

PRELIMINARY PRIORITY PROJECT **HYDROLOGY STUDY**

FOR:

***CLEVELAND AVENUE RESIDENTIAL
ESCONDIDO, CA***

PREPARED FOR:

THE TRUE LIFE COMPANIES

PREPARED BY:

EXCEL ENGINEERING

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Project No: 24-021

DATE PREPARED:

NOVEMBER 17, 2025

DATE REVISED:

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1.0 PROJECT DESCRIPTION

1.1 Project Purpose

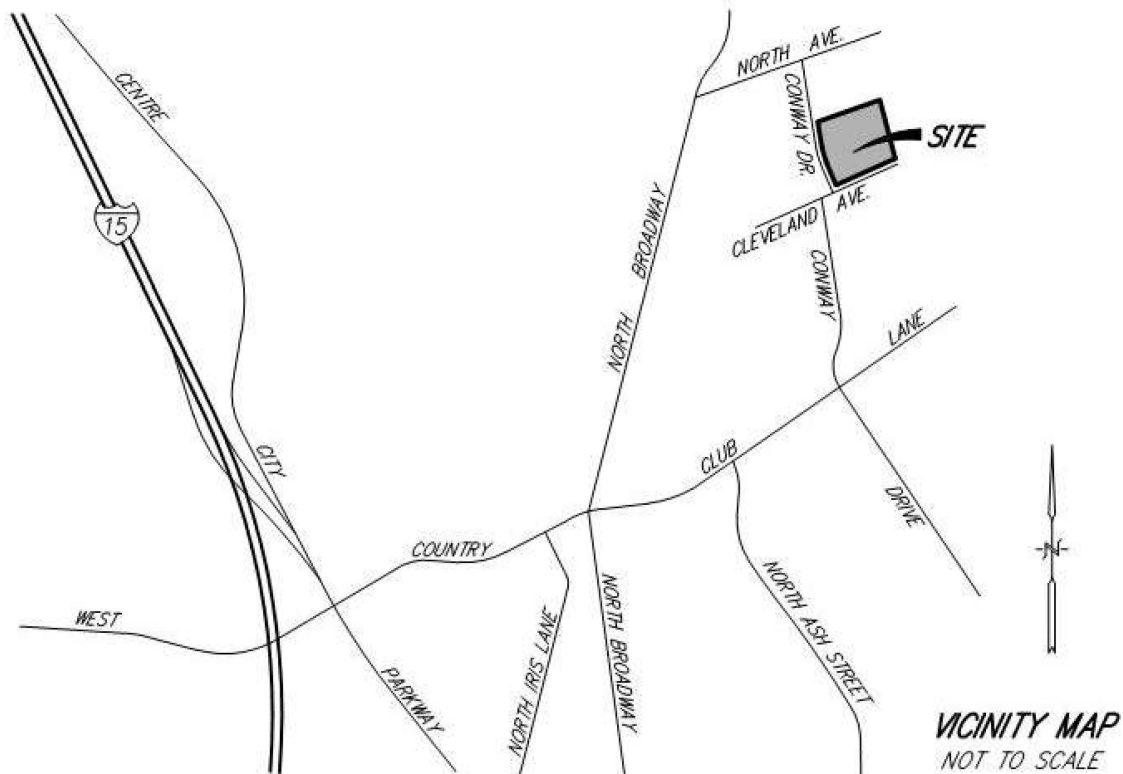
The purpose of this project is to receive approval from the City of Escondido to construct 29 single family residential homes and its associated infrastructure and improvements on an existing 10.38-acre parcel.

1.2 Project Proposed Facilities

The project includes 29 residential lots ranging from 6,000 to 19,000 square feet in size. As part of the new construction, associated improvements will include walkways, grass and landscaped areas, and all necessary utilities (storm, sewer, water, dry, etc.).

Normal uses of such a development will generate storm water runoff with the potential to carry pollutants to off-site tributaries. Biofiltration basins are planned to be incorporated throughout the site to treat runoff from impervious and landscaped areas.

2.0 VICINITY MAP



3.0 SITE MAP

Please see Attachment A – Site map

4.0 DESCRIPTION OF WATERSHED

4.1 Existing Conditions Topography

The existing parcel is currently an undeveloped lot. The majority of the lot sheet flows to an existing headwall inlet on the southwest corner of the lot and stormwater is routed to an existing curb inlet on Conway Drive (POC-1). At the curb inlet, offsite street flows confluence with the onsite flows and are routed underneath Conway Drive via an existing 24" RCP storm drain pipe and outlet at an existing headwall on the west side of Conway Drive.

