

PRELIMINARY HYDROLOGY CALCULATIONS

FOR

ALERE SLOVER AND CACTUS
SAN BERNARDINO, CALIFORNIA

PREPARED FOR

ALERE PROPERTY GROUP, LLC
100 BAYVIEW CR., STE 310
NEWPORT BEACH, CA 92660
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PRELIMINARY APPROVED

By Osvaldo Roque at 3:54 pm, Oct 29, 2018

Additional comments can be addressed in the final submittal

SEPTEMBER 1, 2017
REVISED JUNE 11, 2018

JOB NO. 3569

PREPARED BY

THIENES ENGINEERING
14349 FIRESTONE BLVD.
LA MIRADA, CALIFORNIA 90638
(714) 521-4811

PRELIMINARY HYDROLOGY CALCULATIONS

FOR

ALERE SLOVER AND CACTUS

**PREPARED BY KRISTIE FERRONATO
UNDER THE SUPERVISION OF**

**REINHARD STENZEL DATE:
R.C.E. 56155
EXP. 12/31/18**



Required for final.

INTRODUCTION

A: PROJECT LOCATION

The project site is located at the southwest corner of Slover Avenue and Cactus Avenue in the County of San Bernardino. Please see following page for vicinity map.

B: STUDY PURPOSE

The purpose of this study is to determine the existing and proposed condition 100-year hydrology for the project site.

C: PROJECT STAFF:

Thienes Engineering staff involved in this study include:

Reinhard Stenzel
Kristie Ferronato
Matthew Cruz



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14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH. (714) 521-4811 FAX (714) 521-4173

VICINITY MAP
FOR
ALERE SLOVER AND CACTUS

NOT TO SCALE

DISCUSSION

Project Description

The project site encompasses approximately 13.30 acres. Improvements to the site include one commercial type building with approximately 257,915 square feet. There will be a truck yard located on the northerly side of the building. Vehicle parking lots are located on the easterly and westerly sides of the site with a drive aisle on the southerly side of the building. There will be landscaping adjacent to the street and throughout the project site.

Existing Conditions

The project site is generally a vacant lot with moderate grass and weeds. However there are a few single family homes on the project site. Runoff from the majority of the site generally drains southeasterly towards Cactus. The 100-year existing condition peak flow rate for this portion is approximately 22.7 cfs. The western portion of the site drains westerly toward existing properties to the west. The 100-year existing condition peak flow rate for this portion is approximately 4.4 cfs.

See Appendix "B" for existing condition hydrology calculations.

Proposed Conditions

Runoff the building and truck yard (nodes 100-132 on proposed hydrology map) drains to a series of catch basins in the truck yard. A storm drain will convey the runoff southerly in the eastern drive aisle, while low flows from these areas will bleed off to underground chambers for water quality purposes. The runoff from the eastern vehicle parking area (nodes 140-141) will be collect in a catch basin in the southerly portion of the vehicle parking area (node 141). The runoff will confluence with the runoff from the truck yard (at node 142). The runoff from the westerly and southern drive aisle (nodes 150-152) will be collect in curb opening catch basin (node 152). The runoff will confluence with the main line storm drain (node 153). Since there are no public storm drains in the project area, the runoff from the project site will be discharged via parkway culverts to Cactus Avenue.

The total 100-year peak flow rate for the proposed condition is approximately 49.6 cfs (undetained). See Appendix "B" for proposed condition hydrology calculations.

Detention Calculations

There are no existing storm drains in the vicinity of the project site. Discharge from the site will be limited to less than existing conditions to assure that there are not any adverse effects to downstream properties. In order to limit runoff from the site, some detention will be required. The truck yard north of the building will be utilized for peak flow

detention. This will allow the drive aisle to the west and south and the vehicle parking to the east to discharge undetained.

Calculations show that approximately 12.9 cfs can discharge from the truck yard area with a ponding depth of approximately 0.65 feet. The volume stored at this elevation is approximately 0.41 acre-feet. With the temporary onsite detention, the 100-year proposed condition from the project site is approximately 19.0 cfs (12.9 cfs at node 132 + 2.4 cfs at node 141 + 3.7 cfs at node 152). This is less than the existing condition 100-year peak flow rate.

See Appendix "C" for detention calculations.

Methodology

The San Bernardino County Rational Method program (AES Software) was used for hydrology calculations. The site is composed of soil type "A" per the San Bernardino County Hydrology Manual. AES Software's FLOOD program was used for the hydrograph and detention analysis. See Appendix "A" for pertinent reference materials.

APPENDIX

DESCRIPTION

A

REFERENCE MATERIALS

B

HYDROLOGY CALCULATIONS

C

DETENTION CALCULATIONS

D

CATCH BASIN CALCULATIONS

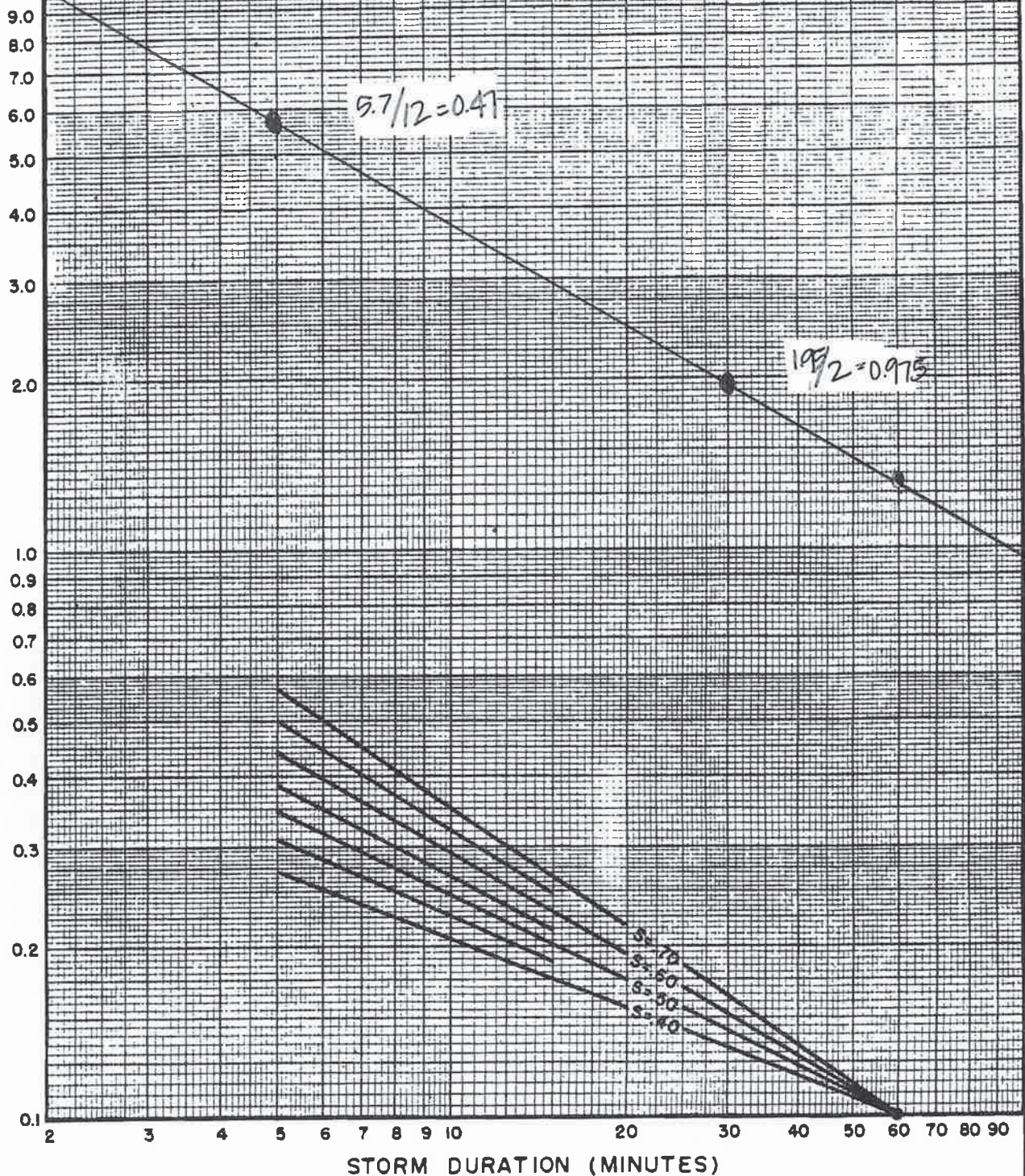
E

HYDROLOGY MAPS

APPENDIX A

REFERENCE MATERIALS

RAINFALL INTENSITY (INCHES / HOUR)



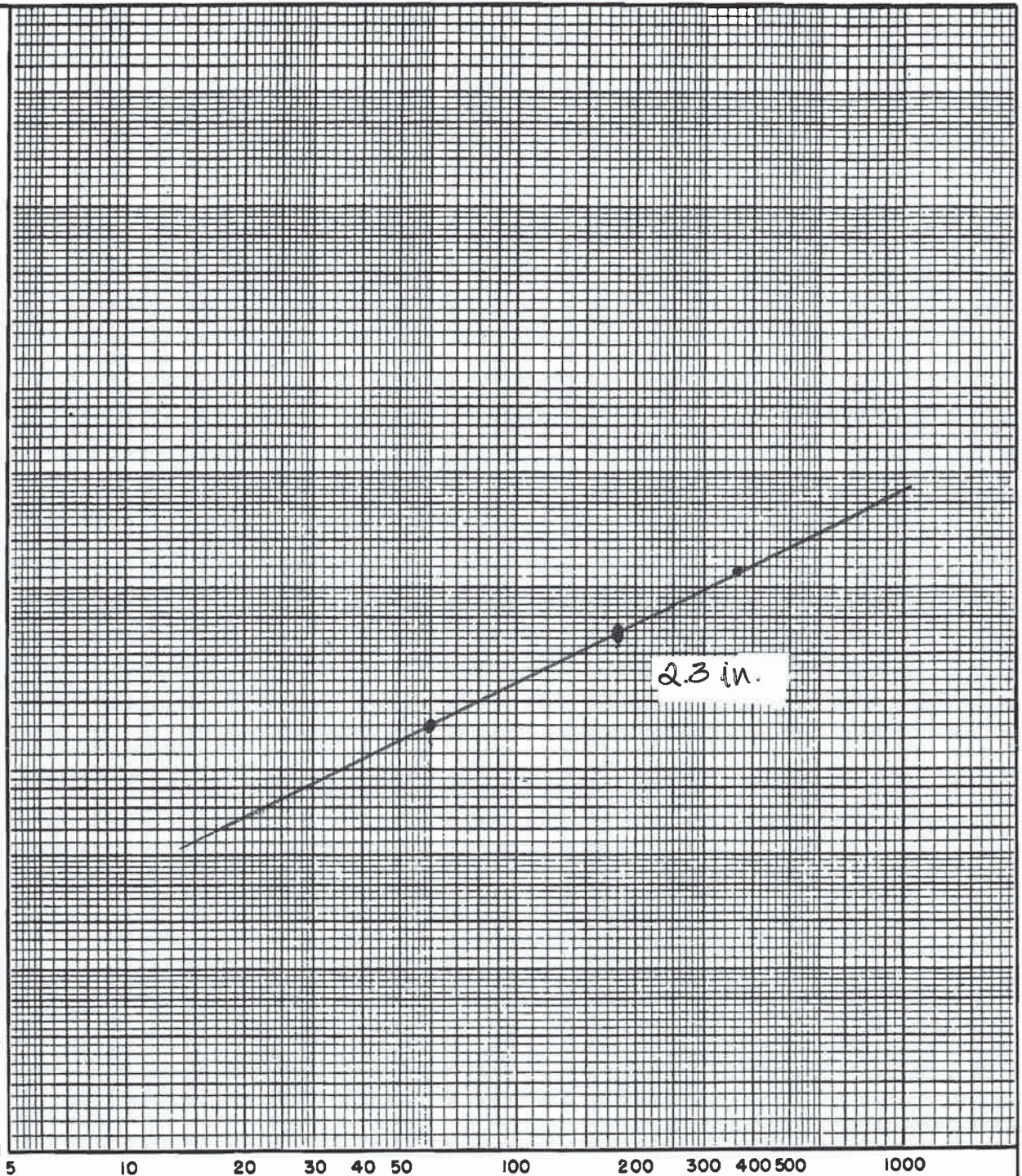
DESIGN STORM FREQUENCY = 100 YEARS
 ONE HOUR POINT RAINFALL = 1.3 INCHES
 LOG-LOG SLOPE = 0.16
 PROJECT LOCATION = Slover & Cactus

