

PRELIMINARY HYDROLOGY & HYDRAULICS STUDY

**W. Arrow Highway & N. San Antonio Avenue
City of Upland, County of San Bernardino**

Project Address:
W. Arrow Highway & N. San Antonio Ave
City of Upland, CA 91786

Prepared For:

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Prepared: May 2025

**Hydrology and Hydraulics Study
For
W. Arrow Hwy and N. San Antonio Ave**

Acknowledgement and Signature Page

This Hydrology and Hydraulics Study was prepared by C&V Consulting, Inc. under the supervision of Dane McDougall, P.E.

Dane McDougall, P.E. 80705
C&V Consulting, Inc.

Date

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- Proposed Conditions – Rational Method

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(TO BE PROVIDED DURING FINAL ENGINEERING)

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I. Purpose

The purpose of this report is to provide quantitative information to verify the design of the storm drain infrastructure and hydrologic methodology of the project site. The values and statements within the confirm the subject site is designed and planned in accordance with the San Bernardino County Hydrology Manual and the City of Upland drainage requirements.

II. Site Description

The proposed project site consists eight (8) parcels over approximately 6.188 gross acres. The site is bounded by West Arrow Highway to the south, existing single family homes to the west and north, and single family homes and a church/ community preschool to the east. Three of the parcels are occupied by two single-family homes and the remaining parcels are vacant land. Along the southwestern corner of the site, there is concrete paving that served as sports courts in the past. Elevations onsite range from 1269 to 1285 feet above mean sea level (msl).

According to the USDA National Cooperative Soil Survey, the site is located in a soil classification, Tujunga loamy sand, 0 to 9 percent slopes, with a hydrologic soil group rating A.

According to the federal Emergency Management Agency (FEMA) FIRM rate map number 06071C8606H, effective date August 28, 2008, the site is located within flood Zone X, area of minimal flood hazard.

A separate Water Quality Management Plan is prepared to address the County storm water quality requirements.

Refer to Appendix A for additional information on site location.

III. Existing Conditions

The existing conditions of the project site consist of mostly a large amount of vacant land with two single family homes. Along the southwestern corner of the site, there is concrete paving that served as sports courts in the past. Elevations onsite range from 1269 to 1285 feet above mean sea level (msl). The site generally slopes from north to south. Existing runoff flows overland from north to south and into W. Arrow Highway. Runoff continues to the east in W. Arrow Highway until it enters an existing catch basin approximately 200' east of the project site. Runoff continues east to N. San Antonio Avenue where it confluences with the South Upland Storm Drain line. Runoff continues south in this storm drain until W 8th Street where it turns east and eventually enters the Cucamonga Creek Channel.

Refer to the Existing Conditions Hydrology Maps located within Appendix A.

IV. Proposed Conditions

The project proposes 19 residential buildings with the construction of 124 units with private garages, private drive aisles, sidewalks, and common landscaped areas. The proposed site is graded to flow via curb and gutter to three (3) curb inlet catch basins and two (2) grated inlets that route storm water to an underground infiltration system which will also function as a detention system. The infiltration system is sized to treat and infiltrate the water quality design capture volume prior to any discharge from the site. When the infiltration system is at capacity, runoff will overflow within the catch basins near the project entry and into the parkway drain that discharges into W. Arrow Highway. After entering W. Arrow Highway, runoff will follow historic drainage patterns.

Refer to the Proposed Conditions Hydrology Maps located within Appendix A.

V. Methodology

The project site's drainage was analyzed according to the San Bernardino Hydrology Manual. The runoff tributary area through the proposed project site is separated into multiple subareas and analyzed with acreage, land-use, soil type, peak flow rate and time of concentration according to the Rational Method and Hydrograph Method as described in the Hydrology Manual. Civil Design was utilized for the Rational Method analysis to obtain the confluence runoff through the project site from the upstream tributary areas.

The existing and proposed runoff of the site was analyzed for peak flow rate and time of concentration for the 25-, and 100- storm events.

VI. Design Assumption

1. The Civil Design Program was used to determine Peak run-off flow rate, time of concentration and run-off volume for subarea.
2. Precipitation Frequency Data was obtained through NOAA Atlas 14, Volume 6, Version 2 in Upland, California referenced in Appendix A.
3. The site is in the soil classification of "A" per Natural Resources Conservation Service Soil Survey Map.
4. Proposed storm drain system is sized for the 100-year return frequency flood protection per Hydrology Manual.
5. Proposed conditions for DMAs are assumed to be Condominium with a perviousness of 35%. Existing conditions are assumed to be 0.4 dwelling/acre with a perviousness of 90% per Hydrology Manual.

VII. Hydrology Results

A summary of the project site's existing and proposed conditions peak runoff values generated from the project site has been provided below.

Hydrology Summary

Existing conditions generated runoff peak flowrate summary:

Pre-Development Conditions	Area (ac)	Q ₂₅ (cfs)	Q ₁₀₀ (cfs)
DMA XA1	0.39	0.88	1.18
DMA XA2	4.77	9.96	13.53
DMA XB	1.03	3.03	4.04
Total	6.19	13.00	17.64

Proposed conditions generated runoff peak flowrate summary:

Post Development Conditions	Area (ac)	Q ₂₅ (cfs)	Q ₁₀₀ (cfs)
DMA P1	0.24	0.865	1.128
DMA P2	5.95	14.016	18.847
Total	6.19	14.882	19.975

Refer to Appendix B of this report for additional information.

Detention Routing

Detention routing calculation verified that the proposed drainage mitigates to the 100-year storm event design peak flowrate per existing conditions. Refer to summary of detention sizing.

Detention routing mitigated runoff drainage summary:

	Drainage Area (ac)	Q ₁₀₀ (cfs)
Existing Condition Peak Flow	6.19	18.77
Proposed Detention Routing Peak Flow	6.19	6.58
Percent Difference	-	-65%

Refer to Appendix C of this report for additional information.

VIII. Hydraulic Results

Catch Basin Inlet Sizing

Catch basin Sizing has been analyzed for the 100-year storm event peak flow rates and will be provided during final engineering

Parkway Drain Sizing

Parkway Drain Sizing will be analyzed based on the 100-year storm event peak flow rates rates and will be provided during final engineering

100-Year Water Surface Elevation (WSE)

The Water surface elevation for the 100-year storm event peak flow rate has been used to verify that the proposed finished floor elevations are at least 1' above the flood elevation. An exhibit will be provided during final engineering

IX. Conclusion

The result from this hydrology study demonstrates that the overall proposed developed condition will generate a higher peak runoff flowrate. Detention/ Routing analysis demonstrates that the 100-year storm mitigated runoff peak flow will be lower than downstream receiving water design conditions. The proposed project will have no hydrologic or hydraulic impacts on the existing downstream drainage facilities. In the event that the design storm is exceeded, runoff will overflow through the catch basin to the parkway drain and continue along the flow downstream following existing conditions.

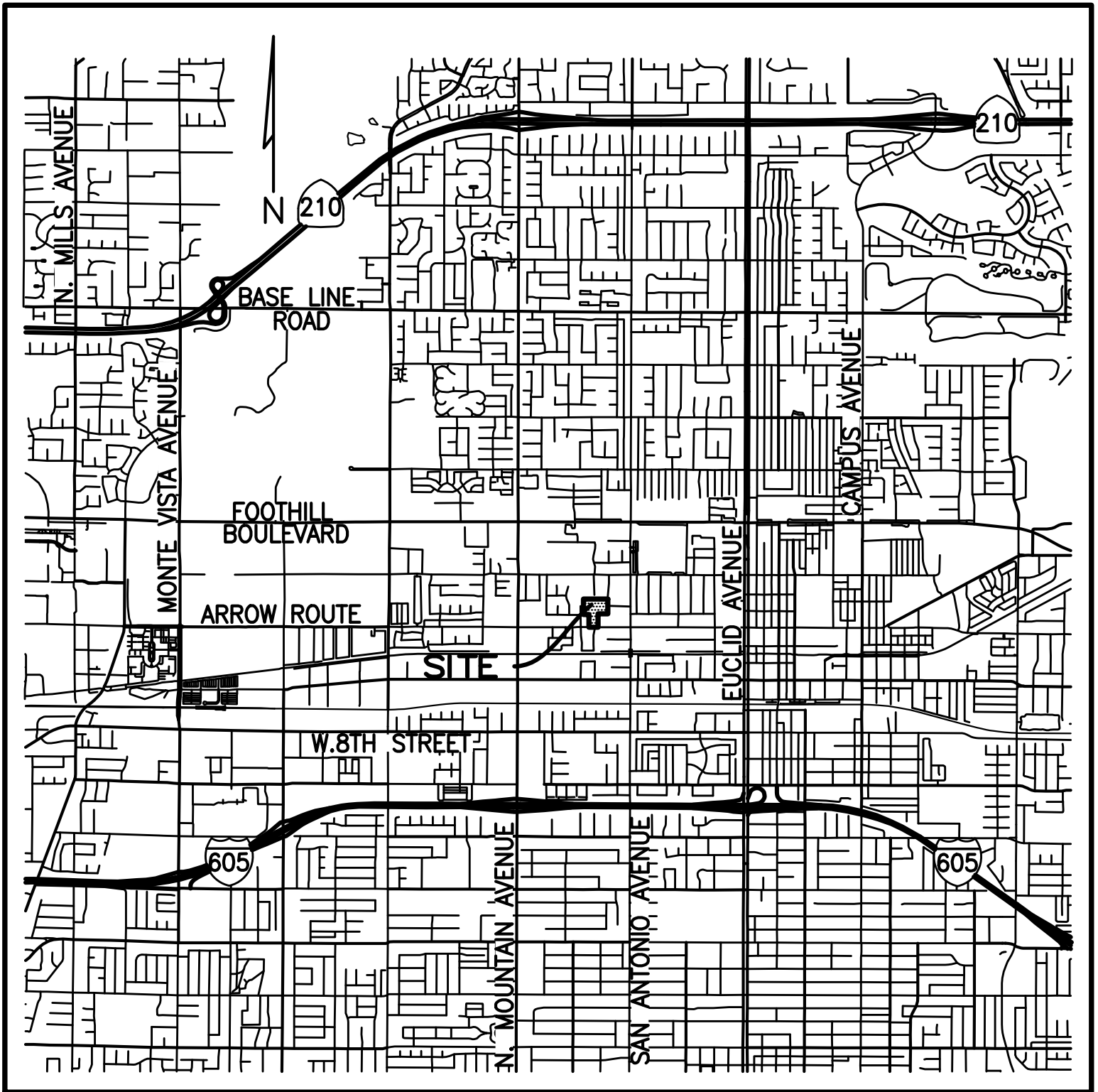
X. References

1. San Bernardino County Hydrology Manual, August 1986.
2. National Oceanic and Atmospheric Administration NOAA Precipitation Frequency Estimate, 14 June 2016.
3. Federal Emergency Management Agency (FEMA) Flood Map. FEMA.
4. United States Department of Agriculture (USDA) Natural Resources Conservation Service, Soil Map.
5. CivilCADD/ CivilDesign Engineering Software, 1989-2019 Version 9.1 was utilized to determine peak flow rates and time of concentrations.
6. Federal Highways Administration, Hydraulic Toolbox Version 5.0, Aug 2020.

APPENDIX A

Maps and Exhibits

Vicinity Map



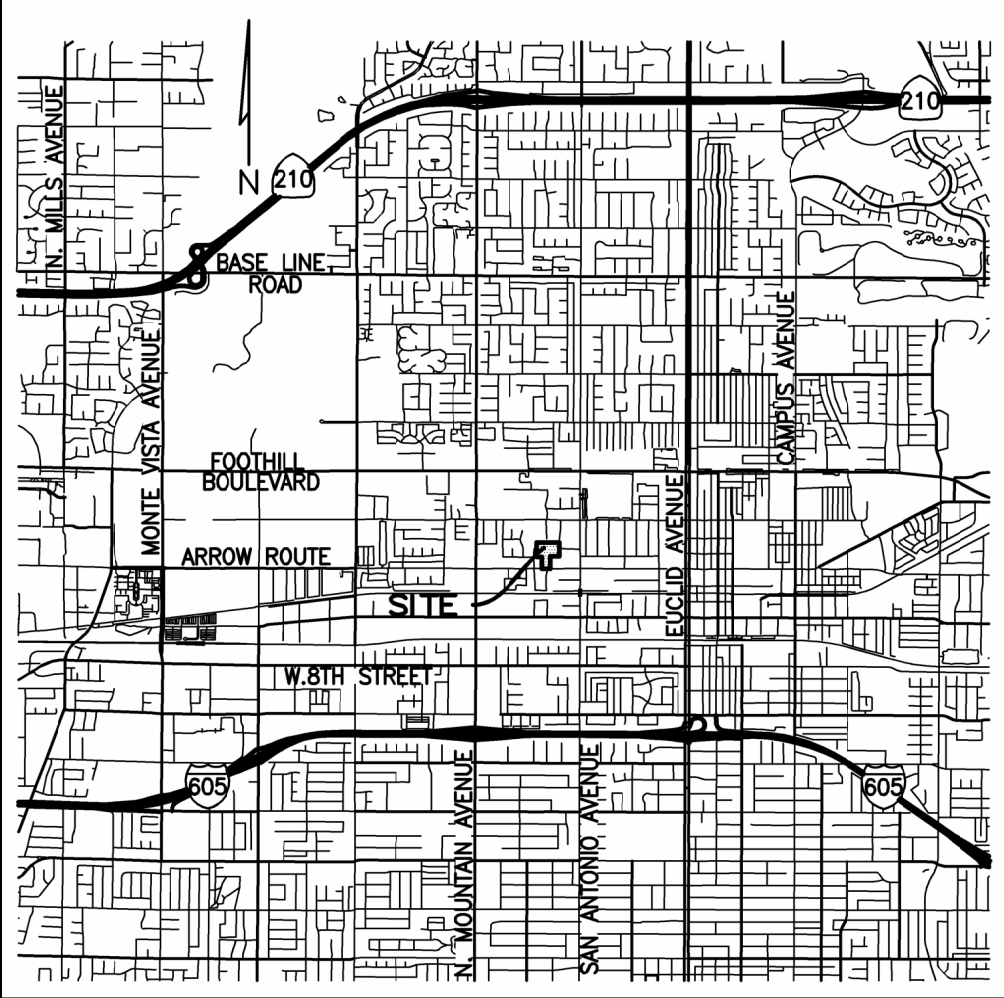
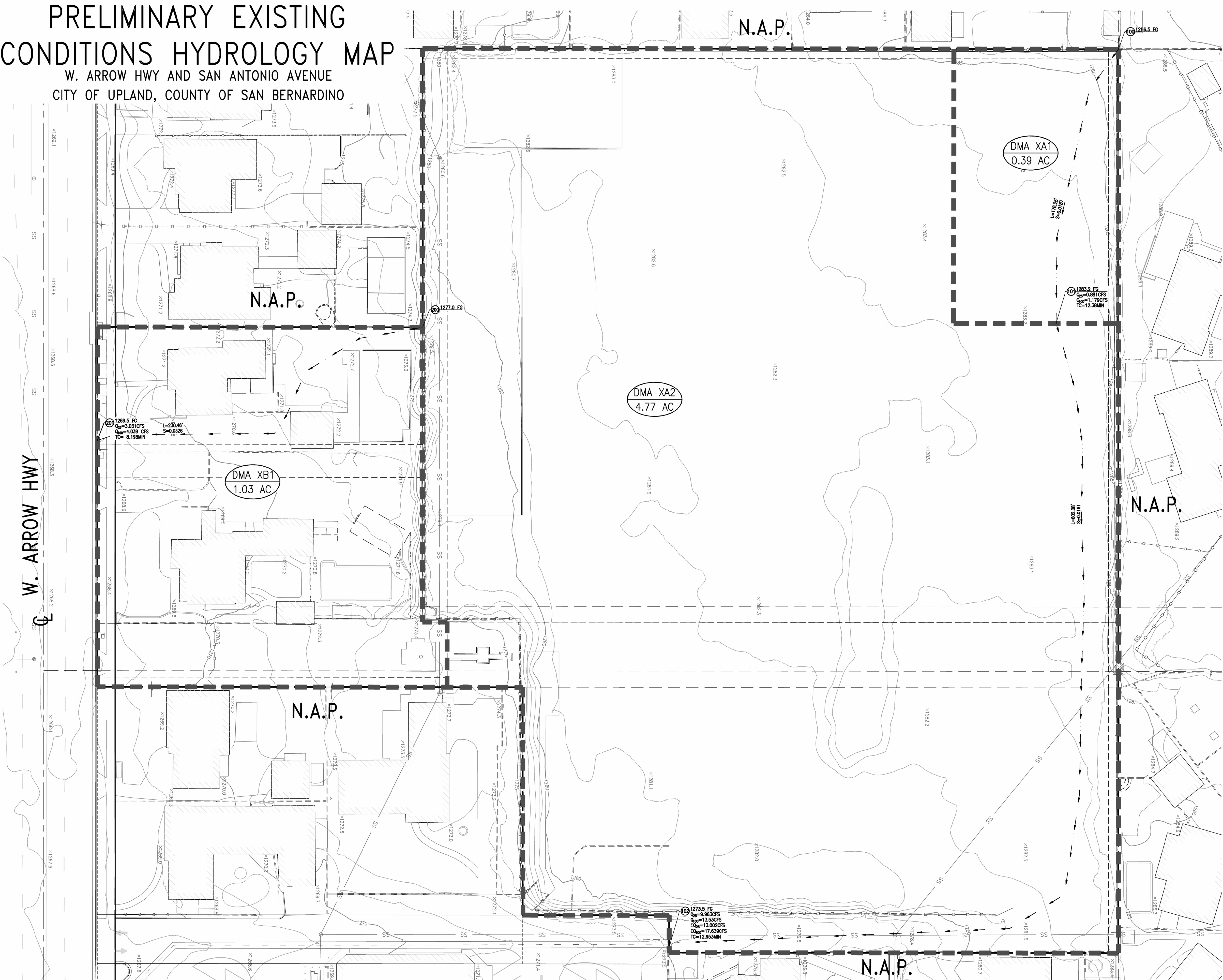
VICINITY MAP

N.T.S.

Existing Conditions Hydrology Map

PRELIMINARY EXISTING
CONDITIONS HYDROLOGY MAP
W. ARROW HWY AND SAN ANTONIO AVENUE
CITY OF UPLAND, COUNTY OF SAN BERNARDINO

W. ARROW HWY



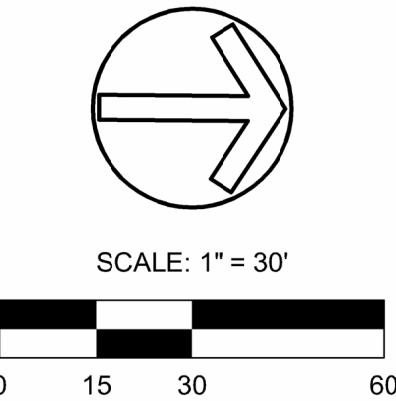
VICINITY MAP
N.T.S.

