

HYDROLOGY REPORT

County of San Bernardino

KISS Logistics Center

Hwy 395 and Phelan Road
APN: 3064-401-03, -04, -05

Prepared For:
City of Hesperia

Prepared By:
Alliance Land Planning & Engineering, Inc.
2248 Faraday Ave.
Carlsbad, CA 92008

June 2022
Job No. 2178



TABLE OF CONTENTS

PROJECT OVERVIEW	2
EXISTING CONDITION DRAINAGE	2
DEVELOPED CONDITION DRAINAGE	2
METHODOLOGY.....	2
RESULTS	3
HYDROMODIFICATION	4
FEMA FLOODPLAIN and HYDRAULIC ANALYSIS	4
CONCLUSION	4

LIST OF APPENDICES

- APPENDIX A – RAINFALL AND SOIL TYPE**
- APPENDIX B – RATIONAL METHOD MODEL OUTPUT**
- APPENDIX C – UNIT HYDROGRAPH MODEL OUTPUT**
- APPENDIX D – FEMA – FIRMETTE EXHIBIT**
- APPENDIX E – EXHIBITS**

PROJECT OVERVIEW

The KISS Logistics Center is a proposed commercial/industrial warehouse project in the City of Hesperia, San Bernardino County, California. The approximate 29.5 acre project site is located on the immediate west side of Hwy 395 just north of Phelan Road and is currently on undeveloped land. Some industrial development exists in the nearby areas as do additional undeveloped parcels of land. The project site lies within a sub-watershed of the Mojave River Basin at an approximate elevation of 3,550' above msl.

EXISTING CONDITION DRAINAGE

The current site is undeveloped and covered in sparse desert vegetation and scrub. Hydrologic soil conditions for the existing site are considered moderately good in terms of residual infiltration per the Type B soils that exist in the area. No significant land forms that indicate erosive activity are currently present on the site.

The project site is flat with a grade that slopes from south to north in a relatively uniform flat plane. No specific concentration points of discharge exist in general as flow mostly sheets toward the north until it reaches Yucca Terrace Road some 500' away.

Some run-on flow sheets onto the project site from the south but is limited by the Phelan Road some 300' away that acts a barrier to any flow further south.

DEVELOPED CONDITION DRAINAGE

The developed condition site will consist of a large industrial warehouse building some 650,000 sf in size. Asphalt parking lot will surround the building and an open water quality/detention basin will run linearly along the north boundary. Some offsite public improvements are required for this project of which will provide a new public road that provides primary and secondary access to the site along the west boundary.

Stormwater will be collected using a system of catch basins and roof drains that route flows to underground pipes. All stormwater will be conveyed to the water quality/detention basin at north end of the project prior to discharge beyond the project boundary. Prior to offsite discharge, flow will be treated for water quality per a WQMP that is provided separately for this project. There is no existing offsite public storm drain, or creek, in this area of Hesperia.

METHODOLOGY

Peak flowrates and runoff volumes for the 100-yr and the 10-yr for existing and developed conditions have been estimated per methods outlined in the County of San Bernardino Hydrology Manual via the rational method and the unit hydrograph method. Computer modeling using Civil Design software was used to calculate the values reported on the maps provided within this report.

A summary of hydrologic parameters are presented in the tables below:

EXISTING CONDITION HYDROLOGY PARAMETERS

Basin	Area (ac)	Hi	Low	Length	Soil Type	Land Use	SCS (II)
1A	6.6	61.5	49.5	650	A	POOR COVER	73
2A	6.4	49.5	37.5	740	A	POOR COVER	73
3A	7.3	60.0	43.0	910	A	POOR COVER	73
4B	9.2	56.5	40.0	920	A	POOR COVER	73
Total	29.5						

DEVELOPED CONDITION HYDROLOGY PARAMETERS

Basin	Area (ac)	Hi (ft)	Low (ft)	Length (ft)	Soil Type	Land Use	SCS (II)
1A	7.5	61	48.8	965	A	COMMERCIAL	32
2A	7.5	48.8	41.5	940	A	COMMERCIAL	32
3B	6.6	61.0	48.8	945	A	COMMERCIAL	32
4B	6.8	48.8	40.5	560	A	COMMERCIAL	32
5C							
Total	28.4						

RAINFALL DATA

	10-YR	100-YR
	in	in
1-HR	0.773	1.29
6-HR	1.76	2.99
100-HR	3.55	6.28

RESULTS

A summary of the existing and developed condition 100-yr peak flowrates and runoff volumes are provided below. Additional 10-yr model output files are provided in Appendix B and Appendix C.

RM PEAK FLOWRATE - 100-YR EVENT

	Existing	Developed
Basin	cfs	cfs
A	40.17	91.66
B	18.93	N/A
TOTAL	59.10	91.66

UH RUNOFF VOLUME - 100-YR EVENT

	Existing	Developed	Volume Required
	ac-ft	ac-ft	ac-ft
TOTAL	12.67	13.89	1.22

HYDROMODIFICATION

There is one above ground hydromod/water quality detention basin proposed for this project. This facility will capture the required hydromodification volume as calculated by taking the difference of the developed 100-yr runoff volume and the existing condition runoff volume and is represented per the “volume required” value shown in the tables above and below.

The ‘volume provided’ within the proposed detention basin is calculated by averaging the surface area of the ponding depth at top and the area of the basin footprint at bottom and then multiplying by the total ponding depth.

This basin will also serve a dual purpose for both hydromod storage and water quality treatment and a detailed discussion on the water quality aspects of this basin is provided in a separate WQMP for this project.

DETENTION BASIN SIZING

Area			Depth	Volume Provided		Volume Required	Surplus
Top (sf)	Bottom (sf)	Average (sf)	ft	cf	ac-ft	ac-ft	ac-ft
26,148	7,931	17,040	4	68,158	1.56	1.22	0.34

FEMA

This project site is shown to not be located within any existing FEMA floodplain and is Zone X since within City of Hesperia limits. Please see FIRMETTE exhibit in Appendix D of this report.

CONCLUSION

This project is considered acceptable for development from a hydrologic perspective. Given the proposed storage facilities to be utilized for stormwater detention, the developed condition project will return discharge levels to that of the existing condition.

APPENDIX A

RAINFALL

&

SOIL TYPE



NOAA Atlas 14, Volume 6, Version 2
Location name: Hesperia, California, USA*
Latitude: 34.4302°, Longitude: -117.4077°
Elevation: 3568.32 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	0.084 (0.070-0.103)	0.121 (0.100-0.148)	0.169 (0.139-0.207)	0.208 (0.170-0.257)	0.262 (0.207-0.335)	0.304 (0.235-0.397)	0.347 (0.262-0.464)	0.392 (0.288-0.539)	0.453 (0.319-0.650)	0.502 (0.341-0.745)
10-min	0.121 (0.100-0.148)	0.173 (0.143-0.212)	0.242 (0.199-0.296)	0.298 (0.244-0.369)	0.376 (0.297-0.480)	0.436 (0.337-0.569)	0.497 (0.376-0.665)	0.562 (0.413-0.772)	0.650 (0.458-0.932)	0.719 (0.489-1.07)
15-min	0.146 (0.121-0.178)	0.209 (0.173-0.256)	0.292 (0.241-0.358)	0.361 (0.295-0.446)	0.454 (0.359-0.580)	0.527 (0.408-0.688)	0.602 (0.454-0.804)	0.679 (0.499-0.934)	0.786 (0.554-1.13)	0.870 (0.592-1.29)
30-min	0.222 (0.184-0.271)	0.318 (0.263-0.388)	0.444 (0.366-0.544)	0.548 (0.448-0.677)	0.690 (0.545-0.881)	0.800 (0.620-1.04)	0.914 (0.690-1.22)	1.03 (0.758-1.42)	1.19 (0.841-1.71)	1.32 (0.899-1.96)
60-min	0.313 (0.259-0.382)	0.448 (0.371-0.548)	0.626 (0.516-0.768)	0.773 (0.632-0.955)	0.973 (0.769-1.24)	1.13 (0.874-1.47)	1.29 (0.974-1.72)	1.46 (1.07-2.00)	1.68 (1.19-2.41)	1.86 (1.27-2.77)
2-hr	0.456 (0.377-0.556)	0.619 (0.512-0.757)	0.841 (0.693-1.03)	1.03 (0.840-1.27)	1.29 (1.02-1.65)	1.50 (1.16-1.95)	1.71 (1.30-2.29)	1.95 (1.43-2.68)	2.27 (1.60-3.26)	2.53 (1.72-3.76)
3-hr	0.576 (0.476-0.703)	0.770 (0.636-0.941)	1.04 (0.854-1.27)	1.26 (1.03-1.56)	1.58 (1.25-2.02)	1.84 (1.42-2.40)	2.11 (1.60-2.82)	2.40 (1.77-3.31)	2.82 (1.99-4.04)	3.16 (2.15-4.69)
6-hr	0.814 (0.674-0.994)	1.08 (0.892-1.32)	1.45 (1.19-1.77)	1.76 (1.44-2.18)	2.22 (1.75-2.83)	2.59 (2.00-3.38)	2.99 (2.26-3.99)	3.42 (2.51-4.70)	4.04 (2.85-5.80)	4.56 (3.11-6.77)
12-hr	1.05 (0.872-1.29)	1.44 (1.19-1.76)	1.97 (1.63-2.42)	2.43 (1.99-3.00)	3.09 (2.44-3.95)	3.63 (2.81-4.74)	4.21 (3.18-5.63)	4.84 (3.56-6.66)	5.76 (4.06-8.25)	6.52 (4.43-9.67)
24-hr	1.43 (1.27-1.65)	2.03 (1.79-2.34)	2.85 (2.52-3.29)	3.55 (3.11-4.14)	4.57 (3.87-5.50)	5.40 (4.48-6.64)	6.28 (5.09-7.92)	7.25 (5.71-9.39)	8.64 (6.53-11.7)	9.79 (7.15-13.7)
2-day	1.63 (1.45-1.88)	2.30 (2.04-2.65)	3.24 (2.86-3.74)	4.05 (3.55-4.72)	5.23 (4.43-6.30)	6.21 (5.15-7.64)	7.27 (5.89-9.15)	8.42 (6.64-10.9)	10.1 (7.64-13.6)	11.5 (8.42-16.1)
3-day	1.75 (1.55-2.02)	2.46 (2.18-2.84)	3.46 (3.05-4.00)	4.33 (3.79-5.04)	5.60 (4.75-6.75)	6.66 (5.53-8.19)	7.81 (6.33-9.84)	9.08 (7.15-11.8)	10.9 (8.27-14.8)	12.5 (9.13-17.5)
4-day	1.89 (1.68-2.18)	2.65 (2.35-3.06)	3.72 (3.29-4.30)	4.65 (4.08-5.42)	6.03 (5.11-7.26)	7.17 (5.95-8.81)	8.40 (6.81-10.6)	9.77 (7.70-12.7)	11.8 (8.90-15.9)	13.5 (9.84-18.8)
7-day	2.12 (1.88-2.44)	2.94 (2.61-3.39)	4.09 (3.61-4.73)	5.10 (4.46-5.94)	6.56 (5.56-7.90)	7.78 (6.46-9.57)	9.10 (7.38-11.5)	10.6 (8.32-13.7)	12.7 (9.60-17.1)	14.5 (10.6-20.2)
10-day	2.27 (2.01-2.61)	3.14 (2.78-3.62)	4.34 (3.83-5.02)	5.39 (4.72-6.28)	6.91 (5.86-8.32)	8.18 (6.79-10.1)	9.54 (7.73-12.0)	11.1 (8.71-14.3)	13.2 (10.0-17.9)	15.1 (11.0-21.1)
20-day	2.74 (2.43-3.16)	3.76 (3.33-4.33)	5.17 (4.56-5.97)	6.38 (5.59-7.44)	8.15 (6.90-9.81)	9.60 (7.97-11.8)	11.2 (9.05-14.1)	12.9 (10.2-16.7)	15.4 (11.7-20.8)	17.5 (12.8-24.5)
30-day	3.24 (2.87-3.73)	4.41 (3.91-5.09)	6.02 (5.32-6.96)	7.41 (6.49-8.64)	9.42 (7.98-11.3)	11.1 (9.19-13.6)	12.9 (10.4-16.2)	14.8 (11.7-19.2)	17.7 (13.4-23.9)	20.2 (14.7-28.2)
45-day	3.86 (3.42-4.45)	5.18 (4.59-5.97)	7.00 (6.18-8.08)	8.55 (7.49-9.97)	10.8 (9.15-13.0)	12.7 (10.5-15.6)	14.7 (11.9-18.5)	16.9 (13.3-21.9)	20.1 (15.2-27.2)	22.9 (16.7-32.0)
60-day	4.40 (3.90-5.07)	5.81 (5.15-6.70)	7.75 (6.84-8.95)	9.40 (8.24-11.0)	11.8 (10.00-14.2)	13.8 (11.4-16.9)	15.9 (12.9-20.0)	18.3 (14.4-23.7)	21.8 (16.5-29.4)	24.8 (18.1-34.6)

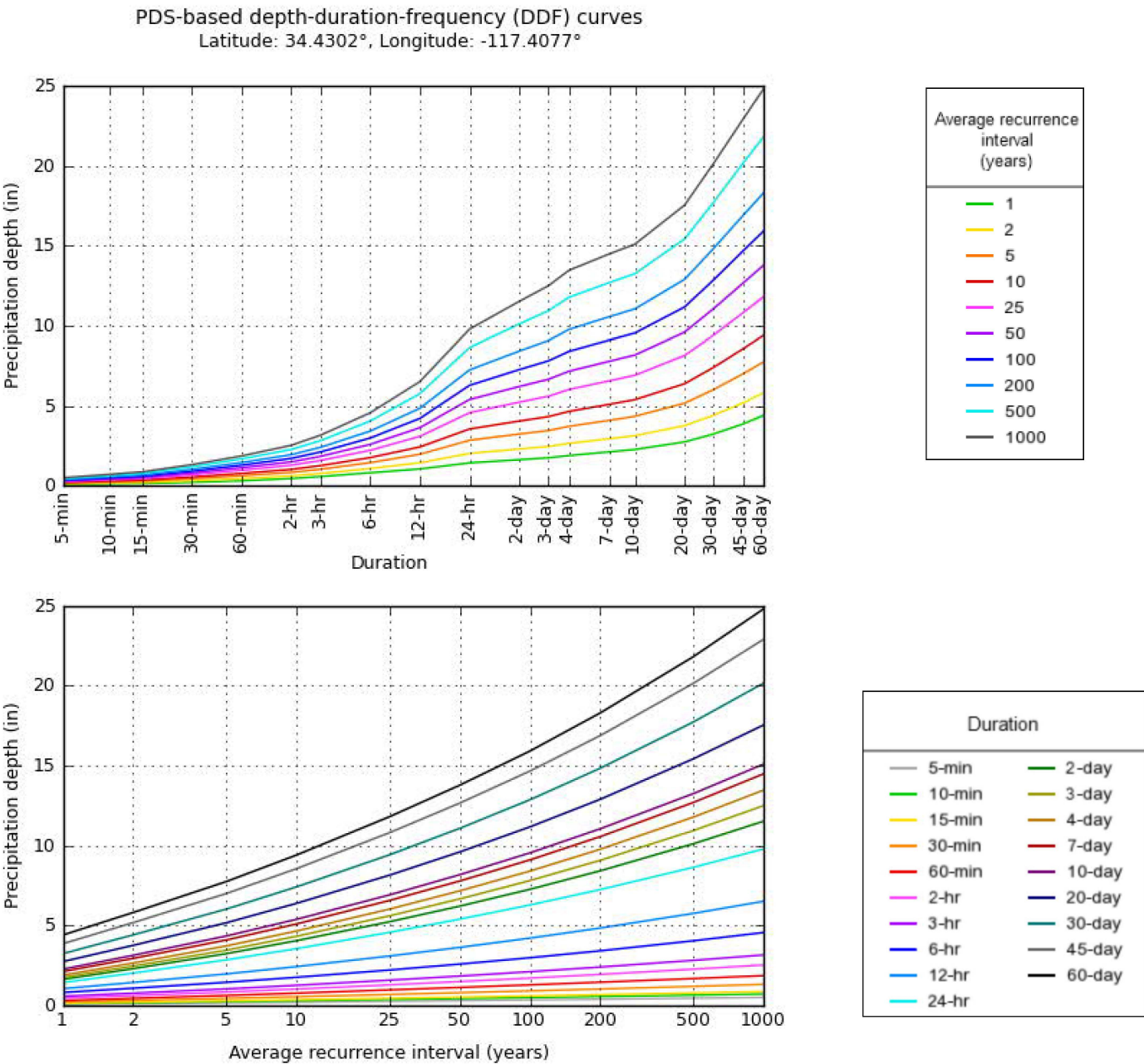
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

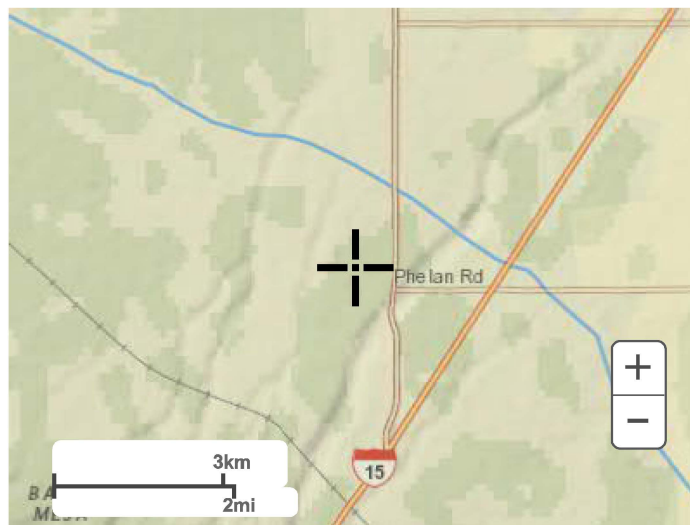
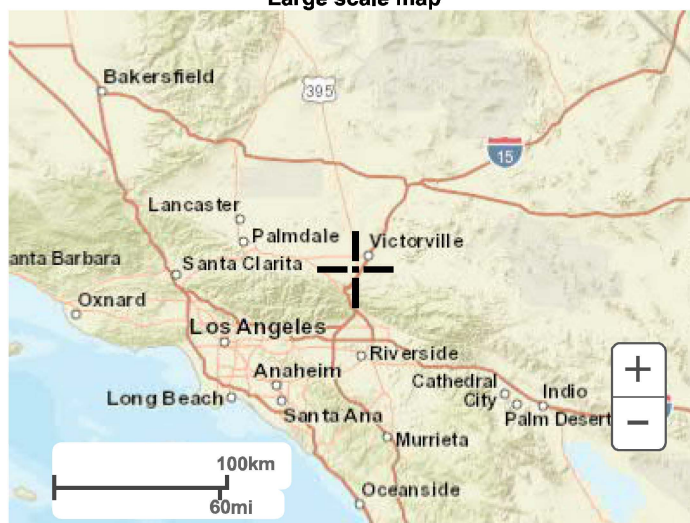
[Back to Top](#)