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

INTENSITY - DURATION
CURVES
CALCULATION SHEET

POINT RAINFALL - INCHES

50.0
40.0
30.0
20.0
10.0
5.0
4.0
3.0
2.0
1.0
0.5
0.4
0.3
0.2
0.1



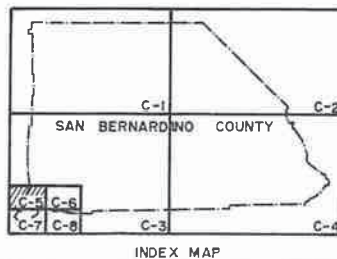
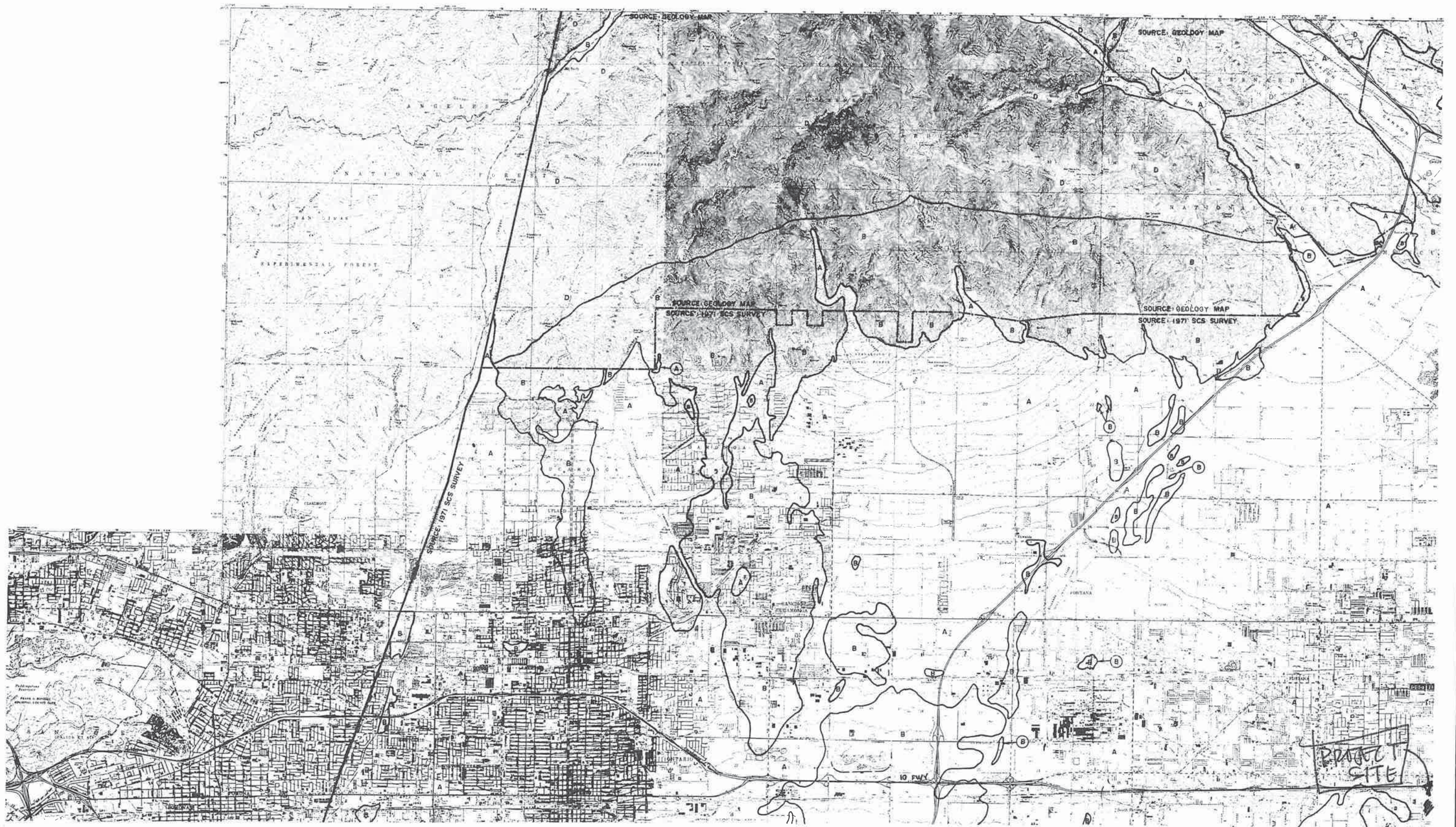
STORM DURATION - MINUTES