LEGEND:

- DRAINAGE MANAGEMENT AREA (DMA) BOUNDARY
- - - EXISTING RIGHT-OF-WAY/ SITE BOUNDARY
- FLOW DIRECTION
- FLOW LINE
- PERVIOUS AREA
- XX DRAINAGE AREA ID
- X.XX AC DRAINAGE AREA IN ACRES
- INITIAL SUBAREA NODE
(00.0) FS SPOT ELEVATION
Q₁₀₀ = X.XX CFS PEAK RUNOFF (CFS)
T_c = X.X MIN TIME OF CONCENTRATION (MIN)

DMA	LANDUSE	AREA (SF)	AREA (AC)	Q25	Q100
XA1	RESIDENTIAL	16,988.40	0.39	0.88	1.18
XA2	RESIDENTIAL	207,725.57	4.77	9.96	13.53
XB1	RESIDENTIAL	44,806.59	1.03	3.03	4.04
TOTAL	RESIDENTIAL	269,520.56	6.19	13.00	17.64

NOTE: PROPOSED DEVELOPMENT PERVIOUS COVERS ASSUMED PER SAN BERNARDINO HYDROLOGY MANUAL LANDUSE.



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SM
DESIGNED BY:
SM
CHECKED BY:
SM
RECOMMENDED BY:

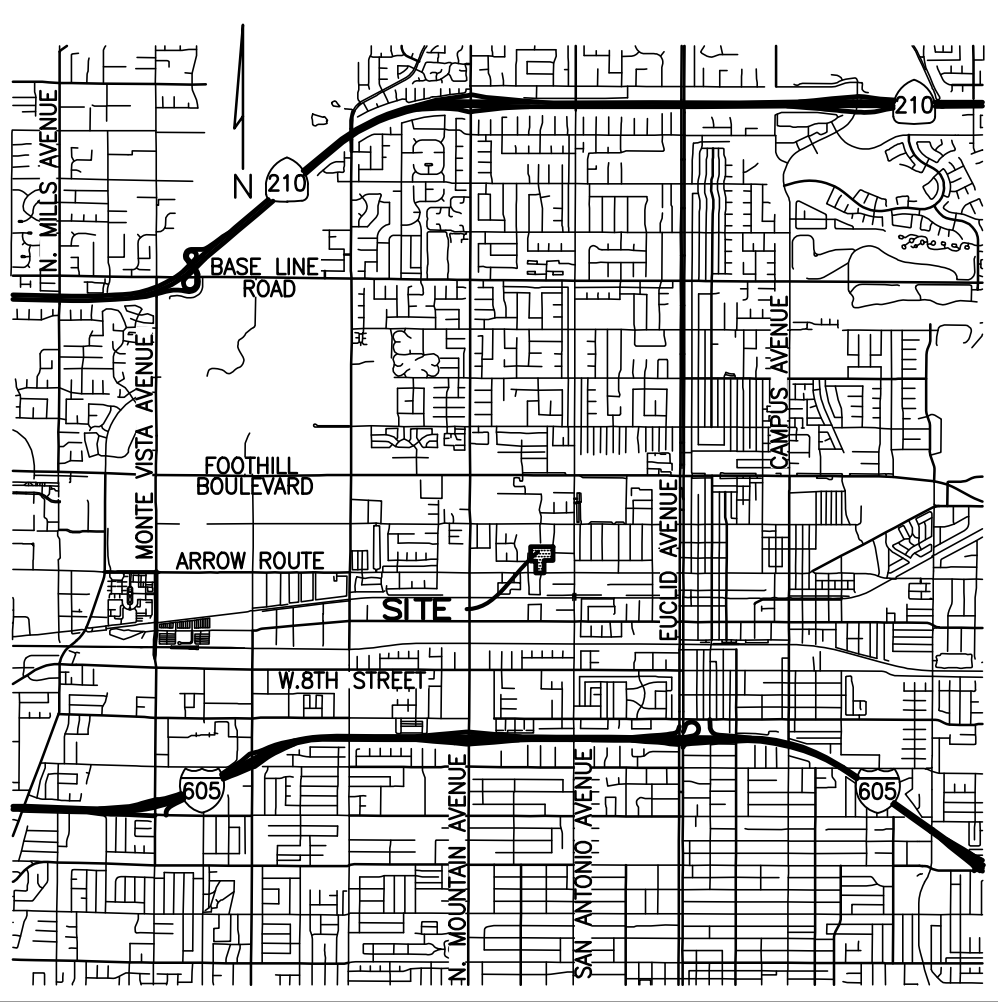
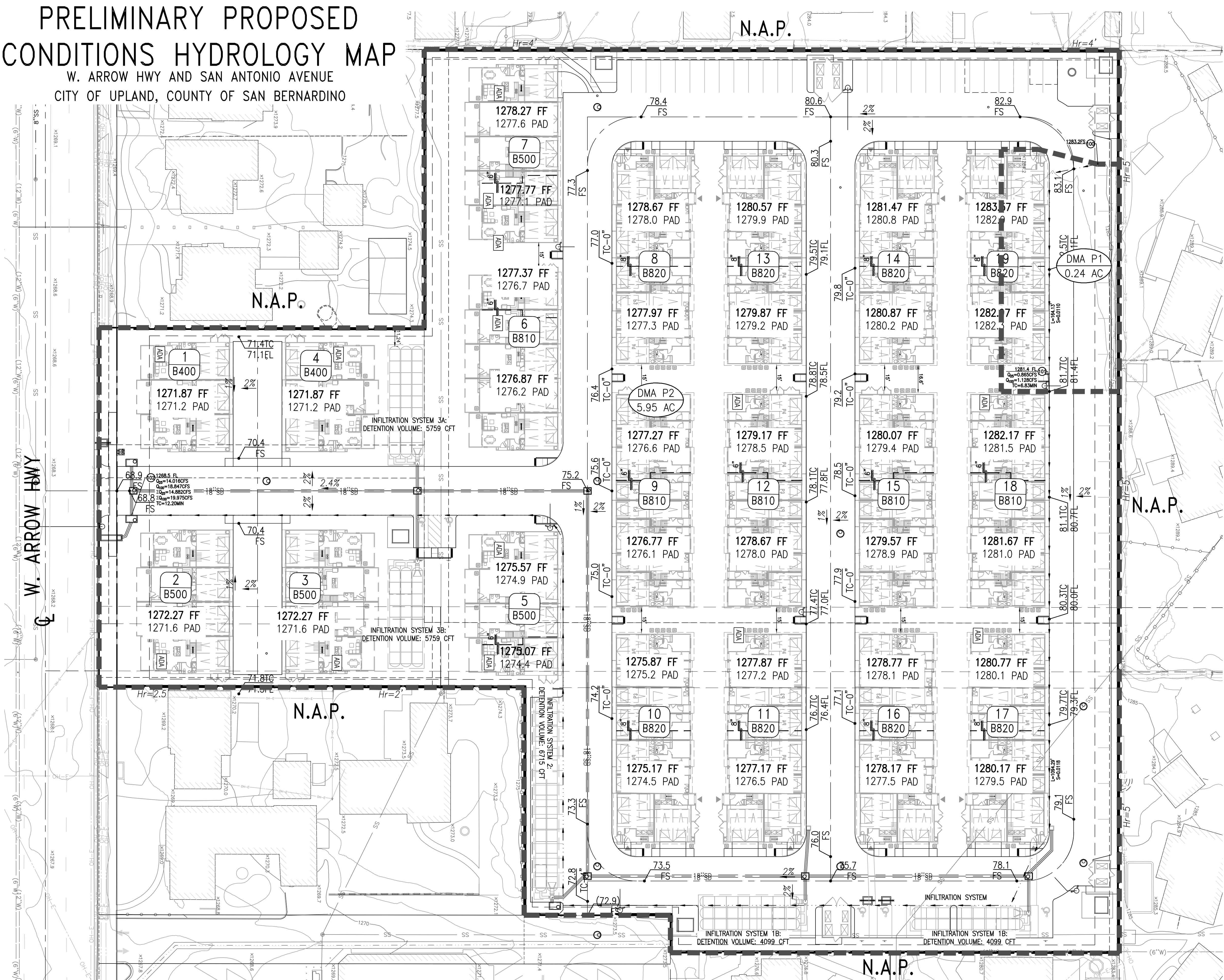
CITY OF UPLAND
PRELIMINARY EXISTING
CONDITIONS HYDROLOGY MAP

PROJECT NO.
TM
SHEET
OF 1 SHEETS
DRAWING NO.

PLAN SET: P501
DATE: 5/2/2025

Proposed Conditions Hydrology Map

PRELIMINARY PROPOSED
CONDITIONS HYDROLOGY MAP
W. ARROW HWY AND SAN ANTONIO AVENUE
CITY OF UPLAND, COUNTY OF SAN BERNARDINO



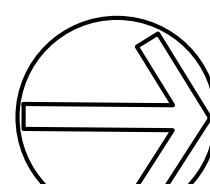
VICINITY MAP
N.T.S.

LEGEND:

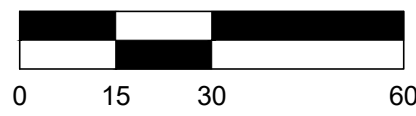
- DRAINAGE MANAGEMENT AREA (DMA) BOUNDARY
- - - EXISTING RIGHT-OF-WAY/ SITE BOUNDARY
- - - FLOW LINE
- XX DRAINAGE AREA ID
- X.XX AC DRAINAGE AREA IN ACRES
- INITIAL SUBAREA NODE
- SPOT ELEVATION
- Q100 = X.XX CFS PEAK RUNOFF (CFS)
- Tc = X.X MIN TIME OF CONCENTRATION (MIN)

DMA	LANDUSE	AREA (SF)	AREA (AC)	Q25	Q100
P1	RESIDENTIAL	10,481.43	0.24	0.88	1.18
P2	RESIDENTIAL	259,039.13	5.95	9.96	13.53
TOTAL	RESIDENTIAL	269,520.56	6.19	13.00	17.64

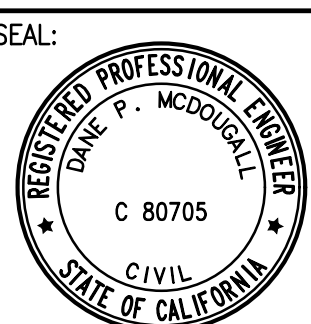
NOTE: PROPOSED DEVELOPMENT PERVIOUS COVERS ASSUMED PER SAN BERNARDINO HYDROLOGY MANUAL LANDUSE.



SCALE: 1" = 30'



PLANS PREPARED BY
C&V
CONSULTING, INC.
CIVIL ENGINEERING
LAND PLANNING & SURVEYING
DATE: R.C.E. # 80705



DRAWN BY: SM
DESIGNED BY: SM
CHECKED BY: SM
RECOMMENDED BY: SM

CITY OF UPLAND
PRELIMINARY PROPOSED
CONDITIONS HYDROLOGY MAP

PROJECT NO. TM
SHEET
OF 1 SHEETS
DRAWING NO.

PLAN SET: P501
DATE: 11/4/2025

NOAA



NOAA Atlas 14, Volume 6, Version 2
Location name: Upland, California, USA*
Latitude: 34.1°, Longitude: -117.6634°
Elevation: 1270 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 & aerals](#)

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	0.122 (0.102-0.148)	0.159 (0.133-0.193)	0.209 (0.173-0.254)	0.249 (0.205-0.305)	0.304 (0.242-0.386)	0.347 (0.270-0.450)	0.391 (0.296-0.520)	0.436 (0.321-0.598)	0.499 (0.352-0.714)	0.548 (0.373-0.813)
10-min	0.175 (0.146-0.212)	0.228 (0.190-0.277)	0.299 (0.248-0.364)	0.357 (0.294-0.438)	0.436 (0.347-0.554)	0.497 (0.387-0.645)	0.560 (0.425-0.746)	0.625 (0.504-1.02)	0.715 (0.535-1.16)	0.785 (0.535-1.16)
15-min	0.211 (0.176-0.256)	0.276 (0.230-0.335)	0.362 (0.300-0.440)	0.431 (0.355-0.529)	0.527 (0.419-0.670)	0.601 (0.468-0.781)	0.677 (0.514-0.902)	0.756 (0.557-1.04)	0.865 (0.610-1.24)	0.950 (0.647-1.41)
30-min	0.312 (0.260-0.378)	0.408 (0.340-0.495)	0.534 (0.443-0.649)	0.637 (0.525-0.782)	0.778 (0.619-0.989)	0.888 (0.691-1.15)	1.00 (0.758-1.33)	1.12 (0.823-1.53)	1.28 (0.901-1.83)	1.40 (0.955-2.08)
60-min	0.472 (0.393-0.571)	0.617 (0.513-0.748)	0.807 (0.670-0.982)	0.963 (0.793-1.18)	1.18 (0.935-1.49)	1.34 (1.04-1.74)	1.51 (1.15-2.01)	1.69 (1.24-2.31)	1.93 (1.36-2.76)	2.12 (1.44-3.14)
2-hr	0.713 (0.595-0.864)	0.926 (0.771-1.12)	1.20 (0.999-1.46)	1.43 (1.18-1.75)	1.73 (1.38-2.20)	1.97 (1.53-2.56)	2.21 (1.68-2.94)	2.46 (1.81-3.37)	2.80 (1.98-4.01)	3.06 (2.09-4.55)
3-hr	0.902 (0.752-1.09)	1.17 (0.972-1.42)	1.51 (1.25-1.84)	1.79 (1.47-2.20)	2.17 (1.72-2.75)	2.46 (1.91-3.19)	2.76 (2.09-3.67)	3.06 (2.26-4.20)	3.48 (2.46-4.98)	3.80 (2.59-5.65)
6-hr	1.29 (1.08-1.57)	1.67 (1.39-2.03)	2.16 (1.79-2.62)	2.55 (2.10-3.13)	3.09 (2.46-3.93)	3.50 (2.73-4.55)	3.92 (2.98-5.22)	4.36 (3.21-5.97)	4.95 (3.49-7.08)	5.40 (3.68-8.02)
12-hr	1.71 (1.42-2.07)	2.22 (1.85-2.69)	2.88 (2.39-3.51)	3.42 (2.82-4.20)	4.16 (3.31-5.29)	4.73 (3.68-6.14)	5.31 (4.03-7.07)	5.91 (4.36-8.10)	6.73 (4.75-9.63)	7.36 (5.01-10.9)
24-hr	2.38 (2.11-2.75)	3.14 (2.78-3.62)	4.13 (3.64-4.78)	4.95 (4.33-5.77)	6.07 (5.14-7.31)	6.94 (5.76-8.54)	7.83 (6.34-9.87)	8.76 (6.90-11.3)	10.0 (7.59-13.5)	11.0 (8.07-15.4)
2-day	2.96 (2.62-3.42)	3.98 (3.52-4.59)	5.34 (4.71-6.18)	6.46 (5.65-7.54)	8.02 (6.79-9.67)	9.24 (7.67-11.4)	10.5 (8.51-13.2)	11.8 (9.33-15.3)	13.7 (10.3-18.5)	15.1 (11.1-21.1)
3-day	3.22 (2.85-3.71)	4.39 (3.88-5.06)	5.96 (5.25-6.89)	7.26 (6.36-8.47)	9.09 (7.69-11.0)	10.5 (8.73-12.9)	12.0 (9.73-15.1)	13.6 (10.7-17.6)	15.8 (11.9-21.3)	17.5 (12.8-24.5)
4-day	3.48 (3.08-4.01)	4.79 (4.23-5.53)	6.55 (5.78-7.58)	8.02 (7.02-9.36)	10.1 (8.53-12.1)	11.7 (9.71-14.4)	13.4 (10.8-16.9)	15.2 (12.0-19.7)	17.7 (13.4-23.9)	19.7 (14.4-27.5)
7-day	3.96 (3.51-4.57)	5.53 (4.89-6.38)	7.64 (6.74-8.84)	9.41 (8.23-11.0)	11.9 (10.1-14.3)	13.9 (11.5-17.0)	15.9 (12.9-20.0)	18.1 (14.2-23.4)	21.1 (16.0-28.5)	23.5 (17.2-32.8)
10-day	4.28 (3.79-4.93)	6.01 (5.32-6.94)	8.36 (7.37-9.67)	10.3 (9.03-12.0)	13.1 (11.1-15.8)	15.3 (12.7-18.8)	17.6 (14.2-22.1)	20.0 (15.8-25.9)	23.4 (17.7-31.6)	26.1 (19.1-36.5)
20-day	5.13 (4.54-5.92)	7.27 (6.43-8.39)	10.2 (8.98-11.8)	12.6 (11.1-14.8)	16.1 (13.7-19.4)	18.9 (15.7-23.3)	21.8 (17.7-27.5)	24.9 (19.6-32.3)	29.3 (22.2-39.6)	32.8 (24.0-45.8)
30-day	6.03 (5.34-6.95)	8.51 (7.53-9.82)	11.9 (10.5-13.8)	14.8 (13.0-17.3)	18.9 (16.0-22.8)	22.2 (18.4-27.3)	25.7 (20.8-32.4)	29.4 (23.2-38.1)	34.7 (26.2-46.8)	38.9 (28.5-54.4)
45-day	7.22 (6.39-8.32)	10.1 (8.90-11.6)	14.0 (12.3-16.2)	17.3 (15.2-20.2)	22.1 (18.8-26.7)	26.0 (21.6-32.0)	30.2 (24.4-38.0)	34.6 (27.2-44.8)	40.9 (30.9-55.2)	46.0 (33.6-64.2)
60-day	8.43 (7.46-9.72)	11.6 (10.2-13.3)	15.9 (14.0-18.4)	19.6 (17.2-22.9)	25.0 (21.2-30.2)	29.4 (24.4-36.2)	34.1 (27.6-42.9)	39.1 (30.8-50.6)	46.3 (35.0-62.5)	52.2 (38.2-72.8)

