 (0.501-0.757)	0.846 (0.670-1.08)	1.06 (0.818-1.37)	1.30 (0.981-1.73)	1.58 (1.16-2.17)	2.30 (1.62-3.29)	3.11 (2.12-4.61)
60-min	0.287 (0.237-0.349)	0.428 (0.354-0.522)	0.644 (0.531-0.789)	0.847 (0.693-1.05)	1.17 (0.926-1.49)	1.46 (1.13-1.90)	1.79 (1.36-2.39)	2.18 (1.61-3.00)	3.18 (2.24-4.55)	4.30 (2.94-6.37)
2-hr	0.402 (0.333-0.490)	0.568 (0.470-0.694)	0.813 (0.671-0.995)	1.03 (0.846-1.28)	1.37 (1.08-1.75)	1.66 (1.29-2.16)	1.98 (1.50-2.65)	2.35 (1.73-3.23)	3.21 (2.27-4.59)	4.35 (2.97-6.44)
3-hr	0.477 (0.395-0.582)	0.662 (0.548-0.808)	0.929 (0.766-1.14)	1.17 (0.954-1.44)	1.52 (1.20-1.94)	1.82 (1.41-2.37)	2.15 (1.63-2.87)	2.52 (1.85-3.46)	3.24 (2.29-4.64)	4.39 (3.00-6.50)
6-hr	0.617 (0.511-0.753)	0.843 (0.697-1.03)	1.16 (0.956-1.42)	1.43 (1.17-1.77)	1.84 (1.45-2.34)	2.17 (1.68-2.82)	2.52 (1.91-3.37)	2.91 (2.14-4.00)	3.48 (2.45-4.97)	4.44 (3.03-6.57)
12-hr	0.749 (0.620-0.914)	1.03 (0.850-1.26)	1.42 (1.17-1.74)	1.76 (1.44-2.17)	2.25 (1.78-2.87)	2.65 (2.06-3.46)	3.09 (2.34-4.12)	3.56 (2.62-4.89)	4.24 (3.00-6.07)	4.81 (3.28-7.12)
24-hr	0.920 (0.815-1.06)	1.28 (1.14-1.48)	1.80 (1.58-2.08)	2.25 (1.97-2.62)	2.91 (2.46-3.50)	3.46 (2.87-4.25)	4.06 (3.29-5.10)	4.72 (3.72-6.10)	5.68 (4.30-7.65)	6.49 (4.75-9.04)
2-day	0.988 (0.876-1.14)	1.40 (1.24-1.62)	2.00 (1.76-2.31)	2.52 (2.21-2.94)	3.29 (2.79-3.96)	3.93 (3.26-4.83)	4.63 (3.75-5.82)	5.40 (4.26-6.98)	6.53 (4.95-8.79)	7.48 (5.48-10.4)
3-day	1.08 (0.952-1.24)	1.55 (1.37-1.78)	2.22 (1.96-2.57)	2.82 (2.47-3.28)	3.69 (3.13-4.44)	4.42 (3.67-5.44)	5.22 (4.23-6.57)	6.10 (4.82-7.89)	7.40 (5.61-9.96)	8.49 (6.22-11.8)
4-day	1.12 (0.995-1.29)	1.63 (1.44-1.88)	2.36 (2.08-2.73)	3.00 (2.63-3.50)	3.95 (3.35-4.75)	4.74 (3.94-5.82)	5.60 (4.54-7.05)	6.56 (5.18-8.48)	7.97 (6.04-10.7)	9.15 (6.70-12.7)
7-day	1.24 (1.10-1.43)	1.84 (1.63-2.12)	2.70 (2.38-3.12)	3.46 (3.03-4.03)	4.59 (3.89-5.52)	5.53 (4.59-6.79)	6.56 (5.32-8.26)	7.70 (6.08-9.96)	9.39 (7.12-12.7)	10.8 (7.93-15.1)
10-day	1.34 (1.19-1.55)	2.00 (1.77-2.31)	2.95 (2.61-3.42)	3.79 (3.32-4.42)	5.04 (4.27-6.07)	6.09 (5.06-7.48)	7.23 (5.86-9.10)	8.50 (6.70-11.0)	10.4 (7.86-14.0)	12.0 (8.76-16.7)
20-day	1.50 (1.33-1.73)	2.25 (1.99-2.60)	3.33 (2.94-3.85)	4.28 (3.75-4.99)	5.69 (4.82-6.85)	6.86 (5.70-8.43)	8.14 (6.60-10.2)	9.55 (7.54-12.4)	11.6 (8.80-15.6)	13.3 (9.77-18.6)
30-day	1.68 (1.49-1.94)	2.52 (2.23-2.91)	3.73 (3.29-4.31)	4.79 (4.19-5.58)	6.35 (5.38-7.65)	7.65 (6.35-9.40)	9.05 (7.34-11.4)	10.6 (8.35-13.7)	12.8 (9.71-17.3)	14.7 (10.8-20.4)
45-day	1.95 (1.73-2.25)	2.91 (2.57-3.35)	4.26 (3.76-4.93)	5.45 (4.77-6.35)	7.19 (6.09-8.66)	8.63 (7.17-10.6)	10.2 (8.25-12.8)	11.9 (9.36-15.3)	14.3 (10.8-19.3)	16.3 (11.9-22.7)
60-day	2.24 (1.99-2.58)	3.31 (2.93-3.81)	4.81 (4.25-5.56)	6.12 (5.36-7.14)	8.03 (6.81-9.67)	9.61 (7.98-11.8)	11.3 (9.16-14.2)	13.1 (10.3-17.0)	15.7 (11.9-21.2)	17.9 (13.1-24.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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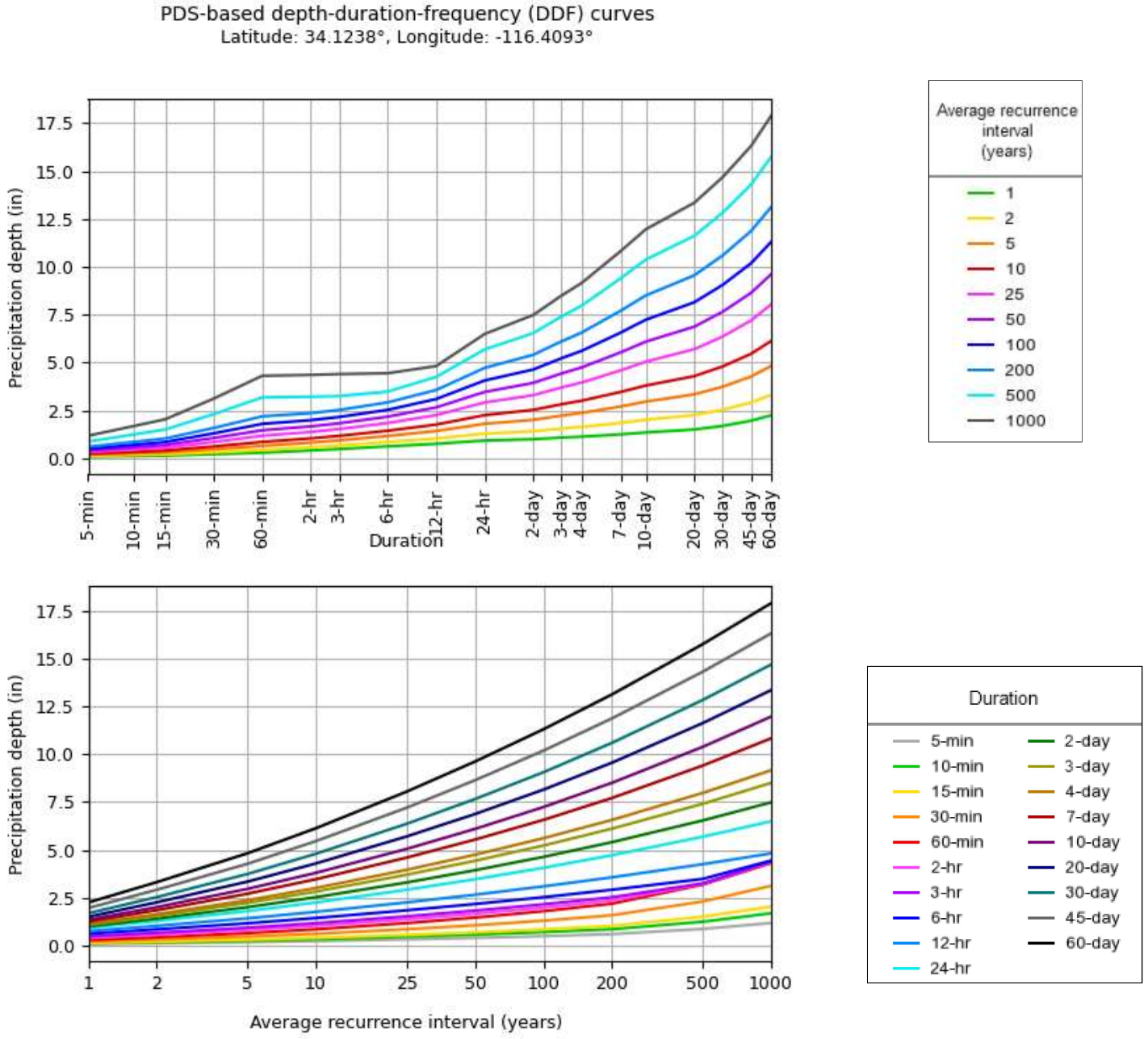
PF graphical



NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Tue Sep 10 22:50:54 2024

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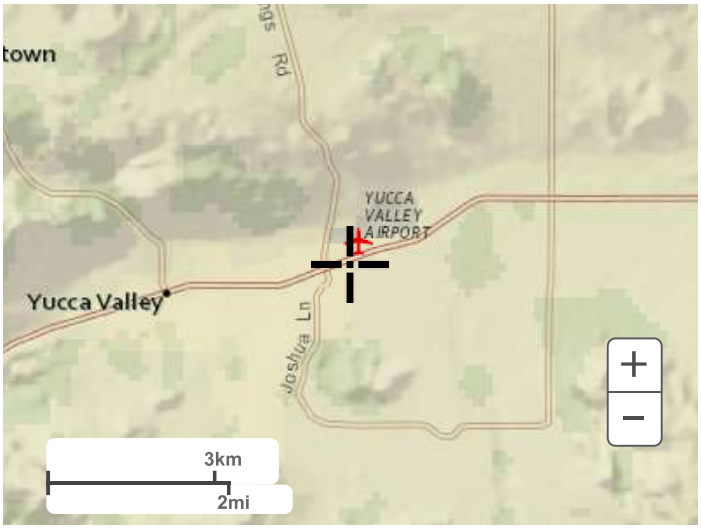
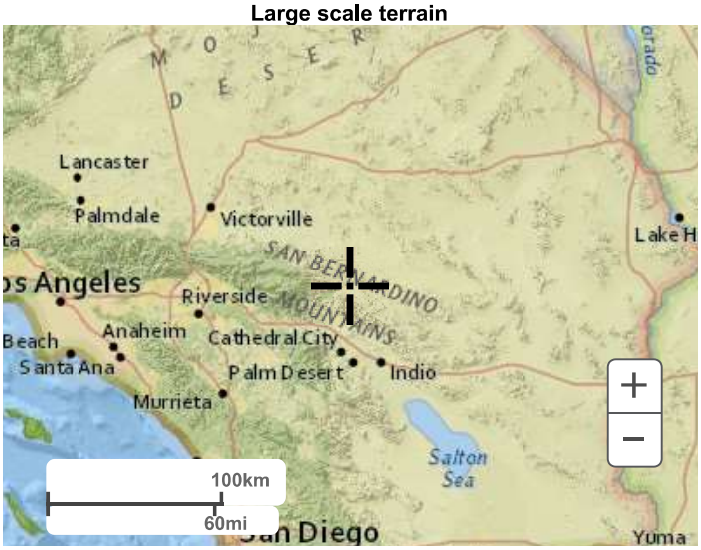
Maps & aerials

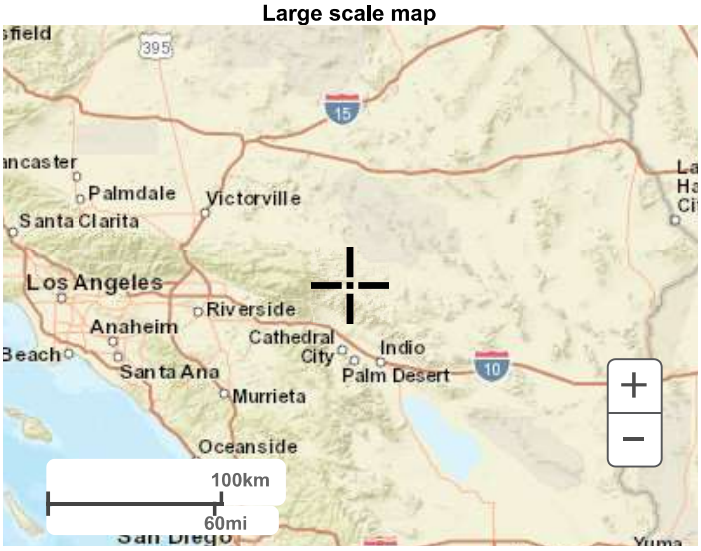
Small scale terrain



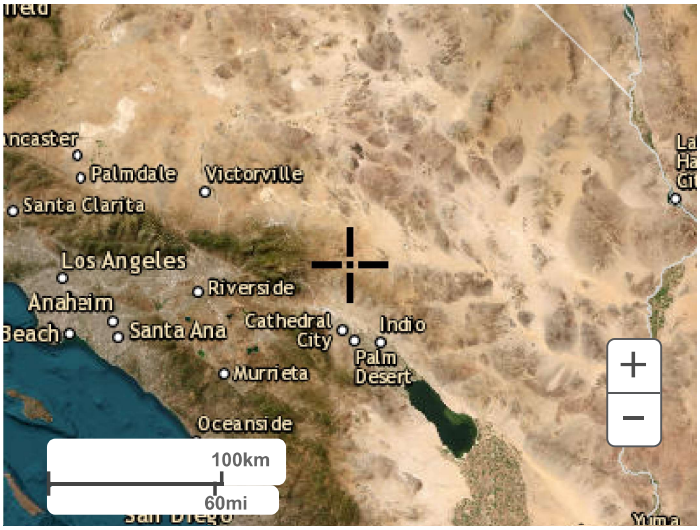
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX II

U n i t H y d r o g r a p h A n a l y s i s

Study date 10/01/24

++

San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 6360

JOSHUA SPRINGS NEW GYMNASIUM 2024
100 YEAR 3 HOUR STORM, POST DEVELOPMENT
OCTOBER 1, 2024 VB

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 10		
20.00	1	0.91
Rainfall data for year 2		
20.00	6	1.00
Rainfall data for year 2		
20.00	24	1.30
Rainfall data for year 100		
20.00	1	1.40

```
------------------------------------------------------------------------
Rainfall data for year 100
            20.00            6           2.50
------------------------------------------------------------------------
Rainfall data for year 100
            20.00           24           5.00
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 3)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 56.0      75.8          9.80      0.490     0.440    0.510    0.224
 66.0      83.8         10.20      0.510     0.304    0.510    0.155

Area-averaged adjusted loss rate Fm (In/Hr) =  0.189

********* Area-Averaged low loss rate fraction, Yb **********

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
     5.00   0.250         56.0      75.8       3.19     0.504
     4.80   0.240         98.0      98.0       0.20     0.953

     5.20   0.260         66.0      83.8       1.93     0.650
     5.00   0.250         98.0      98.0       0.20     0.953

Area-averaged catchment yield fraction, Y =  0.762
Area-averaged low loss fraction, Yb =  0.238
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watercourse length =    3000.00(Ft.)
Length from concentration point to centroid =    1250.00(Ft.)
Elevation difference along watercourse =     150.00(Ft.)
Mannings friction factor along watercourse =  0.030
Watershed area =      20.00(Ac.)
Catchment Lag time =   0.116 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 71.5584
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.189(In/Hr)
Average low loss rate fraction (Yb) = 0.238 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.664(In)
Computed peak 30-minute rainfall =  1.137(In)
Specified peak 1-hour rainfall =  1.400(In)
Computed peak 3-hour rainfall =  1.998(In)
Specified peak 6-hour rainfall =  2.500(In)
Specified peak 24-hour rainfall =  5.000(In)
```

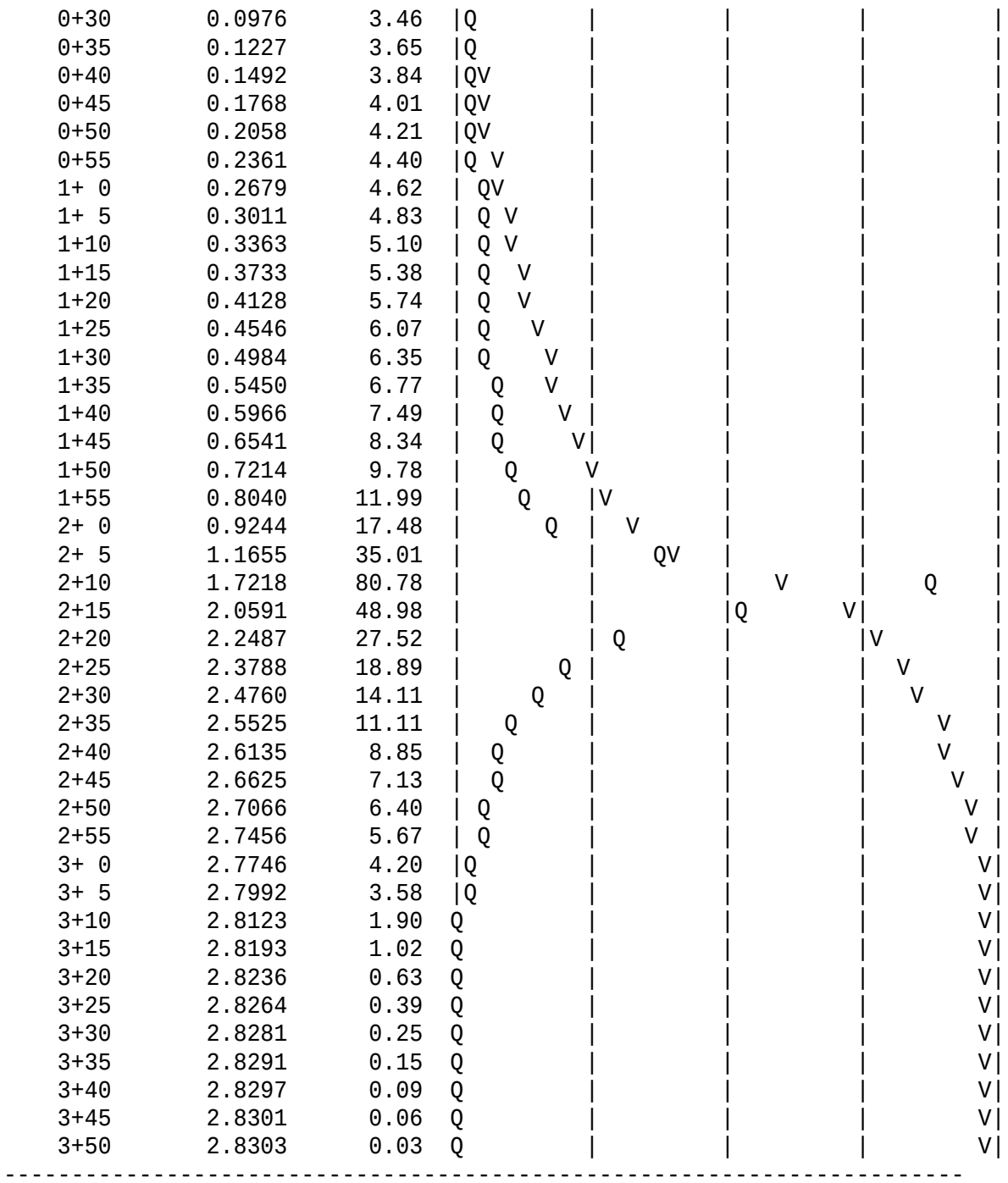
```
Rainfall depth area reduction factors:
Using a total area of      20.00(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999     Adjusted rainfall =  0.664(In)
30-minute factor = 0.999    Adjusted rainfall =  1.136(In)
1-hour factor = 0.999       Adjusted rainfall =  1.399(In)
3-hour factor = 1.000       Adjusted rainfall =  1.997(In)
6-hour factor = 1.000       Adjusted rainfall =  2.500(In)
24-hour factor = 1.000      Adjusted rainfall =  5.000(In)
--------------------------------------------------------------------------

                        U n i t  H y d r o g r a p h
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Interval          'S' Graph          Unit Hydrograph
Number            Mean values             ((CFS))
--------------------------------------------------------------------------
                (K =       241.88 (CFS))

  1                8.231                  19.908
  2               51.673                 105.077
  3               74.307                  54.745
  4               84.207                  23.946
  5               89.961                  13.917
  6               93.549                   8.678
  7               95.969                   5.855
  8               97.532                   3.780
  9               98.410                   2.122
 10               99.248                   2.028
 11              100.000                   1.819
--------------------------------------------------------------------------
--------------------------------------------------------------------------
--------------------------------------------------------------------------
Total soil rain loss =      0.30(In)
Total effective rainfall =      1.70(In)
Peak flow rate in flood hydrograph =     80.78(CFS)
--------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                     3 - H O U R    S T O R M
                R u n o f f      H y d r o g r a p h
--------------------------------------------------------------------------
             Hydrograph in   5   Minute intervals ((CFS))

      --------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0       22.5      45.0      67.5      90.0
-------------------------------------------------------------------------
  0+ 5       0.0019      0.28  Q         |         |         |         |
  0+10       0.0138      1.74  Q         |         |         |         |
  0+15       0.0313      2.53  VQ        |         |         |         |
  0+20       0.0516      2.95  VQ        |         |         |         |
  0+25       0.0738      3.22  |Q        |         |         |         |
```