PROJECT LOCATION Slover & Cactus

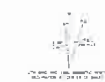
NOTES TEI Job No 3569

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

AREA - AVERAGED
MASS RAINFALL
PLOTING SHEET



- LEGEND
- SOIL GROUP BOUNDARY
 - A SOIL GROUP DESIGNATION
 - BOUNDARY OF INDICATED SOURCE



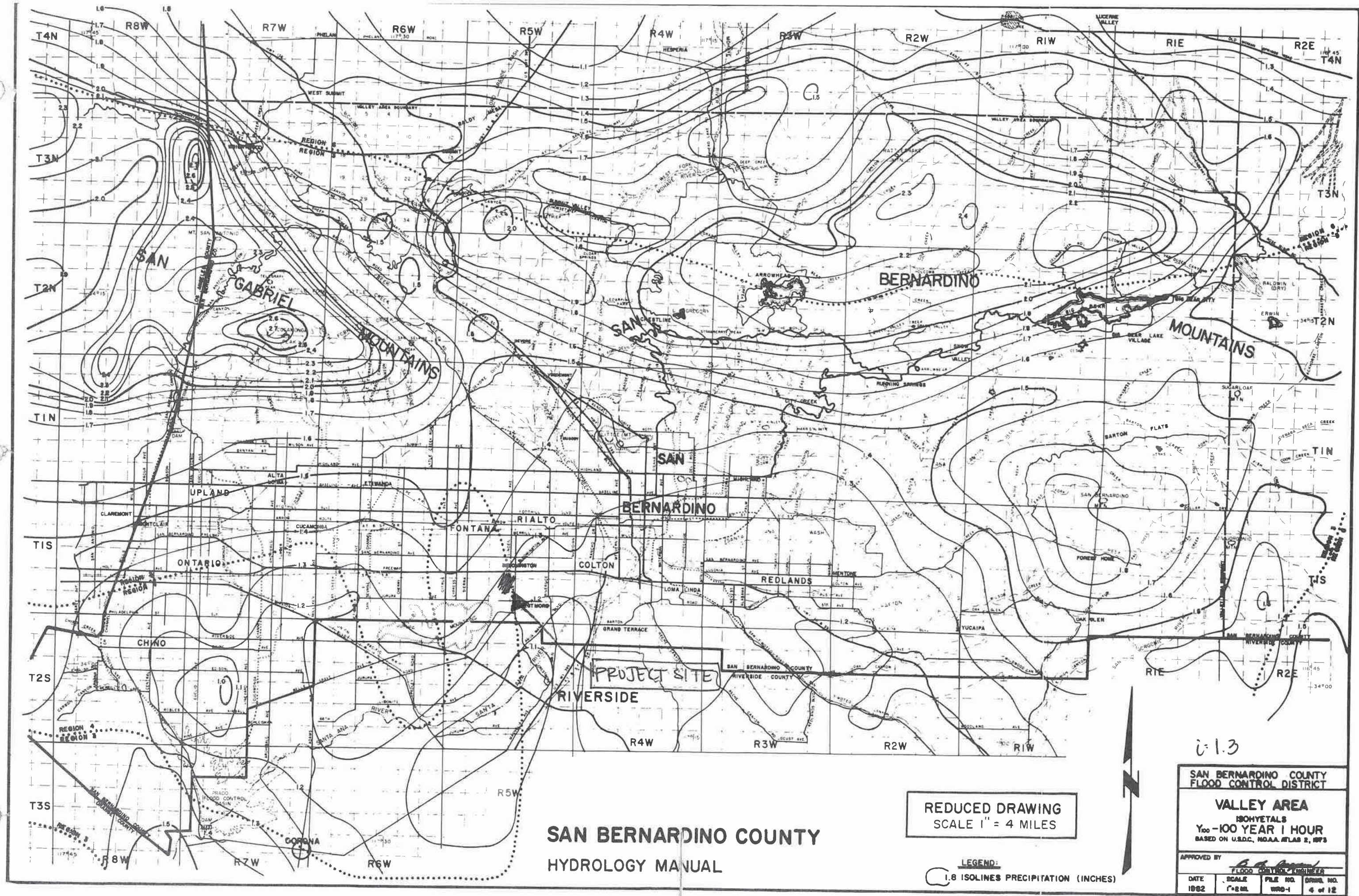
SCALE 1:48,000

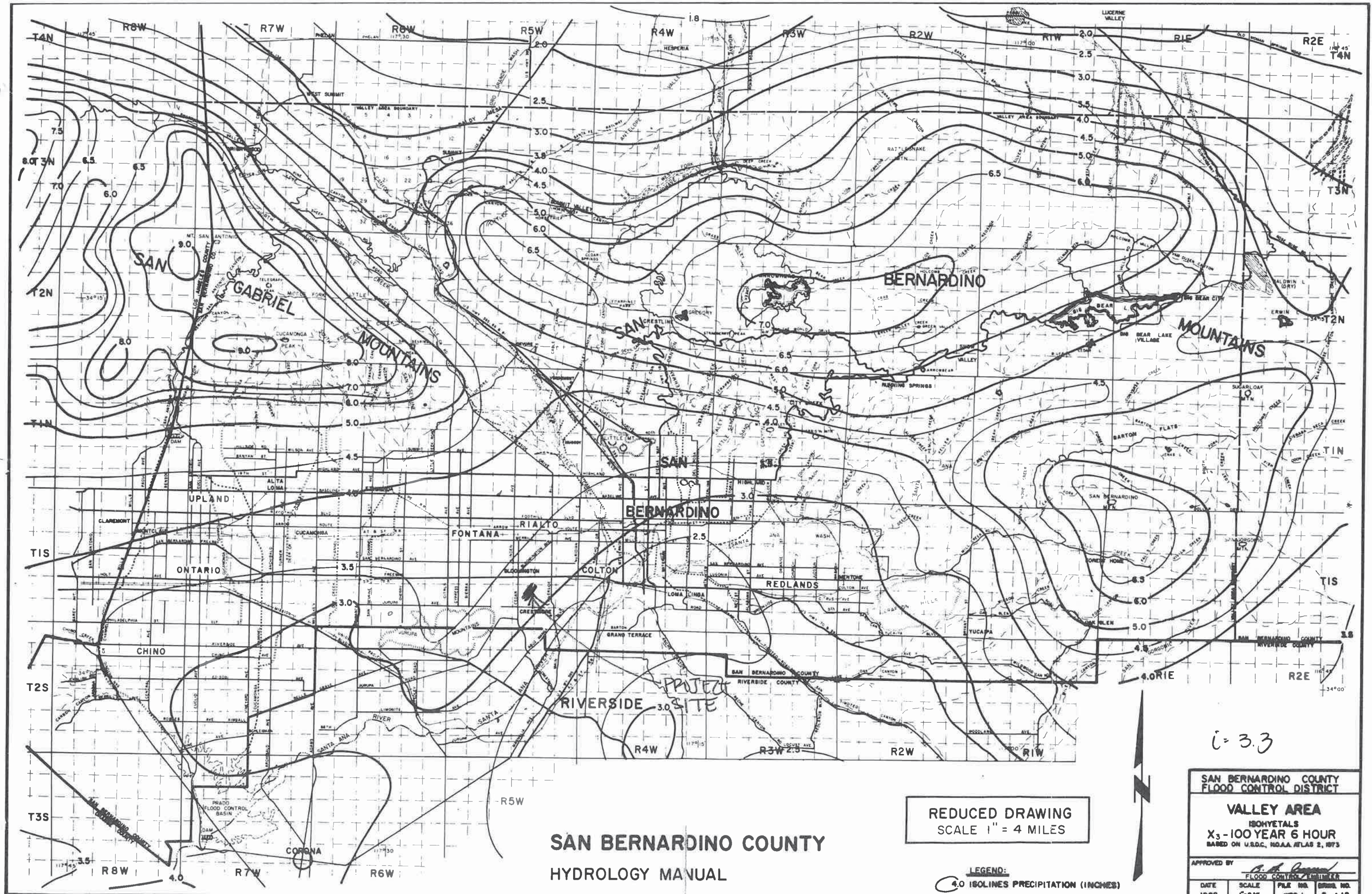
SCALE REDUCED BY 1/2

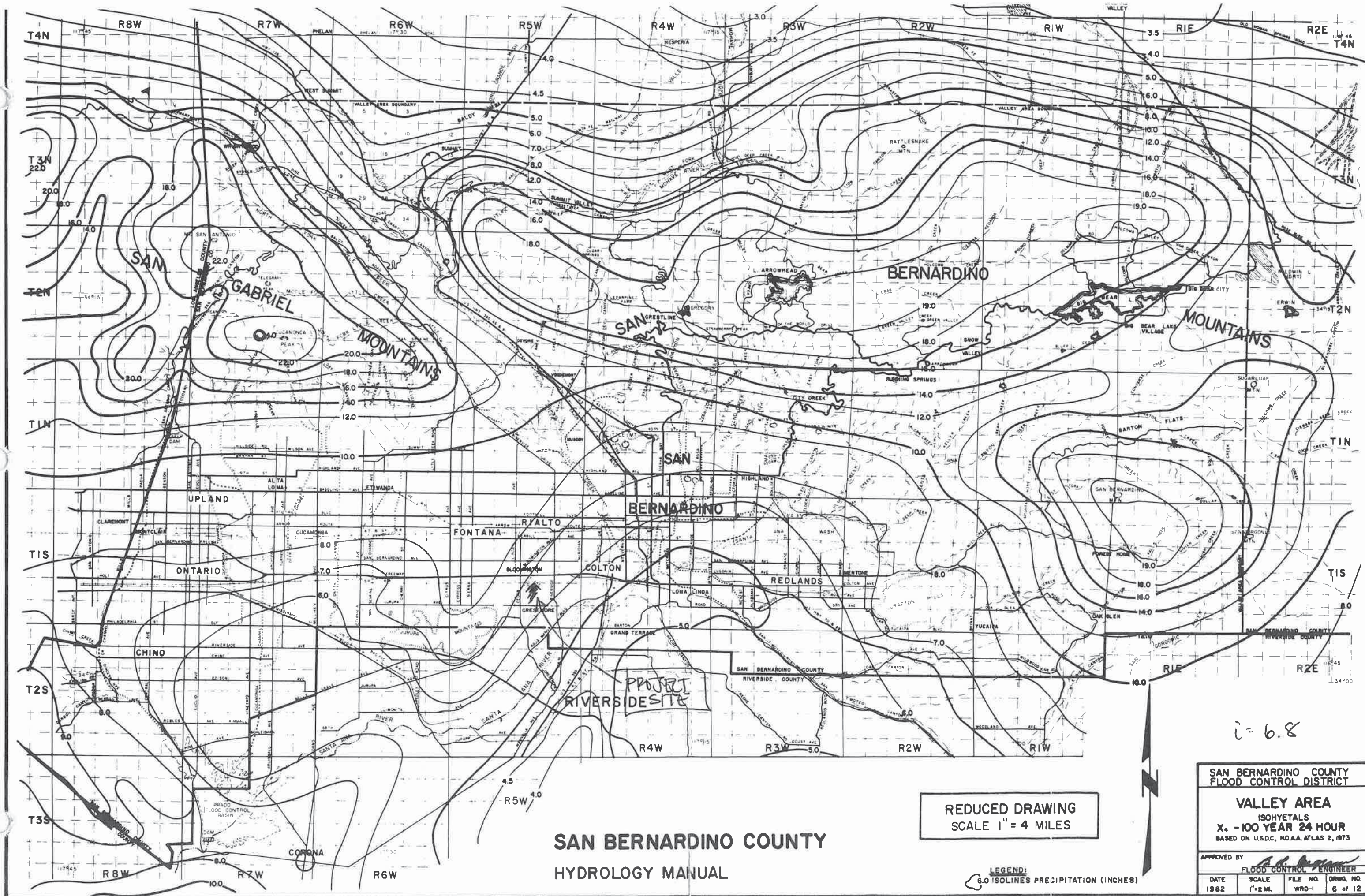
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

SOILTYPE A

**HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHWEST-A AREA**







**SAN BERNARDINO COUNTY
HYDROLOGY MANUAL**

REDUCED DRAWING
SCALE 1" = 4 MILES

LEGEND:
6.0 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

VALLEY AREA
ISOHYETALS
X₄ - 100 YEAR 24 HOUR
BASED ON U.S.D.C. NOAA ATLAS 2, 1973

APPROVED BY *[Signature]*
FLOOD CONTROL ENGINEER
DATE 1982 SCALE 1" = 2 MI. FILE NO. WRD-1 DRWG. NO. 6 of 12

APPENDIX B

HYDROLOGY CALCULATIONS

 RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
 (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
 (c) Copyright 1983-2016 Advanced Engineering Software (aes)
 Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

***** DESCRIPTION OF STUDY *****
 * TEI JOB NO 3569 *
 * EXISTING CONDITION *
 * 100 YEAR STORM EVENT *

FILE NAME: W:\3569\EX100.DAT
 TIME/DATE OF STUDY: 13:20 06/11/2018

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
 SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
 USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(TC;MIN)) = 0.6000
 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP (FT) (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
 as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(velocity) Constraint = 6.0 (FT*FT/S)

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 680.00
 ELEVATION DATA: UPSTREAM(FEET) = 1045.00 DOWNSTREAM(FEET) = 1038.50

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM $T_c(MIN.) = 15.080$
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.977
 SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
NATURAL POOR COVER "OPEN BRUSH"	A	1.70	0.35	1.000	81	18.08
RESIDENTIAL "2 DWELLINGS/ACRE"	A	1.05	0.74	0.700	52	15.08

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(INCH/HR) = 0.47$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.885$
 SUBAREA RUNOFF(CFS) = 6.34
 TOTAL AREA(ACRES) = 2.75 PEAK FLOW RATE(CFS) = 6.34

 FLOW PROCESS FROM NODE 101.00 TO NODE 102.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>TRAVELTIME THRU SUBAREA<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1038.50 DOWNSTREAM(FEET) = 1034.50
 CHANNEL LENGTH THRU SUBAREA(FEET) = 365.00 CHANNEL SLOPE = 0.0110
 CHANNEL FLOW THRU SUBAREA(CFS) = 6.34
 FLOW VELOCITY(FEET/SEC) = 2.34 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) = 2.60 $T_c(MIN.) = 17.68$
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 102.00 = 1045.00 FEET.

 FLOW PROCESS FROM NODE 102.00 TO NODE 102.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

MAINLINE $T_c(MIN.) = 17.68$
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.706
 SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
NATURAL POOR COVER					


```

                                EX100.RES
"OPEN BRUSH"                   A      3.70      0.35      1.000      81
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.35
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
SUBAREA AREA(ACRES) = 3.70      SUBAREA RUNOFF(CFS) = 7.83
EFFECTIVE AREA(ACRES) = 6.45      AREA-AVERAGED Fm(INCH/HR) = 0.38
AREA-AVERAGED Fp(INCH/HR) = 0.40      AREA-AVERAGED Ap = 0.95
TOTAL AREA(ACRES) = 6.4      PEAK FLOW RATE(CFS) = 13.50

*****
FLOW PROCESS FROM NODE 102.00 TO NODE 103.00 IS CODE = 52
=====
>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1034.50 DOWNSTREAM(FEET) = 1032.10
CHANNEL LENGTH THRU SUBAREA(FEET) = 185.00 CHANNEL SLOPE = 0.0130
CHANNEL FLOW THRU SUBAREA(CFS) = 13.50
FLOW VELOCITY(FEET/SEC) = 3.08 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 1.00 Tc(MIN.) = 18.69
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 103.00 = 1230.00 FEET.

*****
FLOW PROCESS FROM NODE 103.00 TO NODE 103.00 IS CODE = 81
=====
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc(MIN.) = 18.69
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.618
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/SCS SOIL AREA Fp Ap SCS
  LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
NATURAL POOR COVER
"OPEN BRUSH" A 4.75 0.35 1.000 81
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.35
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
SUBAREA AREA(ACRES) = 4.75 SUBAREA RUNOFF(CFS) = 9.68
EFFECTIVE AREA(ACRES) = 11.20 AREA-AVERAGED Fm(INCH/HR) = 0.37
AREA-AVERAGED Fp(INCH/HR) = 0.38 AREA-AVERAGED Ap = 0.97
TOTAL AREA(ACRES) = 11.2 PEAK FLOW RATE(CFS) = 22.67
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 11.2 TC(MIN.) = 18.69
EFFECTIVE AREA(ACRES) = 11.20 AREA-AVERAGED Fm(INCH/HR) = 0.37
AREA-AVERAGED Fp(INCH/HR) = 0.38 AREA-AVERAGED Ap = 0.972
PEAK FLOW RATE(CFS) = 22.67
=====
END OF RATIONAL METHOD ANALYSIS

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 RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
 (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
 (c) Copyright 1983-2016 Advanced Engineering Software (aes)
 Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

***** DESCRIPTION OF STUDY *****

* TEI JOB NO 3569 *
 * EXISTING CONDITION (NODE 200-201) *
 * 100 YEAR STORM EVENT *

FILE NAME: W:\3569\EX200.DAT
 TIME/DATE OF STUDY: 16:23 06/11/2018

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
 SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
 USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE($\log(I; \text{IN/HR})$ vs. $\log(T_c; \text{MIN})$) = 0.6000
 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
 as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 590.00
 ELEVATION DATA: UPSTREAM(FEET) = 1045.70 DOWNSTREAM(FEET) = 1038.90

$T_c = K * [(LENGTH^{**} 3.00) / (ELEVATION \text{ CHANGE})]^{**0.20}$
 SUBAREA ANALYSIS USED MINIMUM $T_c(\text{MIN.}) = 16.450$
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.826
 SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
NATURAL POOR COVER "OPEN BRUSH"	A	2.10	0.35	1.000	81	16.45

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(\text{INCH/HR}) = 0.35$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$
 SUBAREA RUNOFF(CFS) = 4.67
 TOTAL AREA(ACRES) = 2.10 PEAK FLOW RATE(CFS) = 4.67

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES)	=	2.1	$T_c(\text{MIN.})$	=	16.45
EFFECTIVE AREA(ACRES)	=	2.10	AREA-AVERAGED $F_m(\text{INCH/HR})$	=	0.35
AREA-AVERAGED $F_p(\text{INCH/HR})$	=	0.35	AREA-AVERAGED A_p	=	1.000
PEAK FLOW RATE(CFS)	=	4.67			

=====

END OF RATIONAL METHOD ANALYSIS

♀

 RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
 (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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 Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

***** DESCRIPTION OF STUDY *****
 * TEI JOB NO 3569 *
 * PROPOSED CONDITION *
 * 100 YEAR STORM EVENT *

FILE NAME: W:\3569\100.DAT
 TIME/DATE OF STUDY: 09:31 06/15/2018

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
 SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
 USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
 USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP HIKE (FT) (FT) (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00 0.0313 0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
 1. Relative Flow-Depth = 0.00 FEET
 as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
 2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)
 *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 335.00
 ELEVATION DATA: UPSTREAM(FEET) = 1041.07 DOWNSTREAM(FEET) = 1037.05

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 7.535
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.514
 SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	3.80	0.74	0.100	52	7.53

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 15.19
 TOTAL AREA(ACRES) = 3.80 PEAK FLOW RATE(CFS) = 15.19

FLOW PROCESS FROM NODE 101.00 TO NODE 112.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1034.10 DOWNSTREAM(FEET) = 1033.30
 FLOW LENGTH(FEET) = 150.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 17.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 6.26
 ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 15.19
 PIPE TRAVEL TIME(MIN.) = 0.40 Tc(MIN.) = 7.93
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 112.00 = 485.00 FEET.

FLOW PROCESS FROM NODE 112.00 TO NODE 112.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 7.93
 RAINFALL INTENSITY(INCH/HR) = 4.38
 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.74
 AREA-AVERAGED Ap = 0.10


```

EFFECTIVE STREAM AREA(ACRES) = 3.80
TOTAL STREAM AREA(ACRES) = 3.80
PEAK FLOW RATE(CFS) AT CONFLUENCE = 15.19
100.RES
*****
FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 225.00
ELEVATION DATA: UPSTREAM(FEET) = 1041.23 DOWNSTREAM(FEET) = 1037.05