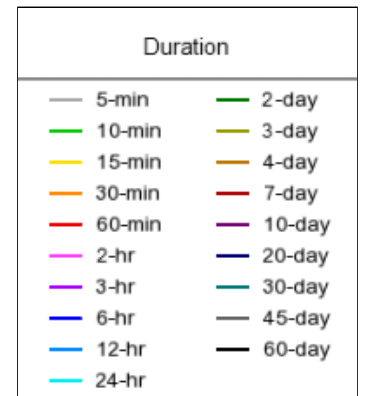
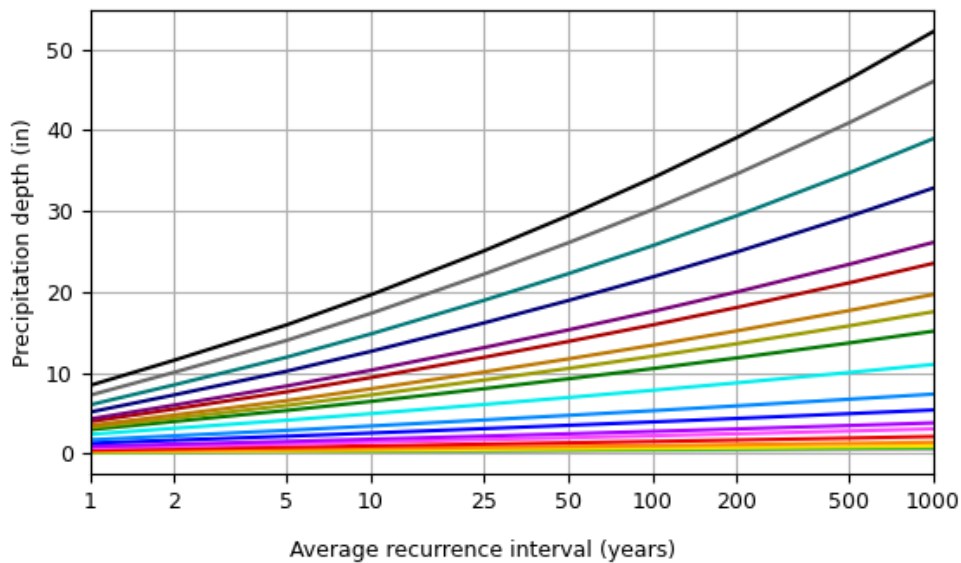
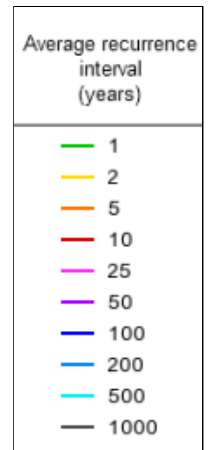
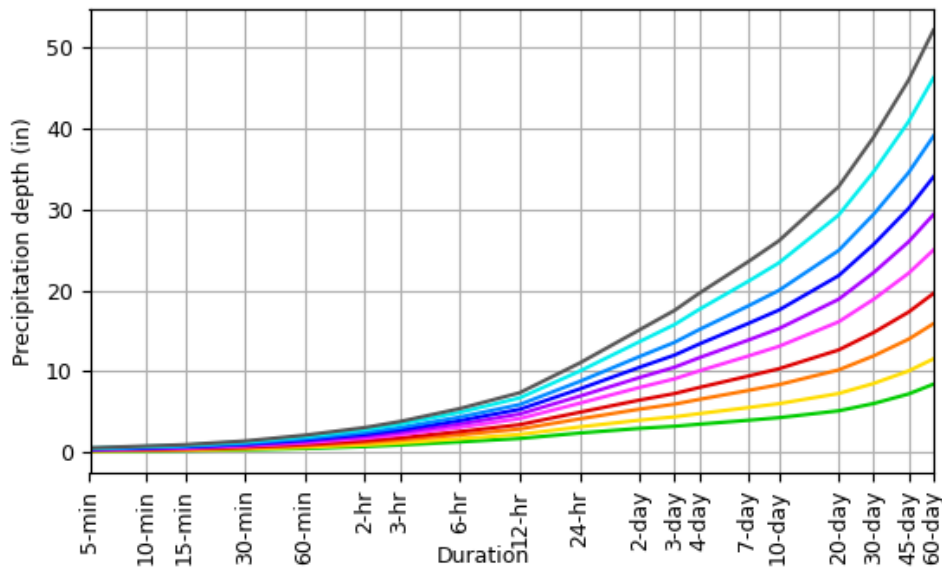
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
 Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
 Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves

Latitude: 34.1000°, Longitude: -117.6634°



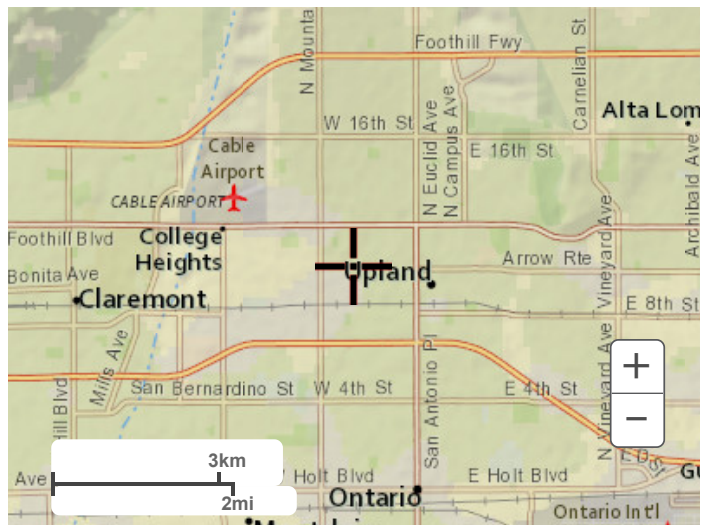
NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Tue Feb 11 02:59:20 2025

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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](#)

Soil Map

Soil Map—San Bernardino County Southwestern Part, California

117° 39' 52" W

438700 438730 438760 438790 438820 438850 438880

3773630 3773600 3773570 3773540 3773510 3773480 3773450 3773420 3773390

TVC

Arrow

W Arrow Hwy

Soil Map may not be valid at this scale.

Map Scale: 1:1,310 if printed on A portrait (8.5" x 11") sheet.

0 15 30 60 90 Meters

N

117° 39' 52" W

117° 39' 44" W

Map Scale: 1:1,310 if printed on A portrait (8.5" x 11") sheet.

N



0 15 30 60 90 Meters

0 50 100 200 300 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Bernardino County Southwestern Part, California

Survey Area Data: Version 16, Aug 30, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 20, 2022—Nov 25, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
TvC	Tujunga gravelly loamy sand, 0 to 9 percent slopes	5.5	100.0%
Totals for Area of Interest		5.5	100.0%

San Bernardino County Southwestern Part, California

TvC—Tujunga gravelly loamy sand, 0 to 9 percent slopes

Map Unit Setting

National map unit symbol: hcl2

Elevation: 10 to 1,500 feet

Mean annual precipitation: 10 to 25 inches

Mean annual air temperature: 59 to 64 degrees F

Frost-free period: 250 to 350 days

Farmland classification: Not prime farmland

Map Unit Composition

Tujunga and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tujunga

Setting

Landform: Alluvial fans

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 36 inches: gravelly loamy sand

H2 - 36 to 60 inches: gravelly sand

Properties and qualities

Slope: 0 to 9 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat excessively drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: Rare

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): 4s

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: A

Ecological site: R019XG912CA - Sandy Fan

Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 5 percent

Landform: Drainageways

Hydric soil rating: Yes

Soboba, gravelly loamy sand

Percent of map unit: 5 percent

Hydric soil rating: No

Delhi, fine sand

Percent of map unit: 5 percent

Hydric soil rating: No

Data Source Information

Soil Survey Area: San Bernardino County Southwestern Part, California

Survey Area Data: Version 16, Aug 30, 2024

APPENDIX B

Hydrology Analysis

Existing Conditions – Rational Method

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2019 Version 9.1
Rational Hydrology Study Date: 05/02/25

WARM023
PRELIMINARY
EX Q25

Program License Serial Number 6677

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.963(In.)
100 Year storm 1 hour rainfall = 1.510(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.181 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

+++++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
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) = 50.00
Adjusted SCS curve number for AMC 3 = 70.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.532(In/Hr)
Initial subarea data:
Initial area flow distance = 176.250(Ft.)
Top (of initial area) elevation = 1286.500(Ft.)
Bottom (of initial area) elevation = 1283.200(Ft.)
Difference in elevation = 3.300(Ft.)
Slope = 0.01872 s(%)= 1.87
 $TC = k(0.706)*[(length^3)/(elevation\ change)]^{0.2}$

Initial area time of concentration = 12.382 min.
Rainfall intensity = 3.043(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.743
Subarea runoff = 0.881(CFS)
Total initial stream area = 0.390(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.532(In/Hr)

+++++
Process from Point/Station 101.000 to Point/Station 102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 0.000(CFS)
Depth of flow = 1.088(Ft.), Average velocity = 16.286(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
2 234.03 382.74
Manning's 'N' friction factor = 0.005

Sub-Channel flow = 5.889(CFS)
' ' flow top width = 0.665(Ft.)
' ' velocity = 16.286(Ft/s)
' ' area = 0.362(Sq.Ft)
' ' Froude number = 3.892

Upstream point elevation = 1283.200(Ft.)
Downstream point elevation = 1273.500(Ft.)
Flow length = 602.080(Ft.)
Travel time = 0.62 min.
Time of concentration = 13.00 min.
Depth of flow = 1.088(Ft.)
Average velocity = 16.286(Ft/s)
Total irregular channel flow = 5.889(CFS)
Irregular channel normal depth above invert elev. = 1.088(Ft.)
Average velocity of channel(s) = 16.286(Ft/s)
!!Warning: Water is above left or right bank elevations

Adding area flow to channel
RESIDENTIAL(1 acre lot)
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) = 0.8000 Max loss rate(Fm)= 0.628(In/Hr)

Rainfall intensity = 2.956(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.711
Subarea runoff = 9.963(CFS) for 4.770(Ac.)
Total runoff = 10.844(CFS)
Effective area this stream = 5.16(Ac.)
Total Study Area (Main Stream No. 1) = 5.16(Ac.)
Area averaged Fm value = 0.621(In/Hr)
Depth of flow = 1.367(Ft.), Average velocity = 18.971(Ft/s)
!!Warning: Water is above left or right bank elevations

+++++
Process from Point/Station 101.000 to Point/Station 102.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 5.160(Ac.)
Runoff from this stream = 10.844(CFS)
Time of concentration = 13.00 min.
Rainfall intensity = 2.956(In/Hr)
Area averaged loss rate (Fm) = 0.6209(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8151
Program is now starting with Main Stream No. 2

+++++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

RESIDENTIAL(1 acre lot)

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) = 0.8000 Max loss rate(Fm)= 0.628(In/Hr)
Initial subarea data:
Initial area flow distance = 230.460(Ft.)
Top (of initial area) elevation = 1277.000(Ft.)
Bottom (of initial area) elevation = 1269.500(Ft.)
Difference in elevation = 7.500(Ft.)
Slope = 0.03254 s(%)= 3.25
TC = $k(0.469)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 8.198 min.
Rainfall intensity = 3.898(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.755
Subarea runoff = 3.031(CFS)

Total initial stream area = 1.030(Ac.)
Pervious area fraction = 0.800
Initial area Fm value = 0.628(In/Hr)

++++
Process from Point/Station 200.000 to Point/Station 201.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 1.030(Ac.)
Runoff from this stream = 3.031(CFS)
Time of concentration = 8.20 min.
Rainfall intensity = 3.898(In/Hr)
Area averaged loss rate (Fm) = 0.6281(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8000
Summary of stream data:

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

1	10.84	5.160	13.00	0.621	2.956
2	3.03	1.030	8.20	0.628	3.898

Qmax(1) =
1.000 * 1.000 * 10.844) +
0.712 * 1.000 * 3.031) + = 13.002

Qmax(2) =
1.403 * 0.631 * 10.844) +
1.000 * 1.000 * 3.031) + = 12.628

Total of 2 main streams to confluence:

Flow rates before confluence point:

11.844 4.031

Maximum flow rates at confluence using above data:

13.002 12.628

Area of streams before confluence:

5.160 1.030

Effective area values after confluence:

6.190 4.285

Results of confluence:

Total flow rate = 13.002(CFS)

Time of concentration = 12.998 min.

Effective stream area after confluence = 6.190(Ac.)

Study area average Pervious fraction(Ap) = 0.813

Study area average soil loss rate(Fm) = 0.622(In/Hr)

Study area total = 6.19(Ac.)

End of computations, Total Study Area = 6.19 (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) = 0.813

Area averaged SCS curve number = 33.1

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2019 Version 9.1
Rational Hydrology Study Date: 05/02/25

WARM023
PRELIMINARY
EX Q100

Program License Serial Number 6677

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.510 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

+++++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (average cover) subarea
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) = 50.00
Adjusted SCS curve number for AMC 3 = 70.00
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.532(In/Hr)
Initial subarea data:
Initial area flow distance = 176.250(Ft.)
Top (of initial area) elevation = 1286.500(Ft.)
Bottom (of initial area) elevation = 1283.200(Ft.)
Difference in elevation = 3.300(Ft.)
Slope = 0.01872 s(%)= 1.87
 $TC = k(0.706)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 12.382 min.
Rainfall intensity = 3.892(In/Hr) for a 100.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.777
Subarea runoff = 1.179(CFS)
Total initial stream area = 0.390(Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.532(In/Hr)

+++++
Process from Point/Station 101.000 to Point/Station 102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 0.000(CFS)
Depth of flow = 1.218(Ft.), Average velocity = 17.567(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
2 234.03 382.74
Manning's 'N' friction factor = 0.005

Sub-Channel flow = 7.973(CFS)
' ' flow top width = 0.745(Ft.)
' ' velocity = 17.567(Ft/s)
' ' area = 0.454(Sq.Ft)
' ' Froude number = 3.966

Upstream point elevation = 1283.200(Ft.)
Downstream point elevation = 1273.500(Ft.)
Flow length = 602.080(Ft.)
Travel time = 0.57 min.
Time of concentration = 12.95 min.
Depth of flow = 1.218(Ft.)
Average velocity = 17.567(Ft/s)
Total irregular channel flow = 7.973(CFS)
Irregular channel normal depth above invert elev. = 1.218(Ft.)
Average velocity of channel(s) = 17.567(Ft/s)
!!Warning: Water is above left or right bank elevations
Adding area flow to channel
RESIDENTIAL(1 acre lot)
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) = 0.8000 Max loss rate(Fm)= 0.628(In/Hr)
Rainfall intensity = 3.788(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified

rational method)(Q=KCIA) is C = 0.752
Subarea runoff = 13.530(CFS) for 4.770(Ac.)
Total runoff = 14.710(CFS)
Effective area this stream = 5.16(Ac.)
Total Study Area (Main Stream No. 1) = 5.16(Ac.)
Area averaged Fm value = 0.621(In/Hr)
Depth of flow = 1.533(Ft.), Average velocity = 20.474(Ft/s)
!!Warning: Water is above left or right bank elevations

++++
Process from Point/Station 101.000 to Point/Station 102.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 5.160(Ac.)
Runoff from this stream = 14.710(CFS)
Time of concentration = 12.95 min.
Rainfall intensity = 3.788(In/Hr)
Area averaged loss rate (Fm) = 0.6209(In/Hr)
Area averaged Pervious ratio (Ap) = 0.8151
Program is now starting with Main Stream No. 2

++++
Process from Point/Station 200.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

RESIDENTIAL(1 acre lot)
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) = 0.8000 Max loss rate(Fm)= 0.628(In/Hr)
Initial subarea data:
Initial area flow distance = 230.460(Ft.)
Top (of initial area) elevation = 1277.000(Ft.)
Bottom (of initial area) elevation = 1269.500(Ft.)
Difference in elevation = 7.500(Ft.)
Slope = 0.03254 s(%)= 3.25
TC = $k(0.469)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 8.198 min.
Rainfall intensity = 4.985(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.787
Subarea runoff = 4.039(CFS)
Total initial stream area = 1.030(Ac.)
Pervious area fraction = 0.800

Initial area Fm value = 0.628(In/Hr)

+++++
Process from Point/Station 200.000 to Point/Station 201.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2

Stream flow area = 1.030(Ac.)

Runoff from this stream = 4.039(CFS)

Time of concentration = 8.20 min.

Rainfall intensity = 4.985(In/Hr)

Area averaged loss rate (Fm) = 0.6281(In/Hr)

Area averaged Pervious ratio (Ap) = 0.8000

Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	14.71	5.160	12.95	0.621	3.788
2	4.04	1.030	8.20	0.628	4.985

Qmax(1) =

1.000 * 1.000 * 14.710) +
0.725 * 1.000 * 4.039) + = 17.639

Qmax(2) =

1.378 * 0.633 * 14.710) +
1.000 * 1.000 * 4.039) + = 16.865

Total of 2 main streams to confluence:

Flow rates before confluence point:

15.710 5.039

Maximum flow rates at confluence using above data:

17.639 16.865

Area of streams before confluence:

5.160 1.030

Effective area values after confluence:

6.190 4.296

Results of confluence:

Total flow rate = 17.639(CFS)

Time of concentration = 12.953 min.

Effective stream area after confluence = 6.190(Ac.)

Study area average Pervious fraction(Ap) = 0.813

Study area average soil loss rate(Fm) = 0.622(In/Hr)

Study area total = 6.19(Ac.)

End of computations, Total Study Area = 6.19 (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) = 0.813

Area averaged SCS curve number = 33.1

Proposed Conditions – Rational Method

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2019 Version 9.1
Rational Hydrology Study Date: 05/02/25

WARM023
PRELIMINARY
PROP Q25

Program License Serial Number 6677

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

Rational hydrology study storm event year is 25.0
10 Year storm 1 hour rainfall = 0.963(In.)
100 Year storm 1 hour rainfall = 1.510(In.)
Computed rainfall intensity:
Storm year = 25.00 1 hour rainfall = 1.181 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

+++++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

CONDOMINIUM 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) = 0.3500 Max loss rate(Fm)= 0.342(In/Hr)
Initial subarea data:
Initial area flow distance = 164.130(Ft.)
Top (of initial area) elevation = 1283.200(Ft.)
Bottom (of initial area) elevation = 1281.400(Ft.)
Difference in elevation = 1.800(Ft.)
Slope = 0.01097 s(%)= 1.10
TC = $k(0.360)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 6.829 min.

Rainfall intensity = 4.349(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.829
Subarea runoff = 0.865(CFS)
Total initial stream area = 0.240(Ac.)
Pervious area fraction = 0.350
Initial area Fm value = 0.342(In/Hr)

+++++
Process from Point/Station 101.000 to Point/Station 102.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1281.400(Ft.)
End of street segment elevation = 1268.500(Ft.)
Length of street segment = 1094.290(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 24.000(Ft.)
Distance from crown to crossfall grade break = 22.500(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 1.500(Ft.)
Gutter hike from flowline = 1.500(In.)
Manning's N in gutter = 0.0130
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 7.916(CFS)
Depth of flow = 0.407(Ft.), Average velocity = 3.168(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 15.581(Ft.)
Flow velocity = 3.17(Ft/s)
Travel time = 5.76 min. TC = 12.59 min.
Adding area flow to street
CONDOMINIUM 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) = 0.3500 Max loss rate(Fm)= 0.342(In/Hr)
Rainfall intensity = 3.013(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.798
Subarea runoff = 14.016(CFS) for 5.950(Ac.)
Total runoff = 14.882(CFS)
Effective area this stream = 6.19(Ac.)
Total Study Area (Main Stream No. 1) = 6.19(Ac.)
Area averaged Fm value = 0.342(In/Hr)

Street flow at end of street = 14.882(CFS)
Half street flow at end of street = 14.882(CFS)
Depth of flow = 0.493(Ft.), Average velocity = 3.694(Ft/s)
Flow width (from curb towards crown)= 19.894(Ft.)
End of computations, Total Study Area = 6.19 (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) = 0.350
Area averaged SCS curve number = 32.0

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2019 Version 9.1
Rational Hydrology Study Date: 05/02/25

WARM023
PRELIMINARY
PROP Q100

Program License Serial Number 6677

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

Rational hydrology study storm event year is 100.0
10 Year storm 1 hour rainfall = 0.963(In.)
100 Year storm 1 hour rainfall = 1.510(In.)
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.510 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++++
Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

CONDOMINIUM 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) = 0.3500 Max loss rate(Fm)= 0.342(In/Hr)
Initial subarea data:
Initial area flow distance = 164.130(Ft.)
Top (of initial area) elevation = 1283.200(Ft.)
Bottom (of initial area) elevation = 1281.400(Ft.)
Difference in elevation = 1.800(Ft.)
Slope = 0.01097 s(%)= 1.10
TC = $k(0.360)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 6.829 min.