APPENDIX III

7245 Joshua Lane, Suite B
Yucca Valley, California 92284
Phone (760)365-7638
Fax (760)365-2146

73-185 Highway 111, Suite A
Palm Desert, California 92260
Phone (760)341-3101
Fax (760)341-5999

Warner engineering
CIVIL ENGINEERING / PLANNING / LAND SURVEYING

DRAINAGE STUDY

FOR

JOSHUA SPRINGS CALVARY CHAPEL GYMNASIUM AND SPORTS FIELD

PREPARED FOR:

JOSHUA SPRINGS CALVARY CHAPEL
57373 JOSHUA LANE
YUCCA VALLEY, CALIFORNIA 92284
PHONE: (760) 365-0769

Tuesday, October 26, 1999

THIS DRAINAGE STUDY WAS PREPARED UNDER THE DIRECTION OF:

WILLIAM H. WARNER, R.C.E. 23256 — 10/27/1999 DATE

REGISTERED PROFESSIONAL ENGINEER
WILLIAM H. WARNER
No. 23256
Exp. 12/31/01
CIVIL
STATE OF CALIFORNIA

TABLE OF CONTENTS

SITE LOCATION:

The proposed development is located on approximately 25 acres at 57373 Joshua Lane on the south side of the road bounded on the east by Kingston Road the south by Neagles Street and on the West by Hardesty Drive in Yucca Valley.

SITE DESCRIPTION:

Existing Site Conditions:

Approximately 8 acres of the 25 acre site is presently disturbed or developed with several buildings.

The site is bordered on the north by Joshua Lane, which receives runoff from the entire site.

The natural terrain slopes down to the north somewhat uniformly at approximately 5%, and supported (until recently stripped) coverage of desert scrub, weeds and Joshua trees.

The site accepts runoff from approximately 18 acres to the south, which is conveyed through the site to Joshua Lane along and existing dirt road and natural drainage course.

Proposed Development:

Development will occur on approximately 17 acres of the balance of the site, with the westerly 4± acres of the south portion of the site to remain undisturbed and vegetated.

A retention basin is proposed near the northeast corner of the site which is intended to retain the 100 year / 3 hour storm in order to reduce the impacts of developing the additional site area.

OBJECTIVE:

The objective of this study is to determine the rates of pre-development and post-development runoff and the amount of onsite stormwater retention required to maintain or reduce the amount of runoff onto downstream properties during the selected storm.

METHODOLOGY:

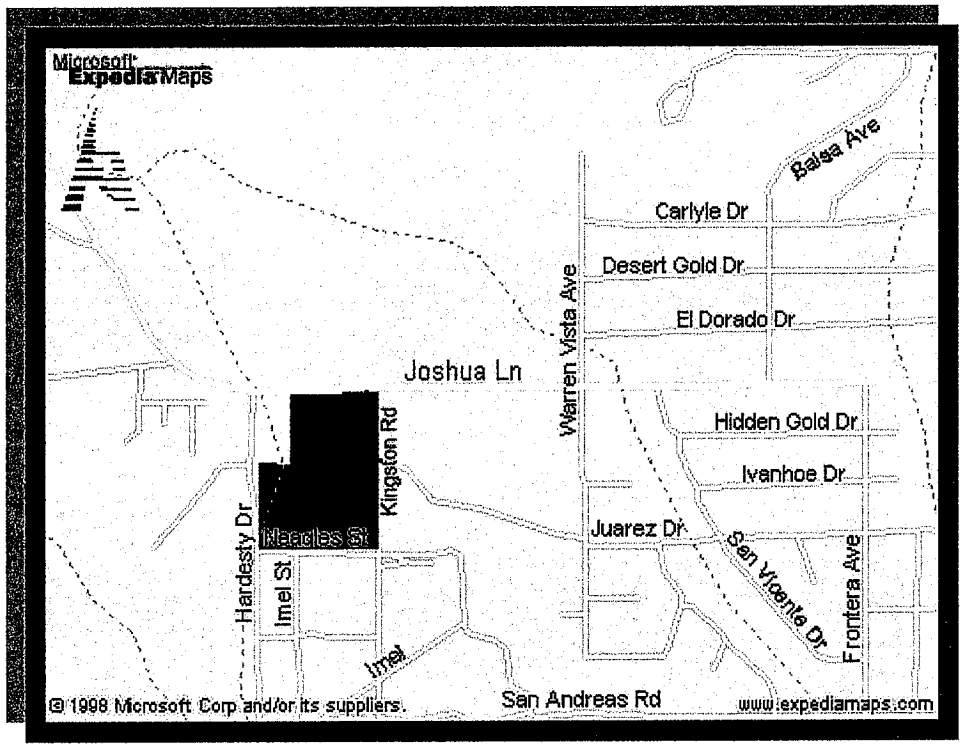
Hydrology – Rational and Unit Hydrograph:

Criteria for this study is based on the County of San Bernardino Hydrology Manual, dated August 1986. The Unit Hydrograph Method was used to determine flood volumes for sizing retention basins. The Rational Method was used to determine pre and post development runoffs. The Flood Hydrograph was used to size the retention basin. The calculations were performed using CIVILDESIGN/CIVILCADD, a computer program developed by Joseph E. Bonadiman and Associates Incorporated, which performs the above in accordance with San Bernardino County Hydrology criteria.

CONCLUSION:

Retention of the stormwater volume from the selected storm will result in the runoff from the project due to that storm being slightly lower than those prior to development.

SITE LOCATION MAP:



PEAK FLOW RATE SUMMARY

PRE AND POST DEVELOPED FLOWS TRIBUTARY TO JOSHUA LANE

	Run No.	Flow (Q-100)	Difference (Pre to Post)
Pre-developed, entire site	331R1	47 cfs	- 3 cfs
Post-development, with basin	331R2	44 cfs	

Pre-developed flows exceed post-developed flows.

RETENTION BASIN

Runoff volume from 100 yr / 3 hr storm (Run 331U1) = 122,400 c.f.

Basin Capacity on Grading Plan: Total = 171,000 c.f., which includes a 40% bulking factor, or 48,600 c.f.

Warner engineering

CIVIL ENGINEERING/PLANNING/LAND SURVEYING

- 35-325 Date Palm Drive
  Suite 232
  Cathedral City, CA 92234
  (619) 321-4017
- 7245 Joshua Lane
  Yucca Valley, CA 92284
  (619) 365-7638