PF graphical



Maps & aerials

Small scale terrain

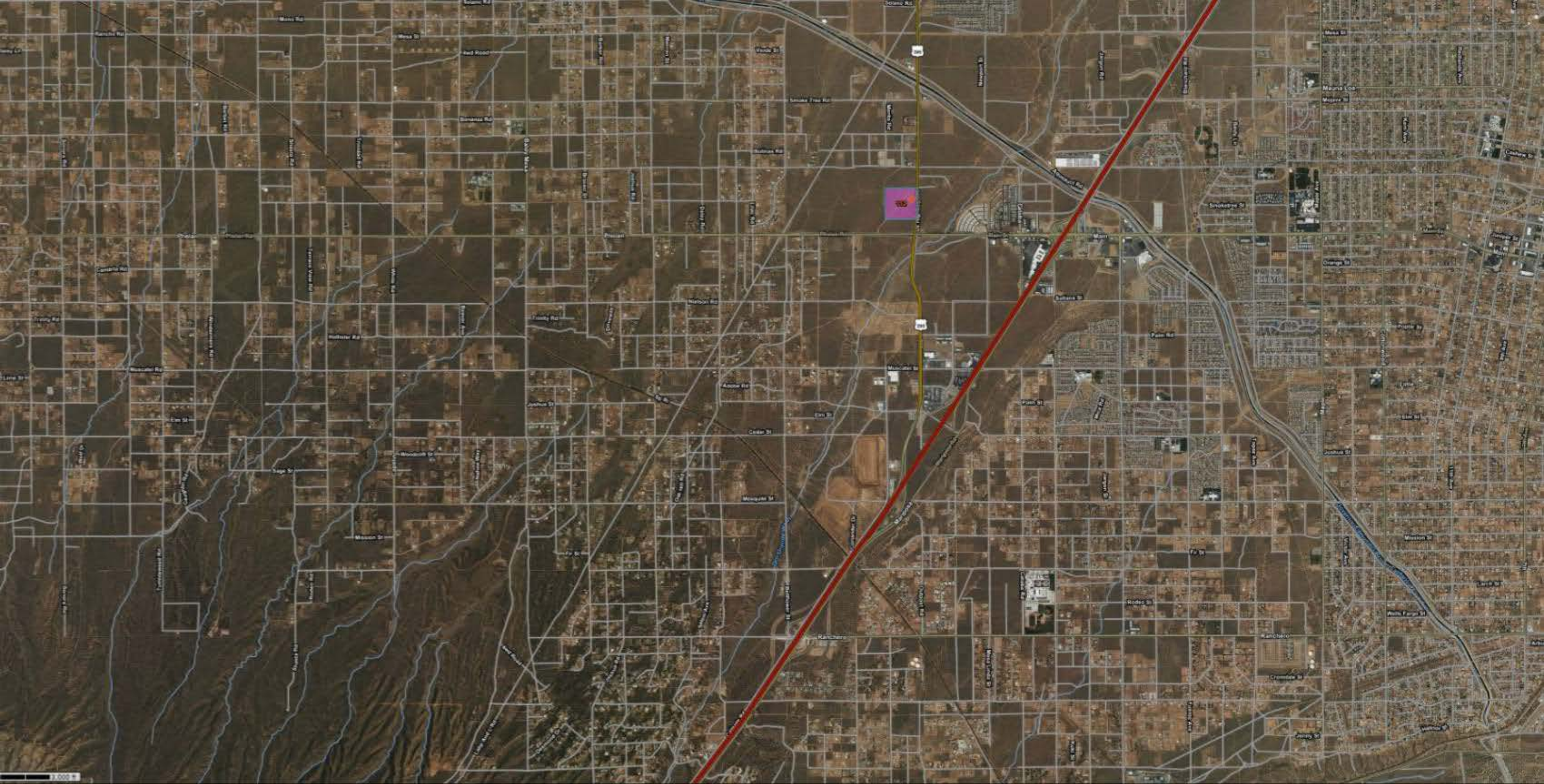
**Large scale terrain****Large scale map****Large scale aerial**



[Back to Top](#)

[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](#)



Hydrologic Soil Group — Summary By Map Unit

by Map Unit — San Bernardino County, California, Mojave River Area (CA671)

Summary by Map Unit — San Bernardino County, California, Mojave River Area (CA671)

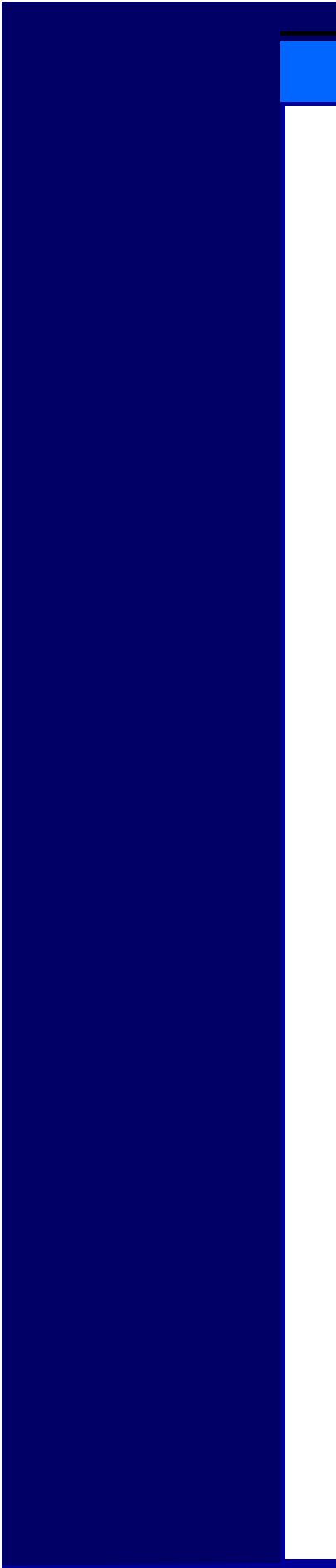
Map unit symbol	Map unit name	Rating	Acres in AOI
	CAJON SAND, 0 TO 2 PERCENT SLOPES	A	36.8
for Area of Interest			36.8

Hydrologic Soil Group

Soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.



APPENDIX B

RATIONAL METHOD MODEL OUTPUT

RATIONAL METHOD
10-YR EVENT
EXISTING AND DEVELOPED

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 7.2
Rational Hydrology Study Date: 06/14/22

HESPERIA 29
EXISTING CONDITION HYDROLOGY BASIN A
10-YR EVENT
ALPE

Program License Serial Number 6301

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.773 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 2

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

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 73.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.485(In/Hr)
Initial subarea data:
Initial area flow distance = 650.000(Ft.)
Top (of initial area) elevation = 61.500(Ft.)
Bottom (of initial area) elevation = 49.500(Ft.)
Difference in elevation = 12.000(Ft.)
Slope = 0.01846 s(%)= 1.85
 $TC = k(0.685)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 20.299 min.
Rainfall intensity = 1.651(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.635
Subarea runoff = 6.922(CFS)
Total initial stream area = 6.600(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.485(In/Hr)

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

Estimated mean flow rate at midpoint of channel = 0.000(CFS)
Depth of flow = 49890.125(Ft.), Average velocity = 1.696(Ft/s)
!!Warning: Water is above left or right bank elevations
***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.00
2	0.00	50.00

Manning's 'N' friction factor = 0.024

```
-----
Sub-Channel flow =      8.455(CFS)
'   '           flow top width =      0.000(Ft.)
'   '           velocity=      1.696(Ft/s)
'   '           area =      4.987(Sq.Ft)
'   '           Froude number =      0.001
```

Upstream point elevation = 49.500(Ft.)
 Downstream point elevation = 37.500(Ft.)
 Flow length = 740.000(Ft.)
 Travel time = 7.27 min.
 Time of concentration = 27.57 min.
 Depth of flow = 49890.125(Ft.)
 Average velocity = 1.696(Ft/s)
 Total irregular channel flow = 8.455(CFS)
 Irregular channel normal depth above invert elev. = 49890.125(Ft.)
 Average velocity of channel(s) = 1.696(Ft/s)
 !!Warning: Water is above left or right bank elevations
 Adding area flow to channel
 Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 73.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.485(In/Hr)
 Rainfall intensity = 1.332(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area, (total area with modified
 rational method)(Q=KCIA) is C = 0.572
 Subarea runoff = 2.986(CFS) for 6.400(Ac.)
 Total runoff = 9.909(CFS)
 Effective area this stream = 13.00(Ac.)
 Total Study Area (Main Stream No. 1) = 13.00(Ac.)
 Area averaged Fm value = 0.485(In/Hr)
 Depth of flow = 54869.000(Ft.), Average velocity = 1.807(Ft/s)
 !!Warning: Water is above left or right bank elevations

```
*****
Process from Point/Station      2.000 to Point/Station      3.000
**** CONFLUENCE OF MAIN STREAMS ****
```

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 13.000(Ac.)
 Runoff from this stream = 9.909(CFS)
 Time of concentration = 27.57 min.
 Rainfall intensity = 1.332(In/Hr)
 Area averaged loss rate (Fm) = 0.4852(In/Hr)
 Area averaged Pervious ratio (Ap) = 1.0000
 Program is now starting with Main Stream No. 2

```
*****
Process from Point/Station      4.000 to Point/Station      5.000
**** INITIAL AREA EVALUATION ****
```

Soil classification AP and SCS values input by user
 USER INPUT of soil data for subarea
 SCS curve number for soil(AMC 2) = 73.00
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.485(In/Hr)

Initial subarea data:
 Initial area flow distance = 910.000(Ft.)
 Top (of initial area) elevation = 60.000(Ft.)
 Bottom (of initial area) elevation = 43.000(Ft.)
 Difference in elevation = 17.000(Ft.)
 Slope = 0.01868 s(%)= 1.87
 $TC = k(0.685)*[(length^3)/(elevation\ change)]^{0.2}$
 Initial area time of concentration = 23.169 min.
 Rainfall intensity = 1.505(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.610
 Subarea runoff = 6.698(CFS)
 Total initial stream area = 7.300(Ac.)
 Pervious area fraction = 1.000
 Initial area Fm value = 0.485(In/Hr)

 Process from Point/Station 5.000 to Point/Station 3.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 29544.375(Ft.), Average velocity = 2.268(Ft/s)
 !!Warning: Water is above left or right bank elevations
 ***** Irregular Channel Data *****

 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.00
2	0.00	20.00

 Manning's 'N' friction factor = 0.024

Sub-Channel flow = 6.698(CFS)

'	'	flow top width = 0.000(Ft.)
'	'	velocity= 2.268(Ft/s)
'	'	area = 2.953(Sq.Ft)
'	'	Froude number = 0.002

Upstream point elevation = 43.000(Ft.)
 Downstream point elevation = 37.500(Ft.)
 Flow length = 320.000(Ft.)
 Travel time = 2.35 min.
 Time of concentration = 25.52 min.
 Depth of flow = 29544.375(Ft.)
 Average velocity = 2.268(Ft/s)
 Total irregular channel flow = 6.698(CFS)
 Irregular channel normal depth above invert elev. = 29544.375(Ft.)
 Average velocity of channel(s) = 2.268(Ft/s)
 !!Warning: Water is above left or right bank elevations

 Process from Point/Station 5.000 to Point/Station 3.000
 **** CONFLUENCE OF MAIN STREAMS ****

 The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 7.300(Ac.)
 Runoff from this stream = 6.698(CFS)
 Time of concentration = 25.52 min.
 Rainfall intensity = 1.406(In/Hr)
 Area averaged loss rate (Fm) = 0.4852(In/Hr)
 Area averaged Pervious ratio (Ap) = 1.0000
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
------------	-----------------	------------	----------	------------	----------------------------

1	9.91	13.000	27.57	0.485	1.332
2	6.70	7.300	25.52	0.485	1.406

Qmax(1) =

1.000 *	1.000 *	9.909) +	
0.920 *	1.000 *	6.698) + =	16.068

Qmax(2) =

1.088 *	0.926 *	9.909) +	
1.000 *	1.000 *	6.698) + =	16.672

Total of 2 main streams to confluence:

Flow rates before confluence point:

10.909	7.698
--------	-------

Maximum flow rates at confluence using above data:

16.068	16.672
--------	--------

Area of streams before confluence:

13.000	7.300
--------	-------

Effective area values after confluence:

20.300	19.332
--------	--------

Results of confluence:

Total flow rate = 16.672(CFS)

Time of concentration = 25.521 min.

Effective stream area after confluence = 19.332(Ac.)

Study area average Pervious fraction(Ap) = 1.000

Study area average soil loss rate(Fm) = 0.485(In/Hr)

Study area total = 20.30(Ac.)

End of computations, Total Study Area = 20.30 (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 = 73.0

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 7.2
Rational Hydrology Study Date: 06/14/22

HESPERIA 29
EXISTING CONDITION HYDROLOGY BASIN B
10-YR EVENT
ALPE

Program License Serial Number 6301

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.773 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 2

+++++
Process from Point/Station 6.000 to Point/Station 7.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 73.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.485(In/Hr)
Initial subarea data:
Initial area flow distance = 920.000(Ft.)
Top (of initial area) elevation = 56.500(Ft.)
Bottom (of initial area) elevation = 40.000(Ft.)
Difference in elevation = 16.500(Ft.)
Slope = 0.01793 s(%)= 1.79
 $TC = k(0.685)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 23.461 min.
Rainfall intensity = 1.492(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.607
Subarea runoff = 8.332(CFS)
Total initial stream area = 9.200(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.485(In/Hr)
End of computations, Total Study Area = 9.20 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number = 73.0

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 7.2
Rational Hydrology Study Date: 06/14/22

HESPERIA 29
DEVELOPED CONDITION HYDROLOGY
10-YR EVENT
ALPE

Program License Serial Number 6301

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.773 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 2

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

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 965.000(Ft.)
Top (of initial area) elevation = 61.000(Ft.)
Bottom (of initial area) elevation = 48.800(Ft.)
Difference in elevation = 12.200(Ft.)
Slope = 0.01264 s(%)= 1.26
 $TC = k(0.304)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 11.385 min.
Rainfall intensity = 2.474(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.864
Subarea runoff = 16.042(CFS)
Total initial stream area = 7.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)

+++++
Process from Point/Station 2.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 48.800(Ft.)
Downstream point/station elevation = 41.500(Ft.)
Pipe length = 940.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 16.042(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 16.042(CFS)
Normal flow depth in pipe = 16.31(In.)
Flow top width inside pipe = 22.40(In.)
Critical Depth = 17.33(In.)
Pipe flow velocity = 7.06(Ft/s)
Travel time through pipe = 2.22 min.
Time of concentration (TC) = 13.60 min.

+++++
Process from Point/Station 2.000 to Point/Station 3.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Time of concentration = 13.60 min.
Rainfall intensity = 2.184(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area, (total area with modified
rational method)(Q=KCIA) is C = 0.860
Subarea runoff = 12.126(CFS) for 7.500(Ac.)
Total runoff = 28.168(CFS)
Effective area this stream = 15.00(Ac.)
Total Study Area (Main Stream No. 1) = 15.00(Ac.)
Area averaged Fm value = 0.098(In/Hr)

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

Upstream point elevation = 41.500(Ft.)
Downstream point elevation = 40.500(Ft.)
Channel length thru subarea = 510.000(Ft.)
Channel base width = 5.000(Ft.)
Slope or 'Z' of left channel bank = 2.000
Slope or 'Z' of right channel bank = 2.000
Manning's 'N' = 0.025
Maximum depth of channel = 6.000(Ft.)
Flow(q) thru subarea = 28.168(CFS)
Depth of flow = 1.400(Ft.), Average velocity = 2.579(Ft/s)
Channel flow top width = 10.601(Ft.)
Flow Velocity = 2.58(Ft/s)
Travel time = 3.30 min.
Time of concentration = 16.90 min.
Critical depth = 0.875(Ft.)

+++++
Process from Point/Station 3.000 to Point/Station 4.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 15.000(Ac.)
Runoff from this stream = 28.168(CFS)

Time of concentration = 16.90 min.
Rainfall intensity = 1.877(In/Hr)
Area averaged loss rate (Fm) = 0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 2

+++++
Process from Point/Station 5.000 to Point/Station 6.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 945.000(Ft.)
Top (of initial area) elevation = 61.000(Ft.)
Bottom (of initial area) elevation = 48.800(Ft.)
Difference in elevation = 12.200(Ft.)
Slope = 0.01291 s(%)= 1.29
TC = $k(0.304)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 11.242 min.
Rainfall intensity = 2.496(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.865
Subarea runoff = 14.247(CFS)
Total initial stream area = 6.600(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.098(In/Hr)

+++++
Process from Point/Station 6.000 to Point/Station 4.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 48.800(Ft.)
Downstream point/station elevation = 40.500(Ft.)
Pipe length = 560.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 14.247(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 14.247(CFS)
Normal flow depth in pipe = 13.43(In.)
Flow top width inside pipe = 20.17(In.)
Critical Depth = 16.82(In.)
Pipe flow velocity = 8.78(Ft/s)
Travel time through pipe = 1.06 min.
Time of concentration (TC) = 12.31 min.