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.888
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.234
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 1.60 0.74 0.100 52 5.89
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 7.43
TOTAL AREA(ACRES) = 1.60 PEAK FLOW RATE(CFS) = 7.43
*****
FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1035.00 DOWNSTREAM(FEET) = 1033.30
FLOW LENGTH(FEET) = 20.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 12.0 INCH PIPE IS 7.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.00
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 7.43
PIPE TRAVEL TIME(MIN.) = 0.02 Tc(MIN.) = 5.91
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 112.00 = 245.00 FEET.
*****
FLOW PROCESS FROM NODE 112.00 TO NODE 112.00 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 5.91
RAINFALL INTENSITY(INCH/HR) = 5.22
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 1.60
TOTAL STREAM AREA(ACRES) = 1.60
PEAK FLOW RATE(CFS) AT CONFLUENCE = 7.43

** CONFLUENCE DATA **
STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (INCH/HR) (ACRES) NODE
1 15.19 7.93 4.377 0.74( 0.07) 0.10 3.8 100.00
2 7.43 5.91 5.223 0.74( 0.07) 0.10 1.6 110.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (INCH/HR) (ACRES) NODE
1 20.97 5.91 5.223 0.74( 0.07) 0.10 4.4 110.00
2 21.40 7.93 4.377 0.74( 0.07) 0.10 5.4 100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 21.40 Tc(MIN.) = 7.93
EFFECTIVE AREA(ACRES) = 5.40 AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 5.4
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 112.00 = 485.00 FEET.
*****
FLOW PROCESS FROM NODE 112.00 TO NODE 122.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1033.30 DOWNSTREAM(FEET) = 1032.60
FLOW LENGTH(FEET) = 35.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 21.0 INCH PIPE IS 15.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.14
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 21.40
PIPE TRAVEL TIME(MIN.) = 0.05 Tc(MIN.) = 7.99
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 122.00 = 520.00 FEET.
*****
FLOW PROCESS FROM NODE 122.00 TO NODE 122.00 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

```

Assumed INV
elevations not
labeled on plan.

Plan indicates 135'


```

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 7.99
RAINFALL INTENSITY(INCH/HR) = 4.36
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 5.40
TOTAL STREAM AREA(ACRES) = 5.40
PEAK FLOW RATE(CFS) AT CONFLUENCE = 21.40

```

```

*****
FLOW PROCESS FROM NODE 120.00 TO NODE 121.00 IS CODE = 21

```

```

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

```

```

INITIAL SUBAREA FLOW-LENGTH(FEET) = 225.00
ELEVATION DATA: UPSTREAM(FEET) = 1041.23 DOWNSTREAM(FEET) = 1037.05

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.888
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.234
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 2.05 0.74 0.100 52 5.89
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 9.52
TOTAL AREA(ACRES) = 2.05 PEAK FLOW RATE(CFS) = 9.52

```

```

*****
FLOW PROCESS FROM NODE 121.00 TO NODE 122.00 IS CODE = 31

```

```

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

```

```

ELEVATION DATA: UPSTREAM(FEET) = 1035.00 DOWNSTREAM(FEET) = 1032.60
FLOW LENGTH(FEET) = 20.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 12.0 INCH PIPE IS 7.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 18.12
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 9.52
PIPE TRAVEL TIME(MIN.) = 0.02 Tc(MIN.) = 5.91
LONGEST FLOWPATH FROM NODE 120.00 TO NODE 122.00 = 245.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 122.00 TO NODE 122.00 IS CODE = 1

```

```

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

```

```

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 5.91
RAINFALL INTENSITY(INCH/HR) = 5.22
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 2.05
TOTAL STREAM AREA(ACRES) = 2.05
PEAK FLOW RATE(CFS) AT CONFLUENCE = 9.52

```

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	20.97	5.96	5.195	0.74(0.07)	0.10	4.4	110.00
1	21.40	7.99	4.359	0.74(0.07)	0.10	5.4	100.00
2	9.52	5.91	5.225	0.74(0.07)	0.10	2.0	120.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	30.41	5.91	5.225	0.74(0.07)	0.10	6.4	120.00
2	30.43	5.96	5.195	0.74(0.07)	0.10	6.5	110.00
3	29.32	7.99	4.359	0.74(0.07)	0.10	7.4	100.00

```

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 30.43 Tc(MIN.) = 5.96
EFFECTIVE AREA(ACRES) = 6.48 AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 7.4
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 122.00 = 520.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 122.00 TO NODE 132.00 IS CODE = 31

```

```

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

```

```

ELEVATION DATA: UPSTREAM(FEET) = 1032.60 DOWNSTREAM(FEET) = 1032.00
FLOW LENGTH(FEET) = 135.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.7 INCHES

```



```

                                100.RES
PIPE-FLOW VELOCITY(FEET/SEC.) = 6.99
ESTIMATED PIPE DIAMETER(INCH) = 33.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 30.43
PIPE TRAVEL TIME(MIN.) = 0.32    Tc(MIN.) = 6.28
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 132.00 = 655.00 FEET.
*****
FLOW PROCESS FROM NODE 132.00 TO NODE 132.00 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 6.28
RAINFALL INTENSITY(INCH/HR) = 5.03
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 6.48
TOTAL STREAM AREA(ACRES) = 7.45
PEAK FLOW RATE(CFS) AT CONFLUENCE = 30.43
*****
FLOW PROCESS FROM NODE 130.00 TO NODE 131.00 IS CODE = 21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 225.00
ELEVATION DATA: UPSTREAM(FEET) = 1041.23 DOWNSTREAM(FEET) = 1037.05

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.888
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.234
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 3.20 0.74 0.100 52 5.89
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 14.86
TOTAL AREA(ACRES) = 3.20 PEAK FLOW RATE(CFS) = 14.86
*****
FLOW PROCESS FROM NODE 131.00 TO NODE 132.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1035.00 DOWNSTREAM(FEET) = 1032.00
FLOW LENGTH(FEET) = 20.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 15.0 INCH PIPE IS 8.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 22.16
ESTIMATED PIPE DIAMETER(INCH) = 15.00    NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 14.86
PIPE TRAVEL TIME(MIN.) = 0.02    Tc(MIN.) = 5.90
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 132.00 = 245.00 FEET.
*****
FLOW PROCESS FROM NODE 132.00 TO NODE 132.00 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 5.90
RAINFALL INTENSITY(INCH/HR) = 5.23
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 3.20
TOTAL STREAM AREA(ACRES) = 3.20
PEAK FLOW RATE(CFS) AT CONFLUENCE = 14.86

** CONFLUENCE DATA **
STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1 30.41 6.23 5.061 0.74( 0.07) 0.10 6.4 120.00
1 30.43 6.28 5.034 0.74( 0.07) 0.10 6.5 110.00
1 29.32 8.31 4.257 0.74( 0.07) 0.10 7.4 100.00
2 14.86 5.90 5.226 0.74( 0.07) 0.10 3.2 130.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1 44.64 5.90 5.226 0.74( 0.07) 0.10 9.3 130.00
2 44.79 6.23 5.061 0.74( 0.07) 0.10 9.6 120.00
3 44.74 6.28 5.034 0.74( 0.07) 0.10 9.7 110.00
4 41.38 8.31 4.257 0.74( 0.07) 0.10 10.6 100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 44.79 Tc(MIN.) = 6.23
EFFECTIVE AREA(ACRES) = 9.64 AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.10

```



```

100.RES
TOTAL AREA(ACRES) = 10.6
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 132.00 = 655.00 FEET.
*****
FLOW PROCESS FROM NODE 132.00 TO NODE 142.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1032.00 DOWNSTREAM(FEET) = 1029.90
FLOW LENGTH(FEET) = 530.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 39.0 INCH PIPE IS 26.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 7.38
ESTIMATED PIPE DIAMETER(INCH) = 39.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 44.79
PIPE TRAVEL TIME(MIN.) = 1.20 Tc(MIN.) = 7.43
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 142.00 = 1185.00 FEET.
*****
FLOW PROCESS FROM NODE 142.00 TO NODE 142.00 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 7.43
RAINFALL INTENSITY(INCH/HR) = 4.55
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 9.64
TOTAL STREAM AREA(ACRES) = 10.65
PEAK FLOW RATE(CFS) AT CONFLUENCE = 44.79
*****
FLOW PROCESS FROM NODE 140.00 TO NODE 141.00 IS CODE = 21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 300.00
ELEVATION DATA: UPSTREAM(FEET) = 1038.92 DOWNSTREAM(FEET) = 1032.56

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.434
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.963
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 0.55 0.74 0.100 52 6.43
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 2.42
TOTAL AREA(ACRES) = 0.55 PEAK FLOW RATE(CFS) = 2.42
*****
FLOW PROCESS FROM NODE 141.00 TO NODE 142.00 IS CODE = 31
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1035.00 DOWNSTREAM(FEET) = 1029.90
FLOW LENGTH(FEET) = 5.00 MANNING'S N = 0.012
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
DEPTH OF FLOW IN 12.0 INCH PIPE IS 2.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 27.12
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.42
PIPE TRAVEL TIME(MIN.) = 0.00 Tc(MIN.) = 6.44
LONGEST FLOWPATH FROM NODE 140.00 TO NODE 142.00 = 305.00 FEET.
*****
FLOW PROCESS FROM NODE 142.00 TO NODE 142.00 IS CODE = 1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 6.44
RAINFALL INTENSITY(INCH/HR) = 4.96
AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.74
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 0.55
TOTAL STREAM AREA(ACRES) = 0.55
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.42