A small portion of the lot and existing offsite area east of the property sheet flows to an existing drainage ditch at the southeast corner of the site where Cleveland Avenue ends (POC-2).

After drainage leaves the site at both POC-1 and POC-2, it flows to the south where the water travels through the Escondido sub-Hydrologic area southward to Escondido Creek. Once in Escondido creek, flows continue until they reach the Pacific Ocean at San Elijo Lagoon.

Please see Attachment C – Watershed Map.

4.2 Existing Conditions + Project Conditions Topography

The project proposes to develop the existing lot for the construction of 29 new single-family residential homes. Fill soil will be brought in to level the site, and the finished building pad grades is a relatively flat plane through the site in the direction of the existing flows away from the building pads towards the water quality treatment basins. Once within the water quality treatment systems, the stormwater infiltrates through the treatment medium into underdrains that route flows to the private onsite storm drainage system.

Approximately 1.8 acres of existing offsite runoff area east of the lot will be routed to a new brow ditch constructed along the property line of the site and routed as bypass flow through the site via a private storm drain system. The onsite flows will confluence with this offsite bypass flow before being routed to the existing curb inlet on Conway Drive (POC-1).

4.3 Hydrologic Unit Contribution

The project site is within the Carlsbad Hydrologic Unit (HU 904), Escondido Creek (HA 904.6), Escondido (HAS 904.62) and San Elijo (HAS 904.61). After drainage leaves the site, it flows to the Escondido sub Hydrologic area southward to Escondido Creek. Once in Escondido Creek, flows continue until they reach the Pacific Ocean at San Elijo Lagoon.

5.0 METHODOLOGY

This study complies with the 2003 San Diego Hydrology Manual. The rational method as presented in Section 3 of that manual and workbook examples were followed.

5.1 Hydrology Software

The “Rational Hydrology Method, San Diego County (2003 Manual)” module of the CIVILCADD/CIVIL DESIGN Engineering software version 7.9 is used in this study. This software was also used to develop hydrographs from the rational method results. This procedure also complies with the 2003 San Diego Hydrology Manual as presented in Section 6.

5.2 Routing Software

No routing calculations were performed for this site at this time. Should further routing be required upon further development of the site and possible site plan changes causing discharge rates to increase above the predeveloped rates, the existing hydromodification/water quality treatment ponds can be used as flow control facilities. In order to show this is the case, Hydraflow Hydrographs 2004 by Intelisolve would then be used in this step. The hydrograph developed from the rational method is then manually entered into this software and routed into each detention pond.

5.3 Hydraulics Software

No hydraulics calculations were performed at this time. If required on future submittals, the hydraulics for the onsite private storm drain system will be

performed using Hydraflow Storm Sewers Extension v.10.4, and Hydraflow Hydrographs Extension v. 10.4 by Autodesk, Inc.
<http://www.autodesk.com/civil3d-stormwater>.

6.0 CALCULATIONS

The calculations to be performed are to determine the flows that will confluence at POC 1 and 2 for both the pre and post-development conditions. These values will then be used to appropriately size piping for HGL and travel flow, detention, and detention facilitates if necessary. The following calculation results are provided below for both the 50-year and 100 year storm frequencies.

Table 1: 50 Year POC-1

	Pre-Development	Post-Development
Area (Acres)	20.02	20.08
T _C (Min.)	13.17	18.09
Q ₅₀ (CFS)	23.97	25.80

Table 2: 50 Year POC-2

	Pre-Development	Post-Development
Area (Acres)	1.12	1.03
T _C (Min.)	10.53	11.91
Q ₅₀ (CFS)	1.96	2.09

Table 3: 100 Year POC-1

	Pre-Development	Post-Development
Area (Acres)	20.02	20.08
T _C (Min.)	12.89	15.48
Q ₁₀₀ (CFS)	29.11	31.31

Table 4: 100 Year POC-2

	Pre-Development	Post-Development
Area (Acres)	1.12	1.03
T _C (Min.)	10.48	11.82
Q ₁₀₀ (CFS)	2.36	2.52

These numbers will be used to size the proposed storm drain pipes and to doublecheck if the existing storm drain outlet facilities are adequate.

6.1 Determine the Watershed that affects the project

Please see the “Watershed Map” in Attachment C

6.2 Calculate Runoff Coefficient

The project site soil type varies across the site between type “A” and type “C” soil (See Attachment C – Soils Index Map). Therefore, a ratio of each soil type based on area will be used to determine the C factor within each subarea.