+++++
Process from Point/Station 6.000 to Point/Station 4.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00

Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
 Time of concentration = 12.31 min.
 Rainfall intensity = 2.343(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area, (total area with modified
 rational method)(Q=KCIA) is C = 0.862
 Subarea runoff = 12.833(CFS) for 6.800(Ac.)
 Total runoff = 27.079(CFS)
 Effective area this stream = 13.40(Ac.)
 Total Study Area (Main Stream No. 2) = 28.40(Ac.)
 Area averaged Fm value = 0.098(In/Hr)

++++++
 Process from Point/Station 6.000 to Point/Station 4.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 13.400(Ac.)
 Runoff from this stream = 27.079(CFS)
 Time of concentration = 12.31 min.
 Rainfall intensity = 2.343(In/Hr)
 Area averaged loss rate (Fm) = 0.0978(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.1000
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	28.17	15.000	16.90	0.098	1.877
2	27.08	13.400	12.31	0.098	2.343

Qmax(1) =
 1.000 * 1.000 * 28.168) +
 0.792 * 1.000 * 27.079) + = 49.620
 Qmax(2) =
 1.262 * 0.728 * 28.168) +
 1.000 * 1.000 * 27.079) + = 52.971

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 29.168 28.079
 Maximum flow rates at confluence using above data:
 49.620 52.971
 Area of streams before confluence:
 15.000 13.400
 Effective area values after confluence:
 28.400 24.322

Results of confluence:
 Total flow rate = 52.971(CFS)
 Time of concentration = 12.306 min.
 Effective stream area after confluence = 24.322(Ac.)
 Study area average Pervious fraction(Ap) = 0.100
 Study area average soil loss rate(Fm) = 0.098(In/Hr)
 Study area total = 28.40(Ac.)

++++++
 Process from Point/Station 4.000 to Point/Station 7.000
 **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 40.500(Ft.)
Downstream point/station elevation = 37.500(Ft.)
Pipe length = 86.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 52.971(CFS)
Nearest computed pipe diameter = 27.00(In.)
Calculated individual pipe flow = 52.971(CFS)
Normal flow depth in pipe = 20.32(In.)
Flow top width inside pipe = 23.30(In.)
Critical depth could not be calculated.
Pipe flow velocity = 16.50(Ft/s)
Travel time through pipe = 0.09 min.
Time of concentration (TC) = 12.39 min.
End of computations, Total Study Area = 28.40 (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(A_p) = 0.100
Area averaged SCS curve number = 32.0

RATIONAL METHOD
100-YR EVENT
EXISTING AND DEVELOPED

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 7.2
Rational Hydrology Study Date: 06/14/22

HESPERIA 29
EXISTING CONDITION HYDROLOGY BASIN A
100-YR EVENT
ALPE

Program License Serial Number 6301

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.290 (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 ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 73.00
Adjusted SCS curve number for AMC 3 = 89.40
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.203(In/Hr)
Initial subarea data:
Initial area flow distance = 650.000(Ft.)
Top (of initial area) elevation = 61.500(Ft.)
Bottom (of initial area) elevation = 49.500(Ft.)
Difference in elevation = 12.000(Ft.)
Slope = 0.01846 s(%)= 1.85
 $TC = k(0.685)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 20.299 min.
Rainfall intensity = 2.755(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.834
Subarea runoff = 15.154(CFS)
Total initial stream area = 6.600(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.203(In/Hr)

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

Estimated mean flow rate at midpoint of channel = 0.000(CFS)
Depth of flow = 84093.375(Ft.), Average velocity = 2.402(Ft/s)
!!Warning: Water is above left or right bank elevations
***** Irregular Channel Data *****

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.00
2	0.00	50.00

Manning's 'N' friction factor = 0.024

Sub-Channel flow = 20.192(CFS)
' ' flow top width = 0.000(Ft.)
' ' velocity= 2.402(Ft/s)
' ' area = 8.407(Sq.Ft)
' ' Froude number = 0.001

Upstream point elevation = 49.500(Ft.)
Downstream point elevation = 37.500(Ft.)
Flow length = 740.000(Ft.)
Travel time = 5.13 min.
Time of concentration = 25.43 min.
Depth of flow = 84093.375(Ft.)
Average velocity = 2.402(Ft/s)
Total irregular channel flow = 20.192(CFS)
Irregular channel normal depth above invert elev. = 84093.375(Ft.)
Average velocity of channel(s) = 2.402(Ft/s)
!!Warning: Water is above left or right bank elevations
Adding area flow to channel
Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 73.00
Adjusted SCS curve number for AMC 3 = 89.40
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.203(In/Hr)
Rainfall intensity = 2.352(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area, (total area with modified
rational method)(Q=KCIA) is C = 0.822
Subarea runoff = 9.989(CFS) for 6.400(Ac.)
Total runoff = 25.143(CFS)
Effective area this stream = 13.00(Ac.)
Total Study Area (Main Stream No. 1) = 13.00(Ac.)
Area averaged Fm value = 0.203(In/Hr)
Depth of flow = 95913.125(Ft.), Average velocity = 2.622(Ft/s)
!!Warning: Water is above left or right bank elevations

+++++
Process from Point/Station 2.000 to Point/Station 3.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 13.000(Ac.)
Runoff from this stream = 25.143(CFS)
Time of concentration = 25.43 min.
Rainfall intensity = 2.352(In/Hr)
Area averaged loss rate (Fm) = 0.2034(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Program is now starting with Main Stream No. 2

+++++
Process from Point/Station 4.000 to Point/Station 5.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea

SCS curve number for soil(AMC 2) = 73.00
Adjusted SCS curve number for AMC 3 = 89.40
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.203(In/Hr)
Initial subarea data:
Initial area flow distance = 910.000(Ft.)
Top (of initial area) elevation = 60.000(Ft.)
Bottom (of initial area) elevation = 43.000(Ft.)
Difference in elevation = 17.000(Ft.)
Slope = 0.01868 s(%)= 1.87
 $TC = k(0.685)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 23.169 min.
Rainfall intensity = 2.511(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.827
Subarea runoff = 15.161(CFS)
Total initial stream area = 7.300(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.203(In/Hr)

Process from Point/Station 5.000 to Point/Station 3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 48227.750(Ft.), Average velocity = 3.144(Ft/s)
!!Warning: Water is above left or right bank elevations
***** Irregular Channel Data *****

Information entered for subchannel number 1 :
Point number 'X' coordinate 'Y' coordinate
1 0.00 0.00
2 0.00 20.00
Manning's 'N' friction factor = 0.024

Sub-Channel flow = 15.161(CFS)
' ' flow top width = 0.000(Ft.)
' ' velocity= 3.144(Ft/s)
' ' area = 4.822(Sq.Ft)
' ' Froude number = 0.003

Upstream point elevation = 43.000(Ft.)
Downstream point elevation = 37.500(Ft.)
Flow length = 320.000(Ft.)
Travel time = 1.70 min.
Time of concentration = 24.87 min.
Depth of flow = 48227.750(Ft.)
Average velocity = 3.144(Ft/s)
Total irregular channel flow = 15.161(CFS)
Irregular channel normal depth above invert elev. = 48227.750(Ft.)
Average velocity of channel(s) = 3.144(Ft/s)
!!Warning: Water is above left or right bank elevations

Process from Point/Station 5.000 to Point/Station 3.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 7.300(Ac.)
Runoff from this stream = 15.161(CFS)
Time of concentration = 24.87 min.
Rainfall intensity = 2.390(In/Hr)

Area averaged loss rate (Fm) = 0.2034(In/Hr)

Area averaged Pervious ratio (Ap) = 1.0000

Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
------------	-----------------	------------	----------	------------	----------------------------

1	25.14	13.000	25.43	0.203	2.352
---	-------	--------	-------	-------	-------

2	15.16	7.300	24.87	0.203	2.390
---	-------	-------	-------	-------	-------

Qmax(1) =

1.000 * 1.000 * 25.143) +
0.983 * 1.000 * 15.161) + = 40.044

Qmax(2) =

1.017 * 0.978 * 25.143) +
1.000 * 1.000 * 15.161) + = 40.171

Total of 2 main streams to confluence:

Flow rates before confluence point:

26.143 16.161

Maximum flow rates at confluence using above data:

40.044 40.171

Area of streams before confluence:

13.000 7.300

Effective area values after confluence:

20.300 20.009

Results of confluence:

Total flow rate = 40.171(CFS)

Time of concentration = 24.865 min.

Effective stream area after confluence = 20.009(Ac.)

Study area average Pervious fraction(Ap) = 1.000

Study area average soil loss rate(Fm) = 0.203(In/Hr)

Study area total = 20.30(Ac.)

End of computations, Total Study Area = 20.30 (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 = 73.0

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 7.2
Rational Hydrology Study Date: 06/14/22

HESPERIA 29
EXISTING CONDITION HYDROLOGY BASIN B
100-YR EVENT
ALPE

Program License Serial Number 6301

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.290 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 3

+++++
Process from Point/Station 6.000 to Point/Station 7.000
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 73.00
Adjusted SCS curve number for AMC 3 = 89.40
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.203(In/Hr)
Initial subarea data:
Initial area flow distance = 920.000(Ft.)
Top (of initial area) elevation = 56.500(Ft.)
Bottom (of initial area) elevation = 40.000(Ft.)
Difference in elevation = 16.500(Ft.)
Slope = 0.01793 s(%)= 1.79
 $TC = k(0.685)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 23.461 min.
Rainfall intensity = 2.489(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.826
Subarea runoff = 18.926(CFS)
Total initial stream area = 9.200(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.203(In/Hr)
End of computations, Total Study Area = 9.20 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number = 73.0

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 7.2
Rational Hydrology Study Date: 06/14/22

HESPERIA 29
DEVELOPED CONDITION HYDROLOGY
100-YR EVENT
ALPE

Program License Serial Number 6301

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.290 (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 = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
Initial subarea data:
Initial area flow distance = 965.000(Ft.)
Top (of initial area) elevation = 61.000(Ft.)
Bottom (of initial area) elevation = 48.800(Ft.)
Difference in elevation = 12.200(Ft.)
Slope = 0.01264 s(%)= 1.26
 $TC = k(0.304)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 11.385 min.
Rainfall intensity = 4.129(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.883
Subarea runoff = 27.343(CFS)
Total initial stream area = 7.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.079(In/Hr)

+++++
Process from Point/Station 2.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 48.800(Ft.)
Downstream point/station elevation = 41.500(Ft.)

Pipe length = 940.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 27.343(CFS)
Nearest computed pipe diameter = 30.00(In.)
Calculated individual pipe flow = 27.343(CFS)
Normal flow depth in pipe = 19.50(In.)
Flow top width inside pipe = 28.62(In.)
Critical Depth = 21.40(In.)
Pipe flow velocity = 8.09(Ft/s)
Travel time through pipe = 1.94 min.
Time of concentration (TC) = 13.32 min.

+++++
Process from Point/Station 2.000 to Point/Station 3.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
Time of concentration = 13.32 min.
Rainfall intensity = 3.699(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area, (total area with modified
rational method)(Q=KCIA) is C = 0.881
Subarea runoff = 21.541(CFS) for 7.500(Ac.)
Total runoff = 48.883(CFS)
Effective area this stream = 15.00(Ac.)
Total Study Area (Main Stream No. 1) = 15.00(Ac.)
Area averaged Fm value = 0.079(In/Hr)

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

Upstream point elevation = 41.500(Ft.)
Downstream point elevation = 40.500(Ft.)
Channel length thru subarea = 510.000(Ft.)
Channel base width = 5.000(Ft.)
Slope or 'Z' of left channel bank = 2.000
Slope or 'Z' of right channel bank = 2.000
Manning's 'N' = 0.025
Maximum depth of channel = 6.000(Ft.)
Flow(q) thru subarea = 48.883(CFS)
Depth of flow = 1.864(Ft.), Average velocity = 3.005(Ft/s)
Channel flow top width = 12.456(Ft.)
Flow Velocity = 3.00(Ft/s)
Travel time = 2.83 min.
Time of concentration = 16.15 min.
Critical depth = 1.219(Ft.)

+++++
Process from Point/Station 3.000 to Point/Station 4.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1

Stream flow area = 15.000(Ac.)
Runoff from this stream = 48.883(CFS)
Time of concentration = 16.15 min.
Rainfall intensity = 3.233(In/Hr)
Area averaged loss rate (Fm) = 0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 2

+++++
Process from Point/Station 5.000 to Point/Station 6.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
Initial subarea data:
Initial area flow distance = 945.000(Ft.)
Top (of initial area) elevation = 61.000(Ft.)
Bottom (of initial area) elevation = 48.800(Ft.)
Difference in elevation = 12.200(Ft.)
Slope = 0.01291 s(%)= 1.29
TC = $k(0.304)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 11.242 min.
Rainfall intensity = 4.166(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.883
Subarea runoff = 24.278(CFS)
Total initial stream area = 6.600(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.079(In/Hr)

+++++
Process from Point/Station 6.000 to Point/Station 4.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 48.800(Ft.)
Downstream point/station elevation = 40.500(Ft.)
Pipe length = 560.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 24.278(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 24.278(CFS)
Normal flow depth in pipe = 17.48(In.)
Flow top width inside pipe = 21.35(In.)
Critical Depth = 20.91(In.)
Pipe flow velocity = 9.89(Ft/s)
Travel time through pipe = 0.94 min.
Time of concentration (TC) = 12.19 min.

+++++
Process from Point/Station 6.000 to Point/Station 4.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 0.000
 SCS curve number for soil(AMC 2) = 32.00
 Adjusted SCS curve number for AMC 3 = 52.00
 Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
 Time of concentration = 12.19 min.
 Rainfall intensity = 3.937(In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area,(total area with modified
 rational method)(Q=KCIA) is C = 0.882
 Subarea runoff = 22.258(CFS) for 6.800(Ac.)
 Total runoff = 46.537(CFS)
 Effective area this stream = 13.40(Ac.)
 Total Study Area (Main Stream No. 2) = 28.40(Ac.)
 Area averaged Fm value = 0.079(In/Hr)

++++++
 Process from Point/Station 6.000 to Point/Station 4.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 13.400(Ac.)
 Runoff from this stream = 46.537(CFS)
 Time of concentration = 12.19 min.
 Rainfall intensity = 3.937(In/Hr)
 Area averaged loss rate (Fm) = 0.0785(In/Hr)
 Area averaged Pervious ratio (Ap) = 0.1000
 Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
------------	-----------------	------------	----------	------------	----------------------------

1	48.88	15.000	16.15	0.079	3.233
2	46.54	13.400	12.19	0.079	3.937

Qmax(1) =
 1.000 * 1.000 * 48.883) +
 0.817 * 1.000 * 46.537) + = 86.926
 Qmax(2) =
 1.223 * 0.755 * 48.883) +
 1.000 * 1.000 * 46.537) + = 91.660

Total of 2 main streams to confluence:

Flow rates before confluence point:

49.883 47.537

Maximum flow rates at confluence using above data:

86.926 91.660

Area of streams before confluence:

15.000 13.400

Effective area values after confluence:

28.400 24.719

Results of confluence:

Total flow rate = 91.660(CFS)

Time of concentration = 12.186 min.

Effective stream area after confluence = 24.719(Ac.)

Study area average Pervious fraction(Ap) = 0.100

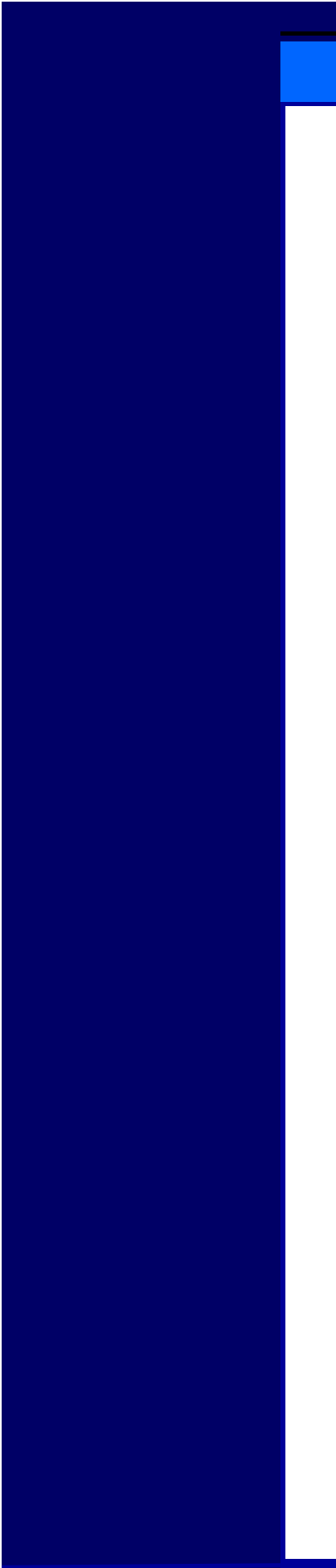
Study area average soil loss rate(Fm) = 0.079(In/Hr)

Study area total = 28.40(Ac.)

+++++
Process from Point/Station 4.000 to Point/Station 7.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 40.500(Ft.)
Downstream point/station elevation = 37.500(Ft.)
Pipe length = 86.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 91.660(CFS)
Nearest computed pipe diameter = 33.00(In.)
Calculated individual pipe flow = 91.660(CFS)
Normal flow depth in pipe = 25.13(In.)
Flow top width inside pipe = 28.13(In.)
Critical depth could not be calculated.
Pipe flow velocity = 18.89(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 12.26 min.
End of computations, Total Study Area = 28.40 (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(A_p) = 0.100
Area averaged SCS curve number = 32.0



APPENDIX C

UNIT HYDROGRAPH METHOD MODEL OUTPUT

UNIT HYDROGRAPH METHOD
100-YR EVENT
EXISTING AND DEVELOPED

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

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2012, Version 7.1

Study date 06/14/22

+++++

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

Program License Serial Number 6301

HESPERIA 29
EXISTING CONDITION HYDROLOGY
100-YR EVENT
ALPE

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 100		
29.50	1	1.29

Rainfall data for year 100		
29.50	6	2.99

Rainfall data for year 100		
29.50	24	6.28

+++++
***** 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)
73.0	89.4	29.50	1.000	0.203	1.000	0.203

Area-averaged adjusted loss rate Fm (In/Hr) = 0.203

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
29.50	1.000	73.0	89.4	1.19	0.804

Area-averaged catchment yield fraction, Y = 0.804

Area-averaged low loss fraction, Yb = 0.196

+++++

Watercourse length = 1390.00(Ft.)