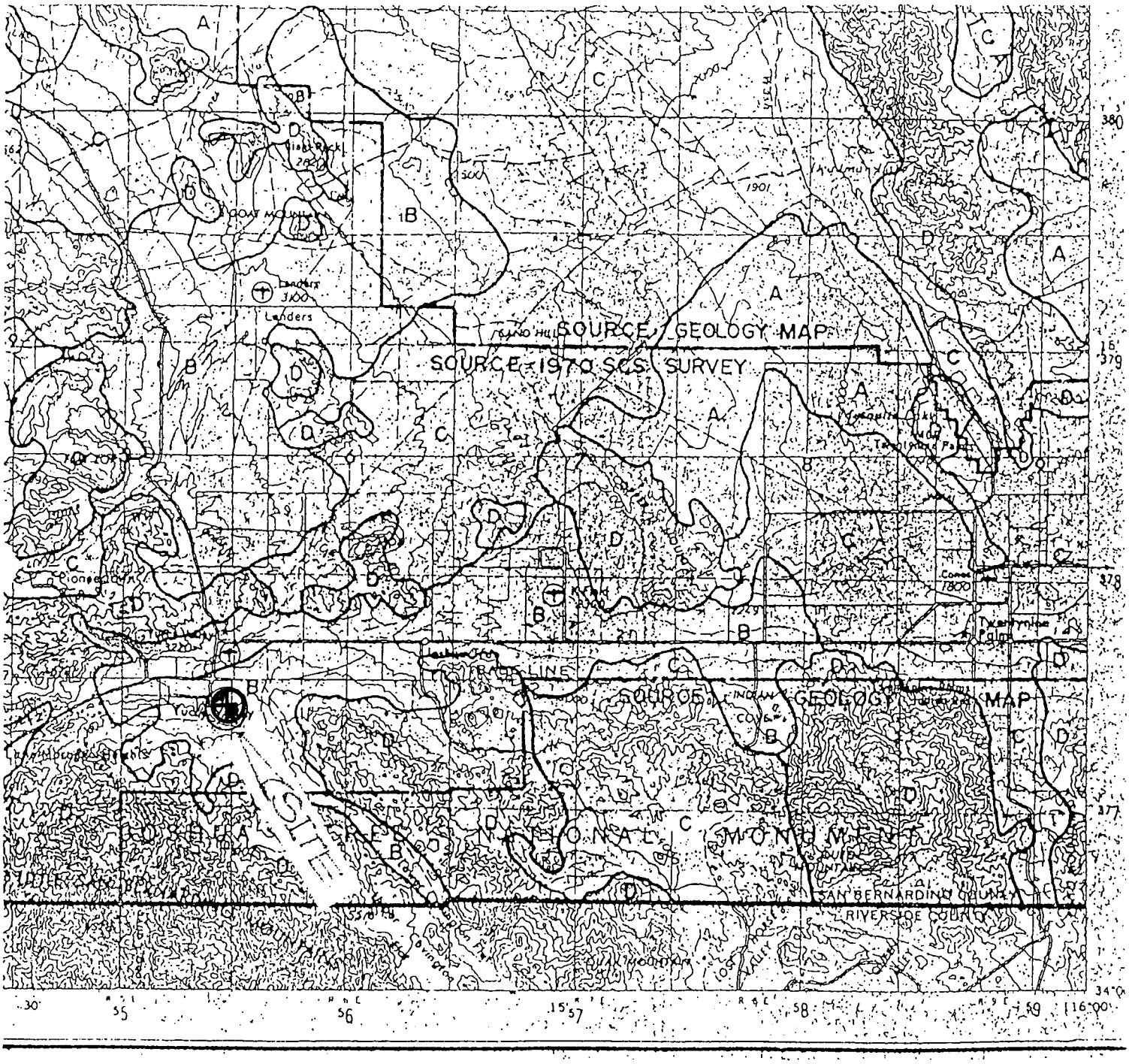
JOB _____

SHEET NO _____ OF _____

CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SCALE _____

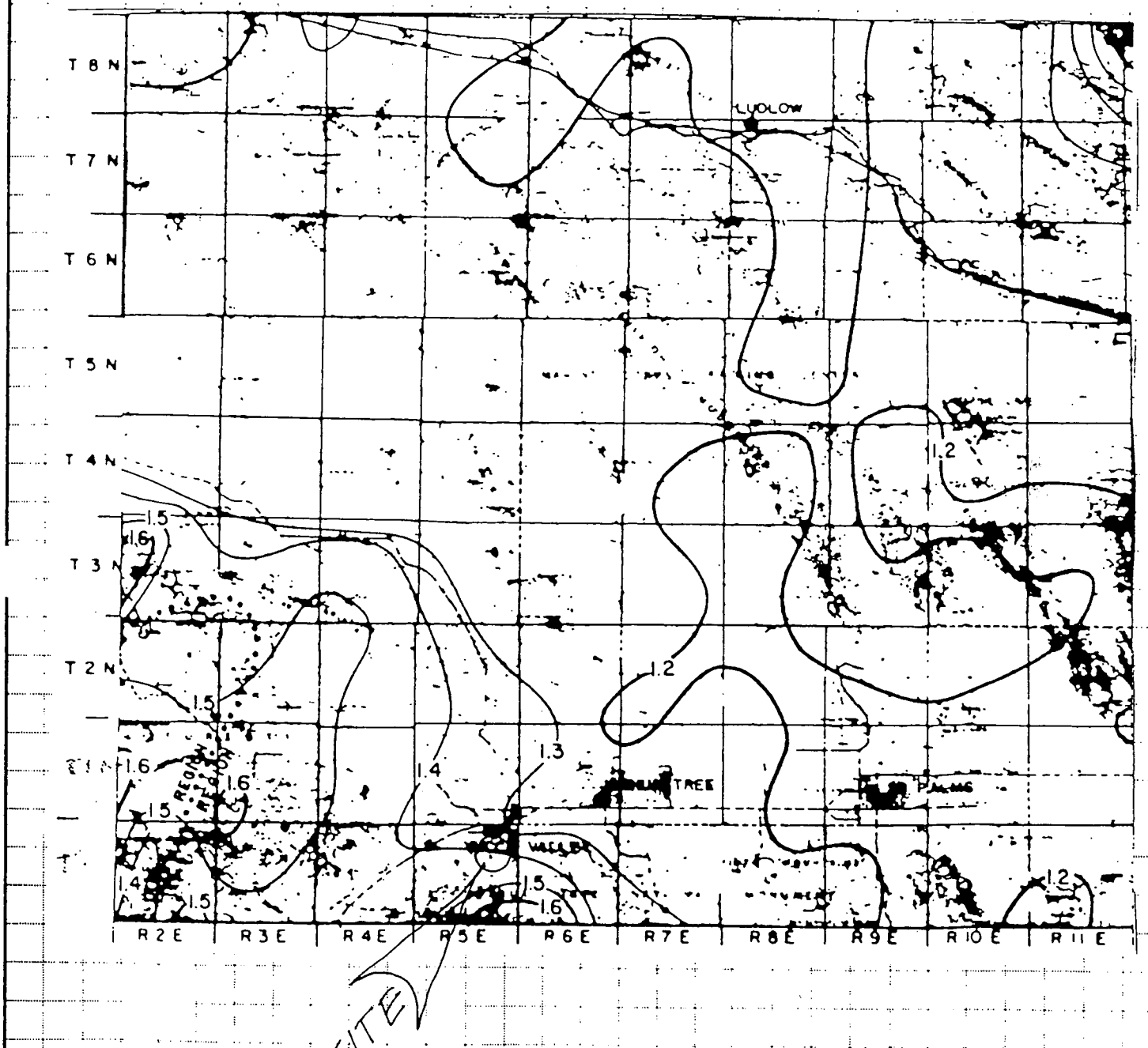


HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHCENTRAL AREA

FIGURE C-11

WARNER ENGINEERING
7245 Joshua Lane
YUCCA VALLEY, CALIFORNIA 92284
(619) 365-7638

JOB Joshua Springs Church 8331CN
SHEET NO _____ OF _____
CALCULATED BY ME DATE 10-8-99
CHECKED BY _____ DATE _____
SCALE _____



100/1 1.4

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

DESIGN AREA
ISOHYETALS
Y_{100} - 100 YEAR 1 HOUR
BASED ON U.S.W.B., N.O.A.A. ATLAS 2, 1973

APPROVED BY _____
FLOOD CONTROL ENGINEER
DATE 1982 | SCALE 1" = 6 MI | FILE NO. W10-1 | DRAWING NO. 10 of 12

SAN BERNARDINO COUNTY

END

LINES PRECIPITATION (INCHES)

FIGURE B-1

WARNER ENGINEERING
7245 Joshua Lane
YUCCA VALLEY, CALIFORNIA 92284
(619) 365-7638

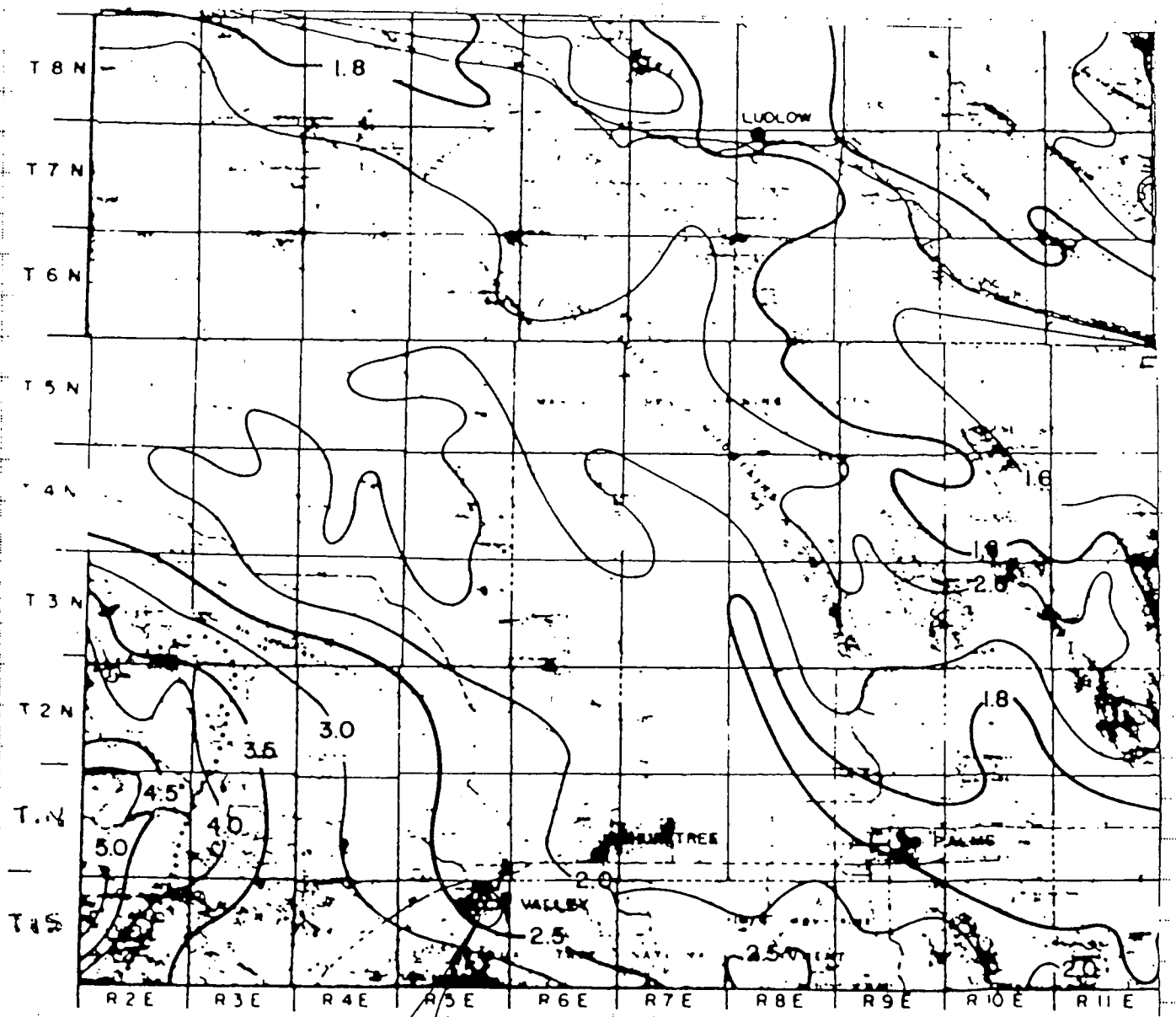
JOB Joshua Springs Church 8331 CN

SHEET NO _____ OF _____

CALCULATED BY NE DATE 11-8-99

CHECKED BY _____ DATE _____

SCALE _____



100/10 2.5

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

DESERT AREA
ISOHYETALS
X_6 - 100 YEAR 6 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973