Rainfall intensity = 5.562(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.845
Subarea runoff = 1.128(CFS)
Total initial stream area = 0.240(Ac.)
Pervious area fraction = 0.350
Initial area Fm value = 0.342(In/Hr)

+++++
Process from Point/Station 101.000 to Point/Station 102.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1281.400(Ft.)
End of street segment elevation = 1268.500(Ft.)
Length of street segment = 1094.290(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 24.000(Ft.)
Distance from crown to crossfall grade break = 22.500(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.020
Gutter width = 1.500(Ft.)
Gutter hike from flowline = 1.500(In.)
Manning's N in gutter = 0.0130
Manning's N from gutter to grade break = 0.0150
Manning's N from grade break to crown = 0.0150
Estimated mean flow rate at midpoint of street = 10.578(CFS)
Depth of flow = 0.444(Ft.), Average velocity = 3.398(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 17.440(Ft.)
Flow velocity = 3.40(Ft/s)
Travel time = 5.37 min. TC = 12.20 min.
Adding area flow to street
CONDOMINIUM 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) = 0.3500 Max loss rate(Fm)= 0.342(In/Hr)
Rainfall intensity = 3.928(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 = 18.847(CFS) for 5.950(Ac.)
Total runoff = 19.975(CFS)
Effective area this stream = 6.19(Ac.)
Total Study Area (Main Stream No. 1) = 6.19(Ac.)
Area averaged Fm value = 0.342(In/Hr)

Street flow at end of street = 19.975(CFS)
Half street flow at end of street = 19.975(CFS)
Depth of flow = 0.546(Ft.), Average velocity = 3.827(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property = 2.32(Ft.)
Flow width (from curb towards crown)= 22.570(Ft.)
End of computations, Total Study Area = 6.19 (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) = 0.350
Area averaged SCS curve number = 32.0

APPENDIX C

Hydrograph Analysis

Existing Conditions Hydrographs

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

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Study date 05/04/25

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

Program License Serial Number 6677

WARM023
PRELIMINARY
EX Q100

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		
6.19	1	1.51

Rainfall data for year 100		
6.19	6	3.92

Rainfall data for year 100		
6.19	24	7.83

+++++

***** 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)
50.0	70.0	6.19	1.000	0.532	1.000	0.532

Area-averaged adjusted loss rate Fm (In/Hr) = 0.532

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
6.19	1.000	50.0	70.0	4.29	0.552

Area-averaged catchment yield fraction, Y = 0.552

Area-averaged low loss fraction, Yb = 0.448

User entry of time of concentration = 0.216 (hours)

+++++

Watershed area = 6.19(Ac.)

Catchment Lag time = 0.173 hours

Unit interval = 5.000 minutes

Unit interval percentage of lag time = 48.2253

Hydrograph baseflow = 0.00(CFS)

Average maximum watershed loss rate(Fm) = 0.532(In/Hr)

Average low loss rate fraction (Yb) = 0.448 (decimal)

VALLEY DEVELOPED S-Graph Selected

Computed peak 5-minute rainfall = 0.559(In)

Computed peak 30-minute rainfall = 1.144(In)

Specified peak 1-hour rainfall = 1.510(In)

Computed peak 3-hour rainfall = 2.710(In)

Specified peak 6-hour rainfall = 3.920(In)

Specified peak 24-hour rainfall = 7.830(In)

Rainfall depth area reduction factors:

Using a total area of 6.19(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.559(In)

30-minute factor = 1.000 Adjusted rainfall = 1.144(In)

1-hour factor = 1.000 Adjusted rainfall = 1.510(In)

3-hour factor = 1.000 Adjusted rainfall = 2.710(In)

6-hour factor = 1.000 Adjusted rainfall = 3.920(In)

24-hour factor = 1.000 Adjusted rainfall = 7.830(In)

Unit Hydrograph

+++++

Interval	'S' Graph	Unit Hydrograph
----------	-----------	-----------------

Number	Mean values	((CFS))

	(K =	74.86 (CFS))
1	4.273	3.199
2	27.827	17.633
3	65.909	28.508
4	88.330	16.784
5	96.387	6.032
6	98.574	1.638
7	99.442	0.650
8	100.000	0.417

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.5587	0.5587
2	0.7372	0.1785
3	0.8670	0.1298
4	0.9728	0.1057
5	1.0636	0.0908
6	1.1440	0.0805
7	1.2168	0.0728
8	1.2836	0.0668
9	1.3455	0.0619
10	1.4034	0.0579
11	1.4579	0.0545
12	1.5096	0.0516
13	1.5753	0.0658
14	1.6387	0.0634
15	1.7001	0.0613
16	1.7595	0.0595
17	1.8173	0.0577
18	1.8735	0.0562
19	1.9282	0.0547
20	1.9816	0.0534
21	2.0338	0.0522
22	2.0848	0.0510
23	2.1348	0.0500
24	2.1837	0.0489
25	2.2317	0.0480
26	2.2788	0.0471
27	2.3251	0.0463
28	2.3706	0.0455
29	2.4153	0.0447
30	2.4593	0.0440
31	2.5027	0.0433
32	2.5453	0.0427
33	2.5874	0.0421
34	2.6289	0.0415
35	2.6698	0.0409

36	2.7102	0.0404
37	2.7500	0.0398
38	2.7893	0.0393
39	2.8282	0.0388
40	2.8665	0.0384
41	2.9045	0.0379
42	2.9420	0.0375
43	2.9791	0.0371
44	3.0158	0.0367
45	3.0521	0.0363
46	3.0880	0.0359
47	3.1236	0.0356
48	3.1588	0.0352
49	3.1936	0.0349
50	3.2282	0.0345
51	3.2624	0.0342
52	3.2963	0.0339
53	3.3299	0.0336
54	3.3632	0.0333
55	3.3962	0.0330
56	3.4290	0.0327
57	3.4614	0.0325
58	3.4936	0.0322
59	3.5256	0.0319
60	3.5573	0.0317
61	3.5887	0.0314
62	3.6199	0.0312
63	3.6509	0.0310
64	3.6816	0.0307
65	3.7122	0.0305
66	3.7425	0.0303
67	3.7725	0.0301
68	3.8024	0.0299
69	3.8321	0.0297
70	3.8616	0.0295
71	3.8908	0.0293
72	3.9199	0.0291
73	3.9470	0.0271
74	3.9739	0.0269
75	4.0006	0.0267
76	4.0271	0.0265
77	4.0535	0.0264
78	4.0797	0.0262
79	4.1057	0.0260
80	4.1316	0.0259
81	4.1573	0.0257
82	4.1828	0.0255
83	4.2082	0.0254
84	4.2334	0.0252
85	4.2585	0.0251

86	4.2834	0.0249
87	4.3082	0.0248
88	4.3328	0.0246
89	4.3573	0.0245
90	4.3817	0.0244
91	4.4059	0.0242
92	4.4300	0.0241
93	4.4540	0.0240
94	4.4779	0.0238
95	4.5016	0.0237
96	4.5252	0.0236
97	4.5486	0.0235
98	4.5720	0.0233
99	4.5952	0.0232
100	4.6183	0.0231
101	4.6413	0.0230
102	4.6642	0.0229
103	4.6869	0.0228
104	4.7096	0.0227
105	4.7321	0.0225
106	4.7546	0.0224
107	4.7769	0.0223
108	4.7991	0.0222
109	4.8213	0.0221
110	4.8433	0.0220
111	4.8652	0.0219
112	4.8870	0.0218
113	4.9088	0.0217
114	4.9304	0.0216
115	4.9519	0.0215
116	4.9734	0.0214
117	4.9947	0.0214
118	5.0160	0.0213
119	5.0372	0.0212
120	5.0582	0.0211
121	5.0792	0.0210
122	5.1001	0.0209
123	5.1210	0.0208
124	5.1417	0.0207
125	5.1624	0.0207
126	5.1829	0.0206
127	5.2034	0.0205
128	5.2238	0.0204
129	5.2442	0.0203
130	5.2644	0.0202
131	5.2846	0.0202
132	5.3047	0.0201
133	5.3247	0.0200
134	5.3446	0.0199
135	5.3645	0.0199

136	5.3843	0.0198
137	5.4040	0.0197
138	5.4237	0.0197
139	5.4432	0.0196
140	5.4628	0.0195
141	5.4822	0.0194
142	5.5016	0.0194
143	5.5209	0.0193
144	5.5401	0.0192
145	5.5593	0.0192
146	5.5784	0.0191
147	5.5974	0.0190
148	5.6164	0.0190
149	5.6353	0.0189
150	5.6541	0.0188
151	5.6729	0.0188
152	5.6916	0.0187
153	5.7103	0.0187
154	5.7289	0.0186
155	5.7474	0.0185
156	5.7659	0.0185
157	5.7843	0.0184
158	5.8027	0.0184
159	5.8210	0.0183
160	5.8392	0.0182
161	5.8574	0.0182
162	5.8755	0.0181
163	5.8936	0.0181
164	5.9116	0.0180
165	5.9296	0.0180
166	5.9475	0.0179
167	5.9654	0.0179
168	5.9832	0.0178
169	6.0009	0.0177
170	6.0186	0.0177
171	6.0362	0.0176
172	6.0538	0.0176
173	6.0714	0.0175
174	6.0889	0.0175
175	6.1063	0.0174
176	6.1237	0.0174
177	6.1410	0.0173
178	6.1583	0.0173
179	6.1756	0.0172
180	6.1928	0.0172
181	6.2099	0.0171
182	6.2270	0.0171
183	6.2441	0.0171
184	6.2611	0.0170
185	6.2780	0.0170

186	6.2949	0.0169
187	6.3118	0.0169
188	6.3286	0.0168
189	6.3454	0.0168
190	6.3621	0.0167
191	6.3788	0.0167
192	6.3955	0.0166
193	6.4121	0.0166
194	6.4286	0.0166
195	6.4452	0.0165
196	6.4616	0.0165
197	6.4781	0.0164
198	6.4945	0.0164
199	6.5108	0.0163
200	6.5271	0.0163
201	6.5434	0.0163
202	6.5596	0.0162
203	6.5758	0.0162
204	6.5919	0.0161
205	6.6081	0.0161
206	6.6241	0.0161
207	6.6402	0.0160
208	6.6561	0.0160
209	6.6721	0.0160
210	6.6880	0.0159
211	6.7039	0.0159
212	6.7197	0.0158
213	6.7355	0.0158
214	6.7513	0.0158
215	6.7670	0.0157
216	6.7827	0.0157
217	6.7984	0.0157
218	6.8140	0.0156
219	6.8296	0.0156
220	6.8451	0.0155
221	6.8606	0.0155
222	6.8761	0.0155
223	6.8915	0.0154
224	6.9069	0.0154
225	6.9223	0.0154
226	6.9377	0.0153
227	6.9530	0.0153
228	6.9682	0.0153
229	6.9835	0.0152
230	6.9987	0.0152
231	7.0138	0.0152
232	7.0290	0.0151
233	7.0441	0.0151
234	7.0591	0.0151
235	7.0742	0.0150

236	7.0892	0.0150
237	7.1042	0.0150
238	7.1191	0.0149
239	7.1340	0.0149
240	7.1489	0.0149
241	7.1638	0.0149
242	7.1786	0.0148
243	7.1934	0.0148
244	7.2081	0.0148
245	7.2229	0.0147
246	7.2376	0.0147
247	7.2522	0.0147
248	7.2669	0.0146
249	7.2815	0.0146
250	7.2961	0.0146
251	7.3106	0.0146
252	7.3251	0.0145
253	7.3396	0.0145
254	7.3541	0.0145
255	7.3685	0.0144
256	7.3829	0.0144
257	7.3973	0.0144
258	7.4117	0.0144
259	7.4260	0.0143
260	7.4403	0.0143
261	7.4545	0.0143
262	7.4688	0.0142
263	7.4830	0.0142
264	7.4972	0.0142
265	7.5114	0.0142
266	7.5255	0.0141
267	7.5396	0.0141
268	7.5537	0.0141
269	7.5677	0.0141
270	7.5818	0.0140
271	7.5958	0.0140
272	7.6097	0.0140
273	7.6237	0.0140
274	7.6376	0.0139
275	7.6515	0.0139
276	7.6654	0.0139
277	7.6792	0.0138
278	7.6931	0.0138
279	7.7068	0.0138
280	7.7206	0.0138
281	7.7344	0.0137
282	7.7481	0.0137
283	7.7618	0.0137
284	7.7755	0.0137
285	7.7891	0.0137

286	7.8028	0.0136
287	7.8164	0.0136
288	7.8299	0.0136

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0136	0.0061	0.0075
2	0.0136	0.0061	0.0075
3	0.0137	0.0061	0.0075
4	0.0137	0.0061	0.0075
5	0.0137	0.0062	0.0076
6	0.0137	0.0062	0.0076
7	0.0138	0.0062	0.0076
8	0.0138	0.0062	0.0076
9	0.0139	0.0062	0.0077
10	0.0139	0.0062	0.0077
11	0.0140	0.0063	0.0077
12	0.0140	0.0063	0.0077
13	0.0140	0.0063	0.0077
14	0.0141	0.0063	0.0078
15	0.0141	0.0063	0.0078
16	0.0141	0.0063	0.0078
17	0.0142	0.0064	0.0078
18	0.0142	0.0064	0.0078
19	0.0143	0.0064	0.0079
20	0.0143	0.0064	0.0079
21	0.0144	0.0064	0.0079
22	0.0144	0.0064	0.0079
23	0.0144	0.0065	0.0080
24	0.0145	0.0065	0.0080
25	0.0145	0.0065	0.0080
26	0.0146	0.0065	0.0080
27	0.0146	0.0066	0.0081
28	0.0146	0.0066	0.0081
29	0.0147	0.0066	0.0081
30	0.0147	0.0066	0.0081
31	0.0148	0.0066	0.0082
32	0.0148	0.0066	0.0082
33	0.0149	0.0067	0.0082
34	0.0149	0.0067	0.0082
35	0.0150	0.0067	0.0083
36	0.0150	0.0067	0.0083
37	0.0151	0.0068	0.0083
38	0.0151	0.0068	0.0083
39	0.0152	0.0068	0.0084
40	0.0152	0.0068	0.0084
41	0.0153	0.0068	0.0084
42	0.0153	0.0069	0.0084

43	0.0154	0.0069	0.0085
44	0.0154	0.0069	0.0085
45	0.0155	0.0069	0.0085
46	0.0155	0.0070	0.0086
47	0.0156	0.0070	0.0086
48	0.0156	0.0070	0.0086
49	0.0157	0.0070	0.0087
50	0.0157	0.0071	0.0087
51	0.0158	0.0071	0.0087
52	0.0158	0.0071	0.0087
53	0.0159	0.0071	0.0088
54	0.0160	0.0072	0.0088
55	0.0160	0.0072	0.0088
56	0.0161	0.0072	0.0089
57	0.0161	0.0072	0.0089
58	0.0162	0.0073	0.0089
59	0.0163	0.0073	0.0090
60	0.0163	0.0073	0.0090
61	0.0164	0.0074	0.0090
62	0.0164	0.0074	0.0091
63	0.0165	0.0074	0.0091
64	0.0166	0.0074	0.0091
65	0.0166	0.0075	0.0092
66	0.0167	0.0075	0.0092
67	0.0168	0.0075	0.0093
68	0.0168	0.0075	0.0093
69	0.0169	0.0076	0.0093
70	0.0170	0.0076	0.0094
71	0.0171	0.0076	0.0094
72	0.0171	0.0077	0.0094
73	0.0172	0.0077	0.0095
74	0.0172	0.0077	0.0095
75	0.0173	0.0078	0.0096
76	0.0174	0.0078	0.0096
77	0.0175	0.0078	0.0096
78	0.0175	0.0079	0.0097
79	0.0176	0.0079	0.0097
80	0.0177	0.0079	0.0098
81	0.0178	0.0080	0.0098
82	0.0179	0.0080	0.0098
83	0.0180	0.0081	0.0099
84	0.0180	0.0081	0.0099
85	0.0181	0.0081	0.0100
86	0.0182	0.0082	0.0100
87	0.0183	0.0082	0.0101
88	0.0184	0.0082	0.0101
89	0.0185	0.0083	0.0102
90	0.0185	0.0083	0.0102
91	0.0187	0.0084	0.0103
92	0.0187	0.0084	0.0103

93	0.0188	0.0085	0.0104
94	0.0189	0.0085	0.0104
95	0.0190	0.0085	0.0105
96	0.0191	0.0086	0.0105
97	0.0192	0.0086	0.0106
98	0.0193	0.0087	0.0106
99	0.0194	0.0087	0.0107
100	0.0195	0.0087	0.0108
101	0.0197	0.0088	0.0108
102	0.0197	0.0088	0.0109
103	0.0199	0.0089	0.0110
104	0.0199	0.0089	0.0110
105	0.0201	0.0090	0.0111
106	0.0202	0.0090	0.0111
107	0.0203	0.0091	0.0112
108	0.0204	0.0092	0.0113
109	0.0206	0.0092	0.0113
110	0.0207	0.0093	0.0114
111	0.0208	0.0093	0.0115
112	0.0209	0.0094	0.0115
113	0.0211	0.0095	0.0116
114	0.0212	0.0095	0.0117
115	0.0214	0.0096	0.0118
116	0.0214	0.0096	0.0118
117	0.0216	0.0097	0.0119
118	0.0217	0.0097	0.0120
119	0.0219	0.0098	0.0121
120	0.0220	0.0099	0.0121
121	0.0222	0.0100	0.0123
122	0.0223	0.0100	0.0123
123	0.0225	0.0101	0.0124
124	0.0227	0.0102	0.0125
125	0.0229	0.0103	0.0126
126	0.0230	0.0103	0.0127
127	0.0232	0.0104	0.0128
128	0.0233	0.0105	0.0129
129	0.0236	0.0106	0.0130
130	0.0237	0.0106	0.0131
131	0.0240	0.0107	0.0132
132	0.0241	0.0108	0.0133
133	0.0244	0.0109	0.0134
134	0.0245	0.0110	0.0135
135	0.0248	0.0111	0.0137
136	0.0249	0.0112	0.0138
137	0.0252	0.0113	0.0139
138	0.0254	0.0114	0.0140
139	0.0257	0.0115	0.0142
140	0.0259	0.0116	0.0143
141	0.0262	0.0117	0.0144
142	0.0264	0.0118	0.0145