Length from concentration point to centroid = 780.00(Ft.)

Elevation difference along watercourse = 24.00(Ft.)

Mannings friction factor along watercourse = 0.020

Watershed area = 29.50(Ac.)

Catchment Lag time = 0.059 hours

Unit interval = 5.000 minutes

Unit interval percentage of lag time = 140.5418

Hydrograph baseflow = 0.00(CFS)

Average maximum watershed loss rate(Fm) = 0.203(In/Hr)

Average low loss rate fraction (Yb) = 0.196 (decimal)

DESERT S-Graph Selected

Computed peak 5-minute rainfall = 0.612(In)

Computed peak 30-minute rainfall = 1.048(In)

Specified peak 1-hour rainfall = 1.290(In)

Computed peak 3-hour rainfall = 2.160(In)

Specified peak 6-hour rainfall = 2.990(In)

Specified peak 24-hour rainfall = 6.280(In)

Rainfall depth area reduction factors:

Using a total area of 29.50(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.611(In)

30-minute factor = 0.999 Adjusted rainfall = 1.046(In)

1-hour factor = 0.999 Adjusted rainfall = 1.288(In)

3-hour factor = 1.000 Adjusted rainfall = 2.160(In)

6-hour factor = 1.000 Adjusted rainfall = 2.990(In)

24-hour factor = 1.000 Adjusted rainfall = 6.280(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 = 356.77 (CFS))

1	29.285	104.480
2	78.722	176.374
3	91.429	45.335
4	96.552	18.276
5	98.699	7.660
6	100.000	4.640

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
---------------------	--------------------------------	-----------------------

1	0.6113	0.6113
2	0.7526	0.1413
3	0.8499	0.0973
4	0.9265	0.0766
5	0.9907	0.0641
6	1.0464	0.0557
7	1.0959	0.0495
8	1.1407	0.0448

9	1.1817	0.0410
10	1.2196	0.0379
11	1.2550	0.0354
12	1.2882	0.0332
13	1.3376	0.0494
14	1.3851	0.0474
15	1.4307	0.0457
16	1.4748	0.0441
17	1.5175	0.0427
18	1.5588	0.0413
19	1.5990	0.0401
20	1.6380	0.0390
21	1.6760	0.0380
22	1.7131	0.0371
23	1.7493	0.0362
24	1.7846	0.0354
25	1.8192	0.0346
26	1.8531	0.0339
27	1.8863	0.0332
28	1.9188	0.0325
29	1.9508	0.0319
30	1.9821	0.0313
31	2.0129	0.0308
32	2.0432	0.0303
33	2.0730	0.0298
34	2.1023	0.0293
35	2.1311	0.0289
36	2.1595	0.0284
37	2.1875	0.0279
38	2.2150	0.0275
39	2.2422	0.0272
40	2.2690	0.0268
41	2.2955	0.0264
42	2.3216	0.0261
43	2.3473	0.0258
44	2.3728	0.0255
45	2.3980	0.0252
46	2.4228	0.0249
47	2.4474	0.0246
48	2.4717	0.0243
49	2.4957	0.0240
50	2.5195	0.0238
51	2.5430	0.0235
52	2.5663	0.0233
53	2.5893	0.0230
54	2.6122	0.0228
55	2.6347	0.0226
56	2.6571	0.0224
57	2.6793	0.0222
58	2.7012	0.0220
59	2.7230	0.0218
60	2.7446	0.0216
61	2.7659	0.0214
62	2.7871	0.0212
63	2.8081	0.0210
64	2.8290	0.0208
65	2.8496	0.0207
66	2.8701	0.0205
67	2.8904	0.0203
68	2.9106	0.0202
69	2.9306	0.0200
70	2.9505	0.0199

71	2.9702	0.0197
72	2.9897	0.0196
73	3.0119	0.0222
74	3.0339	0.0220
75	3.0558	0.0219
76	3.0775	0.0217
77	3.0991	0.0216
78	3.1206	0.0215
79	3.1420	0.0214
80	3.1632	0.0212
81	3.1843	0.0211
82	3.2053	0.0210
83	3.2262	0.0209
84	3.2469	0.0208
85	3.2676	0.0206
86	3.2881	0.0205
87	3.3085	0.0204
88	3.3288	0.0203
89	3.3490	0.0202
90	3.3691	0.0201
91	3.3891	0.0200
92	3.4090	0.0199
93	3.4287	0.0198
94	3.4484	0.0197
95	3.4680	0.0196
96	3.4875	0.0195
97	3.5069	0.0194
98	3.5262	0.0193
99	3.5455	0.0192
100	3.5646	0.0191
101	3.5836	0.0190
102	3.6026	0.0190
103	3.6214	0.0189
104	3.6402	0.0188
105	3.6589	0.0187
106	3.6775	0.0186
107	3.6961	0.0185
108	3.7145	0.0185
109	3.7329	0.0184
110	3.7512	0.0183
111	3.7694	0.0182
112	3.7875	0.0181
113	3.8056	0.0181
114	3.8236	0.0180
115	3.8415	0.0179
116	3.8594	0.0178
117	3.8771	0.0178
118	3.8948	0.0177
119	3.9125	0.0176
120	3.9300	0.0176
121	3.9475	0.0175
122	3.9650	0.0174
123	3.9823	0.0174
124	3.9996	0.0173
125	4.0169	0.0172
126	4.0341	0.0172
127	4.0512	0.0171
128	4.0682	0.0170
129	4.0852	0.0170
130	4.1021	0.0169
131	4.1190	0.0169
132	4.1358	0.0168

133	4.1525	0.0167
134	4.1692	0.0167
135	4.1858	0.0166
136	4.2024	0.0166
137	4.2189	0.0165
138	4.2354	0.0165
139	4.2518	0.0164
140	4.2681	0.0163
141	4.2844	0.0163
142	4.3007	0.0162
143	4.3169	0.0162
144	4.3330	0.0161
145	4.3491	0.0161
146	4.3651	0.0160
147	4.3811	0.0160
148	4.3970	0.0159
149	4.4129	0.0159
150	4.4287	0.0158
151	4.4445	0.0158
152	4.4602	0.0157
153	4.4759	0.0157
154	4.4916	0.0156
155	4.5072	0.0156
156	4.5227	0.0155
157	4.5382	0.0155
158	4.5536	0.0155
159	4.5691	0.0154
160	4.5844	0.0154
161	4.5997	0.0153
162	4.6150	0.0153
163	4.6302	0.0152
164	4.6454	0.0152
165	4.6606	0.0151
166	4.6757	0.0151
167	4.6907	0.0151
168	4.7057	0.0150
169	4.7207	0.0150
170	4.7356	0.0149
171	4.7505	0.0149
172	4.7654	0.0149
173	4.7802	0.0148
174	4.7950	0.0148
175	4.8097	0.0147
176	4.8244	0.0147
177	4.8391	0.0147
178	4.8537	0.0146
179	4.8682	0.0146
180	4.8828	0.0145
181	4.8973	0.0145
182	4.9118	0.0145
183	4.9262	0.0144
184	4.9406	0.0144
185	4.9549	0.0144
186	4.9693	0.0143
187	4.9835	0.0143
188	4.9978	0.0142
189	5.0120	0.0142
190	5.0262	0.0142
191	5.0403	0.0141
192	5.0544	0.0141
193	5.0685	0.0141
194	5.0826	0.0140

195	5.0966	0.0140
196	5.1105	0.0140
197	5.1245	0.0139
198	5.1384	0.0139
199	5.1523	0.0139
200	5.1661	0.0138
201	5.1799	0.0138
202	5.1937	0.0138
203	5.2075	0.0137
204	5.2212	0.0137
205	5.2349	0.0137
206	5.2485	0.0137
207	5.2621	0.0136
208	5.2757	0.0136
209	5.2893	0.0136
210	5.3028	0.0135
211	5.3163	0.0135
212	5.3298	0.0135
213	5.3433	0.0134
214	5.3567	0.0134
215	5.3701	0.0134
216	5.3834	0.0134
217	5.3967	0.0133
218	5.4100	0.0133
219	5.4233	0.0133
220	5.4366	0.0132
221	5.4498	0.0132
222	5.4630	0.0132
223	5.4761	0.0132
224	5.4893	0.0131
225	5.5024	0.0131
226	5.5154	0.0131
227	5.5285	0.0131
228	5.5415	0.0130
229	5.5545	0.0130
230	5.5675	0.0130
231	5.5804	0.0129
232	5.5933	0.0129
233	5.6062	0.0129
234	5.6191	0.0129
235	5.6320	0.0128
236	5.6448	0.0128
237	5.6576	0.0128
238	5.6703	0.0128
239	5.6831	0.0127
240	5.6958	0.0127
241	5.7085	0.0127
242	5.7212	0.0127
243	5.7338	0.0126
244	5.7464	0.0126
245	5.7590	0.0126
246	5.7716	0.0126
247	5.7841	0.0125
248	5.7967	0.0125
249	5.8092	0.0125
250	5.8216	0.0125
251	5.8341	0.0125
252	5.8465	0.0124
253	5.8589	0.0124
254	5.8713	0.0124
255	5.8837	0.0124
256	5.8960	0.0123

257	5.9083	0.0123
258	5.9206	0.0123
259	5.9329	0.0123
260	5.9452	0.0123
261	5.9574	0.0122
262	5.9696	0.0122
263	5.9818	0.0122
264	5.9940	0.0122
265	6.0061	0.0121
266	6.0182	0.0121
267	6.0303	0.0121
268	6.0424	0.0121
269	6.0545	0.0121
270	6.0665	0.0120
271	6.0785	0.0120
272	6.0905	0.0120
273	6.1025	0.0120
274	6.1145	0.0120
275	6.1264	0.0119
276	6.1383	0.0119
277	6.1502	0.0119
278	6.1621	0.0119
279	6.1739	0.0119
280	6.1858	0.0118
281	6.1976	0.0118
282	6.2094	0.0118
283	6.2212	0.0118
284	6.2329	0.0118
285	6.2447	0.0117
286	6.2564	0.0117
287	6.2681	0.0117
288	6.2798	0.0117

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0117	0.0023	0.0094
2	0.0117	0.0023	0.0094
3	0.0117	0.0023	0.0094
4	0.0118	0.0023	0.0095
5	0.0118	0.0023	0.0095
6	0.0118	0.0023	0.0095
7	0.0119	0.0023	0.0095
8	0.0119	0.0023	0.0096
9	0.0119	0.0023	0.0096
10	0.0119	0.0023	0.0096
11	0.0120	0.0023	0.0096
12	0.0120	0.0023	0.0097
13	0.0120	0.0024	0.0097
14	0.0121	0.0024	0.0097
15	0.0121	0.0024	0.0097
16	0.0121	0.0024	0.0098
17	0.0122	0.0024	0.0098
18	0.0122	0.0024	0.0098
19	0.0122	0.0024	0.0098
20	0.0123	0.0024	0.0099
21	0.0123	0.0024	0.0099
22	0.0123	0.0024	0.0099
23	0.0124	0.0024	0.0099
24	0.0124	0.0024	0.0100
25	0.0124	0.0024	0.0100

26	0.0125	0.0024	0.0100
27	0.0125	0.0024	0.0101
28	0.0125	0.0024	0.0101
29	0.0126	0.0025	0.0101
30	0.0126	0.0025	0.0101
31	0.0126	0.0025	0.0102
32	0.0127	0.0025	0.0102
33	0.0127	0.0025	0.0102
34	0.0127	0.0025	0.0102
35	0.0128	0.0025	0.0103
36	0.0128	0.0025	0.0103
37	0.0129	0.0025	0.0104
38	0.0129	0.0025	0.0104
39	0.0129	0.0025	0.0104
40	0.0130	0.0025	0.0104
41	0.0130	0.0025	0.0105
42	0.0131	0.0026	0.0105
43	0.0131	0.0026	0.0105
44	0.0131	0.0026	0.0106
45	0.0132	0.0026	0.0106
46	0.0132	0.0026	0.0106
47	0.0133	0.0026	0.0107
48	0.0133	0.0026	0.0107
49	0.0134	0.0026	0.0107
50	0.0134	0.0026	0.0108
51	0.0134	0.0026	0.0108
52	0.0135	0.0026	0.0108
53	0.0135	0.0026	0.0109
54	0.0136	0.0027	0.0109
55	0.0136	0.0027	0.0110
56	0.0137	0.0027	0.0110
57	0.0137	0.0027	0.0110
58	0.0137	0.0027	0.0111
59	0.0138	0.0027	0.0111
60	0.0138	0.0027	0.0111
61	0.0139	0.0027	0.0112
62	0.0139	0.0027	0.0112
63	0.0140	0.0027	0.0113
64	0.0140	0.0027	0.0113
65	0.0141	0.0028	0.0114
66	0.0141	0.0028	0.0114
67	0.0142	0.0028	0.0114
68	0.0142	0.0028	0.0115
69	0.0143	0.0028	0.0115
70	0.0144	0.0028	0.0115
71	0.0144	0.0028	0.0116
72	0.0145	0.0028	0.0116
73	0.0145	0.0028	0.0117
74	0.0146	0.0029	0.0117
75	0.0147	0.0029	0.0118
76	0.0147	0.0029	0.0118
77	0.0148	0.0029	0.0119
78	0.0148	0.0029	0.0119
79	0.0149	0.0029	0.0120
80	0.0149	0.0029	0.0120
81	0.0150	0.0029	0.0121
82	0.0151	0.0029	0.0121
83	0.0151	0.0030	0.0122
84	0.0152	0.0030	0.0122
85	0.0153	0.0030	0.0123
86	0.0153	0.0030	0.0123
87	0.0154	0.0030	0.0124

88	0.0155	0.0030	0.0124
89	0.0155	0.0030	0.0125
90	0.0156	0.0030	0.0125
91	0.0157	0.0031	0.0126
92	0.0157	0.0031	0.0127
93	0.0158	0.0031	0.0127
94	0.0159	0.0031	0.0128
95	0.0160	0.0031	0.0129
96	0.0160	0.0031	0.0129
97	0.0161	0.0032	0.0130
98	0.0162	0.0032	0.0130
99	0.0163	0.0032	0.0131
100	0.0163	0.0032	0.0132
101	0.0165	0.0032	0.0132
102	0.0165	0.0032	0.0133
103	0.0166	0.0033	0.0134
104	0.0167	0.0033	0.0134
105	0.0168	0.0033	0.0135
106	0.0169	0.0033	0.0136
107	0.0170	0.0033	0.0137
108	0.0170	0.0033	0.0137
109	0.0172	0.0034	0.0138
110	0.0172	0.0034	0.0139
111	0.0174	0.0034	0.0140
112	0.0174	0.0034	0.0140
113	0.0176	0.0034	0.0141
114	0.0176	0.0034	0.0142
115	0.0178	0.0035	0.0143
116	0.0178	0.0035	0.0144
117	0.0180	0.0035	0.0145
118	0.0181	0.0035	0.0145
119	0.0182	0.0036	0.0147
120	0.0183	0.0036	0.0147
121	0.0185	0.0036	0.0148
122	0.0185	0.0036	0.0149
123	0.0187	0.0037	0.0150
124	0.0188	0.0037	0.0151
125	0.0190	0.0037	0.0152
126	0.0190	0.0037	0.0153
127	0.0192	0.0038	0.0155
128	0.0193	0.0038	0.0155
129	0.0195	0.0038	0.0157
130	0.0196	0.0038	0.0158
131	0.0198	0.0039	0.0159
132	0.0199	0.0039	0.0160
133	0.0201	0.0039	0.0162
134	0.0202	0.0040	0.0162
135	0.0204	0.0040	0.0164
136	0.0205	0.0040	0.0165
137	0.0208	0.0041	0.0167
138	0.0209	0.0041	0.0168
139	0.0211	0.0041	0.0170
140	0.0212	0.0042	0.0171
141	0.0215	0.0042	0.0173
142	0.0216	0.0042	0.0174
143	0.0219	0.0043	0.0176
144	0.0220	0.0043	0.0177
145	0.0196	0.0038	0.0157
146	0.0197	0.0039	0.0159
147	0.0200	0.0039	0.0161
148	0.0202	0.0039	0.0162
149	0.0205	0.0040	0.0165

150	0.0207	0.0040	0.0166
151	0.0210	0.0041	0.0169
152	0.0212	0.0041	0.0170
153	0.0216	0.0042	0.0173
154	0.0218	0.0043	0.0175
155	0.0222	0.0043	0.0178
156	0.0224	0.0044	0.0180
157	0.0228	0.0045	0.0184
158	0.0230	0.0045	0.0185
159	0.0235	0.0046	0.0189
160	0.0238	0.0047	0.0191
161	0.0243	0.0048	0.0195
162	0.0246	0.0048	0.0198
163	0.0252	0.0049	0.0202
164	0.0255	0.0050	0.0205
165	0.0261	0.0051	0.0210
166	0.0264	0.0052	0.0213
167	0.0272	0.0053	0.0219
168	0.0275	0.0054	0.0222
169	0.0284	0.0056	0.0229
170	0.0289	0.0056	0.0232
171	0.0298	0.0058	0.0240
172	0.0303	0.0059	0.0244
173	0.0313	0.0061	0.0252
174	0.0319	0.0062	0.0257
175	0.0332	0.0065	0.0267
176	0.0339	0.0066	0.0272
177	0.0354	0.0069	0.0284
178	0.0362	0.0071	0.0291
179	0.0380	0.0074	0.0306
180	0.0390	0.0076	0.0314
181	0.0413	0.0081	0.0333
182	0.0427	0.0083	0.0343
183	0.0457	0.0089	0.0367
184	0.0474	0.0093	0.0382
185	0.0332	0.0065	0.0267
186	0.0354	0.0069	0.0285
187	0.0410	0.0080	0.0330
188	0.0448	0.0088	0.0360
189	0.0557	0.0109	0.0448
190	0.0641	0.0125	0.0516
191	0.0973	0.0170	0.0804
192	0.1413	0.0170	0.1243
193	0.6113	0.0170	0.5943
194	0.0766	0.0150	0.0616
195	0.0495	0.0097	0.0398
196	0.0379	0.0074	0.0305
197	0.0494	0.0097	0.0397
198	0.0441	0.0086	0.0355
199	0.0401	0.0079	0.0323
200	0.0371	0.0073	0.0298
201	0.0346	0.0068	0.0278
202	0.0325	0.0064	0.0262
203	0.0308	0.0060	0.0248
204	0.0293	0.0057	0.0236
205	0.0279	0.0055	0.0225
206	0.0268	0.0052	0.0216
207	0.0258	0.0050	0.0207
208	0.0249	0.0049	0.0200
209	0.0240	0.0047	0.0193
210	0.0233	0.0046	0.0187
211	0.0226	0.0044	0.0182