APPROVED BY _____ FLOOD CONTROL ENGINEER

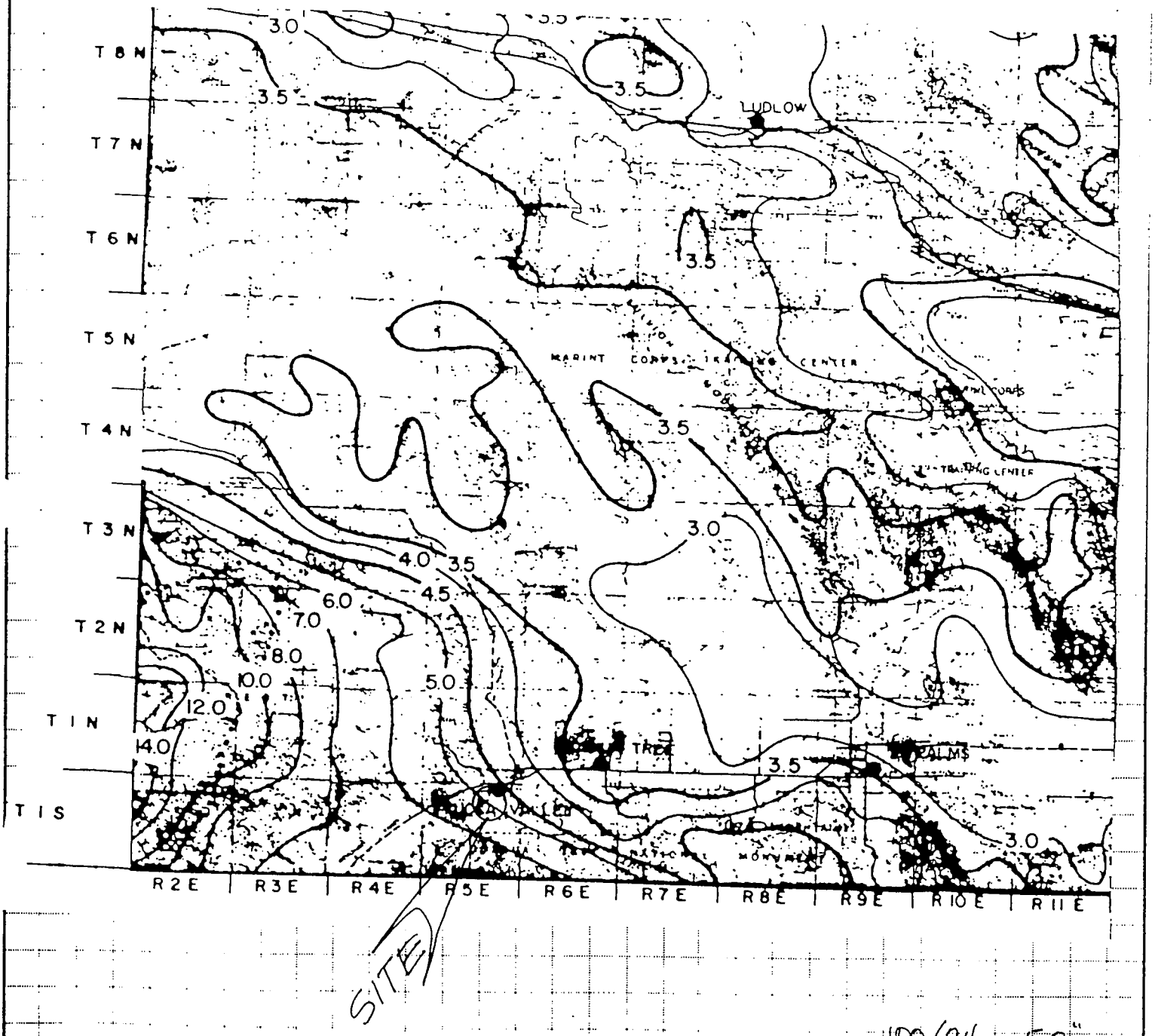
DATE	SCALE	FILE NO.	DRWG. NO.
1982	1" = 6 MI.	WRD-1	11 of 12

SAN BERNARDINO COUNTY

LEGEND
2.0 ISOLINES PRECIPITATION (INCHES)

WARNER ENGINEERING
7245 Joshua Lane
YUCCA VALLEY, CALIFORNIA 92284
(619) 365-7638

JOB Joshua Springs Church 8333 C
SHEET NO. _____ OF _____
CALCULATED BY RE DATE 10-8-99
CHECKED BY _____ DATE _____
SCALE _____



100/24 5.0

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

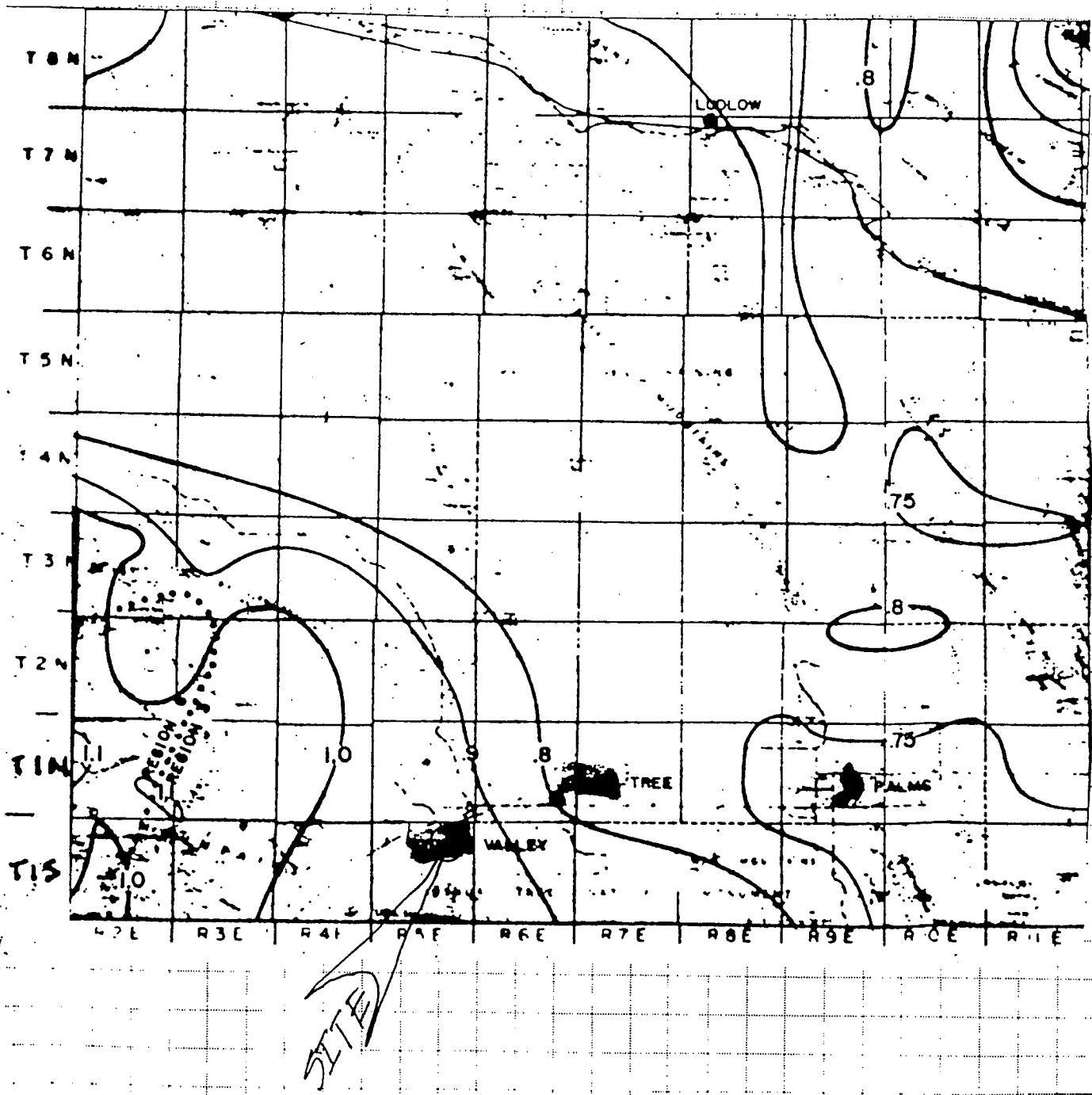
DESERT AREA
ISOHYETALS
X - 100 YEAR 24 HOUR
BASED ON U.S.DC, NOAA ATLAS 2, 1973

SAN BERNARDINO COUNTY

DATE	SCALE	FILE NO	DRWG NO
1982	1" = 6 MI.	WRD-1	12 of

WARNER ENGINEERING
7245 Joshua Lane
YUCCA VALLEY, CALIFORNIA 92284
(619) 365-7638

JOB Joshua Springs Church
SHEET NO. _____ OF _____
CALCULATED BY NB DATE 10-8-99
CHECKED BY _____ DATE _____
SCALE _____



10/1 0.9L

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

DESERT AREA
ISOHYETALS
Y_{10} - 10 YEAR 1 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973

APPROVED BY _____
FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1" = 6 MI.	WRD-1	8 of 12