** CONFLUENCE DATA **
STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1 44.64 7.10 4.678 0.74( 0.07) 0.10 9.3 130.00
1 44.79 7.43 4.554 0.74( 0.07) 0.10 9.6 120.00
1 44.74 7.48 4.533 0.74( 0.07) 0.10 9.7 110.00
1 41.38 9.55 3.916 0.74( 0.07) 0.10 10.6 100.00
2 2.42 6.44 4.962 0.74( 0.07) 0.10 0.6 140.00

```

Seems wrong. Specify INV elevation on plan.

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO

CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	45.38	6.44	4.962	0.74(0.07)	0.10	9.0	140.00
2	46.92	7.10	4.678	0.74(0.07)	0.10	9.9	130.00
3	47.01	7.43	4.554	0.74(0.07)	0.10	10.2	120.00
4	46.94	7.48	4.533	0.74(0.07)	0.10	10.2	110.00
5	43.28	9.55	3.916	0.74(0.07)	0.10	11.2	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 47.01 Tc(MIN.) = 7.43
 EFFECTIVE AREA(ACRES) = 10.19 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 11.2
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 142.00 = 1185.00 FEET.

FLOW PROCESS FROM NODE 142.00 TO NODE 153.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1029.90 DOWNSTREAM(FEET) = 1029.30
 FLOW LENGTH(FEET) = 25.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 27.0 INCH PIPE IS 20.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 14.47
 ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 47.01
 PIPE TRAVEL TIME(MIN.) = 0.03 Tc(MIN.) = 7.45
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 153.00 = 1210.00 FEET.

FLOW PROCESS FROM NODE 153.00 TO NODE 153.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 7.45
 RAINFALL INTENSITY(INCH/HR) = 4.54
 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.74
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 10.19
 TOTAL STREAM AREA(ACRES) = 11.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 47.01

FLOW PROCESS FROM NODE 150.00 TO NODE 151.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

INITIAL SUBAREA FLOW-LENGTH(FEET) = 650.00
 ELEVATION DATA: UPSTREAM(FEET) = 1041.07 DOWNSTREAM(FEET) = 1036.90

$Tc = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.133
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.572
 SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	0.75	0.74	0.100	52	11.13

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 2.36
 TOTAL AREA(ACRES) = 0.75 PEAK FLOW RATE(CFS) = 2.36

FLOW PROCESS FROM NODE 151.00 TO NODE 152.00 IS CODE = 61

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>(STANDARD CURB SECTION USED)<<<<

UPSTREAM ELEVATION(FEET) = 1036.80 DOWNSTREAM ELEVATION(FEET) = 1031.60
 STREET LENGTH(FEET) = 610.00 CURB HEIGHT(INCHES) = 6.0
 STREET HALFWIDTH(FEET) = 20.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 15.00
 INSIDE STREET CROSSFALL(DECIMAL) = 0.012
 OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0149

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.18

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.35
 HALFSTREET FLOOD WIDTH(FEET) = 15.02
 AVERAGE FLOW VELOCITY(FEET/SEC.) = 2.02
 PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 0.70
 STREET FLOW TRAVEL TIME(MIN.) = 5.03 Tc(MIN.) = 16.16
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.856

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
-------------------------------	-------------------	-----------------	-----------------	-----------------	-----------

Does not match plan.

100.RES
 COMMERCIAL A 0.65 0.74 0.100 52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.65 SUBAREA RUNOFF(CFS) = 1.63
 EFFECTIVE AREA(ACRES) = 1.40 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 1.4 PEAK FLOW RATE(CFS) = 3.50

END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(Feet) = 0.35 HALFSTREET FLOOD WIDTH(Feet) = 15.72
 FLOW VELOCITY(Feet/Sec.) = 2.06 DEPTH*VELOCITY(FT*FT/SEC.) = 0.73
 LONGEST FLOWPATH FROM NODE 150.00 TO NODE 152.00 = 1260.00 FEET.

 FLOW PROCESS FROM NODE 152.00 TO NODE 153.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(Feet) = 1029.60 DOWNSTREAM(Feet) = 1029.30
 FLOW LENGTH(Feet) = 150.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 18.0 INCH PIPE IS 11.2 INCHES
 PIPE-FLOW VELOCITY(Feet/Sec.) = 3.04
 ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 3.50
 PIPE TRAVEL TIME(MIN.) = 0.82 Tc(MIN.) = 16.98
 LONGEST FLOWPATH FROM NODE 150.00 TO NODE 153.00 = 1410.00 FEET.

 FLOW PROCESS FROM NODE 153.00 TO NODE 153.00 IS CODE = 1

 >>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
 =====
 TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 16.98
 RAINFALL INTENSITY(INCH/HR) = 2.77
 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.74
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 1.40
 TOTAL STREAM AREA(ACRES) = 1.40
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.50

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	45.38	6.47	4.948	0.74(0.07)	0.10	9.0	140.00
1	46.92	7.13	4.666	0.74(0.07)	0.10	9.9	130.00
1	47.01	7.45	4.543	0.74(0.07)	0.10	10.2	120.00
1	46.94	7.51	4.523	0.74(0.07)	0.10	10.2	110.00
1	43.28	9.58	3.909	0.74(0.07)	0.10	11.2	100.00
2	3.50	16.98	2.772	0.74(0.07)	0.10	1.4	150.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	47.79	6.47	4.948	0.74(0.07)	0.10	9.5	140.00
2	49.42	7.13	4.666	0.74(0.07)	0.10	10.4	130.00
3	49.56	7.45	4.543	0.74(0.07)	0.10	10.8	120.00
4	49.50	7.51	4.523	0.74(0.07)	0.10	10.8	110.00
5	46.09	9.58	3.909	0.74(0.07)	0.10	12.0	100.00
6	33.96	16.98	2.772	0.74(0.07)	0.10	12.6	150.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 49.56 Tc(MIN.) = 7.45
 EFFECTIVE AREA(ACRES) = 10.80 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 12.6
 LONGEST FLOWPATH FROM NODE 150.00 TO NODE 153.00 = 1410.00 FEET.

 FLOW PROCESS FROM NODE 153.00 TO NODE 154.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
 =====
 ELEVATION DATA: UPSTREAM(Feet) = 1029.30 DOWNSTREAM(Feet) = 1029.29
 FLOW LENGTH(Feet) = 8.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 48.0 INCH PIPE IS 36.4 INCHES
 PIPE-FLOW VELOCITY(Feet/Sec.) = 4.85
 ESTIMATED PIPE DIAMETER(INCH) = 48.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 49.56
 PIPE TRAVEL TIME(MIN.) = 0.03 Tc(MIN.) = 7.48
 LONGEST FLOWPATH FROM NODE 150.00 TO NODE 154.00 = 1418.00 FEET.

 FLOW PROCESS FROM NODE 154.00 TO NODE 154.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
 =====
 MAINLINE Tc(MIN.) = 7.48
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.533
 SUBAREA LOSS RATE DATA(AMC III):

100.RES
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL A 0.35 0.74 0.100 52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.35 SUBAREA RUNOFF(CFS) = 1.40
 EFFECTIVE AREA(ACRES) = 11.15 AREA-AVERAGED Fm(INCH/HR) = 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 12.9 PEAK FLOW RATE(CFS) = 49.56
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 12.9 TC(MIN.) = 7.48
 EFFECTIVE AREA(ACRES) = 11.15 AREA-AVERAGED Fm(INCH/HR)= 0.07
 AREA-AVERAGED Fp(INCH/HR) = 0.74 AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS) = 49.56

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	47.79	6.49	4.936	0.74(0.07)	0.10	9.9	140.00