212	0.0220	0.0043	0.0177
213	0.0214	0.0042	0.0172
214	0.0208	0.0041	0.0168
215	0.0203	0.0040	0.0164
216	0.0199	0.0039	0.0160
217	0.0222	0.0043	0.0178
218	0.0217	0.0043	0.0175
219	0.0214	0.0042	0.0172
220	0.0210	0.0041	0.0169
221	0.0206	0.0040	0.0166
222	0.0203	0.0040	0.0163
223	0.0200	0.0039	0.0161
224	0.0197	0.0039	0.0158
225	0.0194	0.0038	0.0156
226	0.0191	0.0037	0.0154
227	0.0189	0.0037	0.0152
228	0.0186	0.0036	0.0150
229	0.0184	0.0036	0.0148
230	0.0181	0.0035	0.0146
231	0.0179	0.0035	0.0144
232	0.0177	0.0035	0.0142
233	0.0175	0.0034	0.0141
234	0.0173	0.0034	0.0139
235	0.0171	0.0033	0.0138
236	0.0169	0.0033	0.0136
237	0.0167	0.0033	0.0135
238	0.0166	0.0032	0.0133
239	0.0164	0.0032	0.0132
240	0.0162	0.0032	0.0131
241	0.0161	0.0031	0.0129
242	0.0159	0.0031	0.0128
243	0.0158	0.0031	0.0127
244	0.0156	0.0031	0.0126
245	0.0155	0.0030	0.0125
246	0.0154	0.0030	0.0124
247	0.0152	0.0030	0.0123
248	0.0151	0.0030	0.0121
249	0.0150	0.0029	0.0120
250	0.0149	0.0029	0.0119
251	0.0147	0.0029	0.0119
252	0.0146	0.0029	0.0118
253	0.0145	0.0028	0.0117
254	0.0144	0.0028	0.0116
255	0.0143	0.0028	0.0115
256	0.0142	0.0028	0.0114
257	0.0141	0.0028	0.0113
258	0.0140	0.0027	0.0112
259	0.0139	0.0027	0.0112
260	0.0138	0.0027	0.0111
261	0.0137	0.0027	0.0110
262	0.0136	0.0027	0.0109
263	0.0135	0.0026	0.0109
264	0.0134	0.0026	0.0108
265	0.0133	0.0026	0.0107
266	0.0132	0.0026	0.0107
267	0.0132	0.0026	0.0106
268	0.0131	0.0026	0.0105
269	0.0130	0.0025	0.0105
270	0.0129	0.0025	0.0104
271	0.0128	0.0025	0.0103
272	0.0128	0.0025	0.0103
273	0.0127	0.0025	0.0102

274	0.0126	0.0025	0.0102
275	0.0125	0.0025	0.0101
276	0.0125	0.0024	0.0100
277	0.0124	0.0024	0.0100
278	0.0123	0.0024	0.0099
279	0.0123	0.0024	0.0099
280	0.0122	0.0024	0.0098
281	0.0121	0.0024	0.0098
282	0.0121	0.0024	0.0097
283	0.0120	0.0024	0.0097
284	0.0120	0.0023	0.0096
285	0.0119	0.0023	0.0096
286	0.0118	0.0023	0.0095
287	0.0118	0.0023	0.0095
288	0.0117	0.0023	0.0094

Total soil rain loss = 1.11(In)
Total effective rainfall = 5.17(In)
Peak flow rate in flood hydrograph = 118.97(CFS)

+++++

24 - 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	50.0	100.0	150.0	200.0
0+ 5	0.0068	0.98	Q				
0+10	0.0250	2.64	Q				
0+15	0.0461	3.07	Q				
0+20	0.0685	3.25	Q				
0+25	0.0915	3.33	Q				
0+30	0.1148	3.38	Q				
0+35	0.1381	3.39	Q				
0+40	0.1616	3.40	Q				
0+45	0.1850	3.41	Q				
0+50	0.2086	3.42	Q				
0+55	0.2322	3.43	Q				
1+ 0	0.2558	3.44	Q				
1+ 5	0.2795	3.44	Q				
1+10	0.3033	3.45	Q				
1+15	0.3272	3.46	QV				
1+20	0.3511	3.47	QV				
1+25	0.3750	3.48	QV				
1+30	0.3991	3.49	QV				
1+35	0.4232	3.50	QV				
1+40	0.4473	3.51	QV				
1+45	0.4716	3.52	QV				
1+50	0.4958	3.53	QV				
1+55	0.5202	3.54	QV				
2+ 0	0.5446	3.55	QV				
2+ 5	0.5691	3.56	QV				
2+10	0.5937	3.57	QV				
2+15	0.6183	3.58	QV				
2+20	0.6430	3.59	Q V				
2+25	0.6677	3.60	Q V				
2+30	0.6926	3.61	Q V				
2+35	0.7175	3.62	Q V				
2+40	0.7425	3.63	Q V				

2+45	0.7675	3.64	Q	V				
2+50	0.7926	3.65	Q	V				
2+55	0.8178	3.66	Q	V				
3+ 0	0.8431	3.67	Q	V				
3+ 5	0.8684	3.68	Q	V				
3+10	0.8939	3.69	Q	V				
3+15	0.9193	3.70	Q	V				
3+20	0.9449	3.71	Q	V				
3+25	0.9706	3.72	Q	V				
3+30	0.9963	3.74	Q	V				
3+35	1.0221	3.75	Q	V				
3+40	1.0480	3.76	Q	V				
3+45	1.0739	3.77	Q	V				
3+50	1.1000	3.78	Q	V				
3+55	1.1261	3.79	Q	V				
4+ 0	1.1523	3.81	Q	V				
4+ 5	1.1786	3.82	Q	V				
4+10	1.2050	3.83	Q	V				
4+15	1.2315	3.84	Q	V				
4+20	1.2580	3.86	Q	V				
4+25	1.2847	3.87	Q	V				
4+30	1.3114	3.88	Q	V				
4+35	1.3382	3.89	Q	V				
4+40	1.3651	3.91	Q	V				
4+45	1.3921	3.92	Q	V				
4+50	1.4192	3.93	Q	V				
4+55	1.4464	3.95	Q	V				
5+ 0	1.4737	3.96	Q	V				
5+ 5	1.5011	3.97	Q	V				
5+10	1.5285	3.99	Q	V				
5+15	1.5561	4.00	Q	V				
5+20	1.5838	4.02	Q	V				
5+25	1.6115	4.03	Q	V				
5+30	1.6394	4.05	Q	V				
5+35	1.6674	4.06	Q	V				
5+40	1.6954	4.08	Q	V				
5+45	1.7236	4.09	Q	V				
5+50	1.7519	4.11	Q	V				
5+55	1.7803	4.12	Q	V				
6+ 0	1.8088	4.14	Q	V				
6+ 5	1.8374	4.15	Q	V				
6+10	1.8661	4.17	Q	V				
6+15	1.8949	4.19	Q	V				
6+20	1.9239	4.20	Q	V				
6+25	1.9529	4.22	Q	V				
6+30	1.9821	4.24	Q	V				
6+35	2.0114	4.25	Q	V				
6+40	2.0408	4.27	Q	V				
6+45	2.0703	4.29	Q	V				
6+50	2.1000	4.31	Q	V				
6+55	2.1298	4.32	Q	V				
7+ 0	2.1597	4.34	Q	V				
7+ 5	2.1897	4.36	Q	V				
7+10	2.2199	4.38	Q	V				
7+15	2.2501	4.40	Q	V				
7+20	2.2806	4.42	Q	V				
7+25	2.3111	4.44	Q	V				
7+30	2.3418	4.46	Q	V				
7+35	2.3726	4.48	Q	V				
7+40	2.4036	4.50	Q	V				
7+45	2.4347	4.52	Q	V				
7+50	2.4660	4.54	Q	V				

7+55	2.4974	4.56	Q	V				
8+ 0	2.5290	4.58	Q	V				
8+ 5	2.5607	4.60	Q	V				
8+10	2.5925	4.63	Q	V				
8+15	2.6245	4.65	Q	V				
8+20	2.6567	4.67	Q	V				
8+25	2.6890	4.69	Q	V				
8+30	2.7215	4.72	Q	V				
8+35	2.7542	4.74	Q	V				
8+40	2.7870	4.77	Q	V				
8+45	2.8200	4.79	Q	V				
8+50	2.8532	4.82	Q	V				
8+55	2.8865	4.84	Q	V				
9+ 0	2.9201	4.87	Q	V				
9+ 5	2.9538	4.89	Q	V				
9+10	2.9877	4.92	Q	V				
9+15	3.0218	4.95	Q	V				
9+20	3.0560	4.98	Q	V				
9+25	3.0905	5.01	Q	V				
9+30	3.1252	5.04	Q	V				
9+35	3.1601	5.06	Q	V				
9+40	3.1952	5.10	Q	V				
9+45	3.2305	5.13	Q	V				
9+50	3.2660	5.16	Q	V				
9+55	3.3017	5.19	Q	V				
10+ 0	3.3377	5.22	Q	V				
10+ 5	3.3739	5.25	Q	V				
10+10	3.4103	5.29	Q	V				
10+15	3.4470	5.32	Q	V				
10+20	3.4839	5.36	Q	V				
10+25	3.5210	5.39	Q	V				
10+30	3.5584	5.43	Q	V				
10+35	3.5961	5.47	Q	V				
10+40	3.6340	5.51	Q	V				
10+45	3.6722	5.55	Q	V				
10+50	3.7107	5.59	Q	V				
10+55	3.7494	5.63	Q	V				
11+ 0	3.7885	5.67	Q	V				
11+ 5	3.8278	5.71	Q	V				
11+10	3.8675	5.76	Q	V				
11+15	3.9074	5.80	Q	V				
11+20	3.9477	5.85	Q	V				
11+25	3.9883	5.90	Q	V				
11+30	4.0293	5.95	Q	V				
11+35	4.0705	5.99	Q	V				
11+40	4.1122	6.05	Q	V				
11+45	4.1542	6.10	Q	V				
11+50	4.1966	6.15	Q	V				
11+55	4.2393	6.21	Q	V				
12+ 0	4.2825	6.27	Q	V				
12+ 5	4.3245	6.09	Q	V				
12+10	4.3642	5.77	Q	V				
12+15	4.4037	5.73	Q	V				
12+20	4.4433	5.76	Q	V				
12+25	4.4833	5.81	Q	V				
12+30	4.5237	5.87	Q	V				
12+35	4.5646	5.94	Q	V				
12+40	4.6060	6.01	Q	V				
12+45	4.6480	6.09	Q	V				
12+50	4.6905	6.17	Q	V				
12+55	4.7336	6.25	Q	V				
13+ 0	4.7772	6.34	Q	V				

13+ 5	4.8215	6.43	Q		V				
13+10	4.8665	6.53	Q		V				
13+15	4.9121	6.62	Q		V				
13+20	4.9585	6.73	Q		V				
13+25	5.0056	6.84	Q		V				
13+30	5.0535	6.95	Q		V				
13+35	5.1021	7.07	Q		V				
13+40	5.1517	7.20	Q		V				
13+45	5.2021	7.32	Q		V				
13+50	5.2536	7.47	Q		V				
13+55	5.3060	7.61	Q		V				
14+ 0	5.3595	7.77	Q		V				
14+ 5	5.4141	7.93	Q		V				
14+10	5.4700	8.12	Q		V				
14+15	5.5272	8.30	Q		V				
14+20	5.5858	8.51	Q		V				
14+25	5.6459	8.72	Q		V				
14+30	5.7076	8.96	Q		V				
14+35	5.7709	9.20	Q		V				
14+40	5.8362	9.48	Q		V				
14+45	5.9034	9.76	Q		V				
14+50	5.9730	10.10	Q		V				
14+55	6.0449	10.44	Q		V				
15+ 0	6.1196	10.85	Q		V				
15+ 5	6.1972	11.28	Q		V				
15+10	6.2784	11.79	Q		V				
15+15	6.3634	12.34	Q		V				
15+20	6.4530	13.01	Q		V				
15+25	6.5371	12.21	Q		V				
15+30	6.6094	10.50	Q		V				
15+35	6.6839	10.82	Q		V				
15+40	6.7654	11.83	Q		V				
15+45	6.8579	13.43	Q		V				
15+50	6.9672	15.87	Q		V				
15+55	7.1089	20.57	Q		V				
16+ 0	7.3207	30.76	Q		V				
16+ 5	7.9345	89.12		Q	V				
16+10	8.7539	118.97			Q	V			
16+15	9.0645	45.10		Q		V			
16+20	9.2380	25.20		Q		V			
16+25	9.3592	17.60		Q		V			
16+30	9.4698	16.06		Q		V			
16+35	9.5565	12.58	Q			V			
16+40	9.6361	11.56	Q			V			
16+45	9.7100	10.72	Q			V			
16+50	9.7791	10.04	Q			V			
16+55	9.8440	9.42	Q			V			
17+ 0	9.9054	8.91	Q			V			
17+ 5	9.9636	8.46	Q			V			
17+10	10.0192	8.07	Q			V			
17+15	10.0724	7.73	Q			V			
17+20	10.1236	7.43	Q			V			
17+25	10.1729	7.16	Q			V			
17+30	10.2206	6.92	Q			V			
17+35	10.2668	6.70	Q			V			
17+40	10.3115	6.50	Q			V			
17+45	10.3551	6.32	Q			V			
17+50	10.3974	6.15	Q			V			
17+55	10.4387	5.99	Q			V			
18+ 0	10.4789	5.85	Q			V			
18+ 5	10.5198	5.94	Q			V			
18+10	10.5626	6.20	Q			V			

18+15	10.6051	6.18	Q				V	
18+20	10.6472	6.11	Q				V	
18+25	10.6887	6.02	Q				V	
18+30	10.7295	5.93	Q				V	
18+35	10.7697	5.83	Q				V	
18+40	10.8093	5.74	Q				V	
18+45	10.8482	5.66	Q				V	
18+50	10.8866	5.57	Q				V	
18+55	10.9245	5.50	Q				V	
19+ 0	10.9618	5.42	Q				V	
19+ 5	10.9986	5.35	Q				V	
19+10	11.0350	5.28	Q				V	
19+15	11.0709	5.21	Q				V	
19+20	11.1063	5.15	Q				V	
19+25	11.1413	5.09	Q				V	
19+30	11.1759	5.03	Q				V	
19+35	11.2102	4.97	Q				V	
19+40	11.2440	4.91	Q				V	
19+45	11.2775	4.86	Q				V	
19+50	11.3106	4.81	Q				V	
19+55	11.3434	4.76	Q				V	
20+ 0	11.3758	4.71	Q				V	
20+ 5	11.4079	4.66	Q				V	
20+10	11.4397	4.62	Q				V	
20+15	11.4713	4.57	Q				V	
20+20	11.5025	4.53	Q				V	
20+25	11.5334	4.49	Q				V	
20+30	11.5640	4.45	Q				V	
20+35	11.5944	4.41	Q				V	
20+40	11.6245	4.37	Q				V	
20+45	11.6544	4.34	Q				V	
20+50	11.6840	4.30	Q				V	
20+55	11.7134	4.26	Q				V	
21+ 0	11.7425	4.23	Q				V	
21+ 5	11.7714	4.20	Q				V	
21+10	11.8001	4.16	Q				V	
21+15	11.8286	4.13	Q				V	
21+20	11.8568	4.10	Q				V	
21+25	11.8848	4.07	Q				V	
21+30	11.9127	4.04	Q				V	
21+35	11.9403	4.01	Q				V	
21+40	11.9678	3.98	Q				V	
21+45	11.9950	3.96	Q				V	
21+50	12.0221	3.93	Q				V	
21+55	12.0489	3.90	Q				V	
22+ 0	12.0756	3.88	Q				V	
22+ 5	12.1022	3.85	Q				V	
22+10	12.1285	3.83	Q				V	
22+15	12.1547	3.80	Q				V	
22+20	12.1807	3.78	Q				V	
22+25	12.2066	3.75	Q				V	
22+30	12.2323	3.73	Q				V	
22+35	12.2578	3.71	Q				V	
22+40	12.2832	3.69	Q				V	
22+45	12.3085	3.67	Q				V	
22+50	12.3336	3.64	Q				V	
22+55	12.3585	3.62	Q				V	
23+ 0	12.3833	3.60	Q				V	
23+ 5	12.4080	3.58	Q				V	
23+10	12.4325	3.56	Q				V	
23+15	12.4569	3.54	Q				V	
23+20	12.4812	3.52	Q				V	

23+25	12.5053	3.50	Q				V
23+30	12.5294	3.49	Q				V
23+35	12.5532	3.47	Q				V
23+40	12.5770	3.45	Q				V
23+45	12.6006	3.43	Q				V
23+50	12.6242	3.42	Q				V
23+55	12.6476	3.40	Q				V
24+ 0	12.6709	3.38	Q				V

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

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2012, Version 7.1

Study date 06/14/22

+++++

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

Program License Serial Number 6301

HESPERIA 29
DEVELOPED CONDITION HYDROLOGY
100-YR EVENT
ALPE

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 100		
29.50	1	1.29

Rainfall data for year 100
29.50 6 2.99

Rainfall data for year 100
29.50 24 6.28

+++++
***** 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)
32.0	52.0	29.50	1.000	0.785	0.100	0.079

Area-averaged adjusted loss rate Fm (In/Hr) = 0.079

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
2.95	0.100	32.0	52.0	9.23	0.229
26.55	0.900	98.0	98.0	0.20	0.962

Area-averaged catchment yield fraction, Y = 0.889

Area-averaged low loss fraction, Yb = 0.111

+++++

Watercourse length = 2500.00(Ft.)