For this preliminary report, the C factors used are based on land use for each subarea. For pre-developed areas, the land use category used is Low Density Residential 1.0 DU/A or less. For onsite post-developed areas, the land use category used is Low Density Residential 2.9 DU/A or less.

6.3 Calculate Storm Flows using the Rational Method

The 50-year post-developed storm flow for this project was calculated to be 25.80 CFS at POC-1 and 2.09 CFS at POC-2. The discharge at both POC-1 and POC-2 is higher than the pre-development conditions, therefore mitigation will need to occur to keep within compliance. Mitigation results and calculations to follow.

Please see “Post Developed Q Calculations” in Attachment E and G for the 50 and 100-year developed conditions.

6.4 Design / Analyze Proposed Storm Drain Facilities

Storm facilities have been designed to accommodate the HGL and flowlines of the proposed storm drain pipes and structures fall within tolerance of the available Q100 flows and are adequately sized.

7.0 MITIGATION MEASURES

A Storm Water Management Plan (SWQMP) has been prepared for this project to discuss treatment and flow control of the lower flows (2-year and 10-year). This Hydrology study analyzes the higher 50 and 100-year flows.

7.1 Mitigate Increase Runoff

As discussed above, the 50 year post-developed runoff rate at POC-1 of 25.80 CFS is higher than the pre-developed rate of 23.97 CFS, and the 50 year post-developed runoff rate at POC-2 of 2.09 CFS is higher than the pre-developed rate of 1.96 CFS (see attachment F and G for calculations). The proposed site development has higher than anticipated flows and mitigation will need to occur in order to decrease the expected peak flows at each POC.

In order to decrease the flows at POC-1, a detention basin will be used to detain and slow runoff onsite at the southwest side of the site before connecting to the existing curb inlet and 24” storm drain line and confluence with the offsite street flows. After detention occurs, the resulting time of concentration at POC-1 is increased from 18.09 minutes to 20.76 minutes. As a result, the post-developed 50 year runoff rate at POC-1 of 25.80 CFS is decreased to 22.33 CFS which is lower than the pre-developed rate of 23.97 CFS.

In order to decrease the flows at POC-2, a detention basin will be used to detain and slow runoff onsite at the southeast corner of the site before outflowing through a curb outlet and confluence with the offsite street flows. After detention occurs, the resulting time of concentration at POC-2 is increased from 11.91 minutes to 13.87 minutes. As a result, the post-developed 50 year runoff rate at POC-2 of 2.09 CFS is decreased to 1.87 CFS which is lower than the pre-developed rate of 1.96 CFS. Tables 5 and 6 below summarize the pre-development, post-development unmitigated, and post-development mitigated conditions for POC-1 and POC-2 for the 50 year storm event. Please see attachment H for post-mitigated flow calculations.

Table 5: 50 Year POC-1 Mitigated

	Pre-Development	Post-Development Unmitigated	Post-Development Mitigated
Area (Acres)	20.02	20.08	20.08
T _C (Min.)	13.17	18.09	20.76
Q ₅₀ (CFS)	23.97	25.80	22.33

Table 6: 50 Year POC-2 Mitigated

	Pre-Development	Post-Development Unmitigated	Post-Development Mitigated
Area (Acres)	1.12	1.03	1.03
T _C (Min.)	10.53	11.91	13.87
Q ₅₀ (CFS)	1.96	2.09	1.87

7.2 Check Capacity of Existing Downstream Storm Drain Facilities

Since peak flows will be anticipated to be mitigated and reduced, no further capacity analysis of downstream storm drain facilities is necessary.

8.0 SUMMARY

The proposed improvements of the project will increase the 50 year peak flows from the pre-developed rate of 23.97 CFS to 25.80 CFS at POC-1 and 1.96 CFS to 2.09 CFS at POC-2. Therefore, mitigation methods are proposed to detain and slow the runoff onsite before confluence with offsite flows at each POC. After detention occurs from the proposed detention basins, peak flows are reduced to 22.33 CFS at POC-1 and 1.87 CFS at POC-2. These post-mitigated 50 year runoff rates are below the pre-developed rates which satisfy the minimum requirements for detention.

9.0 REFERENCES

County of San Diego, Department of Public Works, Flood Control Section, June 2003
San Diego County Hydrology Manual

10.0 DECLARATION OF RESPONSIBLE CHARGE

I hereby declare that I am the engineer of work for this project. That I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions codes, and that the design is consistent with current design.