2	49.42	7.16	4.656	0.74(0.07)	0.10	10.8	130.00
3	49.56	7.48	4.533	0.74(0.07)	0.10	11.2	120.00
4	49.50	7.54	4.513	0.74(0.07)	0.10	11.2	110.00
5	46.09	9.61	3.902	0.74(0.07)	0.10	12.3	100.00
6	33.96	17.01	2.769	0.74(0.07)	0.10	12.9	150.00

=====

END OF RATIONAL METHOD ANALYSIS

APPENDIX C

DETENTION CALCULATIONS

3569 TRUCK YARD STORAGE

Elevation	Depth (feet)	Area (sq. ft.)	Volume (c.f.)	Σ Volume (c.f.)	Σ Volume (ac-ft)	Q Discharge (cfs) *
1037.20	0.00	2,688				
			1,877	1,877	0.043	11.6
1037.40	0.20	16,077				
			5,199	7,075	0.162	12.2
1037.60	0.40	35,913				
			8,460	15,535	0.357	12.8
1037.80	0.60	48,686				
			10,421	25,956	0.596	13.3
1038.00	0.80	55,522				

* ORIFICE EQUATION USED FOR
DISCHARGE Q'S.
18" PIPE WITH 1.5 FT. COVER
AND PONDING IN TRUCK YARD

 FLOOD ROUTING ANALYSIS
 USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
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 Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

***** DESCRIPTION OF STUDY *****
 * TEI JOB NO 3569 *
 * PROPOSED CONDITION *
 * 100 YEAR STORM EVENT *

FILE NAME: W:\3569\BASIN.DAT
 TIME/DATE OF STUDY: 15:46 06/11/2018

 FLOW PROCESS FROM NODE 101.00 TO NODE 132.00 IS CODE = 1
 >>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
 =====

(UNIT-HYDROGRAPH ADDED TO STREAM #1)

WATERSHED AREA = 10.650 ACRES
 BASEFLOW = 44.790 CFS/SQUARE-MILE
 *USER ENTERED "LAG" TIME = 0.100 HOURS
 CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
 THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
 MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
 VALLEY(DEVELOPED) S-GRAPH SELECTED
 MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.042
 LOW LOSS FRACTION = 0.066
 HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH)= 0.47
 SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)= 0.97
 SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.30
 SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 2.30
 SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 3.30
 SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 6.80

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:

5-MINUTE FACTOR = 1.000
 30-MINUTE FACTOR = 1.000
 1-HOUR FACTOR = 1.000
 3-HOUR FACTOR = 1.000
 6-HOUR FACTOR = 1.000
 24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES
 UNIT INTERVAL PERCENTAGE OF LAG-TIME = 83.333

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	12.091	15.573
2	66.357	69.894
3	94.973	36.857
4	99.026	5.220
5	99.610	0.753
6	99.903	0.376
7	100.000	0.125

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.3587
 TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 7.1824

♀

24 - HOUR STORM RUNOFF HYDROGRAPH

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
 (Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	12.5	25.0	37.5	50.0
0.083	0.0064	0.92	Q	*	*	*	*
0.167	0.0183	1.73	VQ	*	*	*	*

BASIN.RES					
0.250	0.0331	2.16	VQ	.	.
0.333	0.0484	2.22	VQ	.	.
0.417	0.0638	2.23	VQ	.	.
0.500	0.0792	2.24	VQ	.	.
0.583	0.0947	2.24	VQ	.	.
0.667	0.1102	2.25	VQ	.	.
0.750	0.1257	2.25	VQ	.	.
0.833	0.1412	2.26	VQ	.	.
0.917	0.1568	2.26	VQ	.	.
1.000	0.1724	2.26	VQ	.	.
1.083	0.1880	2.27	.Q	.	.
1.167	0.2037	2.27	.Q	.	.
1.250	0.2193	2.28	.Q	.	.
1.333	0.2350	2.28	.Q	.	.
1.417	0.2508	2.28	.Q	.	.
1.500	0.2665	2.29	.Q	.	.
1.583	0.2823	2.29	.Q	.	.
1.667	0.2982	2.30	.Q	.	.
1.750	0.3140	2.30	.Q	.	.
1.833	0.3299	2.31	.Q	.	.
1.917	0.3458	2.31	.Q	.	.
2.000	0.3618	2.32	.QV	.	.
2.083	0.3777	2.32	.QV	.	.
2.167	0.3937	2.32	.QV	.	.
2.250	0.4098	2.33	.QV	.	.
2.333	0.4258	2.33	.QV	.	.
2.417	0.4419	2.34	.QV	.	.
2.500	0.4581	2.34	.QV	.	.
2.583	0.4742	2.35	.QV	.	.
2.667	0.4904	2.35	.QV	.	.
2.750	0.5067	2.36	.QV	.	.
2.833	0.5229	2.36	.QV	.	.
2.917	0.5392	2.37	.Q V	.	.
3.000	0.5555	2.37	.Q V	.	.
3.083	0.5719	2.38	.Q V	.	.
3.167	0.5883	2.38	.Q V	.	.
3.250	0.6047	2.39	.Q V	.	.
3.333	0.6212	2.39	.Q V	.	.
3.417	0.6377	2.40	.Q V	.	.
3.500	0.6542	2.40	.Q V	.	.
3.583	0.6708	2.41	.Q V	.	.
3.667	0.6874	2.41	.Q V	.	.
3.750	0.7041	2.42	.Q V	.	.
3.833	0.7208	2.42	.Q V	.	.
3.917	0.7375	2.43	.Q V	.	.
4.000	0.7542	2.43	.Q V	.	.
4.083	0.7710	2.44	.Q V	.	.
4.167	0.7879	2.44	.Q V	.	.
4.250	0.8047	2.45	.Q V	.	.
4.333	0.8217	2.46	.Q V	.	.
4.417	0.8386	2.46	.Q V	.	.
4.500	0.8556	2.47	.Q V	.	.
4.583	0.8726	2.47	.Q V	.	.
4.667	0.8897	2.48	.Q V	.	.
4.750	0.9068	2.49	.Q V	.	.
4.833	0.9240	2.49	.Q V	.	.
4.917	0.9412	2.50	.Q V	.	.
5.000	0.9585	2.50	.Q V	.	.
5.083	0.9757	2.51	.Q V	.	.
5.167	0.9931	2.52	.Q V	.	.
5.250	1.0105	2.52	.Q V	.	.
5.333	1.0279	2.53	.Q V	.	.
5.417	1.0453	2.54	.Q V	.	.
5.500	1.0629	2.54	.Q V	.	.
5.583	1.0804	2.55	.Q V	.	.
5.667	1.0980	2.56	.Q V	.	.
5.750	1.1157	2.56	.Q V	.	.
5.833	1.1334	2.57	.Q V	.	.
5.917	1.1511	2.58	.Q V	.	.
6.000	1.1689	2.59	.Q V	.	.
6.083	1.1868	2.59	.Q V	.	.
6.167	1.2047	2.60	.Q V	.	.
6.250	1.2227	2.61	.Q V	.	.
6.333	1.2407	2.61	.Q V	.	.
6.417	1.2587	2.62	.Q V	.	.
6.500	1.2768	2.63	.Q V	.	.
6.583	1.2950	2.64	.Q V	.	.
6.667	1.3132	2.65	.Q V	.	.
6.750	1.3315	2.65	.Q V	.	.
6.833	1.3498	2.66	.Q V	.	.
6.917	1.3682	2.67	.Q V	.	.
7.000	1.3866	2.68	.Q V	.	.
7.083	1.4052	2.69	.Q V	.	.
7.167	1.4237	2.70	.Q V	.	.
7.250	1.4423	2.70	.Q V	.	.
7.333	1.4610	2.71	.Q V	.	.
7.417	1.4798	2.72	.Q V	.	.
7.500	1.4986	2.73	.Q V	.	.
7.583	1.5174	2.74	.Q V	.	.
7.667	1.5364	2.75	.Q V	.	.
7.750	1.5554	2.76	.Q V	.	.
7.833	1.5744	2.77	.Q V	.	.
7.917	1.5936	2.78	.Q V	.	.
8.000	1.6128	2.79	.Q V	.	.
8.083	1.6320	2.80	.Q V	.	.
8.167	1.6514	2.81	.Q V	.	.
8.250	1.6708	2.82	.Q V	.	.
8.333	1.6903	2.83	.Q V	.	.

BASIN.RES									
8.417	1.7098	2.84	. Q	V.	.	.	.	.	.
8.500	1.7295	2.85	. Q	V.	.	.	.	.	.
8.583	1.7492	2.86	. Q	V.	.	.	.	.	.
8.667	1.7689	2.87	. Q	V.	.	.	.	.	.
8.750	1.7888	2.88	. Q	V.	.	.	.	.	.
8.833	1.8088	2.90	. Q	V	.	.	.	.	.
8.917	1.8288	2.91	. Q	V	.	.	.	.	.
9.000	1.8489	2.92	. Q	V	.	.	.	.	.
9.083	1.8691	2.93	. Q	V	.	.	.	.	.
9.167	1.8894	2.94	. Q	V	.	.	.	.	.
9.250	1.9097	2.96	. Q	V	.	.	.	.	.
9.333	1.9302	2.97	. Q	V	.	.	.	.	.
9.417	1.9507	2.98	. Q	V	.	.	.	.	.
9.500	1.9713	3.00	. Q	V	.	.	.	.	.
9.583	1.9921	3.01	. Q	.V	.	.	.	.	.
9.667	2.0129	3.02	. Q	.V	.	.	.	.	.
9.750	2.0338	3.04	. Q	.V	.	.	.	.	.
9.833	2.0548	3.05	. Q	.V	.	.	.	.	.
9.917	2.0759	3.07	. Q	.V	.	.	.	.	.
10.000	2.0972	3.08	. Q	.V	.	.	.	.	.
10.083	2.1185	3.10	. Q	.V	.	.	.	.	.
10.167	2.1399	3.11	. Q	.V	.	.	.	.	.
10.250	2.1615	3.13	. Q	.V	.	.	.	.	.
10.333	2.1831	3.14	. Q	.V	.	.	.	.	.
10.417	2.2049	3.16	. Q	.V	.	.	.	.	.
10.500	2.2268	3.18	. Q	.V	.	.	.	.	.
10.583	2.2488	3.19	. Q	.V	.	.	.	.	.
10.667	2.2709	3.21	. Q	.V	.	.	.	.	.
10.750	2.2931	3.23	. Q	.V	.	.	.	.	.
10.833	2.3155	3.25	. Q	.V	.	.	.	.	.
10.917	2.3380	3.27	. Q	.V	.	.	.	.	.
11.000	2.3607	3.29	. Q	.V	.	.	.	.	.
11.083	2.3834	3.31	. Q	.V	.	.	.	.	.
11.167	2.4064	3.33	. Q	.V	.	.	.	.	.
11.250	2.4294	3.35	. Q	.V	.	.	.	.	.
11.333	2.4526	3.37	. Q	.V	.	.	.	.	.
11.417	2.4760	3.39	. Q	.V	.	.	.	.	.
11.500	2.4995	3.41	. Q	.V	.	.	.	.	.
11.583	2.5232	3.44	. Q	.V	.	.	.	.	.
11.667	2.5470	3.46	. Q	.V	.	.	.	.	.