Length from concentration point to centroid = 250.00(Ft.)

Elevation difference along watercourse = 23.50(Ft.)

Mannings friction factor along watercourse = 0.015

Watershed area = 29.50(Ac.)

Catchment Lag time = 0.040 hours

Unit interval = 5.000 minutes

Unit interval percentage of lag time = 205.8156

Hydrograph baseflow = 0.00(CFS)

Average maximum watershed loss rate(Fm) = 0.079(In/Hr)

Average low loss rate fraction (Yb) = 0.111 (decimal)

DESERT S-Graph Selected

Computed peak 5-minute rainfall = 0.612(In)

Computed peak 30-minute rainfall = 1.048(In)

Specified peak 1-hour rainfall = 1.290(In)

Computed peak 3-hour rainfall = 2.160(In)

Specified peak 6-hour rainfall = 2.990(In)

Specified peak 24-hour rainfall = 6.280(In)

Rainfall depth area reduction factors:

Using a total area of 29.50(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.611(In)

30-minute factor = 0.999 Adjusted rainfall = 1.046(In)

1-hour factor = 0.999 Adjusted rainfall = 1.288(In)

3-hour factor = 1.000 Adjusted rainfall = 2.160(In)

6-hour factor = 1.000 Adjusted rainfall = 2.990(In)

24-hour factor = 1.000 Adjusted rainfall = 6.280(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 = 356.77 (CFS))

1	43.234	154.244
---	--------	---------

2	88.365	161.012
---	--------	---------

3	96.894	30.430
---	--------	--------

4	100.000	11.080
---	---------	--------

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
---------------------	--------------------------------	-----------------------

1	0.6113	0.6113
---	--------	--------

2	0.7526	0.1413
---	--------	--------

3	0.8499	0.0973
---	--------	--------

4	0.9265	0.0766
---	--------	--------

5	0.9907	0.0641
---	--------	--------

6	1.0464	0.0557
---	--------	--------

7	1.0959	0.0495
---	--------	--------

8	1.1407	0.0448
---	--------	--------

9	1.1817	0.0410
---	--------	--------

10	1.2196	0.0379
11	1.2550	0.0354
12	1.2882	0.0332
13	1.3376	0.0494
14	1.3851	0.0474
15	1.4307	0.0457
16	1.4748	0.0441
17	1.5175	0.0427
18	1.5588	0.0413
19	1.5990	0.0401
20	1.6380	0.0390
21	1.6760	0.0380
22	1.7131	0.0371
23	1.7493	0.0362
24	1.7846	0.0354
25	1.8192	0.0346
26	1.8531	0.0339
27	1.8863	0.0332
28	1.9188	0.0325
29	1.9508	0.0319
30	1.9821	0.0313
31	2.0129	0.0308
32	2.0432	0.0303
33	2.0730	0.0298
34	2.1023	0.0293
35	2.1311	0.0289
36	2.1595	0.0284
37	2.1875	0.0279
38	2.2150	0.0275
39	2.2422	0.0272
40	2.2690	0.0268
41	2.2955	0.0264
42	2.3216	0.0261
43	2.3473	0.0258
44	2.3728	0.0255
45	2.3980	0.0252
46	2.4228	0.0249
47	2.4474	0.0246
48	2.4717	0.0243
49	2.4957	0.0240
50	2.5195	0.0238
51	2.5430	0.0235
52	2.5663	0.0233
53	2.5893	0.0230
54	2.6122	0.0228
55	2.6347	0.0226
56	2.6571	0.0224
57	2.6793	0.0222
58	2.7012	0.0220
59	2.7230	0.0218
60	2.7446	0.0216
61	2.7659	0.0214
62	2.7871	0.0212
63	2.8081	0.0210
64	2.8290	0.0208
65	2.8496	0.0207
66	2.8701	0.0205
67	2.8904	0.0203
68	2.9106	0.0202
69	2.9306	0.0200
70	2.9505	0.0199
71	2.9702	0.0197

72	2.9897	0.0196
73	3.0119	0.0222
74	3.0339	0.0220
75	3.0558	0.0219
76	3.0775	0.0217
77	3.0991	0.0216
78	3.1206	0.0215
79	3.1420	0.0214
80	3.1632	0.0212
81	3.1843	0.0211
82	3.2053	0.0210
83	3.2262	0.0209
84	3.2469	0.0208
85	3.2676	0.0206
86	3.2881	0.0205
87	3.3085	0.0204
88	3.3288	0.0203
89	3.3490	0.0202
90	3.3691	0.0201
91	3.3891	0.0200
92	3.4090	0.0199
93	3.4287	0.0198
94	3.4484	0.0197
95	3.4680	0.0196
96	3.4875	0.0195
97	3.5069	0.0194
98	3.5262	0.0193
99	3.5455	0.0192
100	3.5646	0.0191
101	3.5836	0.0190
102	3.6026	0.0190
103	3.6214	0.0189
104	3.6402	0.0188
105	3.6589	0.0187
106	3.6775	0.0186
107	3.6961	0.0185
108	3.7145	0.0185
109	3.7329	0.0184
110	3.7512	0.0183
111	3.7694	0.0182
112	3.7875	0.0181
113	3.8056	0.0181
114	3.8236	0.0180
115	3.8415	0.0179
116	3.8594	0.0178
117	3.8771	0.0178
118	3.8948	0.0177
119	3.9125	0.0176
120	3.9300	0.0176
121	3.9475	0.0175
122	3.9650	0.0174
123	3.9823	0.0174
124	3.9996	0.0173
125	4.0169	0.0172
126	4.0341	0.0172
127	4.0512	0.0171
128	4.0682	0.0170
129	4.0852	0.0170
130	4.1021	0.0169
131	4.1190	0.0169
132	4.1358	0.0168
133	4.1525	0.0167

134	4.1692	0.0167
135	4.1858	0.0166
136	4.2024	0.0166
137	4.2189	0.0165
138	4.2354	0.0165
139	4.2518	0.0164
140	4.2681	0.0163
141	4.2844	0.0163
142	4.3007	0.0162
143	4.3169	0.0162
144	4.3330	0.0161
145	4.3491	0.0161
146	4.3651	0.0160
147	4.3811	0.0160
148	4.3970	0.0159
149	4.4129	0.0159
150	4.4287	0.0158
151	4.4445	0.0158
152	4.4602	0.0157
153	4.4759	0.0157
154	4.4916	0.0156
155	4.5072	0.0156
156	4.5227	0.0155
157	4.5382	0.0155
158	4.5536	0.0155
159	4.5691	0.0154
160	4.5844	0.0154
161	4.5997	0.0153
162	4.6150	0.0153
163	4.6302	0.0152
164	4.6454	0.0152
165	4.6606	0.0151
166	4.6757	0.0151
167	4.6907	0.0151
168	4.7057	0.0150
169	4.7207	0.0150
170	4.7356	0.0149
171	4.7505	0.0149
172	4.7654	0.0149
173	4.7802	0.0148
174	4.7950	0.0148
175	4.8097	0.0147
176	4.8244	0.0147
177	4.8391	0.0147
178	4.8537	0.0146
179	4.8682	0.0146
180	4.8828	0.0145
181	4.8973	0.0145
182	4.9118	0.0145
183	4.9262	0.0144
184	4.9406	0.0144
185	4.9549	0.0144
186	4.9693	0.0143
187	4.9835	0.0143
188	4.9978	0.0142
189	5.0120	0.0142
190	5.0262	0.0142
191	5.0403	0.0141
192	5.0544	0.0141
193	5.0685	0.0141
194	5.0826	0.0140
195	5.0966	0.0140

196	5.1105	0.0140
197	5.1245	0.0139
198	5.1384	0.0139
199	5.1523	0.0139
200	5.1661	0.0138
201	5.1799	0.0138
202	5.1937	0.0138
203	5.2075	0.0137
204	5.2212	0.0137
205	5.2349	0.0137
206	5.2485	0.0137
207	5.2621	0.0136
208	5.2757	0.0136
209	5.2893	0.0136
210	5.3028	0.0135
211	5.3163	0.0135
212	5.3298	0.0135
213	5.3433	0.0134
214	5.3567	0.0134
215	5.3701	0.0134
216	5.3834	0.0134
217	5.3967	0.0133
218	5.4100	0.0133
219	5.4233	0.0133
220	5.4366	0.0132
221	5.4498	0.0132
222	5.4630	0.0132
223	5.4761	0.0132
224	5.4893	0.0131
225	5.5024	0.0131
226	5.5154	0.0131
227	5.5285	0.0131
228	5.5415	0.0130
229	5.5545	0.0130
230	5.5675	0.0130
231	5.5804	0.0129
232	5.5933	0.0129
233	5.6062	0.0129
234	5.6191	0.0129
235	5.6320	0.0128
236	5.6448	0.0128
237	5.6576	0.0128
238	5.6703	0.0128
239	5.6831	0.0127
240	5.6958	0.0127
241	5.7085	0.0127
242	5.7212	0.0127
243	5.7338	0.0126
244	5.7464	0.0126
245	5.7590	0.0126
246	5.7716	0.0126
247	5.7841	0.0125
248	5.7967	0.0125
249	5.8092	0.0125
250	5.8216	0.0125
251	5.8341	0.0125
252	5.8465	0.0124
253	5.8589	0.0124
254	5.8713	0.0124
255	5.8837	0.0124
256	5.8960	0.0123
257	5.9083	0.0123

258	5.9206	0.0123
259	5.9329	0.0123
260	5.9452	0.0123
261	5.9574	0.0122
262	5.9696	0.0122
263	5.9818	0.0122
264	5.9940	0.0122
265	6.0061	0.0121
266	6.0182	0.0121
267	6.0303	0.0121
268	6.0424	0.0121
269	6.0545	0.0121
270	6.0665	0.0120
271	6.0785	0.0120
272	6.0905	0.0120
273	6.1025	0.0120
274	6.1145	0.0120
275	6.1264	0.0119
276	6.1383	0.0119
277	6.1502	0.0119
278	6.1621	0.0119
279	6.1739	0.0119
280	6.1858	0.0118
281	6.1976	0.0118
282	6.2094	0.0118
283	6.2212	0.0118
284	6.2329	0.0118
285	6.2447	0.0117
286	6.2564	0.0117
287	6.2681	0.0117
288	6.2798	0.0117

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0117	0.0013	0.0104
2	0.0117	0.0013	0.0104
3	0.0117	0.0013	0.0104
4	0.0118	0.0013	0.0105
5	0.0118	0.0013	0.0105
6	0.0118	0.0013	0.0105
7	0.0119	0.0013	0.0105
8	0.0119	0.0013	0.0106
9	0.0119	0.0013	0.0106
10	0.0119	0.0013	0.0106
11	0.0120	0.0013	0.0106
12	0.0120	0.0013	0.0107
13	0.0120	0.0013	0.0107
14	0.0121	0.0013	0.0107
15	0.0121	0.0013	0.0108
16	0.0121	0.0013	0.0108
17	0.0122	0.0014	0.0108
18	0.0122	0.0014	0.0108
19	0.0122	0.0014	0.0109
20	0.0123	0.0014	0.0109
21	0.0123	0.0014	0.0109
22	0.0123	0.0014	0.0109
23	0.0124	0.0014	0.0110
24	0.0124	0.0014	0.0110
25	0.0124	0.0014	0.0110
26	0.0125	0.0014	0.0111

27	0.0125	0.0014	0.0111
28	0.0125	0.0014	0.0111
29	0.0126	0.0014	0.0112
30	0.0126	0.0014	0.0112
31	0.0126	0.0014	0.0112
32	0.0127	0.0014	0.0113
33	0.0127	0.0014	0.0113
34	0.0127	0.0014	0.0113
35	0.0128	0.0014	0.0114
36	0.0128	0.0014	0.0114
37	0.0129	0.0014	0.0114
38	0.0129	0.0014	0.0115
39	0.0129	0.0014	0.0115
40	0.0130	0.0014	0.0115
41	0.0130	0.0014	0.0116
42	0.0131	0.0015	0.0116
43	0.0131	0.0015	0.0116
44	0.0131	0.0015	0.0117
45	0.0132	0.0015	0.0117
46	0.0132	0.0015	0.0117
47	0.0133	0.0015	0.0118
48	0.0133	0.0015	0.0118
49	0.0134	0.0015	0.0119
50	0.0134	0.0015	0.0119
51	0.0134	0.0015	0.0119
52	0.0135	0.0015	0.0120
53	0.0135	0.0015	0.0120
54	0.0136	0.0015	0.0121
55	0.0136	0.0015	0.0121
56	0.0137	0.0015	0.0121
57	0.0137	0.0015	0.0122
58	0.0137	0.0015	0.0122
59	0.0138	0.0015	0.0123
60	0.0138	0.0015	0.0123
61	0.0139	0.0015	0.0124
62	0.0139	0.0016	0.0124
63	0.0140	0.0016	0.0125
64	0.0140	0.0016	0.0125
65	0.0141	0.0016	0.0125
66	0.0141	0.0016	0.0126
67	0.0142	0.0016	0.0126
68	0.0142	0.0016	0.0127
69	0.0143	0.0016	0.0127
70	0.0144	0.0016	0.0128
71	0.0144	0.0016	0.0128
72	0.0145	0.0016	0.0129
73	0.0145	0.0016	0.0129
74	0.0146	0.0016	0.0130
75	0.0147	0.0016	0.0130
76	0.0147	0.0016	0.0131
77	0.0148	0.0016	0.0131
78	0.0148	0.0016	0.0132
79	0.0149	0.0017	0.0132
80	0.0149	0.0017	0.0133
81	0.0150	0.0017	0.0133
82	0.0151	0.0017	0.0134
83	0.0151	0.0017	0.0135
84	0.0152	0.0017	0.0135
85	0.0153	0.0017	0.0136
86	0.0153	0.0017	0.0136
87	0.0154	0.0017	0.0137
88	0.0155	0.0017	0.0137

89	0.0155	0.0017	0.0138
90	0.0156	0.0017	0.0139
91	0.0157	0.0017	0.0139
92	0.0157	0.0018	0.0140
93	0.0158	0.0018	0.0141
94	0.0159	0.0018	0.0141
95	0.0160	0.0018	0.0142
96	0.0160	0.0018	0.0142
97	0.0161	0.0018	0.0143
98	0.0162	0.0018	0.0144
99	0.0163	0.0018	0.0145
100	0.0163	0.0018	0.0145
101	0.0165	0.0018	0.0146
102	0.0165	0.0018	0.0147
103	0.0166	0.0019	0.0148
104	0.0167	0.0019	0.0148
105	0.0168	0.0019	0.0149
106	0.0169	0.0019	0.0150
107	0.0170	0.0019	0.0151
108	0.0170	0.0019	0.0151
109	0.0172	0.0019	0.0153
110	0.0172	0.0019	0.0153
111	0.0174	0.0019	0.0154
112	0.0174	0.0019	0.0155
113	0.0176	0.0020	0.0156
114	0.0176	0.0020	0.0157
115	0.0178	0.0020	0.0158
116	0.0178	0.0020	0.0159
117	0.0180	0.0020	0.0160
118	0.0181	0.0020	0.0161
119	0.0182	0.0020	0.0162
120	0.0183	0.0020	0.0163
121	0.0185	0.0021	0.0164
122	0.0185	0.0021	0.0165
123	0.0187	0.0021	0.0166
124	0.0188	0.0021	0.0167
125	0.0190	0.0021	0.0168
126	0.0190	0.0021	0.0169
127	0.0192	0.0021	0.0171
128	0.0193	0.0021	0.0172
129	0.0195	0.0022	0.0173
130	0.0196	0.0022	0.0174
131	0.0198	0.0022	0.0176
132	0.0199	0.0022	0.0177
133	0.0201	0.0022	0.0179
134	0.0202	0.0022	0.0180
135	0.0204	0.0023	0.0181
136	0.0205	0.0023	0.0182
137	0.0208	0.0023	0.0184
138	0.0209	0.0023	0.0185
139	0.0211	0.0023	0.0188
140	0.0212	0.0024	0.0189
141	0.0215	0.0024	0.0191
142	0.0216	0.0024	0.0192
143	0.0219	0.0024	0.0194
144	0.0220	0.0024	0.0196
145	0.0196	0.0022	0.0174
146	0.0197	0.0022	0.0175
147	0.0200	0.0022	0.0178
148	0.0202	0.0022	0.0179
149	0.0205	0.0023	0.0182
150	0.0207	0.0023	0.0184