WATER RESOURCES DIVISION

SAN BERNARDINO COUNTY

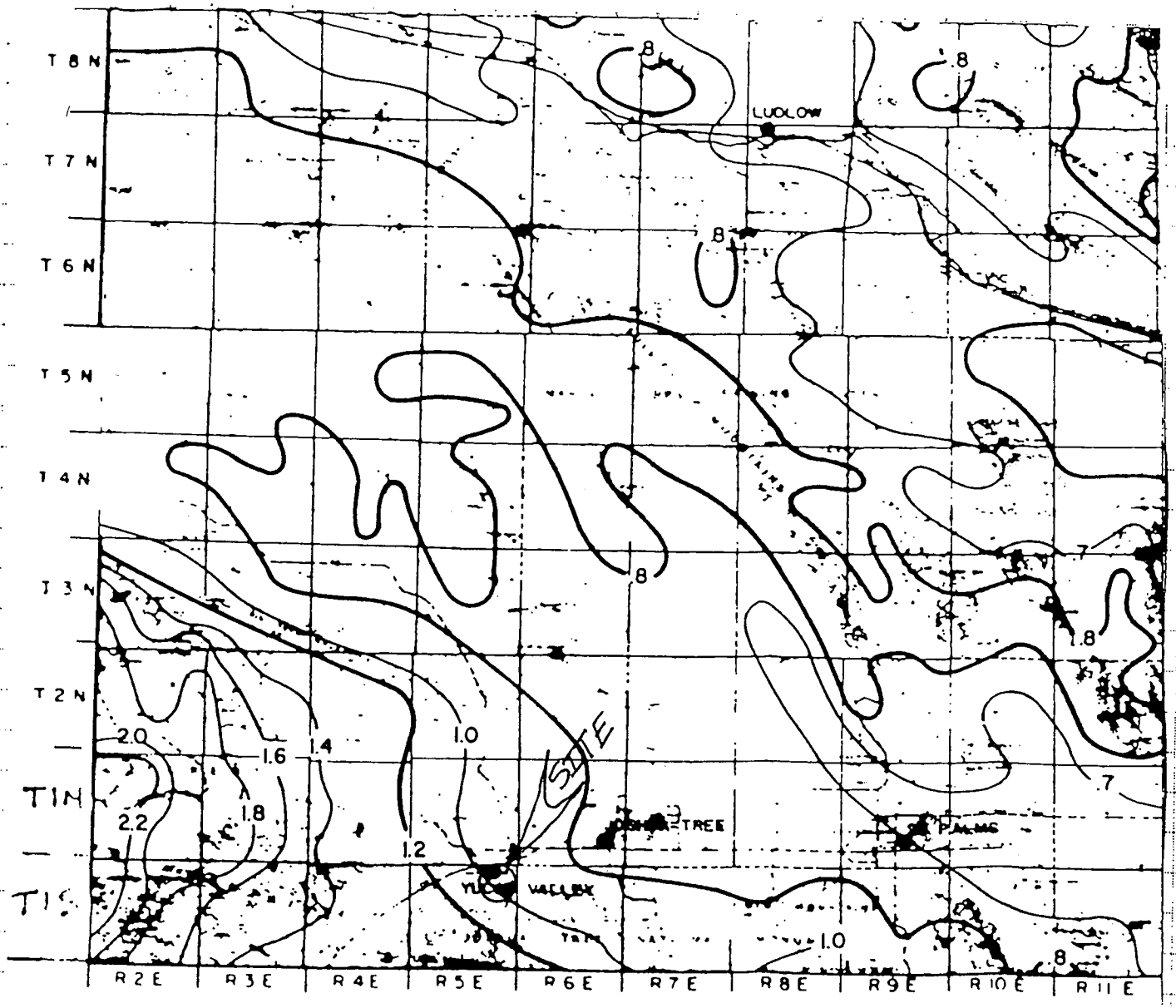
HYDROLOGY MANUAL

LEGEND:
8.5 ISOLINES PRECIPITATION (INCHES)

FIGURE B-2

WARNER ENGINEERING
7245 Joshua Lane
YUCCA VALLEY, CALIFORNIA 92284
(619) 365-7638

JOB Joshua Springs Church 8331 CN
SHEET NO. _____ OF _____
CALCULATED BY ME DATE 10/8/99
CHECKED BY _____ DATE _____
SCALE _____



2/Le 1"

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

DESERT AREA
ISOHYETALS
X_1 - 2 YEAR 6 HOUR
BASED ON U.S.D.C. NOAA ATLAS 2, 1973

APPROVED BY _____
FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRAWING NO.
1982	1" = 6 MI.	WRD-1	7 of 12

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

1.0 ISOLINES PRECIPITATION

FIGURE B-7

WARNER ENGINEERING
7245 Joshua Lane
YUCCA VALLEY, CALIFORNIA 92284
(619) 365-7638

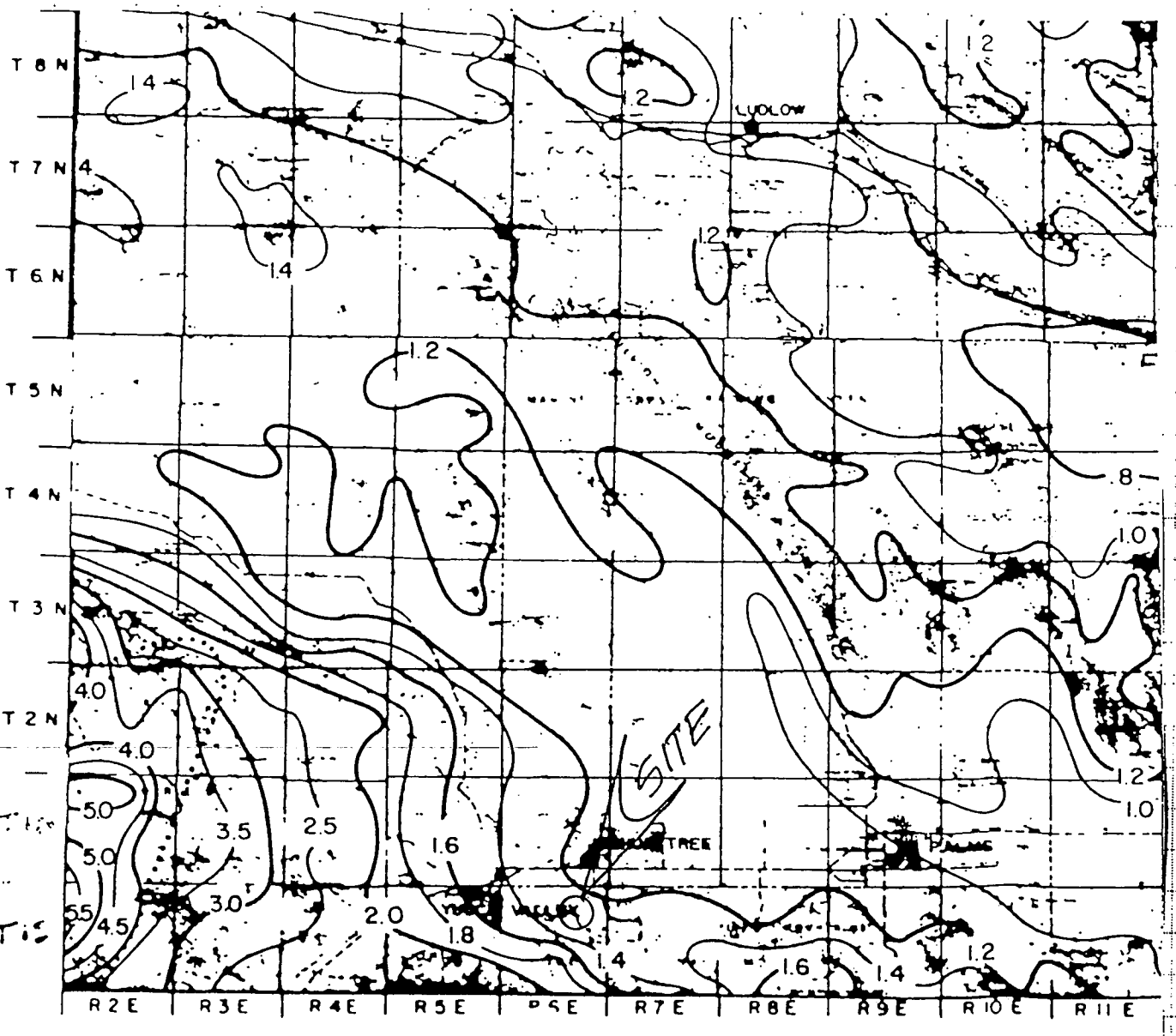
JOB Joshua Springs Church 8531CR

SHEET NO _____ OF _____

CALCULATED BY ME DATE 10/8/98

CHECKED BY _____ DATE _____

SCALE _____



2/24 1.3

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

DESERT AREA
ISOHYETALS
X_2 - 2 YEAR 24 HOUR
BASED ON U.S.B.C., N.O.A.A. ATLAS 2, 1973

APPROVED BY _____

SCALE 1" = 6 MI. | FILE NO. WRD-1 | DRWG. No. B of 12

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

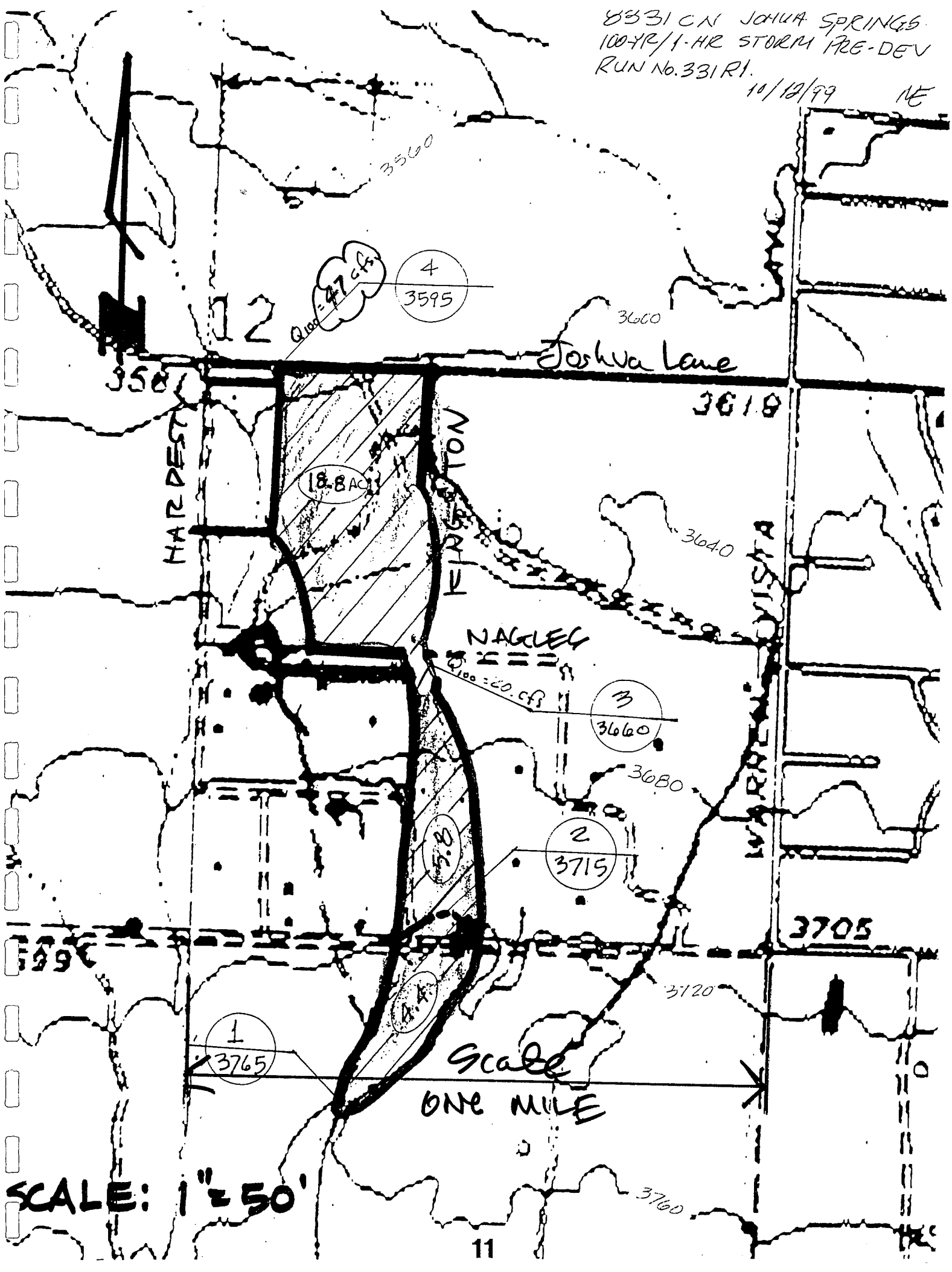
LEGEND

12 ISOLINES

PRODUCT 204-1 NEBS Inc., Groton, Mass. 01471

FIGURE B-8

8331 CN JOHUA SPRINGS
100-YR/1-HR STORM PRE-DEV
RUN No. 331R1.
10/12/99 ME



San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-1998 Version 5.3
Rational Hydrology Study Date: 10/13/99