11.750	2.5710	3.48	. Q	.V	.	.	.	.	.
11.833	2.5952	3.51	. Q	.V	.	.	.	.	.
11.917	2.6195	3.54	. Q	.V	.	.	.	.	.
12.000	2.6441	3.56	. Q	.V	.	.	.	.	.
12.083	2.6688	3.59	. Q	.V	.	.	.	.	.
12.167	2.6937	3.62	. Q	.V	.	.	.	.	.
12.250	2.7188	3.64	. Q	.V	.	.	.	.	.
12.333	2.7441	3.67	. Q	.V	.	.	.	.	.
12.417	2.7696	3.70	. Q	.V	.	.	.	.	.
12.500	2.7953	3.74	. Q	.V	.	.	.	.	.
12.583	2.8213	3.77	. Q	.V	.	.	.	.	.
12.667	2.8475	3.80	. Q	.V	.	.	.	.	.
12.750	2.8739	3.84	. Q	.V	.	.	.	.	.
12.833	2.9006	3.88	. Q	.V	.	.	.	.	.
12.917	2.9276	3.91	. Q	.V	.	.	.	.	.
13.000	2.9548	3.95	. Q	.V	.	.	.	.	.
13.083	2.9823	3.99	. Q	.V	.	.	.	.	.
13.167	3.0101	4.04	. Q	.V	.	.	.	.	.
13.250	3.0382	4.08	. Q	.V	.	.	.	.	.
13.333	3.0666	4.13	. Q	.V	.	.	.	.	.
13.417	3.0954	4.18	. Q	.V	.	.	.	.	.
13.500	3.1245	4.23	. Q	.V	.	.	.	.	.
13.583	3.1540	4.28	. Q	.V	.	.	.	.	.
13.667	3.1839	4.34	. Q	.V	.	.	.	.	.
13.750	3.2141	4.39	. Q	.V	.	.	.	.	.
13.833	3.2449	4.46	. Q	.V	.	.	.	.	.
13.917	3.2760	4.52	. Q	.V	.	.	.	.	.
14.000	3.3076	4.59	. Q	.V	.	.	.	.	.
14.083	3.3397	4.66	. Q	.V	.	.	.	.	.
14.167	3.3723	4.74	. Q	.V	.	.	.	.	.
14.250	3.4055	4.81	. Q	.V	.	.	.	.	.
14.333	3.4393	4.90	. Q	.V	.	.	.	.	.
14.417	3.4736	4.99	. Q	.V	.	.	.	.	.
14.500	3.5088	5.10	. Q	.V	.	.	.	.	.
14.583	3.5446	5.20	. Q	.V	.	.	.	.	.
14.667	3.5812	5.32	. Q	.V	.	.	.	.	.
14.750	3.6187	5.44	. Q	.V	.	.	.	.	.
14.833	3.6572	5.59	. Q	.V	.	.	.	.	.
14.917	3.6967	5.73	. Q	.V	.	.	.	.	.
15.000	3.7374	5.91	. Q	.V	.	.	.	.	.
15.083	3.7793	6.09	. Q	.V	.	.	.	.	.
15.167	3.8228	6.31	. Q	.V	.	.	.	.	.
15.250	3.8677	6.53	. Q	.V	.	.	.	.	.
15.333	3.9147	6.82	. Q	.V	.	.	.	.	.
15.417	3.9626	6.96	. Q	.V	.	.	.	.	.
15.500	4.0085	6.66	. Q	.V	.	.	.	.	.
15.583	4.0548	6.72	. Q	.V	.	.	.	.	.
15.667	4.1049	7.28	. Q	.V	.	.	.	.	.
15.750	4.1596	7.95	. Q	.V	.	.	.	.	.
15.833	4.2209	8.89	. Q	.V	.	.	.	.	.
15.917	4.2923	10.37	. Q	.V	.	.	.	.	.
16.000	4.3866	13.70	. Q	.V	.	.	.	.	.
16.083	4.5437	22.81	. Q	.V	.	.	.	.	.
16.167	4.8248	40.81	. Q	.V	.	.	.	.	.
16.250	5.0028	25.85	. Q	.V	.	.	.	.	.
16.333	5.0828	11.62	. Q	.V	.	.	.	.	.
16.417	5.1387	8.12	. Q	.V	.	.	.	.	.
16.500	5.1902	7.47	. Q	.V	.	.	.	.	.

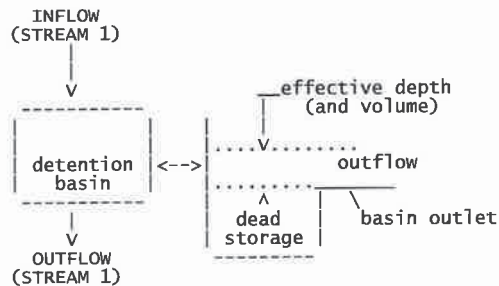
				BASIN.RES			
16.583	5.2381	6.96	.	.	.	V.	.
16.667	5.2822	6.40	.	.	.	V.	.
16.750	5.3234	5.98	.	.	.	V.	.
16.833	5.3623	5.65	.	.	.	V.	.
16.917	5.3993	5.37	.	.	.	V	.
17.000	5.4347	5.14	.	.	.	V	.
17.083	5.4687	4.94	.	.	.	V	.
17.167	5.5016	4.77	.	.	.	V	.
17.250	5.5334	4.62	.	.	.	V	.
17.333	5.5643	4.48	.	.	.	V	.
17.417	5.5943	4.36	.	.	.	V	.
17.500	5.6235	4.25	.	.	.	V	.
17.583	5.6521	4.15	.	.	.	V	.
17.667	5.6800	4.05	.	.	.	V	.
17.750	5.7073	3.97	.	.	.	V	.
17.833	5.7341	3.89	.	.	.	V	.
17.917	5.7604	3.82	.	.	.	V	.
18.000	5.7862	3.75	.	.	.	V	.
18.083	5.8116	3.69	.	.	.	V	.
18.167	5.8366	3.63	.	.	.	V	.
18.250	5.8612	3.57	.	.	.	V	.
18.333	5.8854	3.52	.	.	.	V	.
18.417	5.9093	3.47	.	.	.	V	.
18.500	5.9329	3.42	.	.	.	V	.
18.583	5.9562	3.38	.	.	.	V	.
18.667	5.9791	3.34	.	.	.	V	.
18.750	6.0018	3.29	.	.	.	V	.
18.833	6.0242	3.26	.	.	.	V	.
18.917	6.0464	3.22	.	.	.	V	.
19.000	6.0683	3.18	.	.	.	V	.
19.083	6.0900	3.15	.	.	.	V	.
19.167	6.1115	3.12	.	.	.	V	.
19.250	6.1328	3.09	.	.	.	V	.
19.333	6.1538	3.06	.	.	.	V	.
19.417	6.1747	3.03	.	.	.	V	.
19.500	6.1953	3.00	.	.	.	V	.
19.583	6.2158	2.97	.	.	.	V	.
19.667	6.2361	2.95	.	.	.	V	.
19.750	6.2563	2.92	.	.	.	V	.
19.833	6.2762	2.90	.	.	.	V	.
19.917	6.2961	2.88	.	.	.	V	.
20.000	6.3157	2.85	.	.	.	V	.
20.083	6.3352	2.83	.	.	.	V	.
20.167	6.3546	2.81	.	.	.	V	.
20.250	6.3738	2.79	.	.	.	V	.
20.333	6.3929	2.77	.	.	.	V	.
20.417	6.4119	2.75	.	.	.	V	.
20.500	6.4307	2.73	.	.	.	V	.
20.583	6.4494	2.72	.	.	.	V	.
20.667	6.4680	2.70	.	.	.	V	.
20.750	6.4864	2.68	.	.	.	V	.
20.833	6.5048	2.66	.	.	.	V	.
20.917	6.5230	2.65	.	.	.	V	.
21.000	6.5412	2.63	.	.	.	V	.
21.083	6.5592	2.62	.	.	.	V	.
21.167	6.5771	2.60	.	.	.	V	.
21.250	6.5949	2.59	.	.	.	V	.
21.333	6.6126	2.57	.	.	.	V	.
21.417	6.6303	2.56	.	.	.	V	.
21.500	6.6478	2.55	.	.	.	V	.
21.583	6.6652	2.53	.	.	.	V	.
21.667	6.6826	2.52	.	.	.	V	.
21.750	6.6998	2.51	.	.	.	V	.
21.833	6.7170	2.49	.	.	.	V	.
21.917	6.7341	2.48	.	.	.	V	.
22.000	6.7511	2.47	.	.	.	V	.
22.083	6.7680	2.46	.	.	.	V	.
22.167	6.7849	2.45	.	.	.	V	.
22.250	6.8017	2.44	.	.	.	V	.
22.333	6.8184	2.42	.	.	.	V	.
22.417	6.8350	2.41	.	.	.	V	.
22.500	6.8515	2.40	.	.	.	V	.
22.583	6.8680	2.39	.	.	.	V	.
22.667	6.8844	2.38	.	.	.	V	.
22.750	6.9008	2.37	.	.	.	V	.
22.833	6.9170	2.36	.	.	.	V	.
22.917	6.9332	2.35	.	.	.	V	.
23.000	6.9494	2.34	.	.	.	V	.
23.083	6.9655	2.33	.	.	.	V	.
23.167	6.9815	2.33	.	.	.	V	.
23.250	6.9974	2.32	.	.	.	V	.
23.333	7.0133	2.31	.	.	.	V	.
23.417	7.0292	2.30	.	.	.	V	.
23.500	7.0449	2.29	.	.	.	V	.
23.583	7.0607	2.28	.	.	.	V	.
23.667	7.0763	2.27	.	.	.	V	.
23.750	7.0919	2.27	.	.	.	V	.
23.833	7.1075	2.26	.	.	.	V	.
23.917	7.1230	2.25	.	.	.	V	.
24.000	7.1384	2.24	.	.	.	V	.
24.083	7.1526	2.06	.	.	.	V	.
24.167	7.1612	1.25	Q	.	.	V	.
24.250	7.1668	0.82	Q	.	.	V	.
24.333	7.1720	0.76	Q	.	.	V	.
24.417	7.1772	0.75	Q	.	.	V	.
24.500	7.1824	0.75	Q	.	.	V	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:

(Note: 100% of Peak Flow Rate estimate assumed to have an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1470.0
10%	260.0
20%	35.0
30%	20.0
40%	15.0
50%	15.0
60%	10.0
70%	5.0
80%	5.0
90%	5.0

 FLOW PROCESS FROM NODE 132.00 TO NODE 132.00 IS CODE = 3.1
 >>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<



ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
 THROUGH A FLOW-THROUGH DETENTION BASIN
 SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
 DEAD STORAGE(AF) = 0.000
 SPECIFIED DEAD STORAGE(AF) FILLED = 0.000
 SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000
 DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	0.20	11.60	0.043
3	0.40	12.20	0.162
4	0.60	12.80	0.357
5	0.80	13.30	0.596

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(5-MINUTE COMPUTATION INTERVALS):
 (Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
 MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
12.083	0.000	3.59	0.00	0.06	3.6	0.013
12.167	0.000	3.62	0.00	0.06	3.6	0.013
12.250	0.000	3.64	0.00	0.06	3.6	0.013
12.333	0.000	3.67	0.00	0.06	3.7	0.014
12.417	0.000	3.70	0.00	0.06	3.7	0.014
12.500	0.000	3.74	0.00	0.06	3.7	0.014
12.583	0.000	3.77	0.00	0.06	3.8	0.014
12.667	0.000	3.80	0.00	0.07	3.8	0.014
12.750	0.000	3.84	0.00	0.07	3.8	0.014
12.833	0.000	3.88	0.00	0.07	3.9	0.014
12.917	0.000	3.91	0.00	0.07	3.9	0.014
13.000	0.000	3.95	0.00	0.07	3.9	0.015
13.083	0.000	3.99	0.00	0.07	4.0	0.015
13.167	0.000	4.04	0.00	0.07	4.0	0.015
13.250	0.000	4.08	0.00	0.07	4.1	0.015
13.333	0.000	4.13	0.00	0.07	4.1	0.015
13.417	0.000	4.18	0.00	0.07	4.2	0.015
13.500	0.000	4.23	0.00	0.07	4.2	0.016
13.583	0.000	4.28	0.00	0.07	4.3	0.016
13.667	0.000	4.34	0.00	0.07	4.3	0.016
13.750	0.000	4.39	0.00	0.08	4.4	0.016
13.833	0.000	4.46	0.00	0.08	4.4	0.017
13.917	0.000	4.52	0.00	0.08	4.5	0.017
14.000	0.000	4.59	0.00	0.08	4.6	0.017
14.083	0.000	4.66	0.00	0.08	4.6	0.017
14.167	0.000	4.74	0.00	0.08	4.7	0.018
14.250	0.000	4.81	0.00	0.08	4.8	0.018