143	0.0267	0.0120	0.0147
144	0.0269	0.0121	0.0148
145	0.0291	0.0130	0.0160
146	0.0293	0.0131	0.0161
147	0.0297	0.0133	0.0164
148	0.0299	0.0134	0.0165
149	0.0303	0.0136	0.0167
150	0.0305	0.0137	0.0168
151	0.0310	0.0139	0.0171
152	0.0312	0.0140	0.0172
153	0.0317	0.0142	0.0175
154	0.0319	0.0143	0.0176
155	0.0325	0.0146	0.0179
156	0.0327	0.0147	0.0181
157	0.0333	0.0149	0.0184
158	0.0336	0.0151	0.0185
159	0.0342	0.0153	0.0189
160	0.0345	0.0155	0.0190
161	0.0352	0.0158	0.0194
162	0.0356	0.0159	0.0196
163	0.0363	0.0163	0.0200
164	0.0367	0.0165	0.0202
165	0.0375	0.0168	0.0207
166	0.0379	0.0170	0.0209
167	0.0388	0.0174	0.0214
168	0.0393	0.0176	0.0217
169	0.0404	0.0181	0.0223
170	0.0409	0.0183	0.0226
171	0.0421	0.0189	0.0232
172	0.0427	0.0191	0.0235
173	0.0440	0.0197	0.0243
174	0.0447	0.0201	0.0247
175	0.0463	0.0208	0.0255
176	0.0471	0.0211	0.0260
177	0.0489	0.0220	0.0270
178	0.0500	0.0224	0.0276
179	0.0522	0.0234	0.0288
180	0.0534	0.0240	0.0295
181	0.0562	0.0252	0.0310
182	0.0577	0.0259	0.0318
183	0.0613	0.0275	0.0338
184	0.0634	0.0284	0.0350
185	0.0516	0.0232	0.0285
186	0.0545	0.0245	0.0301
187	0.0619	0.0278	0.0342
188	0.0668	0.0299	0.0368
189	0.0805	0.0361	0.0444
190	0.0908	0.0407	0.0501
191	0.1298	0.0444	0.0854
192	0.1785	0.0444	0.1341

193	0.5587	0.0444	0.5143
194	0.1057	0.0444	0.0614
195	0.0728	0.0326	0.0401
196	0.0579	0.0260	0.0319
197	0.0658	0.0295	0.0363
198	0.0595	0.0267	0.0328
199	0.0547	0.0245	0.0302
200	0.0510	0.0229	0.0281
201	0.0480	0.0215	0.0265
202	0.0455	0.0204	0.0251
203	0.0433	0.0194	0.0239
204	0.0415	0.0186	0.0229
205	0.0398	0.0179	0.0220
206	0.0384	0.0172	0.0212
207	0.0371	0.0166	0.0205
208	0.0359	0.0161	0.0198
209	0.0349	0.0156	0.0192
210	0.0339	0.0152	0.0187
211	0.0330	0.0148	0.0182
212	0.0322	0.0144	0.0178
213	0.0314	0.0141	0.0173
214	0.0307	0.0138	0.0170
215	0.0301	0.0135	0.0166
216	0.0295	0.0132	0.0163
217	0.0271	0.0121	0.0149
218	0.0265	0.0119	0.0146
219	0.0260	0.0117	0.0144
220	0.0255	0.0115	0.0141
221	0.0251	0.0112	0.0138
222	0.0246	0.0111	0.0136
223	0.0242	0.0109	0.0134
224	0.0238	0.0107	0.0131
225	0.0235	0.0105	0.0129
226	0.0231	0.0104	0.0127
227	0.0228	0.0102	0.0126
228	0.0224	0.0101	0.0124
229	0.0221	0.0099	0.0122
230	0.0218	0.0098	0.0120
231	0.0215	0.0097	0.0119
232	0.0213	0.0095	0.0117
233	0.0210	0.0094	0.0116
234	0.0207	0.0093	0.0114
235	0.0205	0.0092	0.0113
236	0.0202	0.0091	0.0112
237	0.0200	0.0090	0.0110
238	0.0198	0.0089	0.0109
239	0.0196	0.0088	0.0108
240	0.0194	0.0087	0.0107
241	0.0192	0.0086	0.0106
242	0.0190	0.0085	0.0105

243	0.0188	0.0084	0.0104
244	0.0186	0.0083	0.0103
245	0.0184	0.0083	0.0102
246	0.0182	0.0082	0.0101
247	0.0181	0.0081	0.0100
248	0.0179	0.0080	0.0099
249	0.0177	0.0080	0.0098
250	0.0176	0.0079	0.0097
251	0.0174	0.0078	0.0096
252	0.0173	0.0078	0.0095
253	0.0171	0.0077	0.0095
254	0.0170	0.0076	0.0094
255	0.0169	0.0076	0.0093
256	0.0167	0.0075	0.0092
257	0.0166	0.0074	0.0092
258	0.0165	0.0074	0.0091
259	0.0163	0.0073	0.0090
260	0.0162	0.0073	0.0089
261	0.0161	0.0072	0.0089
262	0.0160	0.0072	0.0088
263	0.0159	0.0071	0.0088
264	0.0158	0.0071	0.0087
265	0.0157	0.0070	0.0086
266	0.0155	0.0070	0.0086
267	0.0154	0.0069	0.0085
268	0.0153	0.0069	0.0085
269	0.0152	0.0068	0.0084
270	0.0151	0.0068	0.0083
271	0.0150	0.0067	0.0083
272	0.0149	0.0067	0.0082
273	0.0149	0.0067	0.0082
274	0.0148	0.0066	0.0081
275	0.0147	0.0066	0.0081
276	0.0146	0.0065	0.0080
277	0.0145	0.0065	0.0080
278	0.0144	0.0065	0.0079
279	0.0143	0.0064	0.0079
280	0.0142	0.0064	0.0079
281	0.0142	0.0064	0.0078
282	0.0141	0.0063	0.0078
283	0.0140	0.0063	0.0077
284	0.0139	0.0062	0.0077
285	0.0138	0.0062	0.0076
286	0.0138	0.0062	0.0076
287	0.0137	0.0061	0.0076
288	0.0136	0.0061	0.0075

Total soil rain loss = 3.25(In)

Total effective rainfall = 4.58(In)

Peak flow rate in flood hydrograph = 18.77(CFS)

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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	5.0	10.0	15.0	20.0
0+ 5	0.0002		0.02	Q				
0+10	0.0012		0.16	Q				
0+15	0.0038		0.37	Q				
0+20	0.0072		0.50	Q				
0+25	0.0109		0.54	VQ				
0+30	0.0148		0.56	VQ				
0+35	0.0187		0.56	VQ				
0+40	0.0226		0.57	VQ				
0+45	0.0265		0.57	VQ				
0+50	0.0304		0.57	VQ				
0+55	0.0344		0.57	VQ				
1+ 0	0.0383		0.57	VQ				
1+ 5	0.0423		0.58	VQ				
1+10	0.0462		0.58	VQ				
1+15	0.0502		0.58	VQ				
1+20	0.0542		0.58	VQ				
1+25	0.0582		0.58	VQ				
1+30	0.0623		0.58	Q				
1+35	0.0663		0.59	Q				
1+40	0.0703		0.59	Q				
1+45	0.0744		0.59	Q				
1+50	0.0784		0.59	Q				
1+55	0.0825		0.59	Q				
2+ 0	0.0866		0.59	Q				
2+ 5	0.0907		0.60	Q				
2+10	0.0948		0.60	Q				
2+15	0.0989		0.60	Q				
2+20	0.1031		0.60	Q				
2+25	0.1072		0.60	Q				
2+30	0.1114		0.60	Q				
2+35	0.1156		0.61	Q				
2+40	0.1198		0.61	QV				
2+45	0.1240		0.61	QV				
2+50	0.1282		0.61	QV				
2+55	0.1324		0.61	QV				
3+ 0	0.1366		0.62	QV				
3+ 5	0.1409		0.62	QV				
3+10	0.1452		0.62	QV				
3+15	0.1494		0.62	QV				

3+20	0.1537	0.62	QV				
3+25	0.1580	0.63	QV				
3+30	0.1624	0.63	QV				
3+35	0.1667	0.63	QV				
3+40	0.1711	0.63	QV				
3+45	0.1754	0.63	QV				
3+50	0.1798	0.64	Q V				
3+55	0.1842	0.64	Q V				
4+ 0	0.1886	0.64	Q V				
4+ 5	0.1930	0.64	Q V				
4+10	0.1975	0.64	Q V				
4+15	0.2019	0.65	Q V				
4+20	0.2064	0.65	Q V				
4+25	0.2109	0.65	Q V				
4+30	0.2154	0.65	Q V				
4+35	0.2199	0.66	Q V				
4+40	0.2245	0.66	Q V				
4+45	0.2290	0.66	Q V				
4+50	0.2336	0.66	Q V				
4+55	0.2382	0.67	Q V				
5+ 0	0.2428	0.67	Q V				
5+ 5	0.2474	0.67	Q V				
5+10	0.2520	0.67	Q V				
5+15	0.2567	0.68	Q V				
5+20	0.2613	0.68	Q V				
5+25	0.2660	0.68	Q V				
5+30	0.2707	0.68	Q V				
5+35	0.2755	0.69	Q V				
5+40	0.2802	0.69	Q V				
5+45	0.2850	0.69	Q V				
5+50	0.2898	0.69	Q V				
5+55	0.2946	0.70	Q V				
6+ 0	0.2994	0.70	Q V				
6+ 5	0.3042	0.70	Q V				
6+10	0.3091	0.71	Q V				
6+15	0.3140	0.71	Q V				
6+20	0.3189	0.71	Q V				
6+25	0.3238	0.71	Q V				
6+30	0.3287	0.72	Q V				
6+35	0.3337	0.72	Q V				
6+40	0.3387	0.72	Q V				
6+45	0.3437	0.73	Q V				
6+50	0.3487	0.73	Q V				
6+55	0.3538	0.73	Q V				
7+ 0	0.3589	0.74	Q V				
7+ 5	0.3640	0.74	Q V				
7+10	0.3691	0.74	Q V				
7+15	0.3742	0.75	Q V				
7+20	0.3794	0.75	Q V				
7+25	0.3846	0.75	Q V				

7+30	0.3898	0.76	Q	V				
7+35	0.3951	0.76	Q	V				
7+40	0.4003	0.77	Q	V				
7+45	0.4056	0.77	Q	V				
7+50	0.4110	0.77	Q	V				
7+55	0.4163	0.78	Q	V				
8+ 0	0.4217	0.78	Q	V				
8+ 5	0.4271	0.78	Q	V				
8+10	0.4325	0.79	Q	V				
8+15	0.4380	0.79	Q	V				
8+20	0.4435	0.80	Q	V				
8+25	0.4490	0.80	Q	V				
8+30	0.4545	0.81	Q	V				
8+35	0.4601	0.81	Q	V				
8+40	0.4657	0.81	Q	V				
8+45	0.4714	0.82	Q	V				
8+50	0.4770	0.82	Q	V				
8+55	0.4827	0.83	Q	V				
9+ 0	0.4885	0.83	Q	V				
9+ 5	0.4942	0.84	Q	V				
9+10	0.5000	0.84	Q	V				
9+15	0.5059	0.85	Q	V				
9+20	0.5117	0.85	Q	V				
9+25	0.5177	0.86	Q	V				
9+30	0.5236	0.86	Q	V				
9+35	0.5296	0.87	Q	V				
9+40	0.5356	0.87	Q	V				
9+45	0.5417	0.88	Q	V				
9+50	0.5478	0.89	Q	V				
9+55	0.5539	0.89	Q	V				
10+ 0	0.5601	0.90	Q	V				
10+ 5	0.5663	0.90	Q	V				
10+10	0.5726	0.91	Q	V				
10+15	0.5789	0.92	Q	V				
10+20	0.5852	0.92	Q	V				
10+25	0.5916	0.93	Q	V				
10+30	0.5980	0.94	Q	V				
10+35	0.6045	0.94	Q	V				
10+40	0.6111	0.95	Q	V				
10+45	0.6177	0.96	Q	V				
10+50	0.6243	0.96	Q	V				
10+55	0.6310	0.97	Q	V				
11+ 0	0.6377	0.98	Q	V				
11+ 5	0.6445	0.99	Q	V				
11+10	0.6514	0.99	Q	V				
11+15	0.6583	1.00	Q	V				
11+20	0.6653	1.01	Q	V				
11+25	0.6723	1.02	Q	V				
11+30	0.6794	1.03	Q	V				
11+35	0.6865	1.04	Q	V				

11+40	0.6937	1.05	Q	V		
11+45	0.7010	1.06	Q	V		
11+50	0.7084	1.07	Q	V		
11+55	0.7158	1.08	Q	V		
12+ 0	0.7233	1.09	Q	V		
12+ 5	0.7309	1.10	Q	V		
12+10	0.7387	1.13	Q	V		
12+15	0.7467	1.17	Q	V		
12+20	0.7550	1.20	Q	V		
12+25	0.7634	1.22	Q	V		
12+30	0.7719	1.23	Q	V		
12+35	0.7805	1.25	Q	V		
12+40	0.7891	1.26	Q	V		
12+45	0.7979	1.27	Q	V		
12+50	0.8068	1.29	Q	V		
12+55	0.8158	1.30	Q	V		
13+ 0	0.8249	1.32	Q	V		
13+ 5	0.8340	1.34	Q	V		
13+10	0.8434	1.35	Q	V		
13+15	0.8528	1.37	Q	V		
13+20	0.8623	1.39	Q	V		
13+25	0.8720	1.41	Q	V		
13+30	0.8819	1.43	Q	V		
13+35	0.8918	1.45	Q	V		
13+40	0.9019	1.47	Q	V		
13+45	0.9122	1.49	Q	V		
13+50	0.9226	1.52	Q	V		
13+55	0.9332	1.54	Q	V		
14+ 0	0.9440	1.57	Q	V		
14+ 5	0.9550	1.59	Q	V		
14+10	0.9662	1.62	Q	V		
14+15	0.9776	1.66	Q	V		
14+20	0.9892	1.69	Q	V		
14+25	1.0011	1.73	Q	V		
14+30	1.0133	1.76	Q	V		
14+35	1.0257	1.80	Q	V		
14+40	1.0384	1.85	Q	V		
14+45	1.0515	1.90	Q	V		
14+50	1.0649	1.95	Q	V		
14+55	1.0787	2.00	Q	V		
15+ 0	1.0929	2.06	Q	V		
15+ 5	1.1076	2.13	Q	V		
15+10	1.1228	2.21	Q	V		
15+15	1.1386	2.29	Q	V		
15+20	1.1551	2.39	Q	V		
15+25	1.1721	2.47	Q	V		
15+30	1.1889	2.44	Q	V		
15+35	1.2049	2.33	Q	V		
15+40	1.2211	2.36	Q	V		
15+45	1.2386	2.53	Q	V		

15+50	1.2581	2.83	Q		V		
15+55	1.2810	3.33	Q		V		
16+ 0	1.3114	4.42	Q		V		
16+ 5	1.3641	7.65		Q	V		
16+10	1.4670	14.94			V	Q	
16+15	1.5962	18.77				V	Q
16+20	1.6802	12.19			Q	V	
16+25	1.7232	6.25		Q		V	
16+30	1.7485	3.66	Q			V	
16+35	1.7690	2.98	Q			V	
16+40	1.7874	2.68	Q			V	
16+45	1.8034	2.31	Q			V	
16+50	1.8182	2.15	Q			V	
16+55	1.8321	2.02	Q			V	
17+ 0	1.8452	1.91	Q			V	
17+ 5	1.8577	1.82	Q			V	
17+10	1.8697	1.73	Q			V	
17+15	1.8811	1.66	Q			V	
17+20	1.8922	1.60	Q			V	
17+25	1.9028	1.55	Q			V	
17+30	1.9131	1.50	Q			V	
17+35	1.9231	1.45	Q			V	
17+40	1.9328	1.41	Q			V	
17+45	1.9423	1.37	Q			V	
17+50	1.9515	1.34	Q			V	
17+55	1.9605	1.31	Q			V	
18+ 0	1.9692	1.28	Q			V	
18+ 5	1.9778	1.25	Q			V	
18+10	1.9861	1.20	Q			V	
18+15	1.9940	1.15	Q			V	
18+20	2.0017	1.11	Q			V	
18+25	2.0091	1.08	Q			V	
18+30	2.0164	1.06	Q			V	
18+35	2.0236	1.04	Q			V	
18+40	2.0306	1.02	Q			V	
18+45	2.0375	1.00	Q			V	
18+50	2.0443	0.99	Q			V	
18+55	2.0510	0.97	Q			V	
19+ 0	2.0576	0.96	Q			V	
19+ 5	2.0641	0.94	Q			V	
19+10	2.0705	0.93	Q			V	
19+15	2.0768	0.92	Q			V	
19+20	2.0830	0.90	Q			V	
19+25	2.0892	0.89	Q			V	
19+30	2.0953	0.88	Q			V	
19+35	2.1012	0.87	Q			V	
19+40	2.1072	0.86	Q			V	
19+45	2.1130	0.85	Q			V	
19+50	2.1188	0.84	Q			V	
19+55	2.1245	0.83	Q			V	

20+ 0	2.1301	0.82	Q				V
20+ 5	2.1357	0.81	Q				V
20+10	2.1412	0.80	Q				V
20+15	2.1467	0.79	Q				V
20+20	2.1521	0.79	Q				V
20+25	2.1574	0.78	Q				V
20+30	2.1627	0.77	Q				V
20+35	2.1680	0.76	Q				V
20+40	2.1732	0.75	Q				V
20+45	2.1783	0.75	Q				V
20+50	2.1834	0.74	Q				V
20+55	2.1885	0.73	Q				V
21+ 0	2.1935	0.73	Q				V
21+ 5	2.1985	0.72	Q				V
21+10	2.2034	0.72	Q				V
21+15	2.2083	0.71	Q				V
21+20	2.2131	0.70	Q				V
21+25	2.2179	0.70	Q				V
21+30	2.2227	0.69	Q				V
21+35	2.2274	0.69	Q				V
21+40	2.2321	0.68	Q				V
21+45	2.2368	0.68	Q				V
21+50	2.2414	0.67	Q				V
21+55	2.2460	0.67	Q				V
22+ 0	2.2505	0.66	Q				V
22+ 5	2.2551	0.66	Q				V
22+10	2.2595	0.65	Q				V
22+15	2.2640	0.65	Q				V
22+20	2.2684	0.64	Q				V
22+25	2.2728	0.64	Q				V
22+30	2.2772	0.63	Q				V
22+35	2.2815	0.63	Q				V
22+40	2.2858	0.63	Q				V
22+45	2.2901	0.62	Q				V
22+50	2.2944	0.62	Q				V
22+55	2.2986	0.61	Q				V
23+ 0	2.3028	0.61	Q				V
23+ 5	2.3070	0.61	Q				V
23+10	2.3111	0.60	Q				V
23+15	2.3153	0.60	Q				V
23+20	2.3194	0.60	Q				V
23+25	2.3234	0.59	Q				V
23+30	2.3275	0.59	Q				V
23+35	2.3315	0.59	Q				V
23+40	2.3355	0.58	Q				V
23+45	2.3395	0.58	Q				V
23+50	2.3435	0.58	Q				V
23+55	2.3474	0.57	Q				V
24+ 0	2.3514	0.57	Q				V

Proposed Conditions Hydrographs/ Routing Analysis

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

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Study date 05/04/25

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

Program License Serial Number 6677

WARM023
PRELIMINARY
PROP Q100

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		
6.19	1	1.51

Rainfall data for year 100
6.19 6 3.92

Rainfall data for year 100
6.19 24 7.83

+++++

***** 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	6.19	1.000	0.785	0.350	0.275

Area-averaged adjusted loss rate Fm (In/Hr) = 0.275

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
2.17	0.350	32.0	52.0	9.23	0.301
4.02	0.650	98.0	98.0	0.20	0.969

Area-averaged catchment yield fraction, Y = 0.735

Area-averaged low loss fraction, Yb = 0.265

User entry of time of concentration = 0.200 (hours)

+++++

Watershed area = 6.19(Ac.)