JOSHUA SPRINGS CHURCH, YUCCA VALLEY, CA WO 8331CN
100-YR, 1-HR STORM PRE-DEVELOPMENT, TRIBUTARY TO NW COR OF SITE
RUN NO. 331R1

Warner Engineering, Yucca Valley, California - S/N 598

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.400 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 3

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

UNDEVELOPED (average 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) = 69.00
Adjusted SCS curve number for AMC 3 = 86.20
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.262(In/Hr)
Initial subarea data:
Initial area flow distance = 950.000(Ft.)
Top (of initial area) elevation = 3765.000(Ft.)
Bottom (of initial area) elevation = 3715.000(Ft.)
Difference in elevation = 50.000(Ft.)
Slope = 0.05263 s(%)= 5.26
TC = k(0.706)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 19.754 min.
Rainfall intensity = 3.047(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.823
Subarea runoff = 11.031(CFS)
Total initial stream area = 4.400(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.262(In/Hr)

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

Upstream point elevation = 3715.000(Ft.)
Downstream point elevation = 3660.000(Ft.)
Channel length thru subarea = 1200.000(Ft.)
Channel base width = 100.000(Ft.)

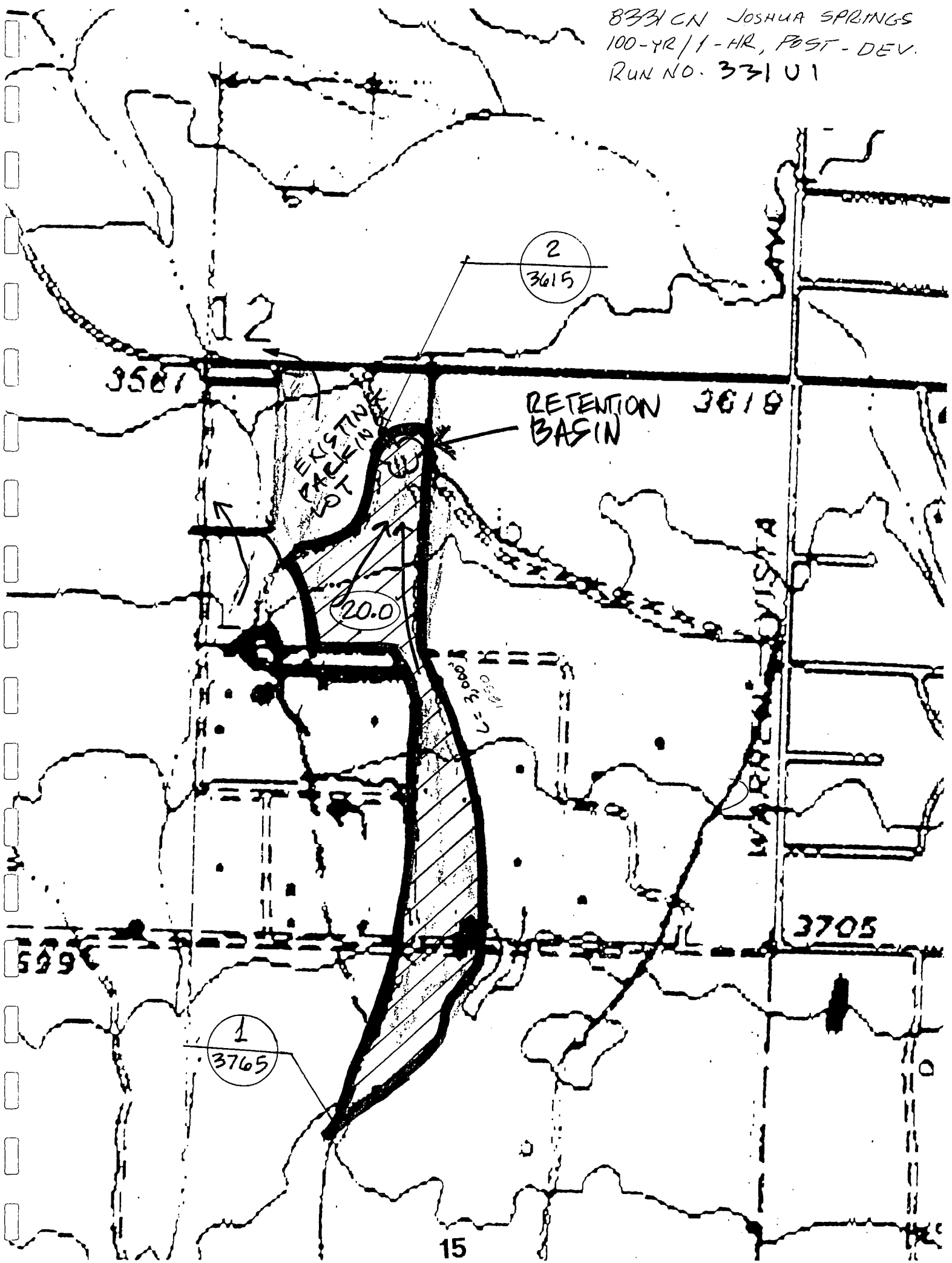
```
Slope or 'Z' of left channel bank = 100.000
Slope or 'Z' of right channel bank = 100.000
Estimated mean flow rate at midpoint of channel =     18.301(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     18.301(CFS)
Depth of flow =   0.068(Ft.), Average velocity =   2.535(Ft/s)
Channel flow top width =  113.527(Ft.)
Flow Velocity =    2.53(Ft/s)
Travel time  =    7.89 min.
Time of concentration =   27.64 min.
Critical depth =      0.098(Ft.)
 Adding area flow to channel
UNDEVELOPED (average 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)  = 69.00
Adjusted SCS curve number for AMC 3 = 86.20
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.262(In/Hr)
Rainfall intensity =      2.408(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.802
Subarea runoff =      8.677(CFS) for    5.800(Ac.)
Total runoff =     19.707(CFS)
Effective area this stream =       10.20(Ac.)
Total Study Area (Main Stream No. 1) =       10.20(Ac.)
Area averaged Fm value =    0.262(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** IMPROVED CHANNEL TRAVEL TIME ****

------------------------------------------------------------------------------
Upstream point elevation =  3660.000(Ft.)
Downstream point elevation =  3595.000(Ft.)
Channel length thru subarea  =  1350.000(Ft.)
Channel base width       =  100.000(Ft.)
Slope or 'Z' of left channel bank = 100.000
Slope or 'Z' of right channel bank = 100.000
Estimated mean flow rate at midpoint of channel =     37.869(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     37.869(CFS)
Depth of flow =   0.102(Ft.), Average velocity =   3.360(Ft/s)
Channel flow top width =  120.449(Ft.)
Flow Velocity =    3.36(Ft/s)
Travel time  =    6.70 min.
Time of concentration =   34.34 min.
Critical depth =      0.156(Ft.)
 Adding area flow to channel
UNDEVELOPED (average 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)  = 69.00
Adjusted SCS curve number for AMC 3 = 86.20
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.262(In/Hr)
Rainfall intensity =      2.069(In/Hr) for a   100.0 year storm
```

Effective runoff coefficient used for area,(total area with modified rational method)(Q=KCIA) is C = 0.786
Subarea runoff = 27.469(CFS) for 18.800(Ac.)
Total runoff = 47.176(CFS)
Effective area this stream = 29.00(Ac.)
Total Study Area (Main Stream No. 1) = 29.00(Ac.)
Area averaged Fm value = 0.262(In/Hr)
End of computations, Total Study Area = 29.00 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number = 69.0


8331 CN JOSHUA SPRINGS
100-YR/1-HR, POST-DEV.
RUN NO. 3311 U1
2
3615
12
3581
RETENTION
BASIN
3618
EXISTING
PAVED
LOT
20.0
L= 3000ft
WARREN
3705
599
1
3765

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/13/99

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San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Warner Engineering, Yucca Valley, California - S/N 598

JOSHUA SPRINGS CHRUCH, YUCCA VALLEY, CA WO 8331CN/DS
100-YR, 3-HR STORM, POST DEVELOPMENT
RUN NO. 331U1, 10-13-99, ME

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 10		
20.00	1	0.91
Rainfall data for year 2		
20.00	6	1.00
Rainfall data for year 2		
20.00	24	1.30
Rainfall data for year 100		
20.00	1	1.40
Rainfall data for year 100		
20.00	6	2.50
Rainfall data for year 100		
20.00	24	5.00

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
56.0	75.8	9.80	0.490	0.440	0.200	0.088
66.0	83.8	10.20	0.510	0.304	1.000	0.304

Area-averaged adjusted loss rate Fm (In/Hr) = 0.198

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
1.96	0.098	56.0	75.8	3.19	0.504
7.84	0.392	98.0	98.0	0.20	0.953
10.20	0.510	66.0	83.8	1.93	0.650

Area-averaged catchment yield fraction, Y = 0.754
Area-averaged low loss fraction, Yb = 0.246
++
Watercourse length = 3000.00(Ft.)
Length from concentration point to centroid = 1250.00(Ft.)
Elevation difference along watercourse = 150.00(Ft.)
Mannings friction factor along watercourse = 0.030
Watershed area = 20.00(Ac.)
Catchment Lag time = 0.116 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 71.5584
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.198(In/Hr)
Average low loss rate fraction (Yb) = 0.246 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.664(In)
Computed peak 30-minute rainfall = 1.137(In)
Specified peak 1-hour rainfall = 1.400(In)
Computed peak 3-hour rainfall = 1.998(In)
Specified peak 6-hour rainfall = 2.500(In)
Specified peak 24-hour rainfall = 5.000(In)