				BASIN.RES		
14.333	0.000	4.90	0.00	0.08	4.9	0.018
14.417	0.000	4.99	0.00	0.09	4.9	0.018
14.500	0.000	5.10	0.00	0.09	5.0	0.019
14.583	0.000	5.20	0.00	0.09	5.1	0.019
14.667	0.000	5.32	0.00	0.09	5.3	0.020
14.750	0.000	5.44	0.00	0.09	5.4	0.020
14.833	0.000	5.59	0.00	0.10	5.5	0.021
14.917	0.000	5.73	0.00	0.10	5.7	0.021
15.000	0.000	5.91	0.00	0.10	5.8	0.022
15.083	0.000	6.09	0.00	0.10	6.0	0.023
15.167	0.000	6.31	0.00	0.11	6.2	0.023
15.250	0.000	6.53	0.00	0.11	6.4	0.024
15.333	0.000	6.82	0.00	0.12	6.7	0.025
15.417	0.000	6.96	0.00	0.12	6.9	0.026
15.500	0.000	6.66	0.00	0.12	6.8	0.025
15.583	0.000	6.72	0.00	0.12	6.7	0.025
15.667	0.000	7.28	0.00	0.13	7.0	0.027
15.750	0.000	7.95	0.00	0.14	7.6	0.029
15.833	0.000	8.89	0.00	0.15	8.4	0.033
15.917	0.000	10.37	0.00	0.18	9.6	0.038
16.000	0.000	13.70	0.00	0.22	11.0	0.057
16.083	0.000	22.81	0.00	0.35	11.9	0.132
16.167	0.000	40.81	0.00	0.57	12.4	0.328
16.250	0.000	25.85	0.00	0.65	12.8	0.418
16.333	0.000	11.62	0.00	0.64	12.9	0.409
16.417	0.000	8.12	0.00	0.62	12.9	0.376
16.500	0.000	7.47	0.00	0.58	12.8	0.339
16.583	0.000	6.96	0.00	0.54	12.7	0.300
16.667	0.000	6.40	0.00	0.50	12.6	0.258
16.750	0.000	5.98	0.00	0.45	12.4	0.213
16.833	0.000	5.65	0.00	0.41	12.3	0.167
16.917	0.000	5.37	0.00	0.33	12.1	0.121
17.000	0.000	5.14	0.00	0.25	11.9	0.075
17.083	0.000	4.94	0.00	0.16	10.7	0.035
17.167	0.000	4.77	0.00	0.09	7.2	0.018
17.250	0.000	4.62	0.00	0.08	4.8	0.017
17.333	0.000	4.48	0.00	0.08	4.6	0.017
17.417	0.000	4.36	0.00	0.08	4.4	0.016
17.500	0.000	4.25	0.00	0.07	4.3	0.016
17.583	0.000	4.15	0.00	0.07	4.2	0.015
17.667	0.000	4.05	0.00	0.07	4.1	0.015
17.750	0.000	3.97	0.00	0.07	4.0	0.015
17.833	0.000	3.89	0.00	0.07	3.9	0.014
17.917	0.000	3.82	0.00	0.07	3.9	0.014
18.000	0.000	3.75	0.00	0.06	3.8	0.014
18.083	0.000	3.69	0.00	0.06	3.7	0.014
18.167	0.000	3.63	0.00	0.06	3.7	0.013
18.250	0.000	3.57	0.00	0.06	3.6	0.013
18.333	0.000	3.52	0.00	0.06	3.5	0.013
18.417	0.000	3.47	0.00	0.06	3.5	0.013
18.500	0.000	3.42	0.00	0.06	3.4	0.013
18.583	0.000	3.38	0.00	0.06	3.4	0.013
18.667	0.000	3.34	0.00	0.06	3.4	0.012
18.750	0.000	3.29	0.00	0.06	3.3	0.012
18.833	0.000	3.26	0.00	0.06	3.3	0.012
18.917	0.000	3.22	0.00	0.06	3.2	0.012
19.000	0.000	3.18	0.00	0.05	3.2	0.012
19.083	0.000	3.15	0.00	0.05	3.2	0.012
19.167	0.000	3.12	0.00	0.05	3.1	0.012
19.250	0.000	3.09	0.00	0.05	3.1	0.011
19.333	0.000	3.06	0.00	0.05	3.1	0.011
19.417	0.000	3.03	0.00	0.05	3.0	0.011
19.500	0.000	3.00	0.00	0.05	3.0	0.011
19.583	0.000	2.97	0.00	0.05	3.0	0.011
19.667	0.000	2.95	0.00	0.05	3.0	0.011
19.750	0.000	2.92	0.00	0.05	2.9	0.011
19.833	0.000	2.90	0.00	0.05	2.9	0.011
19.917	0.000	2.88	0.00	0.05	2.9	0.011

PROCESS SUMMARY OF STORAGE:

INFLOW VOLUME =	7.182 AF	
BASIN STORAGE =	0.000 AF (WITH	0.000 AF INITIALLY FILLED)
OUTFLOW VOLUME =	7.182 AF	
LOSS VOLUME =	0.000 AF	

END OF FLOODSCX ROUTING ANALYSIS

APPENDIX D

CATCH BASIN CALCULATIONS

GRATE INLET CALCULATION SHEET

Grate at HI

Use A.P.W.A. Standard Plan No. 305-2

$$Q/P = 3.0(H)^{3/2}$$

$$P = \text{Perimeter} = 14.48'$$

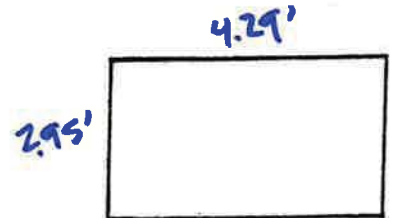
$$H = \text{Maximum depth of ponding at grate} = \underline{0.5}'$$

$$Q_{\max} = 3.0(P)(H)^{3/2} = 3.0(14.48)(\underline{0.5})^{3/2} = \underline{15.4} \text{ cfs}$$

$$\text{Assume 50\% clogging implies } \underline{7.7} \text{ cfs}$$

$$Q_{\underline{100}} \text{ at } \underline{HI} = \underline{2.4} \text{ cfs} < \underline{7.7} \text{ cfs}$$

1 grate O.K.



CURB OPENING BASIN CALCULATION SHEET

Basin Located At 152

h = height of catch basin opening 0.5 ,

H = Maximum depth of ponding at catch basin .67 ,

$$H/h = \underline{.67} / \underline{0.5} = \underline{1.34} ,$$

Use Table "L" to yield 1.5 cfs/l.f.

$$Q_{100} \text{ at } \underline{152} = \underline{3.5} \text{ cfs}$$

$(Q_{100})/(\text{Table "L" result}) = \underline{3.5} / \underline{1.5} = \underline{2.3}$ = minimum length of opening required to intercept Q.

Length of Catch Basin Recommended = 7.0 ,

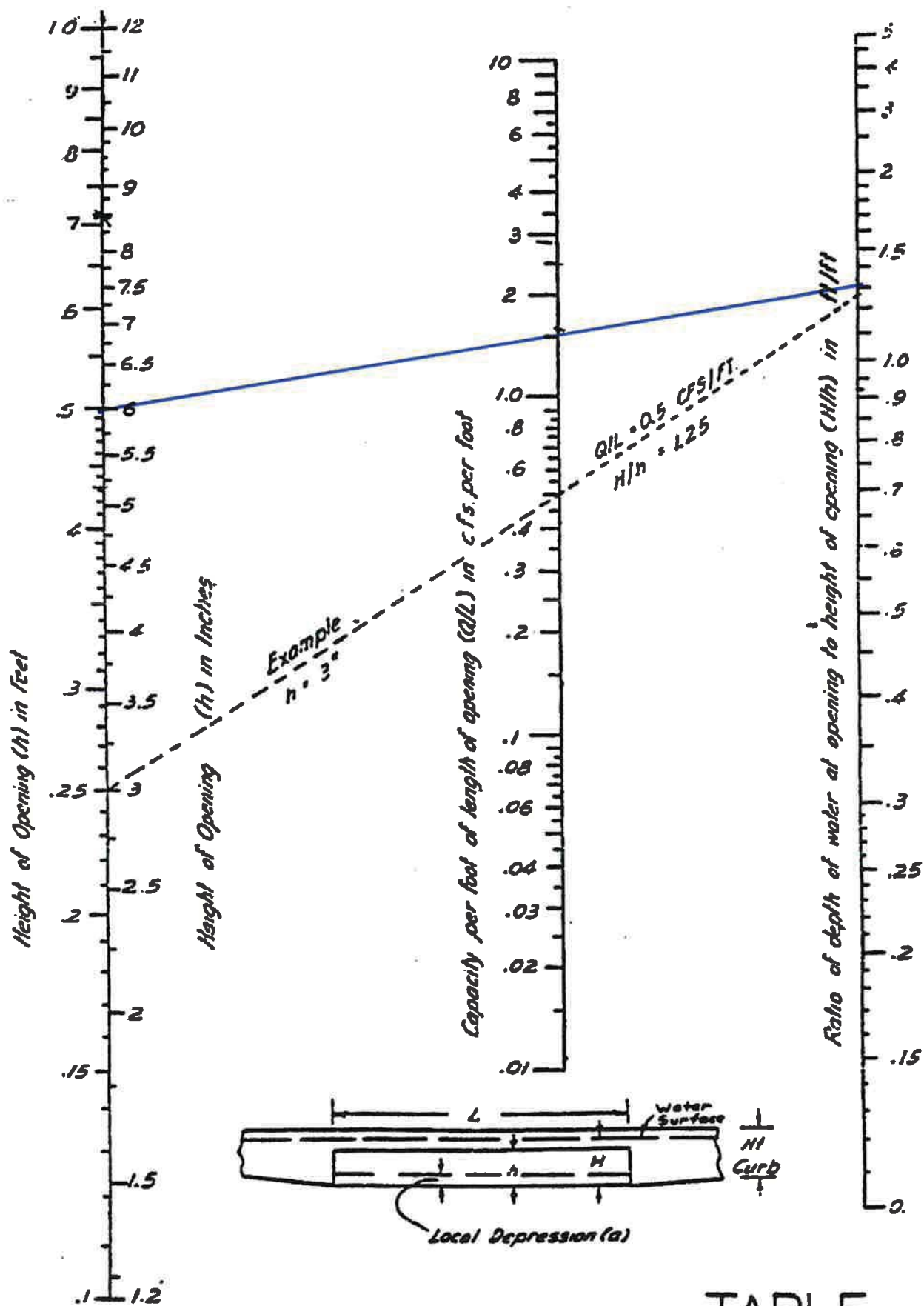


TABLE L

HYDRAULIC ELEMENTS - I PROGRAM PACKAGE
(C) Copyright 1982-99 Advanced Engineering Software (aes)
Ver. 8.0 Release Date: 01/01/99 License ID 1435

Analysis prepared by:

THIENES ENGINEERING
16800 VALLEY VIEW AVENUE
LA MIRADA CA 90638
PH: (714) 521-4811 FAX: (714) 521-4173

TIME/DATE OF STUDY: 15:28 7/21/2017
=====

***** DESCRIPTION OF STUDY *****
* TEI JOB NO 3569 *
* PARKWAY CUVLERT *
* OUT TO CACTUS *

>>>CHANNEL INPUT INFORMATION<<<
=====

NORMAL DEPTH (FEET) = 0.33
CHANNEL Z1 (HORIZONTAL/VERTICAL) = 0.00
Z2 (HORIZONTAL/VERTICAL) = 0.00
CONSTANT CHANNEL SLOPE (FEET/FEET) = 0.020000
UNIFORM FLOW (CFS) = 18.00
MANNINGS FRICTION FACTOR = 0.0140
=====

NORMAL-DEPTH FLOW INFORMATION:

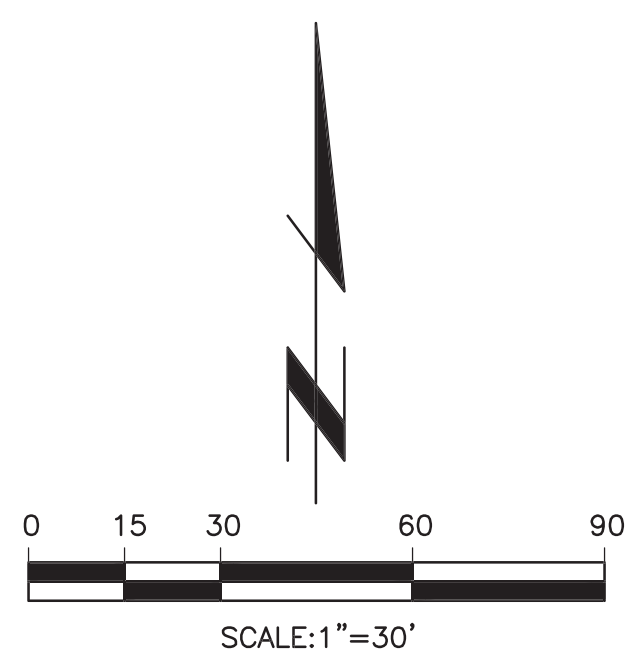
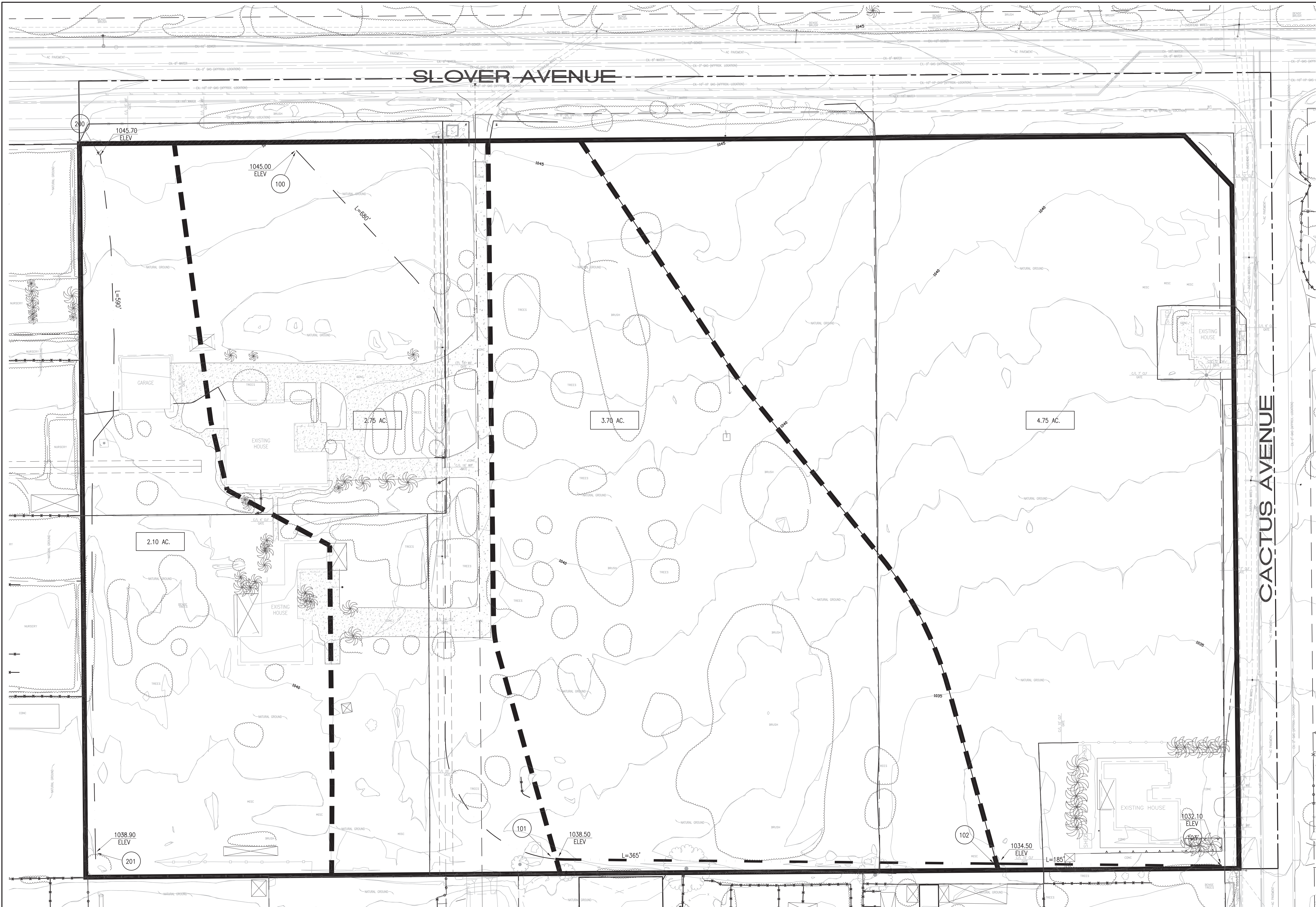
>>>> BASEWIDTH (FEET) = 8.02
FLOW TOP-WIDTH (FEET) = 8.02
FLOW AREA (SQUARE FEET) = 2.65
HYDRAULIC DEPTH (FEET) = 0.33
FLOW AVERAGE VELOCITY (FEET/SEC.) = 6.80
UNIFORM FROUDE NUMBER = 2.086
PRESSURE + MOMENTUM (POUNDS) = 264.48
AVERAGED VELOCITY HEAD (FEET) = 0.718
SPECIFIC ENERGY (FEET) = 1.048
=====

CRITICAL-DEPTH FLOW INFORMATION:

CRITICAL FLOW TOP-WIDTH (FEET) = 8.02
CRITICAL FLOW AREA (SQUARE FEET) = 4.31
CRITICAL FLOW HYDRAULIC DEPTH (FEET) = 0.54
CRITICAL FLOW AVERAGE VELOCITY (FEET/SEC.) = 4.17
CRITICAL DEPTH (FEET) = 0.54
CRITICAL FLOW PRESSURE + MOMENTUM (POUNDS) = 217.94
AVERAGED CRITICAL FLOW VELOCITY HEAD (FEET) = 0.271
CRITICAL FLOW SPECIFIC ENERGY (FEET) = 0.808
=====

SLOVER AVENUE

CACTUS AVENUE



LEGEND	
	PROJECT BOUNDARY
	SUBAREA BOUNDARY
	FLOWLINE
	SUBAREA AREA
	NODE NUMBER

PREPARED FOR:
ALERE PROPERTY GROUP, LLC.
100 BAYVIEW CIRCLE, SUITE 310
NEWPORT BEACH, CA 92660
PHONE: (949) 509-5000
FAX: (949) 509-5001

Tti Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14140 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH (714) 521-4811 FAX (714) 521-4133

COUNTY OF SAN BERNARDINO
PUBLIC WORKS DEPARTMENT
EXISTING HYDROLOGY MAP
ALERE SLOVER AND CACTUS
SAN BERNARDINO, CA.

Designed by _____	Approved by _____	Date _____
Checked by _____		
Date _____		
Designed by _____	Public Works Director _____	R.C.E. XXXXX
Date _____		
Checked by _____		
Date _____		
Sheet 1 of 1		Sheets

3569/1 OF 1 SHEET

Last Update: 6/11/18
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SLOVER AVENUE

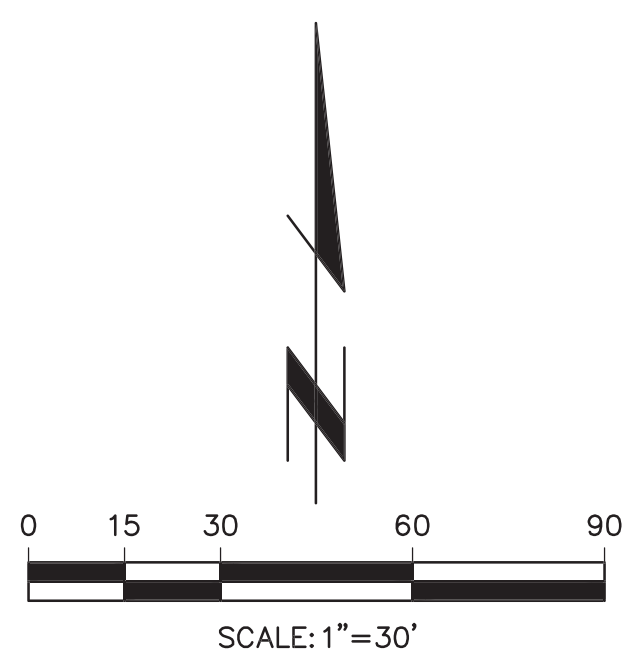
CACTUS AVENUE

Specify all INV elevations.

What is this connecting to?

Specify bottom elevation.

Specify spillway elevation.



LEGEND	
	PROJECT BOUNDARY
	SUBAREA BOUNDARY
	FLOWLINE
	SUBAREA AREA
	NODE NUMBER
	100 YEAR PONDING LIMITS

PREPARED FOR:
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COUNTY OF SAN BERNARDINO
PUBLIC WORKS DEPARTMENT
PROPOSED HYDROLOGY MAP
ALERE SLOVER AND CACTUS
SAN BERNARDINO, CA.

Designed by _____	Approved by _____	Date _____
Checked by _____		
Date _____		
Designed by _____	Public Works Director _____	R.C.E. XXXXX
Date _____		
Checked by _____		
Date _____		
Sheet 1 of 1		Sheets