151	0.0210	0.0023	0.0187
152	0.0212	0.0024	0.0188
153	0.0216	0.0024	0.0192
154	0.0218	0.0024	0.0193
155	0.0222	0.0025	0.0197
156	0.0224	0.0025	0.0199
157	0.0228	0.0025	0.0203
158	0.0230	0.0026	0.0205
159	0.0235	0.0026	0.0209
160	0.0238	0.0026	0.0211
161	0.0243	0.0027	0.0216
162	0.0246	0.0027	0.0218
163	0.0252	0.0028	0.0224
164	0.0255	0.0028	0.0226
165	0.0261	0.0029	0.0232
166	0.0264	0.0029	0.0235
167	0.0272	0.0030	0.0241
168	0.0275	0.0031	0.0245
169	0.0284	0.0032	0.0253
170	0.0289	0.0032	0.0256
171	0.0298	0.0033	0.0265
172	0.0303	0.0034	0.0269
173	0.0313	0.0035	0.0279
174	0.0319	0.0036	0.0284
175	0.0332	0.0037	0.0295
176	0.0339	0.0038	0.0301
177	0.0354	0.0039	0.0314
178	0.0362	0.0040	0.0322
179	0.0380	0.0042	0.0338
180	0.0390	0.0043	0.0347
181	0.0413	0.0046	0.0367
182	0.0427	0.0047	0.0379
183	0.0457	0.0051	0.0406
184	0.0474	0.0053	0.0422
185	0.0332	0.0037	0.0295
186	0.0354	0.0039	0.0314
187	0.0410	0.0046	0.0365
188	0.0448	0.0050	0.0398
189	0.0557	0.0062	0.0495
190	0.0641	0.0065	0.0576
191	0.0973	0.0065	0.0908
192	0.1413	0.0065	0.1347
193	0.6113	0.0065	0.6047
194	0.0766	0.0065	0.0701
195	0.0495	0.0055	0.0440
196	0.0379	0.0042	0.0337
197	0.0494	0.0055	0.0439
198	0.0441	0.0049	0.0392
199	0.0401	0.0045	0.0357
200	0.0371	0.0041	0.0329
201	0.0346	0.0038	0.0307
202	0.0325	0.0036	0.0289
203	0.0308	0.0034	0.0274
204	0.0293	0.0033	0.0260
205	0.0279	0.0031	0.0248
206	0.0268	0.0030	0.0238
207	0.0258	0.0029	0.0229
208	0.0249	0.0028	0.0221
209	0.0240	0.0027	0.0214
210	0.0233	0.0026	0.0207
211	0.0226	0.0025	0.0201
212	0.0220	0.0024	0.0195

213	0.0214	0.0024	0.0190
214	0.0208	0.0023	0.0185
215	0.0203	0.0023	0.0181
216	0.0199	0.0022	0.0176
217	0.0222	0.0025	0.0197
218	0.0217	0.0024	0.0193
219	0.0214	0.0024	0.0190
220	0.0210	0.0023	0.0187
221	0.0206	0.0023	0.0183
222	0.0203	0.0023	0.0180
223	0.0200	0.0022	0.0178
224	0.0197	0.0022	0.0175
225	0.0194	0.0022	0.0172
226	0.0191	0.0021	0.0170
227	0.0189	0.0021	0.0168
228	0.0186	0.0021	0.0165
229	0.0184	0.0020	0.0163
230	0.0181	0.0020	0.0161
231	0.0179	0.0020	0.0159
232	0.0177	0.0020	0.0157
233	0.0175	0.0019	0.0156
234	0.0173	0.0019	0.0154
235	0.0171	0.0019	0.0152
236	0.0169	0.0019	0.0150
237	0.0167	0.0019	0.0149
238	0.0166	0.0018	0.0147
239	0.0164	0.0018	0.0146
240	0.0162	0.0018	0.0144
241	0.0161	0.0018	0.0143
242	0.0159	0.0018	0.0142
243	0.0158	0.0018	0.0140
244	0.0156	0.0017	0.0139
245	0.0155	0.0017	0.0138
246	0.0154	0.0017	0.0137
247	0.0152	0.0017	0.0135
248	0.0151	0.0017	0.0134
249	0.0150	0.0017	0.0133
250	0.0149	0.0017	0.0132
251	0.0147	0.0016	0.0131
252	0.0146	0.0016	0.0130
253	0.0145	0.0016	0.0129
254	0.0144	0.0016	0.0128
255	0.0143	0.0016	0.0127
256	0.0142	0.0016	0.0126
257	0.0141	0.0016	0.0125
258	0.0140	0.0016	0.0124
259	0.0139	0.0015	0.0123
260	0.0138	0.0015	0.0122
261	0.0137	0.0015	0.0122
262	0.0136	0.0015	0.0121
263	0.0135	0.0015	0.0120
264	0.0134	0.0015	0.0119
265	0.0133	0.0015	0.0118
266	0.0132	0.0015	0.0118
267	0.0132	0.0015	0.0117
268	0.0131	0.0015	0.0116
269	0.0130	0.0014	0.0116
270	0.0129	0.0014	0.0115
271	0.0128	0.0014	0.0114
272	0.0128	0.0014	0.0113
273	0.0127	0.0014	0.0113
274	0.0126	0.0014	0.0112

275	0.0125	0.0014	0.0112
276	0.0125	0.0014	0.0111
277	0.0124	0.0014	0.0110
278	0.0123	0.0014	0.0110
279	0.0123	0.0014	0.0109
280	0.0122	0.0014	0.0109
281	0.0121	0.0014	0.0108
282	0.0121	0.0013	0.0107
283	0.0120	0.0013	0.0107
284	0.0120	0.0013	0.0106
285	0.0119	0.0013	0.0106
286	0.0118	0.0013	0.0105
287	0.0118	0.0013	0.0105
288	0.0117	0.0013	0.0104

 Total soil rain loss = 0.62(In)
 Total effective rainfall = 5.66(In)
 Peak flow rate in flood hydrograph = 118.37(CFS)

+++++

24 - 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	50.0	100.0	150.0	200.0
0+ 5	0.0110	1.60	Q					
0+10	0.0336	3.28	Q					
0+15	0.0584	3.60	Q					
0+20	0.0840	3.72	Q					
0+25	0.1097	3.73	Q					
0+30	0.1355	3.74	Q					
0+35	0.1613	3.75	Q					
0+40	0.1872	3.76	Q					
0+45	0.2132	3.77	Q					
0+50	0.2392	3.78	Q					
0+55	0.2653	3.79	Q					
1+ 0	0.2915	3.80	Q					
1+ 5	0.3177	3.81	Q					
1+10	0.3440	3.82	Q					
1+15	0.3704	3.83	QV					
1+20	0.3968	3.84	QV					
1+25	0.4233	3.85	QV					
1+30	0.4499	3.86	QV					
1+35	0.4765	3.87	QV					
1+40	0.5033	3.88	QV					
1+45	0.5300	3.89	QV					
1+50	0.5569	3.90	QV					
1+55	0.5838	3.91	QV					
2+ 0	0.6108	3.92	QV					
2+ 5	0.6379	3.93	QV					
2+10	0.6651	3.94	QV					
2+15	0.6923	3.95	QV					
2+20	0.7196	3.97	Q V					
2+25	0.7470	3.98	Q V					
2+30	0.7745	3.99	Q V					
2+35	0.8020	4.00	Q V					
2+40	0.8296	4.01	Q V					
2+45	0.8573	4.02	Q V					

2+50	0.8851	4.03	Q	V				
2+55	0.9130	4.05	Q	V				
3+ 0	0.9409	4.06	Q	V				
3+ 5	0.9689	4.07	Q	V				
3+10	0.9971	4.08	Q	V				
3+15	1.0252	4.09	Q	V				
3+20	1.0535	4.11	Q	V				
3+25	1.0819	4.12	Q	V				
3+30	1.1103	4.13	Q	V				
3+35	1.1389	4.14	Q	V				
3+40	1.1675	4.16	Q	V				
3+45	1.1962	4.17	Q	V				
3+50	1.2250	4.18	Q	V				
3+55	1.2539	4.20	Q	V				
4+ 0	1.2829	4.21	Q	V				
4+ 5	1.3120	4.22	Q	V				
4+10	1.3412	4.24	Q	V				
4+15	1.3705	4.25	Q	V				
4+20	1.3998	4.26	Q	V				
4+25	1.4293	4.28	Q	V				
4+30	1.4589	4.29	Q	V				
4+35	1.4885	4.31	Q	V				
4+40	1.5183	4.32	Q	V				
4+45	1.5482	4.34	Q	V				
4+50	1.5781	4.35	Q	V				
4+55	1.6082	4.37	Q	V				
5+ 0	1.6384	4.38	Q	V				
5+ 5	1.6687	4.40	Q	V				
5+10	1.6990	4.41	Q	V				
5+15	1.7295	4.43	Q	V				
5+20	1.7601	4.44	Q	V				
5+25	1.7909	4.46	Q	V				
5+30	1.8217	4.48	Q	V				
5+35	1.8526	4.49	Q	V				
5+40	1.8837	4.51	Q	V				
5+45	1.9148	4.53	Q	V				
5+50	1.9461	4.54	Q	V				
5+55	1.9775	4.56	Q	V				
6+ 0	2.0091	4.58	Q	V				
6+ 5	2.0407	4.60	Q	V				
6+10	2.0725	4.61	Q	V				
6+15	2.1044	4.63	Q	V				
6+20	2.1364	4.65	Q	V				
6+25	2.1685	4.67	Q	V				
6+30	2.2008	4.69	Q	V				
6+35	2.2332	4.71	Q	V				
6+40	2.2657	4.72	Q	V				
6+45	2.2984	4.74	Q	V				
6+50	2.3312	4.76	Q	V				
6+55	2.3642	4.78	Q	V				
7+ 0	2.3973	4.80	Q	V				
7+ 5	2.4305	4.82	Q	V				
7+10	2.4638	4.84	Q	V				
7+15	2.4974	4.87	Q	V				
7+20	2.5310	4.89	Q	V				
7+25	2.5648	4.91	Q	V				
7+30	2.5988	4.93	Q	V				
7+35	2.6329	4.95	Q	V				
7+40	2.6672	4.98	Q	V				
7+45	2.7016	5.00	Q	V				
7+50	2.7362	5.02	Q	V				
7+55	2.7709	5.05	Q	V				

8+ 0	2.8059	5.07	Q	V				
8+ 5	2.8410	5.09	Q	V				
8+10	2.8762	5.12	Q	V				
8+15	2.9116	5.14	Q	V				
8+20	2.9472	5.17	Q	V				
8+25	2.9830	5.20	Q	V				
8+30	3.0190	5.22	Q	V				
8+35	3.0551	5.25	Q	V				
8+40	3.0915	5.28	Q	V				
8+45	3.1280	5.30	Q	V				
8+50	3.1647	5.33	Q	V				
8+55	3.2016	5.36	Q	V				
9+ 0	3.2387	5.39	Q	V				
9+ 5	3.2760	5.42	Q	V				
9+10	3.3136	5.45	Q	V				
9+15	3.3513	5.48	Q	V				
9+20	3.3892	5.51	Q	V				
9+25	3.4274	5.54	Q	V				
9+30	3.4658	5.57	Q	V				
9+35	3.5044	5.61	Q	V				
9+40	3.5433	5.64	Q	V				
9+45	3.5823	5.67	Q	V				
9+50	3.6217	5.71	Q	V				
9+55	3.6612	5.74	Q	V				
10+ 0	3.7010	5.78	Q	V				
10+ 5	3.7411	5.82	Q	V				
10+10	3.7814	5.86	Q	V				
10+15	3.8220	5.89	Q	V				
10+20	3.8629	5.93	Q	V				
10+25	3.9040	5.97	Q	V				
10+30	3.9454	6.01	Q	V				
10+35	3.9871	6.06	Q	V				
10+40	4.0291	6.10	Q	V				
10+45	4.0715	6.14	Q	V				
10+50	4.1141	6.19	Q	V				
10+55	4.1570	6.23	Q	V				
11+ 0	4.2002	6.28	Q	V				
11+ 5	4.2438	6.33	Q	V				
11+10	4.2877	6.38	Q	V				
11+15	4.3320	6.43	Q	V				
11+20	4.3766	6.48	Q	V				
11+25	4.4216	6.53	Q	V				
11+30	4.4670	6.59	Q	V				
11+35	4.5127	6.64	Q	V				
11+40	4.5589	6.70	Q	V				
11+45	4.6054	6.76	Q	V				
11+50	4.6524	6.82	Q	V				
11+55	4.6998	6.88	Q	V				
12+ 0	4.7476	6.95	Q	V				
12+ 5	4.7933	6.64	Q	V				
12+10	4.8368	6.31	Q	V				
12+15	4.8802	6.31	Q	V				
12+20	4.9240	6.35	Q	V				
12+25	4.9683	6.43	Q	V				
12+30	5.0131	6.51	Q	V				
12+35	5.0584	6.59	Q	V				
12+40	5.1044	6.67	Q	V				
12+45	5.1509	6.76	Q	V				
12+50	5.1981	6.85	Q	V				
12+55	5.2459	6.94	Q	V				
13+ 0	5.2944	7.04	Q	V				
13+ 5	5.3436	7.14	Q	V				

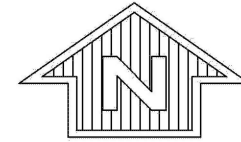
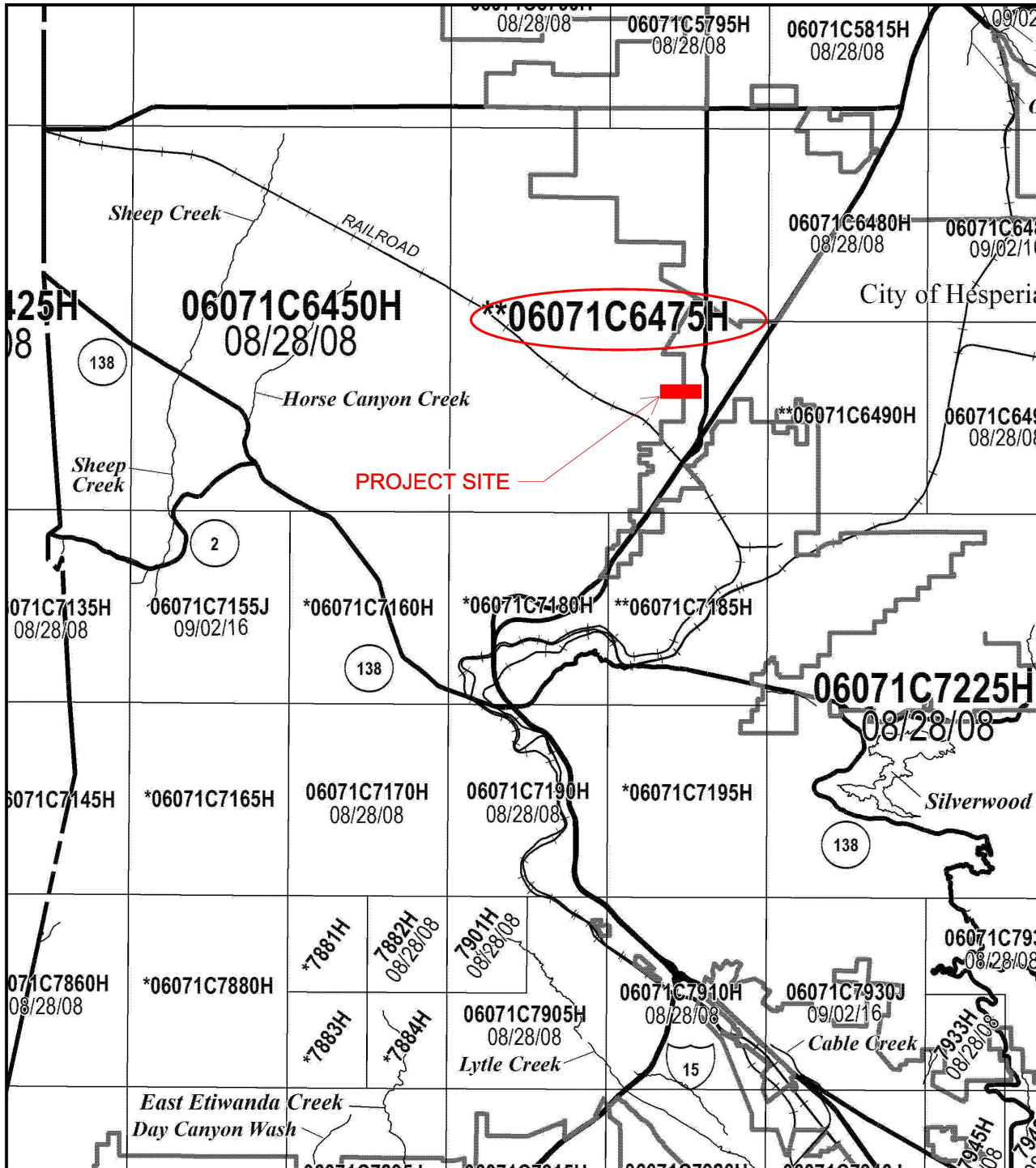
13+10	5.3935	7.25	Q		V			
13+15	5.4442	7.36	Q		V			
13+20	5.4956	7.47	Q		V			
13+25	5.5480	7.60	Q		V			
13+30	5.6011	7.72	Q		V			
13+35	5.6552	7.86	Q		V			
13+40	5.7103	7.99	Q		V			
13+45	5.7664	8.14	Q		V			
13+50	5.8235	8.30	Q		V			
13+55	5.8818	8.47	Q		V			
14+ 0	5.9413	8.64	Q		V			
14+ 5	6.0021	8.83	Q		V			
14+10	6.0644	9.03	Q		V			
14+15	6.1281	9.25	Q		V			
14+20	6.1933	9.47	Q		V			
14+25	6.2603	9.72	Q		V			
14+30	6.3290	9.97	Q		V			
14+35	6.3996	10.26	Q		V			
14+40	6.4724	10.56	Q		V			
14+45	6.5475	10.91	Q		V			
14+50	6.6251	11.26	Q		V			
14+55	6.7055	11.68	Q		V			
15+ 0	6.7890	12.12	Q		V			
15+ 5	6.8760	12.64	Q		V			
15+10	6.9669	13.19	Q		V			
15+15	7.0624	13.87	Q		V			
15+20	7.1629	14.60	Q		V			
15+25	7.2524	12.99	Q		V			
15+30	7.3305	11.33	Q		V			
15+35	7.4134	12.05	Q		V			
15+40	7.5050	13.29	Q		V			
15+45	7.6118	15.50	Q		V			
15+50	7.7390	18.47	Q		V			
15+55	7.9127	25.23	Q		V			
16+ 0	8.1724	37.71	Q		V			
16+ 5	8.9876	118.37	Q		V			
16+10	9.7678	113.28	Q		V			
16+15	10.0293	37.97	Q		V			
16+20	10.1748	21.12	Q		V			
16+25	10.2734	14.32	Q		V			
16+30	10.3741	14.63	Q		V			
16+35	10.4673	13.52	Q		V			
16+40	10.5534	12.50	Q		V			
16+45	10.6330	11.57	Q		V			
16+50	10.7075	10.81	Q		V			
16+55	10.7776	10.18	Q		V			
17+ 0	10.8440	9.65	Q		V			
17+ 5	10.9072	9.18	Q		V			
17+10	10.9676	8.77	Q		V			
17+15	11.0255	8.41	Q		V			
17+20	11.0813	8.10	Q		V			
17+25	11.1351	7.81	Q		V			
17+30	11.1872	7.56	Q		V			
17+35	11.2376	7.32	Q		V			
17+40	11.2865	7.11	Q		V			
17+45	11.3341	6.91	Q		V			
17+50	11.3805	6.73	Q		V			
17+55	11.4257	6.56	Q		V			
18+ 0	11.4698	6.40	Q		V			
18+ 5	11.5155	6.63	Q		V			
18+10	11.5629	6.89	Q		V			
18+15	11.6100	6.83	Q		V			