Catchment Lag time = 0.160 hours

Unit interval = 5.000 minutes

Unit interval percentage of lag time = 52.0833

Hydrograph baseflow = 0.00(CFS)

Average maximum watershed loss rate(Fm) = 0.342(In/Hr)

Average low loss rate fraction (Yb) = 0.265 (decimal)

Note: user entry of the Fm value

VALLEY DEVELOPED S-Graph Selected

Computed peak 5-minute rainfall = 0.559(In)

Computed peak 30-minute rainfall = 1.144(In)

Specified peak 1-hour rainfall = 1.510(In)

Computed peak 3-hour rainfall = 2.710(In)

Specified peak 6-hour rainfall = 3.920(In)

Specified peak 24-hour rainfall = 7.830(In)

Rainfall depth area reduction factors:

Using a total area of 6.19(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.559(In)

30-minute factor = 1.000 Adjusted rainfall = 1.144(In)

1-hour factor = 1.000 Adjusted rainfall = 1.510(In)

3-hour factor = 1.000 Adjusted rainfall = 2.710(In)

6-hour factor = 1.000 Adjusted rainfall = 3.920(In)

24-hour factor = 1.000 Adjusted rainfall = 7.830(In)

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

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Interval	'S' Graph	Unit Hydrograph
Number	Mean values	((CFS))

(K = 74.86 (CFS))

1	4.951	3.706
2	32.173	20.379
3	71.993	29.810
4	91.514	14.613
5	97.565	4.529
6	98.956	1.042
7	100.000	0.781

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

1	0.5587	0.5587
2	0.7372	0.1785
3	0.8670	0.1298
4	0.9728	0.1057
5	1.0636	0.0908
6	1.1440	0.0805
7	1.2168	0.0728
8	1.2836	0.0668
9	1.3455	0.0619
10	1.4034	0.0579
11	1.4579	0.0545
12	1.5096	0.0516
13	1.5753	0.0658
14	1.6387	0.0634
15	1.7001	0.0613
16	1.7595	0.0595
17	1.8173	0.0577
18	1.8735	0.0562
19	1.9282	0.0547
20	1.9816	0.0534
21	2.0338	0.0522
22	2.0848	0.0510
23	2.1348	0.0500
24	2.1837	0.0489
25	2.2317	0.0480
26	2.2788	0.0471
27	2.3251	0.0463
28	2.3706	0.0455
29	2.4153	0.0447
30	2.4593	0.0440
31	2.5027	0.0433
32	2.5453	0.0427
33	2.5874	0.0421
34	2.6289	0.0415

35	2.6698	0.0409
36	2.7102	0.0404
37	2.7500	0.0398
38	2.7893	0.0393
39	2.8282	0.0388
40	2.8665	0.0384
41	2.9045	0.0379
42	2.9420	0.0375
43	2.9791	0.0371
44	3.0158	0.0367
45	3.0521	0.0363
46	3.0880	0.0359
47	3.1236	0.0356
48	3.1588	0.0352
49	3.1936	0.0349
50	3.2282	0.0345
51	3.2624	0.0342
52	3.2963	0.0339
53	3.3299	0.0336
54	3.3632	0.0333
55	3.3962	0.0330
56	3.4290	0.0327
57	3.4614	0.0325
58	3.4936	0.0322
59	3.5256	0.0319
60	3.5573	0.0317
61	3.5887	0.0314
62	3.6199	0.0312
63	3.6509	0.0310
64	3.6816	0.0307
65	3.7122	0.0305
66	3.7425	0.0303
67	3.7725	0.0301
68	3.8024	0.0299
69	3.8321	0.0297
70	3.8616	0.0295
71	3.8908	0.0293
72	3.9199	0.0291
73	3.9470	0.0271
74	3.9739	0.0269
75	4.0006	0.0267
76	4.0271	0.0265
77	4.0535	0.0264
78	4.0797	0.0262
79	4.1057	0.0260
80	4.1316	0.0259
81	4.1573	0.0257
82	4.1828	0.0255
83	4.2082	0.0254
84	4.2334	0.0252

85	4.2585	0.0251
86	4.2834	0.0249
87	4.3082	0.0248
88	4.3328	0.0246
89	4.3573	0.0245
90	4.3817	0.0244
91	4.4059	0.0242
92	4.4300	0.0241
93	4.4540	0.0240
94	4.4779	0.0238
95	4.5016	0.0237
96	4.5252	0.0236
97	4.5486	0.0235
98	4.5720	0.0233
99	4.5952	0.0232
100	4.6183	0.0231
101	4.6413	0.0230
102	4.6642	0.0229
103	4.6869	0.0228
104	4.7096	0.0227
105	4.7321	0.0225
106	4.7546	0.0224
107	4.7769	0.0223
108	4.7991	0.0222
109	4.8213	0.0221
110	4.8433	0.0220
111	4.8652	0.0219
112	4.8870	0.0218
113	4.9088	0.0217
114	4.9304	0.0216
115	4.9519	0.0215
116	4.9734	0.0214
117	4.9947	0.0214
118	5.0160	0.0213
119	5.0372	0.0212
120	5.0582	0.0211
121	5.0792	0.0210
122	5.1001	0.0209
123	5.1210	0.0208
124	5.1417	0.0207
125	5.1624	0.0207
126	5.1829	0.0206
127	5.2034	0.0205
128	5.2238	0.0204
129	5.2442	0.0203
130	5.2644	0.0202
131	5.2846	0.0202
132	5.3047	0.0201
133	5.3247	0.0200
134	5.3446	0.0199

135	5.3645	0.0199
136	5.3843	0.0198
137	5.4040	0.0197
138	5.4237	0.0197
139	5.4432	0.0196
140	5.4628	0.0195
141	5.4822	0.0194
142	5.5016	0.0194
143	5.5209	0.0193
144	5.5401	0.0192
145	5.5593	0.0192
146	5.5784	0.0191
147	5.5974	0.0190
148	5.6164	0.0190
149	5.6353	0.0189
150	5.6541	0.0188
151	5.6729	0.0188
152	5.6916	0.0187
153	5.7103	0.0187
154	5.7289	0.0186
155	5.7474	0.0185
156	5.7659	0.0185
157	5.7843	0.0184
158	5.8027	0.0184
159	5.8210	0.0183
160	5.8392	0.0182
161	5.8574	0.0182
162	5.8755	0.0181
163	5.8936	0.0181
164	5.9116	0.0180
165	5.9296	0.0180
166	5.9475	0.0179
167	5.9654	0.0179
168	5.9832	0.0178
169	6.0009	0.0177
170	6.0186	0.0177
171	6.0362	0.0176
172	6.0538	0.0176
173	6.0714	0.0175
174	6.0889	0.0175
175	6.1063	0.0174
176	6.1237	0.0174
177	6.1410	0.0173
178	6.1583	0.0173
179	6.1756	0.0172
180	6.1928	0.0172
181	6.2099	0.0171
182	6.2270	0.0171
183	6.2441	0.0171
184	6.2611	0.0170

185	6.2780	0.0170
186	6.2949	0.0169
187	6.3118	0.0169
188	6.3286	0.0168
189	6.3454	0.0168
190	6.3621	0.0167
191	6.3788	0.0167
192	6.3955	0.0166
193	6.4121	0.0166
194	6.4286	0.0166
195	6.4452	0.0165
196	6.4616	0.0165
197	6.4781	0.0164
198	6.4945	0.0164
199	6.5108	0.0163
200	6.5271	0.0163
201	6.5434	0.0163
202	6.5596	0.0162
203	6.5758	0.0162
204	6.5919	0.0161
205	6.6081	0.0161
206	6.6241	0.0161
207	6.6402	0.0160
208	6.6561	0.0160
209	6.6721	0.0160
210	6.6880	0.0159
211	6.7039	0.0159
212	6.7197	0.0158
213	6.7355	0.0158
214	6.7513	0.0158
215	6.7670	0.0157
216	6.7827	0.0157
217	6.7984	0.0157
218	6.8140	0.0156
219	6.8296	0.0156
220	6.8451	0.0155
221	6.8606	0.0155
222	6.8761	0.0155
223	6.8915	0.0154
224	6.9069	0.0154
225	6.9223	0.0154
226	6.9377	0.0153
227	6.9530	0.0153
228	6.9682	0.0153
229	6.9835	0.0152
230	6.9987	0.0152
231	7.0138	0.0152
232	7.0290	0.0151
233	7.0441	0.0151
234	7.0591	0.0151

235	7.0742	0.0150
236	7.0892	0.0150
237	7.1042	0.0150
238	7.1191	0.0149
239	7.1340	0.0149
240	7.1489	0.0149
241	7.1638	0.0149
242	7.1786	0.0148
243	7.1934	0.0148
244	7.2081	0.0148
245	7.2229	0.0147
246	7.2376	0.0147
247	7.2522	0.0147
248	7.2669	0.0146
249	7.2815	0.0146
250	7.2961	0.0146
251	7.3106	0.0146
252	7.3251	0.0145
253	7.3396	0.0145
254	7.3541	0.0145
255	7.3685	0.0144
256	7.3829	0.0144
257	7.3973	0.0144
258	7.4117	0.0144
259	7.4260	0.0143
260	7.4403	0.0143
261	7.4545	0.0143
262	7.4688	0.0142
263	7.4830	0.0142
264	7.4972	0.0142
265	7.5114	0.0142
266	7.5255	0.0141
267	7.5396	0.0141
268	7.5537	0.0141
269	7.5677	0.0141
270	7.5818	0.0140
271	7.5958	0.0140
272	7.6097	0.0140
273	7.6237	0.0140
274	7.6376	0.0139
275	7.6515	0.0139
276	7.6654	0.0139
277	7.6792	0.0138
278	7.6931	0.0138
279	7.7068	0.0138
280	7.7206	0.0138
281	7.7344	0.0137
282	7.7481	0.0137
283	7.7618	0.0137
284	7.7755	0.0137

285	7.7891	0.0137
286	7.8028	0.0136
287	7.8164	0.0136
288	7.8299	0.0136

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0136	0.0036	0.0100
2	0.0136	0.0036	0.0100
3	0.0137	0.0036	0.0100
4	0.0137	0.0036	0.0101
5	0.0137	0.0036	0.0101
6	0.0137	0.0036	0.0101
7	0.0138	0.0037	0.0101
8	0.0138	0.0037	0.0102
9	0.0139	0.0037	0.0102
10	0.0139	0.0037	0.0102
11	0.0140	0.0037	0.0103
12	0.0140	0.0037	0.0103
13	0.0140	0.0037	0.0103
14	0.0141	0.0037	0.0103
15	0.0141	0.0037	0.0104
16	0.0141	0.0037	0.0104
17	0.0142	0.0038	0.0104
18	0.0142	0.0038	0.0105
19	0.0143	0.0038	0.0105
20	0.0143	0.0038	0.0105
21	0.0144	0.0038	0.0106
22	0.0144	0.0038	0.0106
23	0.0144	0.0038	0.0106
24	0.0145	0.0038	0.0106
25	0.0145	0.0038	0.0107
26	0.0146	0.0039	0.0107
27	0.0146	0.0039	0.0107
28	0.0146	0.0039	0.0108
29	0.0147	0.0039	0.0108
30	0.0147	0.0039	0.0108
31	0.0148	0.0039	0.0109
32	0.0148	0.0039	0.0109
33	0.0149	0.0039	0.0109
34	0.0149	0.0039	0.0110
35	0.0150	0.0040	0.0110
36	0.0150	0.0040	0.0110
37	0.0151	0.0040	0.0111
38	0.0151	0.0040	0.0111
39	0.0152	0.0040	0.0112
40	0.0152	0.0040	0.0112
41	0.0153	0.0040	0.0112

42	0.0153	0.0041	0.0113
43	0.0154	0.0041	0.0113
44	0.0154	0.0041	0.0113
45	0.0155	0.0041	0.0114
46	0.0155	0.0041	0.0114
47	0.0156	0.0041	0.0115
48	0.0156	0.0041	0.0115
49	0.0157	0.0042	0.0115
50	0.0157	0.0042	0.0116
51	0.0158	0.0042	0.0116
52	0.0158	0.0042	0.0116
53	0.0159	0.0042	0.0117
54	0.0160	0.0042	0.0117
55	0.0160	0.0042	0.0118
56	0.0161	0.0043	0.0118
57	0.0161	0.0043	0.0119
58	0.0162	0.0043	0.0119
59	0.0163	0.0043	0.0120
60	0.0163	0.0043	0.0120
61	0.0164	0.0043	0.0121
62	0.0164	0.0043	0.0121
63	0.0165	0.0044	0.0121
64	0.0166	0.0044	0.0122
65	0.0166	0.0044	0.0122
66	0.0167	0.0044	0.0123
67	0.0168	0.0044	0.0123
68	0.0168	0.0045	0.0124
69	0.0169	0.0045	0.0124
70	0.0170	0.0045	0.0125
71	0.0171	0.0045	0.0125
72	0.0171	0.0045	0.0126
73	0.0172	0.0046	0.0126
74	0.0172	0.0046	0.0127
75	0.0173	0.0046	0.0128
76	0.0174	0.0046	0.0128
77	0.0175	0.0046	0.0129
78	0.0175	0.0046	0.0129
79	0.0176	0.0047	0.0130
80	0.0177	0.0047	0.0130
81	0.0178	0.0047	0.0131
82	0.0179	0.0047	0.0131
83	0.0180	0.0048	0.0132
84	0.0180	0.0048	0.0132
85	0.0181	0.0048	0.0133
86	0.0182	0.0048	0.0134
87	0.0183	0.0048	0.0135
88	0.0184	0.0049	0.0135
89	0.0185	0.0049	0.0136
90	0.0185	0.0049	0.0136
91	0.0187	0.0049	0.0137

92	0.0187	0.0050	0.0138
93	0.0188	0.0050	0.0139
94	0.0189	0.0050	0.0139
95	0.0190	0.0050	0.0140
96	0.0191	0.0051	0.0140
97	0.0192	0.0051	0.0141
98	0.0193	0.0051	0.0142
99	0.0194	0.0051	0.0143
100	0.0195	0.0052	0.0143
101	0.0197	0.0052	0.0144
102	0.0197	0.0052	0.0145
103	0.0199	0.0053	0.0146
104	0.0199	0.0053	0.0147
105	0.0201	0.0053	0.0148
106	0.0202	0.0053	0.0148
107	0.0203	0.0054	0.0149
108	0.0204	0.0054	0.0150
109	0.0206	0.0054	0.0151
110	0.0207	0.0055	0.0152
111	0.0208	0.0055	0.0153
112	0.0209	0.0055	0.0154
113	0.0211	0.0056	0.0155
114	0.0212	0.0056	0.0156
115	0.0214	0.0057	0.0157
116	0.0214	0.0057	0.0158
117	0.0216	0.0057	0.0159
118	0.0217	0.0058	0.0160
119	0.0219	0.0058	0.0161
120	0.0220	0.0058	0.0162
121	0.0222	0.0059	0.0163
122	0.0223	0.0059	0.0164
123	0.0225	0.0060	0.0166
124	0.0227	0.0060	0.0167
125	0.0229	0.0061	0.0168
126	0.0230	0.0061	0.0169
127	0.0232	0.0061	0.0171
128	0.0233	0.0062	0.0172
129	0.0236	0.0062	0.0173
130	0.0237	0.0063	0.0174
131	0.0240	0.0063	0.0176
132	0.0241	0.0064	0.0177
133	0.0244	0.0064	0.0179
134	0.0245	0.0065	0.0180
135	0.0248	0.0066	0.0182
136	0.0249	0.0066	0.0183
137	0.0252	0.0067	0.0186
138	0.0254	0.0067	0.0187
139	0.0257	0.0068	0.0189
140	0.0259	0.0068	0.0190
141	0.0262	0.0069	0.0193

142	0.0264	0.0070	0.0194
143	0.0267	0.0071	0.0196
144	0.0269	0.0071	0.0198
145	0.0291	0.0077	0.0214
146	0.0293	0.0077	0.0215
147	0.0297	0.0079	0.0218
148	0.0299	0.0079	0.0220
149	0.0303	0.0080	0.0223
150	0.0305	0.0081	0.0224
151	0.0310	0.0082	0.0228
152	0.0312	0.0083	0.0229
153	0.0317	0.0084	0.0233
154	0.0319	0.0085	0.0235
155	0.0325	0.0086	0.0239
156	0.0327	0.0087	0.0241
157	0.0333	0.0088	0.0245
158	0.0336	0.0089	0.0247
159	0.0342	0.0091	0.0252
160	0.0345	0.0091	0.0254
161	0.0352	0.0093	0.0259
162	0.0356	0.0094	0.0262
163	0.0363	0.0096	0.0267
164	0.0367	0.0097	0.0270
165	0.0375	0.0099	0.0276
166	0.0379	0.0100	0.0279
167	0.0388	0.0103	0.0286
168	0.0393	0.0104	0.0289
169	0.0404	0.0107	0.0297
170	0.0409	0.0108	0.0301
171	0.0421	0.0111	0.0309
172	0.0427	0.0113	0.0314
173	0.0440	0.0116	0.0324
174	0.0447	0.0118	0.0329
175	0.0463	0.0122	0.0340
176	0.0471	0.0125	0.0346
177	0.0489	0.0130	0.0360
178	0.0500	0.0132	0.0367
179	0.0522	0.0138	0.0384
180	0.0534	0.0141	0.0393
181	0.0562	0.0149	0.0413
182	0.0577	0.0153	0.0425
183	0.0613	0.0162	0.0451
184	0.0634	0.0168	0.0466
185	0.0516	0.0137	0.0380
186	0.0545	0.0144	0.0401
187	0.0619	0.0164	0.0455
188	0.0668	0.0177	0.0491
189	0.0805	0.0213	0.0592
190	0.0908	0.0240	0.0668
191	0.1298	0.0285	0.1013