Rainfall depth area reduction factors:
Using a total area of 20.00(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.664(In)
30-minute factor = 0.999 Adjusted rainfall = 1.136(In)
1-hour factor = 0.999 Adjusted rainfall = 1.399(In)
3-hour factor = 1.000 Adjusted rainfall = 1.997(In)
6-hour factor = 1.000 Adjusted rainfall = 2.500(In)
24-hour factor = 1.000 Adjusted rainfall = 5.000(In)

U n i t H y d r o g r a p h

++

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 241.88 (CFS))	
1	8.231	19.908
2	51.673	105.077
3	74.307	54.745

4	84.207	23.946
5	89.961	13.917
6	93.549	8.678
7	95.969	5.855
8	97.532	3.780
9	98.410	2.122
10	99.248	2.028
11	100.000	1.819

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.6637	0.6637
2	0.8171	0.1534
3	0.9228	0.1057
4	1.0060	0.0832
5	1.0756	0.0696
6	1.1361	0.0605
7	1.1899	0.0538
8	1.2385	0.0486
9	1.2830	0.0445
10	1.3242	0.0412
11	1.3626	0.0384
12	1.3987	0.0360
13	1.4355	0.0368
14	1.4704	0.0349
15	1.5037	0.0333
16	1.5355	0.0318
17	1.5660	0.0305
18	1.5953	0.0293
19	1.6235	0.0282
20	1.6507	0.0272
21	1.6771	0.0263
22	1.7026	0.0255
23	1.7273	0.0247
24	1.7513	0.0240
25	1.7746	0.0233
26	1.7974	0.0227
27	1.8195	0.0221
28	1.8411	0.0216
29	1.8622	0.0211
30	1.8827	0.0206
31	1.9029	0.0201
32	1.9226	0.0197
33	1.9419	0.0193
34	1.9608	0.0189
35	1.9793	0.0185
36	1.9974	0.0182

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0182	0.0045	0.0137
2	0.0185	0.0045	0.0140
3	0.0193	0.0047	0.0145
4	0.0197	0.0048	0.0149
5	0.0206	0.0051	0.0155
6	0.0211	0.0052	0.0159
7	0.0221	0.0054	0.0167
8	0.0227	0.0056	0.0171
9	0.0240	0.0059	0.0181

10	0.0247	0.0061	0.0187
11	0.0263	0.0065	0.0199
12	0.0272	0.0067	0.0205
13	0.0293	0.0072	0.0221
14	0.0305	0.0075	0.0230
15	0.0333	0.0082	0.0251
16	0.0349	0.0086	0.0263
17	0.0360	0.0089	0.0272
18	0.0384	0.0094	0.0290
19	0.0445	0.0109	0.0336
20	0.0486	0.0119	0.0367
21	0.0605	0.0149	0.0456
22	0.0696	0.0165	0.0531
23	0.1057	0.0165	0.0892
24	0.1534	0.0165	0.1369
25	0.6637	0.0165	0.6472
26	0.0832	0.0165	0.0667
27	0.0538	0.0132	0.0406
28	0.0412	0.0101	0.0311
29	0.0368	0.0090	0.0278
30	0.0318	0.0078	0.0240
31	0.0282	0.0069	0.0213
32	0.0255	0.0063	0.0192
33	0.0233	0.0057	0.0176
34	0.0216	0.0053	0.0163
35	0.0201	0.0049	0.0152
36	0.0189	0.0046	0.0143

Total soil rain loss = 0.31(In)
Total effective rainfall = 1.69(In)
Peak flow rate in flood hydrograph = 80.60(CFS)

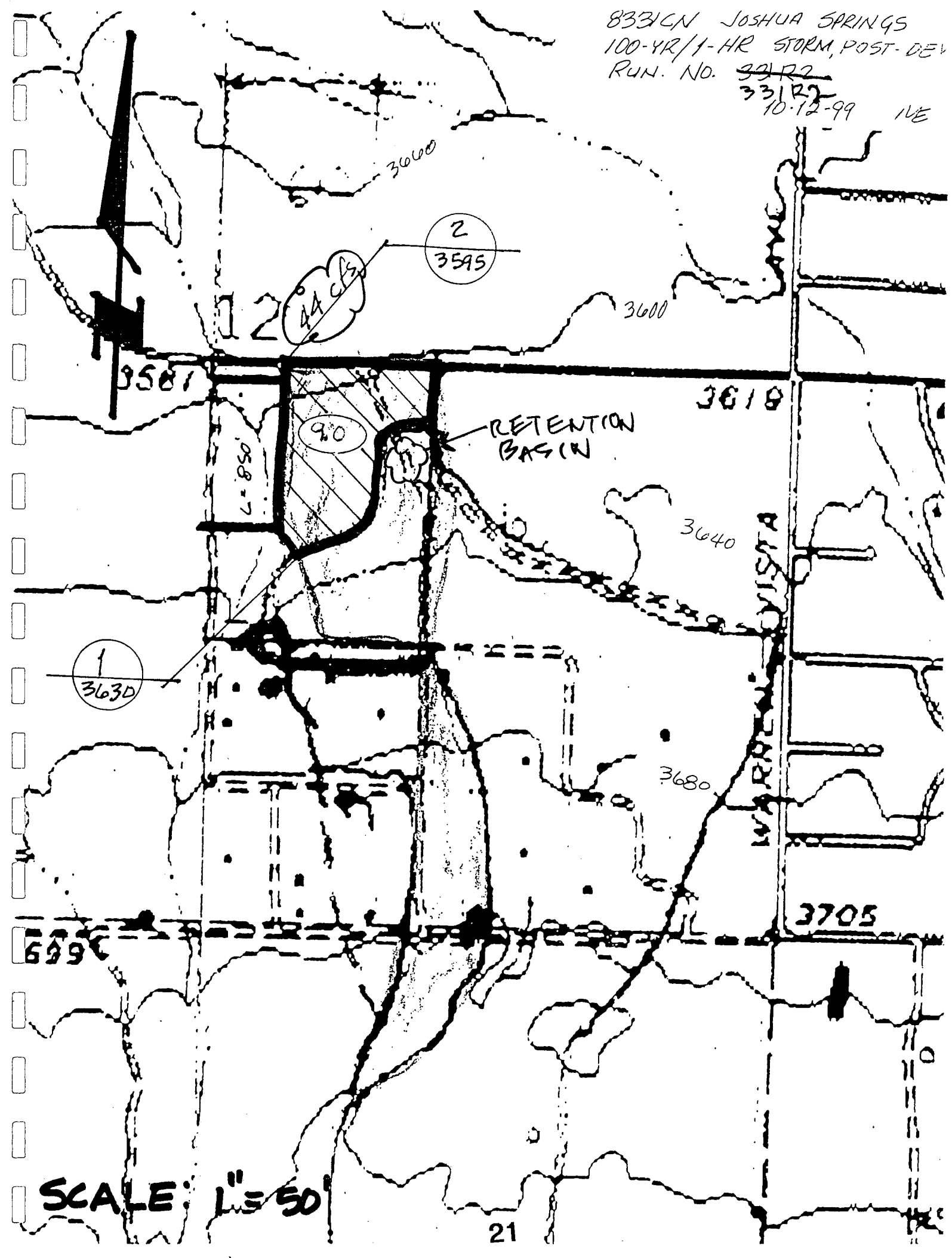
++

3 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	22.5	45.0	67.5	90.0
0+ 5	0.0019	0.27	Q				
0+10	0.0137	1.72	Q				
0+15	0.0310	2.51	VQ				
0+20	0.0511	2.92	VQ				
0+25	0.0731	3.19	|Q				
0+30	0.0966	3.42	|Q				
0+35	0.1215	3.61	|Q				
0+40	0.1477	3.80	|QV				
0+45	0.1751	3.97	|QV				
0+50	0.2038	4.17	|QV				
0+55	0.2338	4.36	|Q V				
1+ 0	0.2653	4.57	| QV				
1+ 5	0.2982	4.78	| Q V				
1+10	0.3330	5.05	| Q V				
1+15	0.3697	5.32	| Q V				
1+20	0.4089	5.69	| Q V				
1+25	0.4502	6.01	| Q V				
1+30	0.4936	6.29	| Q V				
1+35	0.5397	6.70	| Q V				

1+40	0.5908	7.42	Q V
1+45	0.6477	8.26	Q V
1+50	0.7144	9.68	Q V
1+55	0.7961	11.85	Q V
2+ 0	0.9153	17.32	Q V
2+ 5	1.1553	34.84	QV
2+10	1.7104	80.60	V Q
2+15	2.0465	48.81	Q V
2+20	2.2351	27.39	Q V
2+25	2.3645	18.79	Q V
2+30	2.4611	14.02	Q V
2+35	2.5371	11.04	Q V
2+40	2.5976	8.79	Q V
2+45	2.6463	7.07	Q V
2+50	2.6901	6.35	Q V
2+55	2.7288	5.62	Q V
3+ 0	2.7574	4.16	Q V
3+ 5	2.7818	3.54	Q V
3+10	2.7948	1.88	Q V
3+15	2.8018	1.01	Q V
3+20	2.8060	0.62	Q V
3+25	2.8087	0.39	Q V
3+30	2.8104	0.25	Q V
3+35	2.8114	0.15	Q V
3+40	2.8121	0.09	Q V
3+45	2.8125	0.06	Q V
3+50	2.8126	0.03	Q V


833CN JOSHUA SPRINGS
100-YR/1-HR STORM, POST-DEV
RUN. NO. ~~33R2~~ 33IR2
10-12-99 IVE
3660
2
3595
12
44 ac
3600
9581
3618
RETENTION BASIN
9.0
7.85
3640
1
3630
3680
3705
699
SCALE: 1"=50'

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-1998 Version 5.3
Rational Hydrology Study Date: 10/12/99

JOSHUA SPRINGS CHURCH, YUCCA VALLEY, CA WO8331CN
100-YR, 1-HR STORM, POST-DEVELOPMENT
RUN NO. 331R1, 10-12-99, ME

Warner Engineering, Yucca Valley, California - S/N 598

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.400 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 3

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

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044(In/Hr)
Initial subarea data:
Initial area flow distance = 850.000(Ft.)
Top (of initial area) elevation = 3630.000(Ft.)
Bottom (of initial area) elevation = 3595.000(Ft.)
Difference in elevation = 35.000(Ft.)
Slope = 0.04118 s(%)= 4.12
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.545 min.
Rainfall intensity = 5.478(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.893
Subarea runoff = 44.017(CFS)
Total initial stream area = 9.000(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.044(In/Hr)
End of computations, Total Study Area = 9.00 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged SCS curve number = 56.0