18+20	11.6564	6.74	Q				V	
18+25	11.7020	6.62	Q				V	
18+30	11.7469	6.51	Q				V	
18+35	11.7910	6.41	Q				V	
18+40	11.8345	6.31	Q				V	
18+45	11.8773	6.22	Q				V	
18+50	11.9195	6.13	Q				V	
18+55	11.9611	6.04	Q				V	
19+ 0	12.0022	5.96	Q				V	
19+ 5	12.0427	5.88	Q				V	
19+10	12.0827	5.81	Q				V	
19+15	12.1221	5.73	Q				V	
19+20	12.1611	5.66	Q				V	
19+25	12.1997	5.60	Q				V	
19+30	12.2378	5.53	Q				V	
19+35	12.2754	5.47	Q				V	
19+40	12.3127	5.41	Q				V	
19+45	12.3495	5.35	Q				V	
19+50	12.3860	5.29	Q				V	
19+55	12.4221	5.24	Q				V	
20+ 0	12.4578	5.19	Q				V	
20+ 5	12.4931	5.14	Q				V	
20+10	12.5282	5.09	Q				V	
20+15	12.5629	5.04	Q				V	
20+20	12.5972	4.99	Q				V	
20+25	12.6313	4.95	Q				V	
20+30	12.6651	4.90	Q				V	
20+35	12.6985	4.86	Q				V	
20+40	12.7317	4.82	Q				V	
20+45	12.7646	4.78	Q				V	
20+50	12.7972	4.74	Q				V	
20+55	12.8296	4.70	Q				V	
21+ 0	12.8617	4.66	Q				V	
21+ 5	12.8935	4.62	Q				V	
21+10	12.9251	4.59	Q				V	
21+15	12.9565	4.55	Q				V	
21+20	12.9876	4.52	Q				V	
21+25	13.0185	4.49	Q				V	
21+30	13.0492	4.45	Q				V	
21+35	13.0797	4.42	Q				V	
21+40	13.1099	4.39	Q				V	
21+45	13.1399	4.36	Q				V	
21+50	13.1698	4.33	Q				V	
21+55	13.1994	4.30	Q				V	
22+ 0	13.2288	4.27	Q				V	
22+ 5	13.2581	4.25	Q				V	
22+10	13.2871	4.22	Q				V	
22+15	13.3160	4.19	Q				V	
22+20	13.3447	4.17	Q				V	
22+25	13.3732	4.14	Q				V	
22+30	13.4015	4.11	Q				V	
22+35	13.4297	4.09	Q				V	
22+40	13.4577	4.07	Q				V	
22+45	13.4855	4.04	Q				V	
22+50	13.5132	4.02	Q				V	
22+55	13.5407	4.00	Q				V	
23+ 0	13.5681	3.97	Q				V	
23+ 5	13.5953	3.95	Q				V	
23+10	13.6223	3.93	Q				V	
23+15	13.6492	3.91	Q				V	
23+20	13.6760	3.89	Q				V	
23+25	13.7026	3.87	Q				V	

23+30	13.7291	3.84	Q				V
23+35	13.7554	3.82	Q				V
23+40	13.7817	3.81	Q				V
23+45	13.8077	3.79	Q				V
23+50	13.8337	3.77	Q				V
23+55	13.8595	3.75	Q				V
24+ 0	13.8852	3.73	Q				V

APPENDIX D

FEMA



NFIP

MAP INDEX

FIRM

FLOOD INSURANCE RATE MAP

SAN BERNARDINO
COUNTY,
CALIFORNIA

AND INCORPORATED AREAS

(SEE LISTING OF COMMUNITIES TABLE)

MAP INDEX

SHEET 1 OF 2

PANELS PRINTED:

3915, 3916, 3917, 3918, 3919, 3936, 3938, 3939, 3943, 3975, 4000, 4025, 4500, 4507, 4509, 4526, 4527, 4528, 4529, 4532, 4551, 4556, 5150, 5780, 5785, 5790, 5795, 5805, 5810, 5815, 5820, 5840, 5845, 6425, 6450, 6480, 6485, 6495, 6505, 6515, 7135, 7155, 7170, 7190, 7225, 7240, 7243, 7244, 7290, 7295, 7315, 7320, 7860, 7870, 7882, 7890, 7895, 7901, 7905, 7910, 7915, 7920, 7930, 7933, 7935, 7940, 7942, 7944, 7945, 7955, 7956, 7961, 7963, 7965, 8000, 8005, 8007, 8010, 8026, 8607, 8608, 8609, 8615, 8616, 8617, 8620, 8628, 8629, 8630, 8633, 8634, 8635, 8636, 8637, 8638, 8639, 8641, 8642, 8651, 8652, 8653, 8654, 8658, 8666, 8676, 8677, 8678, 8679, 8681, 8682, 8683, 8684, 8686, 8687, 8688, 8689, 8691, 8692, 8693, 8694, 8701, 8702, 8703, 8704, 8706, 8707, 8708, 8709, 8711, 8712, 8714, 8716, 8717, 8718, 8728, 8730, 8735, 8740, 8745, 8755, 8760, 8765, 8850, 9330, 9335, 9345, 9375

(SEE SHEET 2 FOR ADDITIONAL
PANELS PRINTED)

MAP NUMBER

06071CIND1E

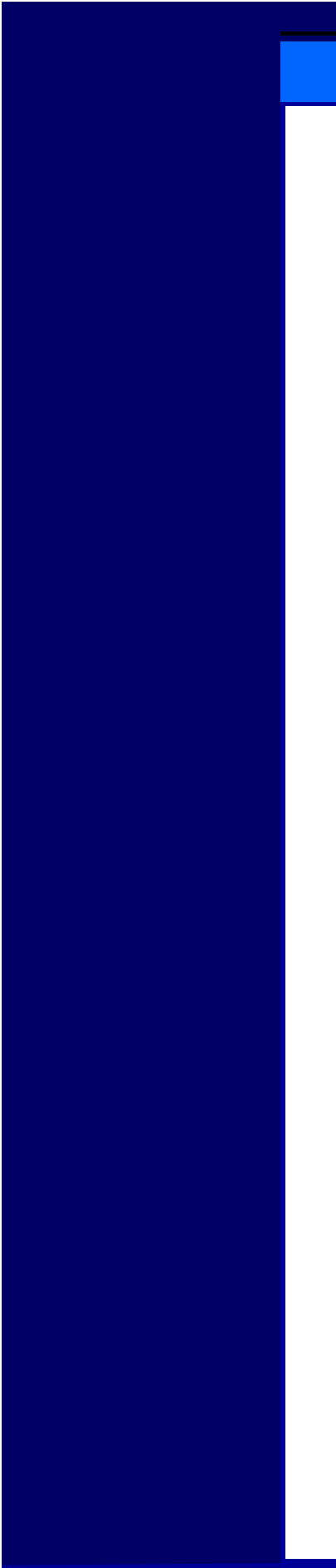
MAP REVISED
SEPTEMBER 2, 2016



Federal Emergency Management Agency

This is an official FIRMette showing a portion of the above-referenced flood map created from the MSC FIRMette Web tool. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For additional information about how to make sure the map is current, please see the Flood Hazard Mapping Updates Overview Fact Sheet available on the FEMA Flood Map Service Center home page at <https://msc.fema.gov>.

** Panel not printed - Unincorporated areas Zone D; Other areas Zone X



APPENDIX E

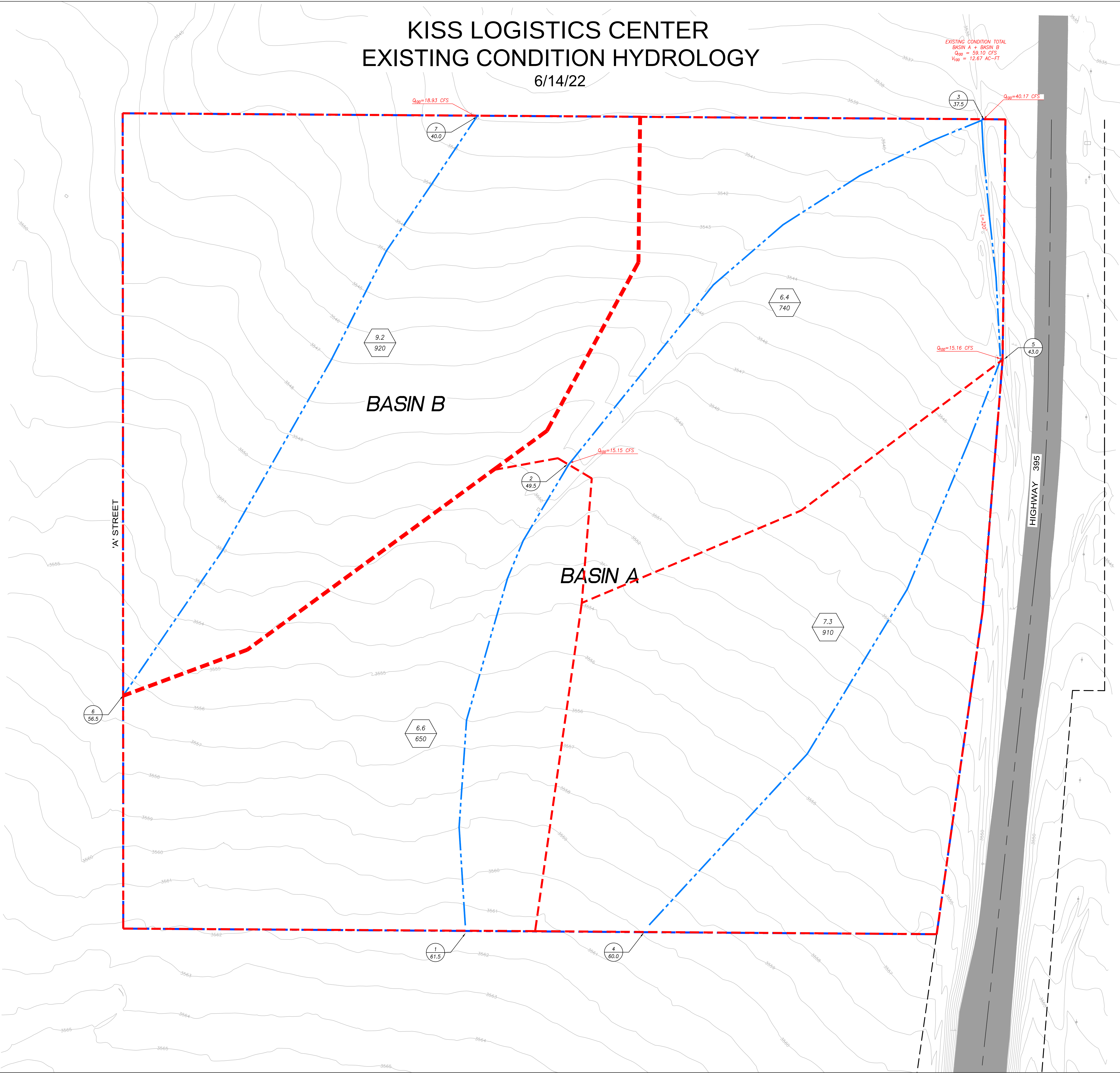
EXHIBITS

**EXISTING CONDITION HYDROLOGY
&
DEVELOPED CONDITION HYDROLOGY**

KISS LOGISTICS CENTER
EXISTING CONDITION HYDROLOGY
6/14/22

EXISTING CONDITION TOTAL
BASIN A + BASIN B
 $Q_{100} = 59.10$ CFS
 $V_{100} = 12.67$ AC-FT

- NOTES:
1. PEAK FLOWS REPORTED ON THIS MAP ARE TAKEN FROM RATIONAL METHOD MODEL.
 2. RUNOFF VOLUMES REPORTED ON THIS MAP TAKEN FROM UNIT HYDROGRAPH MODEL.



NOTE: ADD 3500 TO ALL PROPOSED ELEVATIONS SHOWN.



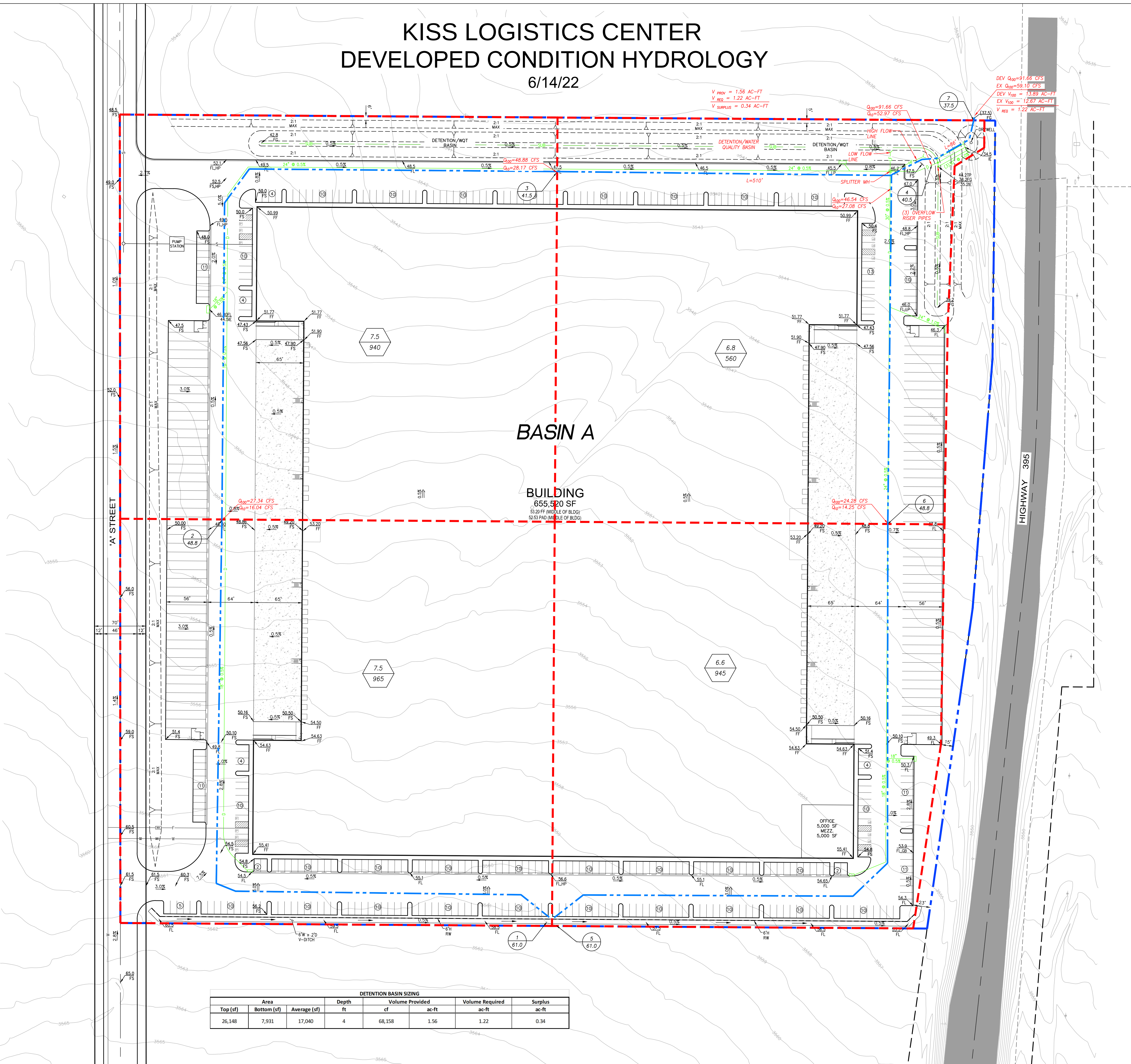
2248 FARADAY AVE.
CARLSBAD, CA 92008
TEL: (760) 431-8886
FAX: (760) 431-8802
27413 TOURNEY ROAD
SUITE 120
VALDICO, CA 91355
TEL: (661) 799-2760

CIVIL ENGINEERING • LAND PLANNING • HILLSIDE DESIGN • SURVEYING

KISS LOGISTICS CENTER DEVELOPED CONDITION HYDROLOGY

6/14/22

NOTES:
1. PEAK FLOWS REPORTED ON THIS MAP ARE
TAKEN FROM RATIONAL METHOD MODEL.
2. RUNOFF VOLUMES REPORTED ON THIS MAP
TAKEN FROM UNIT HYDROGRAPH MODEL.



NOTE: ADD 3500 TO ALL PROPOSED
ELEVATIONS SHOWN.

ALLIANCE
LAND PLANNING & ENGINEERING INC.
CIVIL ENGINEERING • LAND PLANNING • HILLSIDE DESIGN • SURVEYING

2248 FARADAY AVE.
CARLSBAD, CA 92008
TEL: (760) 431-8896
FAX: (760) 431-8802
27413 TOURNAY ROAD
SUITE 100
VALDICO, CA 91355
TEL: (661) 799-2760

SCALE: 1"=50'

LEGEND:

- PROPERTY LINE
- SUBAREA
- FLOWPATH
- PROPOSED STORM DRAIN
- PROPOSED LOWFLOW DRAIN
- PROPOSED HIGH FLOW CATCH BASIN
- NODE
- ELEVATION
- ACREAGE
- LENGTH