192	0.1785	0.0285	0.1500
193	0.5587	0.0285	0.5302
194	0.1057	0.0280	0.0777
195	0.0728	0.0193	0.0535
196	0.0579	0.0153	0.0426
197	0.0658	0.0174	0.0483
198	0.0595	0.0157	0.0437
199	0.0547	0.0145	0.0402
200	0.0510	0.0135	0.0375
201	0.0480	0.0127	0.0353
202	0.0455	0.0120	0.0334
203	0.0433	0.0115	0.0319
204	0.0415	0.0110	0.0305
205	0.0398	0.0105	0.0293
206	0.0384	0.0102	0.0282
207	0.0371	0.0098	0.0273
208	0.0359	0.0095	0.0264
209	0.0349	0.0092	0.0256
210	0.0339	0.0090	0.0249
211	0.0330	0.0087	0.0243
212	0.0322	0.0085	0.0237
213	0.0314	0.0083	0.0231
214	0.0307	0.0081	0.0226
215	0.0301	0.0080	0.0221
216	0.0295	0.0078	0.0217
217	0.0271	0.0072	0.0199
218	0.0265	0.0070	0.0195
219	0.0260	0.0069	0.0191
220	0.0255	0.0068	0.0188
221	0.0251	0.0066	0.0184
222	0.0246	0.0065	0.0181
223	0.0242	0.0064	0.0178
224	0.0238	0.0063	0.0175
225	0.0235	0.0062	0.0173
226	0.0231	0.0061	0.0170
227	0.0228	0.0060	0.0167
228	0.0224	0.0059	0.0165
229	0.0221	0.0059	0.0163
230	0.0218	0.0058	0.0160
231	0.0215	0.0057	0.0158
232	0.0213	0.0056	0.0156
233	0.0210	0.0056	0.0154
234	0.0207	0.0055	0.0152
235	0.0205	0.0054	0.0151
236	0.0202	0.0054	0.0149
237	0.0200	0.0053	0.0147
238	0.0198	0.0052	0.0146
239	0.0196	0.0052	0.0144
240	0.0194	0.0051	0.0142
241	0.0192	0.0051	0.0141

242	0.0190	0.0050	0.0139
243	0.0188	0.0050	0.0138
244	0.0186	0.0049	0.0137
245	0.0184	0.0049	0.0135
246	0.0182	0.0048	0.0134
247	0.0181	0.0048	0.0133
248	0.0179	0.0047	0.0132
249	0.0177	0.0047	0.0131
250	0.0176	0.0047	0.0129
251	0.0174	0.0046	0.0128
252	0.0173	0.0046	0.0127
253	0.0171	0.0045	0.0126
254	0.0170	0.0045	0.0125
255	0.0169	0.0045	0.0124
256	0.0167	0.0044	0.0123
257	0.0166	0.0044	0.0122
258	0.0165	0.0044	0.0121
259	0.0163	0.0043	0.0120
260	0.0162	0.0043	0.0119
261	0.0161	0.0043	0.0118
262	0.0160	0.0042	0.0118
263	0.0159	0.0042	0.0117
264	0.0158	0.0042	0.0116
265	0.0157	0.0041	0.0115
266	0.0155	0.0041	0.0114
267	0.0154	0.0041	0.0114
268	0.0153	0.0041	0.0113
269	0.0152	0.0040	0.0112
270	0.0151	0.0040	0.0111
271	0.0150	0.0040	0.0111
272	0.0149	0.0040	0.0110
273	0.0149	0.0039	0.0109
274	0.0148	0.0039	0.0109
275	0.0147	0.0039	0.0108
276	0.0146	0.0039	0.0107
277	0.0145	0.0038	0.0107
278	0.0144	0.0038	0.0106
279	0.0143	0.0038	0.0105
280	0.0142	0.0038	0.0105
281	0.0142	0.0037	0.0104
282	0.0141	0.0037	0.0104
283	0.0140	0.0037	0.0103
284	0.0139	0.0037	0.0102
285	0.0138	0.0037	0.0102
286	0.0138	0.0036	0.0101
287	0.0137	0.0036	0.0101
288	0.0136	0.0036	0.0100

Total soil rain loss = 1.93(In)

Total effective rainfall = 5.90(In)
Peak flow rate in flood hydrograph = 20.35(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	7.5	15.0	22.5	30.0
0+ 5	0.0003	0.04	Q				
0+10	0.0019	0.24	Q				
0+15	0.0056	0.54	Q				
0+20	0.0103	0.69	Q				
0+25	0.0154	0.73	Q				
0+30	0.0205	0.75	Q				
0+35	0.0257	0.76	VQ				
0+40	0.0309	0.76	VQ				
0+45	0.0362	0.76	VQ				
0+50	0.0414	0.76	VQ				
0+55	0.0467	0.76	VQ				
1+ 0	0.0519	0.77	VQ				
1+ 5	0.0572	0.77	VQ				
1+10	0.0625	0.77	VQ				
1+15	0.0678	0.77	VQ				
1+20	0.0732	0.77	VQ				
1+25	0.0785	0.78	Q				
1+30	0.0839	0.78	Q				
1+35	0.0893	0.78	Q				
1+40	0.0946	0.78	Q				
1+45	0.1000	0.78	Q				
1+50	0.1055	0.79	Q				
1+55	0.1109	0.79	Q				
2+ 0	0.1164	0.79	Q				
2+ 5	0.1218	0.79	Q				
2+10	0.1273	0.80	Q				
2+15	0.1328	0.80	Q				
2+20	0.1383	0.80	Q				
2+25	0.1439	0.80	Q				
2+30	0.1494	0.81	Q				
2+35	0.1550	0.81	QV				
2+40	0.1606	0.81	QV				
2+45	0.1662	0.81	QV				
2+50	0.1718	0.82	QV				
2+55	0.1774	0.82	QV				
3+ 0	0.1831	0.82	QV				
3+ 5	0.1888	0.82	QV				
3+10	0.1945	0.83	QV				

3+15	0.2002	0.83	QV				
3+20	0.2059	0.83	QV				
3+25	0.2117	0.83	QV				
3+30	0.2174	0.84	QV				
3+35	0.2232	0.84	QV				
3+40	0.2290	0.84	Q V				
3+45	0.2348	0.85	Q V				
3+50	0.2407	0.85	Q V				
3+55	0.2465	0.85	Q V				
4+ 0	0.2524	0.85	Q V				
4+ 5	0.2583	0.86	Q V				
4+10	0.2642	0.86	Q V				
4+15	0.2702	0.86	Q V				
4+20	0.2762	0.87	Q V				
4+25	0.2821	0.87	Q V				
4+30	0.2881	0.87	Q V				
4+35	0.2942	0.88	Q V				
4+40	0.3002	0.88	Q V				
4+45	0.3063	0.88	Q V				
4+50	0.3124	0.88	Q V				
4+55	0.3185	0.89	Q V				
5+ 0	0.3247	0.89	Q V				
5+ 5	0.3308	0.89	Q V				
5+10	0.3370	0.90	Q V				
5+15	0.3432	0.90	Q V				
5+20	0.3494	0.91	Q V				
5+25	0.3557	0.91	Q V				
5+30	0.3620	0.91	Q V				
5+35	0.3683	0.92	Q V				
5+40	0.3746	0.92	Q V				
5+45	0.3810	0.92	Q V				
5+50	0.3874	0.93	Q V				
5+55	0.3938	0.93	Q V				
6+ 0	0.4002	0.93	Q V				
6+ 5	0.4067	0.94	Q V				
6+10	0.4131	0.94	Q V				
6+15	0.4197	0.95	Q V				
6+20	0.4262	0.95	Q V				
6+25	0.4328	0.95	Q V				
6+30	0.4394	0.96	Q V				
6+35	0.4460	0.96	Q V				
6+40	0.4526	0.97	Q V				
6+45	0.4593	0.97	Q V				
6+50	0.4660	0.97	Q V				
6+55	0.4728	0.98	Q V				
7+ 0	0.4796	0.98	Q V				
7+ 5	0.4864	0.99	Q V				
7+10	0.4932	0.99	Q V				
7+15	0.5001	1.00	Q V				
7+20	0.5070	1.00	Q V				

7+25	0.5139	1.01	Q	V				
7+30	0.5209	1.01	Q	V				
7+35	0.5279	1.02	Q	V				
7+40	0.5349	1.02	Q	V				
7+45	0.5419	1.03	Q	V				
7+50	0.5491	1.03	Q	V				
7+55	0.5562	1.04	Q	V				
8+ 0	0.5634	1.04	Q	V				
8+ 5	0.5706	1.05	Q	V				
8+10	0.5778	1.05	Q	V				
8+15	0.5851	1.06	Q	V				
8+20	0.5924	1.06	Q	V				
8+25	0.5998	1.07	Q	V				
8+30	0.6072	1.07	Q	V				
8+35	0.6146	1.08	Q	V				
8+40	0.6221	1.09	Q	V				
8+45	0.6296	1.09	Q	V				
8+50	0.6372	1.10	Q	V				
8+55	0.6448	1.10	Q	V				
9+ 0	0.6525	1.11	Q	V				
9+ 5	0.6602	1.12	Q	V				
9+10	0.6679	1.12	Q	V				
9+15	0.6757	1.13	Q	V				
9+20	0.6835	1.14	Q	V				
9+25	0.6914	1.14	Q	V				
9+30	0.6994	1.15	Q	V				
9+35	0.7073	1.16	Q	V				
9+40	0.7154	1.17	Q	V				
9+45	0.7235	1.17	Q	V				
9+50	0.7316	1.18	Q	V				
9+55	0.7398	1.19	Q	V				
10+ 0	0.7480	1.20	Q	V				
10+ 5	0.7563	1.21	Q	V				
10+10	0.7647	1.21	Q	V				
10+15	0.7731	1.22	Q	V				
10+20	0.7816	1.23	Q	V				
10+25	0.7901	1.24	Q	V				
10+30	0.7987	1.25	Q	V				
10+35	0.8074	1.26	Q	V				
10+40	0.8161	1.27	Q	V				
10+45	0.8249	1.28	Q	V				
10+50	0.8338	1.29	Q	V				
10+55	0.8427	1.30	Q	V				
11+ 0	0.8517	1.31	Q	V				
11+ 5	0.8608	1.32	Q	V				
11+10	0.8699	1.33	Q	V				
11+15	0.8791	1.34	Q	V				
11+20	0.8884	1.35	Q	V				
11+25	0.8978	1.36	Q	V				
11+30	0.9073	1.37	Q	V				

11+35	0.9168	1.39	Q	V		
11+40	0.9265	1.40	Q	V		
11+45	0.9362	1.41	Q	V		
11+50	0.9460	1.43	Q	V		
11+55	0.9559	1.44	Q	V		
12+ 0	0.9659	1.45	Q	V		
12+ 5	0.9761	1.47	Q	V		
12+10	0.9865	1.51	Q	V		
12+15	0.9973	1.57	Q	V		
12+20	1.0084	1.61	Q	V		
12+25	1.0196	1.63	Q	V		
12+30	1.0309	1.65	Q	V		
12+35	1.0424	1.66	Q	V		
12+40	1.0540	1.68	Q	V		
12+45	1.0657	1.70	Q	V		
12+50	1.0775	1.72	Q	V		
12+55	1.0895	1.74	Q	V		
13+ 0	1.1017	1.76	Q	V		
13+ 5	1.1139	1.78	Q	V		
13+10	1.1264	1.81	Q	V		
13+15	1.1390	1.83	Q	V		
13+20	1.1517	1.85	Q	V		
13+25	1.1647	1.88	Q	V		
13+30	1.1778	1.91	Q	V		
13+35	1.1911	1.93	Q	V		
13+40	1.2046	1.96	Q	V		
13+45	1.2184	1.99	Q	V		
13+50	1.2323	2.02	Q	V		
13+55	1.2465	2.06	Q	V		
14+ 0	1.2609	2.09	Q	V		
14+ 5	1.2756	2.13	Q	V		
14+10	1.2906	2.17	Q	V		
14+15	1.3058	2.21	Q	V		
14+20	1.3214	2.26	Q	V		
14+25	1.3373	2.31	Q	V		
14+30	1.3535	2.36	Q	V		
14+35	1.3701	2.41	Q	V		
14+40	1.3872	2.47	Q	V		
14+45	1.4047	2.54	Q	V		
14+50	1.4226	2.61	Q	V		
14+55	1.4411	2.68	Q	V		
15+ 0	1.4601	2.77	Q	V		
15+ 5	1.4798	2.86	Q	V		
15+10	1.5002	2.96	Q	V		
15+15	1.5214	3.08	Q	V		
15+20	1.5435	3.21	Q	V		
15+25	1.5663	3.31	Q	V		
15+30	1.5886	3.24	Q	V		
15+35	1.6099	3.08	Q	V		
15+40	1.6316	3.15	Q	V		

15+45	1.6551	3.42	Q		V	
15+50	1.6815	3.84	Q		V	
15+55	1.7125	4.49	Q		V	
16+ 0	1.7523	5.78	Q		V	
16+ 5	1.8168	9.37		Q	V	
16+10	1.9370	17.45			Q V	
16+15	2.0772	20.35				Q
16+20	2.1609	12.15		Q		V
16+25	2.2050	6.41	Q			V
16+30	2.2341	4.22	Q			V
16+35	2.2606	3.84	Q			V
16+40	2.2831	3.28	Q			V
16+45	2.3041	3.04	Q			V
16+50	2.3236	2.83	Q			V
16+55	2.3419	2.67	Q			V
17+ 0	2.3593	2.52	Q			V
17+ 5	2.3758	2.40	Q			V
17+10	2.3916	2.29	Q			V
17+15	2.4068	2.20	Q			V
17+20	2.4214	2.12	Q			V
17+25	2.4355	2.05	Q			V
17+30	2.4491	1.98	Q			V
17+35	2.4624	1.92	Q			V
17+40	2.4753	1.87	Q			V
17+45	2.4878	1.82	Q			V
17+50	2.5001	1.78	Q			V
17+55	2.5120	1.73	Q			V
18+ 0	2.5237	1.69	Q			V
18+ 5	2.5351	1.65	Q			V
18+10	2.5460	1.59	Q			V
18+15	2.5565	1.52	Q			V
18+20	2.5666	1.47	Q			V
18+25	2.5765	1.44	Q			V
18+30	2.5862	1.41	Q			V
18+35	2.5957	1.38	Q			V
18+40	2.6051	1.36	Q			V
18+45	2.6143	1.34	Q			V
18+50	2.6233	1.31	Q			V
18+55	2.6322	1.29	Q			V
19+ 0	2.6410	1.27	Q			V
19+ 5	2.6496	1.25	Q			V
19+10	2.6582	1.24	Q			V
19+15	2.6665	1.22	Q			V
19+20	2.6748	1.20	Q			V
19+25	2.6830	1.19	Q			V
19+30	2.6911	1.17	Q			V
19+35	2.6990	1.16	Q			V
19+40	2.7069	1.14	Q			V
19+45	2.7147	1.13	Q			V
19+50	2.7223	1.12	Q			V

19+55	2.7299	1.10	Q				V
20+ 0	2.7374	1.09	Q				V
20+ 5	2.7449	1.08	Q				V
20+10	2.7522	1.07	Q				V
20+15	2.7595	1.06	Q				V
20+20	2.7667	1.04	Q				V
20+25	2.7738	1.03	Q				V
20+30	2.7809	1.02	Q				V
20+35	2.7878	1.01	Q				V
20+40	2.7948	1.00	Q				V
20+45	2.8016	1.00	Q				V
20+50	2.8084	0.99	Q				V
20+55	2.8151	0.98	Q				V
21+ 0	2.8218	0.97	Q				V
21+ 5	2.8284	0.96	Q				V
21+10	2.8350	0.95	Q				V
21+15	2.8415	0.94	Q				V
21+20	2.8479	0.94	Q				V
21+25	2.8543	0.93	Q				V
21+30	2.8607	0.92	Q				V
21+35	2.8670	0.91	Q				V
21+40	2.8732	0.91	Q				V
21+45	2.8794	0.90	Q				V
21+50	2.8856	0.89	Q				V
21+55	2.8917	0.89	Q				V
22+ 0	2.8978	0.88	Q				V
22+ 5	2.9038	0.87	Q				V
22+10	2.9097	0.87	Q				V
22+15	2.9157	0.86	Q				V
22+20	2.9216	0.86	Q				V
22+25	2.9274	0.85	Q				V
22+30	2.9333	0.84	Q				V
22+35	2.9390	0.84	Q				V
22+40	2.9448	0.83	Q				V
22+45	2.9505	0.83	Q				V
22+50	2.9561	0.82	Q				V
22+55	2.9618	0.82	Q				V
23+ 0	2.9674	0.81	Q				V
23+ 5	2.9729	0.81	Q				V
23+10	2.9785	0.80	Q				V
23+15	2.9840	0.80	Q				V
23+20	2.9894	0.79	Q				V
23+25	2.9948	0.79	Q				V
23+30	3.0002	0.78	Q				V
23+35	3.0056	0.78	Q				V
23+40	3.0110	0.78	Q				V
23+45	3.0163	0.77	Q				V
23+50	3.0215	0.77	Q				V
23+55	3.0268	0.76	Q				V
24+ 0	3.0320	0.76	Q				V

Hydraulic Analysis Report

Project Data

Project Title:

Designer:

Project Date: Sunday, May 4, 2025

Project Units: U.S. Customary Units

Notes:

Detention Basin Analysis: Detention Basin Analysis

Notes:

Storage Input Parameters

Storage Capacity: Known volume

Elevation ft	Volume acre-ft
0.00	0.00
1.00	0.11
2.00	0.22
3.00	0.33
4.00	0.44
5.00	0.55
6.00	0.61

Discharge Input Parameters

Known Discharge: Known Discharge 1

Discharge cfs

0.00	0.22
1.00	0.00
2.00	0.00
3.00	0.00
4.00	0.00
5.00	0.00
6.00	0.00

Weir: Parkway Drain

Weir Length: 6.0000 ft

Weir Coefficient: 3.1000

Height above base: 5.5000 ft

Base Elevation: 0.0000 ft

Storage & Discharge Input Parameters

Elevation - Storage - Discharge

Elevation ft	Storage acre-ft	Discharge cfs
0.00	0.00	0.22
1.00	0.11	0.00
2.00	0.22	0.00
3.00	0.33	0.00
4.00	0.44	0.00
5.00	0.55	0.00
6.00	0.61	6.58

Detention Basin Input Parameters

Inflow Hydrograph

Peak Inflow Discharge: 18.770 cfs, Time to Peak: 975.00 (min), Total Inflow Volume: 102352.50 ft³

Time (min)	Discharge cfs
5.00	0.02
10.00	0.16
15.00	0.37
20.00	0.50
25.00	0.54
30.00	0.56
35.00	0.56
40.00	0.57
45.00	0.57
50.00	0.57
55.00	0.57
60.00	0.57
65.00	0.58
70.00	0.58
75.00	0.58
80.00	0.58
85.00	0.58
90.00	0.58
95.00	0.59
100.00	0.59
105.00	0.59
110.00	0.59
115.00	0.59
120.00	0.59
125.00	0.60
130.00	0.60

135.00	0.60
140.00	0.60
145.00	0.60
150.00	0.60
155.00	0.61
160.00	0.61
165.00	0.61
170.00	0.61
175.00	0.61
180.00	0.62
185.00	0.62
190.00	0.62
195.00	0.62
200.00	0.62
205.00	0.63
210.00	0.63
215.00	0.63
220.00	0.63
225.00	0.63
230.00	0.64
235.00	0.64
240.00	0.64
245.00	0.64
250.00	0.64
255.00	0.65
260.00	0.65
265.00	0.65
270.00	0.65
275.00	0.66
280.00	0.66
285.00	0.66
290.00	0.66
295.00	0.67
300.00	0.67
305.00	0.67
310.00	0.67
315.00	0.68
320.00	0.68
325.00	0.68
330.00	0.68
335.00	0.69
340.00	0.69
345.00	0.69
350.00	0.69
355.00	0.70
360.00	0.70
365.00	0.70
370.00	0.71
375.00	0.71
380.00	0.71

385.00	0.71
390.00	0.72
395.00	0.72
400.00	0.72
405.00	0.73
410.00	0.73
415.00	0.73
420.00	0.74
425.00	0.74
430.00	0.74
435.00	0.75
440.00	0.75
445.00	0.75
450.00	0.76
455.00	0.76
460.00	0.77
465.00	0.77
470.00	0.77
475.00	0.78
480.00	0.78
485.00	0.78
490.00	0.79
495.00	0.79
500.00	0.80
505.00	0.80
510.00	0.81
515.00	0.81
520.00	0.81
525.00	0.82
530.00	0.82
535.00	0.83
540.00	0.83
545.00	0.84
550.00	0.84
555.00	0.85
560.00	0.85
565.00	0.86
570.00	0.86
575.00	0.87
580.00	0.87
585.00	0.88
590.00	0.89
595.00	0.89
600.00	0.90
605.00	0.90
610.00	0.91
615.00	0.92
620.00	0.92
625.00	0.93
630.00	0.94

635.00	0.94
640.00	0.95
645.00	0.96
650.00	0.96
655.00	0.97
660.00	0.98
665.00	0.99
670.00	0.99
675.00	1.00
680.00	1.01
685.00	1.02
690.00	1.03
695.00	1.04
700.00	1.05
705.00	1.06
710.00	1.07
715.00	1.08
720.00	1.09
725.00	1.10
730.00	1.13
735.00	1.17
740.00	1.20
745.00	1.22
750.00	1.23
755.00	1.25
760.00	1.26
765.00	1.27
770.00	1.29
775.00	1.30
780.00	1.32
785.00	1.34
790.00	1.35
795.00	1.37
800.00	1.39
805.00	1.41
810.00	1.43
815.00	1.45
820.00	1.47
825.00	1.49
830.00	1.52
835.00	1.54
840.00	1.57
845.00	1.59
850.00	1.62
855.00	1.66
860.00	1.69
865.00	1.73
870.00	1.76
875.00	1.80
880.00	1.85

885.00	1.90
890.00	1.95
895.00	2.00
900.00	2.06
905.00	2.13
910.00	2.21
915.00	2.29
920.00	2.39
925.00	2.47
930.00	2.44
935.00	2.33
940.00	2.36
945.00	2.53
950.00	2.83
955.00	3.33
960.00	4.42
965.00	7.65
970.00	14.94
975.00	18.77
980.00	12.19
985.00	6.25
990.00	3.66
995.00	2.98
1000.00	2.68
1005.00	2.31
1010.00	2.15
1015.00	2.02
1020.00	1.91
1025.00	1.82
1030.00	1.73
1035.00	1.66
1040.00	1.60
1045.00	1.55
1050.00	1.50
1055.00	1.45
1060.00	1.41
1065.00	1.37
1070.00	1.34
1075.00	1.31
1080.00	1.28
1085.00	1.25
1090.00	1.20
1095.00	1.15
1100.00	1.11
1105.00	1.08
1110.00	1.06
1115.00	1.04
1120.00	1.02
1125.00	1.00
1130.00	0.99

1135.00	0.97
1140.00	0.96
1145.00	0.94
1150.00	0.93
1155.00	0.92
1160.00	0.90
1165.00	0.89
1170.00	0.88
1175.00	0.87
1180.00	0.86
1185.00	0.85
1190.00	0.84
1195.00	0.83
1200.00	0.82
1205.00	0.81
1210.00	0.80
1215.00	0.79
1220.00	0.79
1225.00	0.78
1230.00	0.77
1235.00	0.76
1240.00	0.75
1245.00	0.75
1250.00	0.74
1255.00	0.73
1260.00	0.73
1265.00	0.72
1270.00	0.72
1275.00	0.71
1280.00	0.70
1285.00	0.70
1290.00	0.69
1295.00	0.69
1300.00	0.68
1305.00	0.68
1310.00	0.67
1315.00	0.67
1320.00	0.66
1325.00	0.66
1330.00	0.65
1335.00	0.65
1340.00	0.64
1345.00	0.64
1350.00	0.63
1355.00	0.63
1360.00	0.63
1365.00	0.62
1370.00	0.62
1375.00	0.61
1380.00	0.61

1385.00	0.61
1390.00	0.60
1395.00	0.60
1400.00	0.60
1405.00	0.59
1410.00	0.59
1415.00	0.59
1420.00	0.58
1425.00	0.58
1430.00	0.58
1435.00	0.57
1440.00	0.57

Initial Storage = 0.0000 acre-ft

Detention Basin Result Parameters

Basin Overflowed!

Routed Hydrograph

Peak Outflow Discharge: 6.576 cfs, Time to Peak: 970.00 (min), Total Outflow Volume: 78477.60 ft³

Time min	Discharge cfs	Storage acre-ft
0.00	0.00	0.000000
10.00	0.00	0.001102
15.00	0.21	0.550000
20.00	0.21	0.552000
25.00	0.21	0.554304
30.00	0.20	0.556779
35.00	0.20	0.559287
40.00	0.19	0.561899
45.00	0.19	0.564546
50.00	0.18	0.567230
55.00	0.18	0.569950
60.00	0.17	0.572707
65.00	0.16	0.575570
70.00	0.16	0.578473
75.00	0.15	0.581415
80.00	0.15	0.584398
85.00	0.14	0.587421
90.00	0.14	0.590485
95.00	0.13	0.593660
100.00	0.12	0.596879
105.00	0.12	0.600141
110.00	0.11	0.603448
115.00	0.10	0.606799
120.00	0.10	0.610197
125.00	0.09	0.613710
130.00	0.08	0.617270

135.00	0.08	0.620880
140.00	0.07	0.624538
145.00	0.06	0.628246
150.00	0.05	0.632005
155.00	0.05	0.635884
160.00	0.04	0.639816
165.00	0.03	0.643802
170.00	0.02	0.647842
175.00	0.02	0.651936
180.00	0.01	0.656156
185.00	0.00	0.660426
190.00	0.00	0.664696
195.00	0.00	0.668966
200.00	0.00	0.673236
205.00	0.00	0.677575
210.00	0.00	0.681914
215.00	0.00	0.686253
220.00	0.00	0.690591
225.00	0.00	0.694930
230.00	0.00	0.699338
235.00	0.00	0.703746
240.00	0.00	0.708153
245.00	0.00	0.712561
250.00	0.00	0.716969
255.00	0.00	0.721445
260.00	0.00	0.725922
265.00	0.00	0.730398
270.00	0.00	0.734875
275.00	0.00	0.739420
280.00	0.00	0.743966
285.00	0.00	0.748511
290.00	0.00	0.753057
295.00	0.00	0.757671
300.00	0.00	0.762285
305.00	0.00	0.766900
310.00	0.00	0.771514
315.00	0.00	0.776197
320.00	0.00	0.780880
325.00	0.00	0.785563
330.00	0.00	0.790247
335.00	0.00	0.794999
340.00	0.00	0.799751
345.00	0.00	0.804503
350.00	0.00	0.809255
355.00	0.00	0.814076
360.00	0.00	0.818897
365.00	0.00	0.823718
370.00	0.00	0.828607
375.00	0.00	0.833497
380.00	0.00	0.838387

385.00	0.00	0.843277
390.00	0.00	0.848235
395.00	0.00	0.853194
400.00	0.00	0.858153
405.00	0.00	0.863180
410.00	0.00	0.868208
415.00	0.00	0.873235
420.00	0.00	0.878332
425.00	0.00	0.883428
430.00	0.00	0.888524
435.00	0.00	0.893690
440.00	0.00	0.898855
445.00	0.00	0.904020
450.00	0.00	0.909254
455.00	0.00	0.914489
460.00	0.00	0.919792
465.00	0.00	0.925095
470.00	0.00	0.930398
475.00	0.00	0.935769
480.00	0.00	0.941141
485.00	0.00	0.946513
490.00	0.00	0.951954
495.00	0.00	0.957395
500.00	0.00	0.962904
505.00	0.00	0.968414
510.00	0.00	0.973992
515.00	0.00	0.979571
520.00	0.00	0.985149
525.00	0.00	0.990797
530.00	0.00	0.996444
535.00	0.00	1.002160
540.00	0.00	1.007877
545.00	0.00	1.013662
550.00	0.00	1.019447
555.00	0.00	1.025301
560.00	0.00	1.031155
565.00	0.00	1.037078
570.00	0.00	1.043000
575.00	0.00	1.048992
580.00	0.00	1.054984
585.00	0.00	1.061044
590.00	0.00	1.067174
595.00	0.00	1.073303
600.00	0.00	1.079502
605.00	0.00	1.085700
610.00	0.00	1.091967
615.00	0.00	1.098303
620.00	0.31	1.102521
625.00	0.66	1.104389
630.00	0.82	1.105244

635.00	0.89	1.105613
640.00	0.92	1.105822
645.00	0.94	1.105961
650.00	0.95	1.106021
655.00	0.96	1.106096
660.00	0.97	1.106178
665.00	0.98	1.106262
670.00	0.98	1.106299
675.00	0.99	1.106364
680.00	1.00	1.106441
685.00	1.01	1.106524
690.00	1.02	1.106609
695.00	1.03	1.106695
700.00	1.04	1.106781
705.00	1.05	1.106868
710.00	1.06	1.106954
715.00	1.07	1.107041
720.00	1.08	1.107128
725.00	1.09	1.107214
730.00	1.10	1.107399
735.00	1.13	1.107677
740.00	1.16	1.107944
745.00	1.19	1.108158
750.00	1.21	1.108299
755.00	1.23	1.108459
760.00	1.24	1.108577
765.00	1.26	1.108677
770.00	1.27	1.108819
775.00	1.28	1.108930
780.00	1.30	1.109076
785.00	1.32	1.109238
790.00	1.33	1.109357
795.00	1.35	1.109507
800.00	1.37	1.109670
805.00	1.39	1.109839
810.00	1.41	1.110010
815.00	1.42	1.110183
820.00	1.44	1.110356
825.00	1.46	1.110529
830.00	1.49	1.110752
835.00	1.51	1.110946
840.00	1.54	1.111178
845.00	1.56	1.111377
850.00	1.59	1.111610
855.00	1.62	1.111908
860.00	1.65	1.112184
865.00	1.68	1.112501
870.00	1.72	1.112785
875.00	1.75	1.113105
880.00	1.79	1.113489

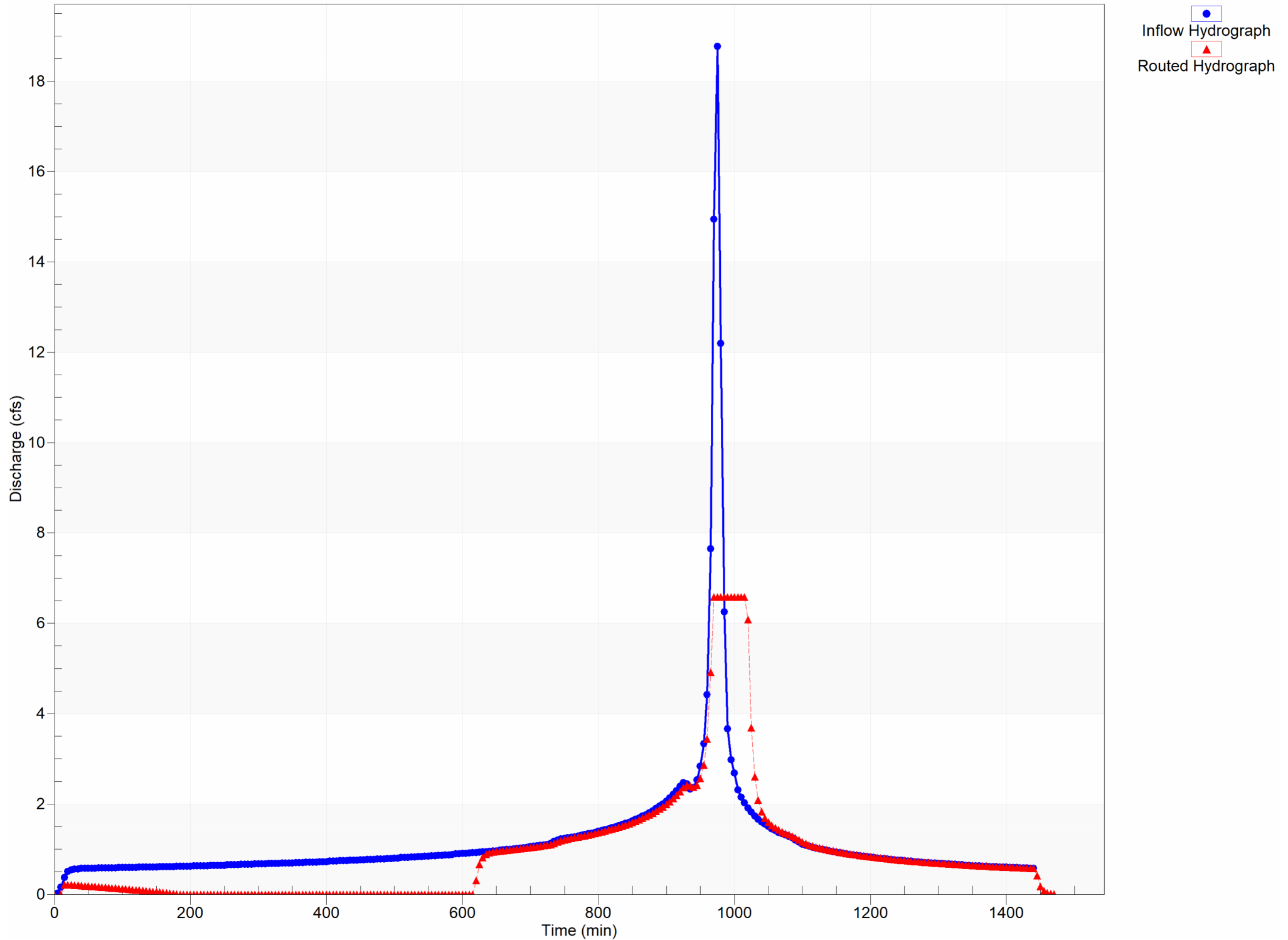
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890.00	1.89	1.114326
895.00	1.94	1.114755
900.00	1.99	1.115236
905.00	2.05	1.115789
910.00	2.12	1.116421
915.00	2.19	1.117089
920.00	2.28	1.117869
925.00	2.36	1.118600
930.00	2.42	1.118768
935.00	2.40	1.118298
940.00	2.37	1.118243
945.00	2.41	1.119057
950.00	2.56	1.120887
955.00	2.86	1.124141
960.00	3.44	1.130917
965.00	4.91	1.149760
970.00	6.58	1.207363
975.00	6.58	1.291342
980.00	6.58	1.330005
985.00	6.58	1.327760
990.00	6.58	1.307676
995.00	6.58	1.282910
1000.00	6.58	1.256077
1005.00	6.58	1.226697
1010.00	6.58	1.196214
1015.00	6.58	1.164836
1020.00	6.08	1.136100
1025.00	3.68	1.123260
1030.00	2.60	1.117278
1035.00	2.08	1.114353
1040.00	1.83	1.112795
1045.00	1.68	1.111877
1050.00	1.59	1.111235
1055.00	1.53	1.110711
1060.00	1.47	1.110288
1065.00	1.43	1.109908
1070.00	1.39	1.109597
1075.00	1.35	1.109314
1080.00	1.32	1.109045
1085.00	1.29	1.108781
1090.00	1.25	1.108420
1095.00	1.21	1.108018
1100.00	1.16	1.107648
1105.00	1.12	1.107340
1110.00	1.09	1.107109
1115.00	1.07	1.106910
1120.00	1.05	1.106726
1125.00	1.03	1.106548
1130.00	1.01	1.106422

1135.00	0.99	1.106269
1140.00	0.98	1.106154
1145.00	0.96	1.106006
1150.00	0.95	1.105892
1155.00	0.93	1.105794
1160.00	0.92	1.105653
1165.00	0.91	1.105543
1170.00	0.89	1.105446
1175.00	0.88	1.105355
1180.00	0.87	1.105267
1185.00	0.86	1.105179
1190.00	0.85	1.105092
1195.00	0.84	1.105006
1200.00	0.83	1.104919
1205.00	0.82	1.104832
1210.00	0.81	1.104745
1215.00	0.80	1.104659
1220.00	0.80	1.104621
1225.00	0.79	1.104556
1230.00	0.78	1.104478
1235.00	0.77	1.104396
1240.00	0.76	1.104311
1245.00	0.76	1.104274
1250.00	0.75	1.104209
1255.00	0.74	1.104132
1260.00	0.73	1.104098
1265.00	0.73	1.104035
1270.00	0.72	1.104007
1275.00	0.72	1.103946
1280.00	0.71	1.103870
1285.00	0.70	1.103838
1290.00	0.70	1.103774
1295.00	0.69	1.103747
1300.00	0.69	1.103686
1305.00	0.68	1.103660
1310.00	0.68	1.103599
1315.00	0.67	1.103573
1320.00	0.67	1.103512
1325.00	0.66	1.103486
1330.00	0.66	1.103425
1335.00	0.65	1.103399
1340.00	0.65	1.103339
1345.00	0.64	1.103313
1350.00	0.64	1.103252
1355.00	0.63	1.103226
1360.00	0.63	1.103215
1365.00	0.63	1.103161
1370.00	0.62	1.103137
1375.00	0.62	1.103078
1380.00	0.61	1.103052

1385.00	0.61	1.103041
1390.00	0.61	1.102987
1395.00	0.60	1.102964
1400.00	0.60	1.102954
1405.00	0.60	1.102900
1410.00	0.59	1.102877
1415.00	0.59	1.102867
1420.00	0.59	1.102813
1425.00	0.58	1.102790
1430.00	0.58	1.102780
1435.00	0.58	1.102727
1440.00	0.57	1.102704
1445.00	0.41	1.099884
1450.00	0.18	1.098668
1455.00	0.08	1.098143
1460.00	0.03	1.097917
1465.00	0.01	1.097819
1470.00	0.01	1.097777

Routed Hydrographs

100-year, 24-hour Storm Event



APPENDIX D

Hydraulics Analysis

(To be provided during Final Engineering)

APPENDIX E

Reference Materials