I understand that the check of the project drawings and specifications by the City of Escondido is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

ENGINEER OF WORK

Excel Engineering
440 State Place
Escondido, CA 92029
Tel – (760)745-8118
Fax – (760)745-1890

Project Number: 24-021

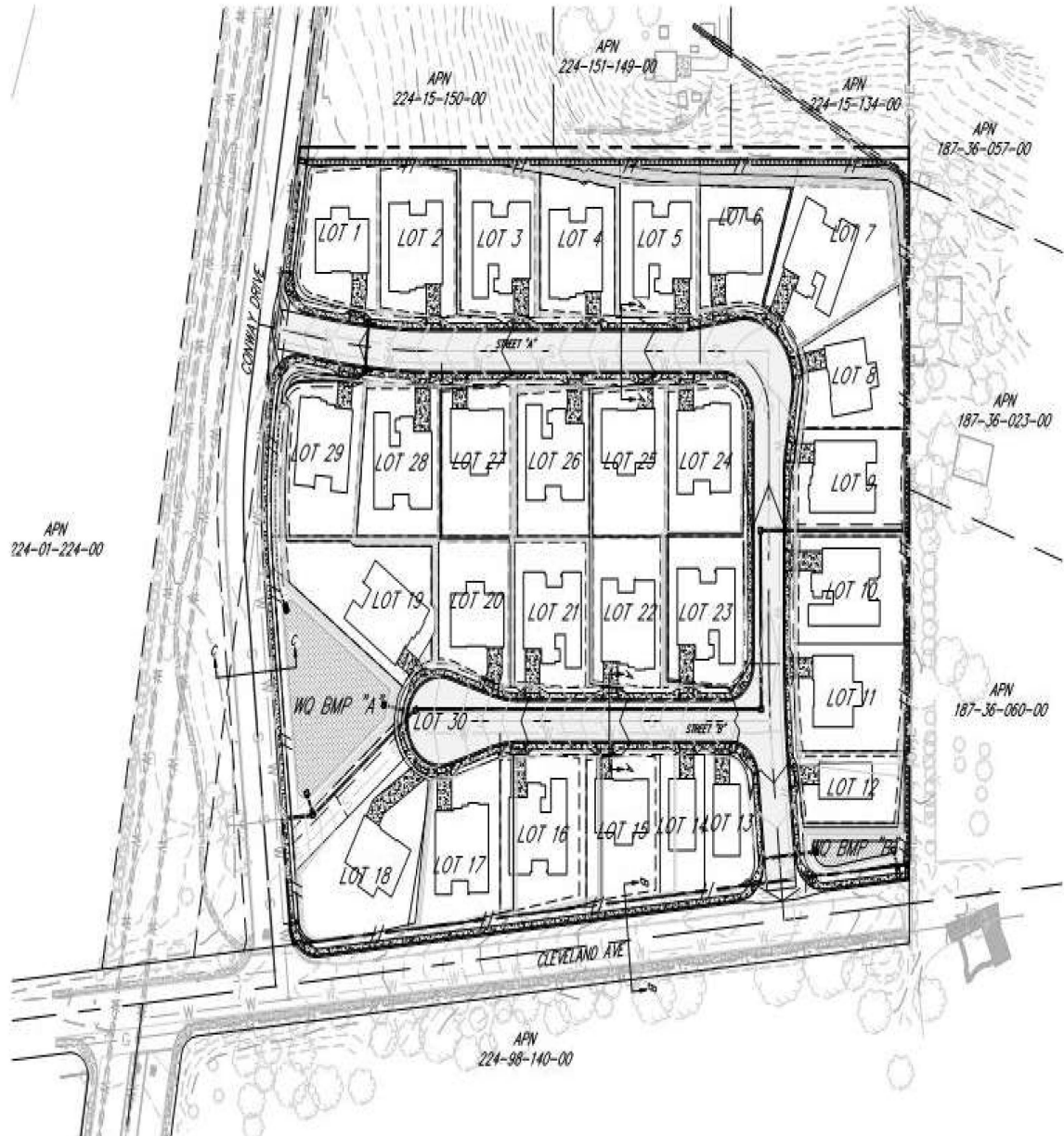


Robert D. Dentino, RCE 45629
Registration Expire: December 31, 2026



11/17/2025
Date

ATTACHMENT A SITE MAP



ATTACHMENT B
FIGURES & TABLES FROM THE SD HYDROLOGY MANUAL 2003

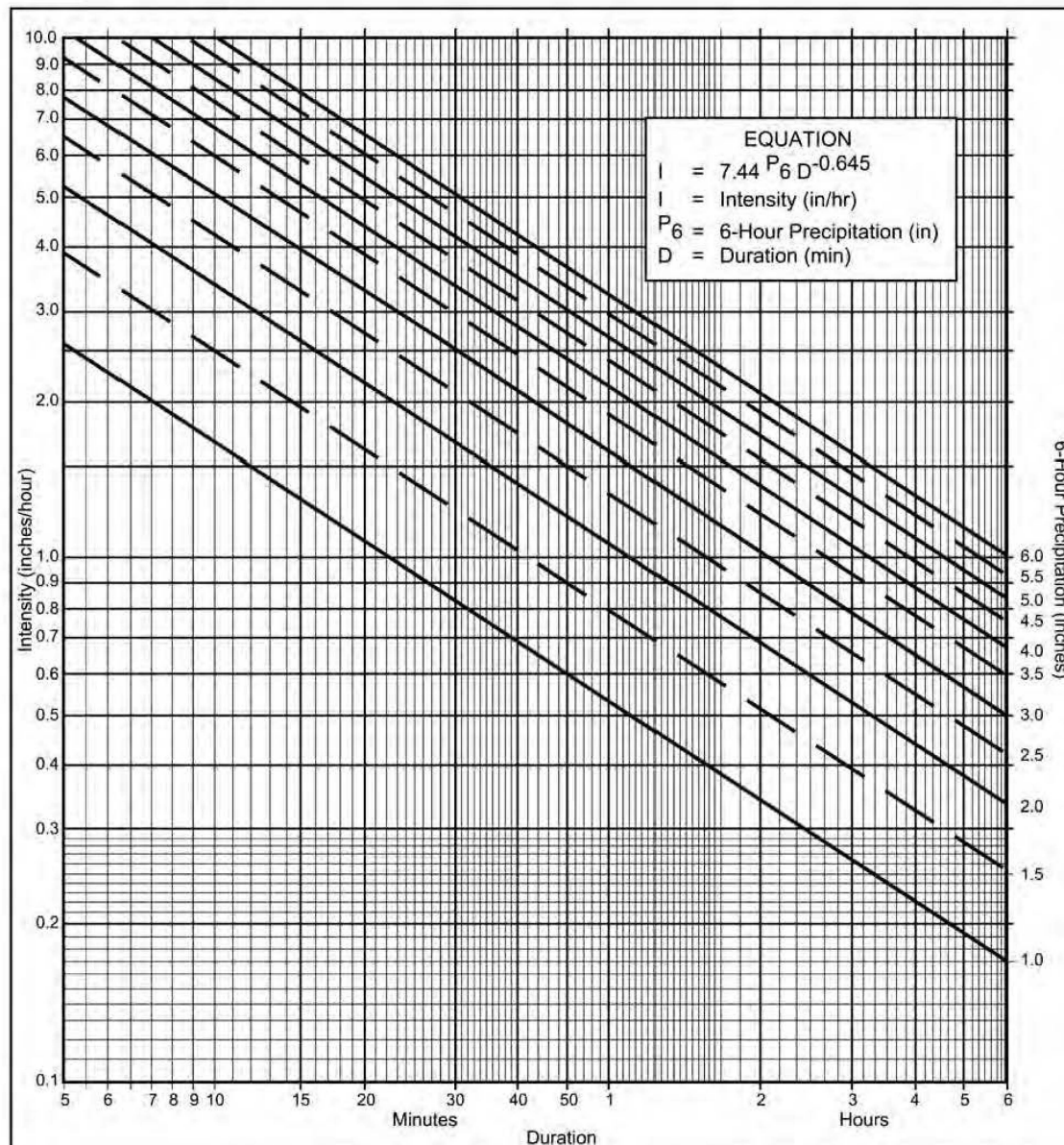
**Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS**

Land Use		Runoff Coefficient "C"				
		% IMPER.	Soil Type			
NRCS Elements	County Elements		A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, C_p , for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).

DU/A = dwelling units per acre

NRCS = National Resources Conservation Service



Directions for Application:

- (1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).
- (2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicable to Desert).
- (3) Plot 6 hr precipitation on the right side of the chart.
- (4) Draw a line through the point parallel to the plotted lines.
- (5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

- (a) Selected frequency _____ year
- (b) $P_6 =$ _____ in., $P_{24} =$ _____, $\frac{P_6}{P_{24}} =$ _____ %⁽²⁾
- (c) Adjusted $P_6^{(2)} =$ _____ in.
- (d) $t_x =$ _____ min.
- (e) $I =$ _____ in./hr.

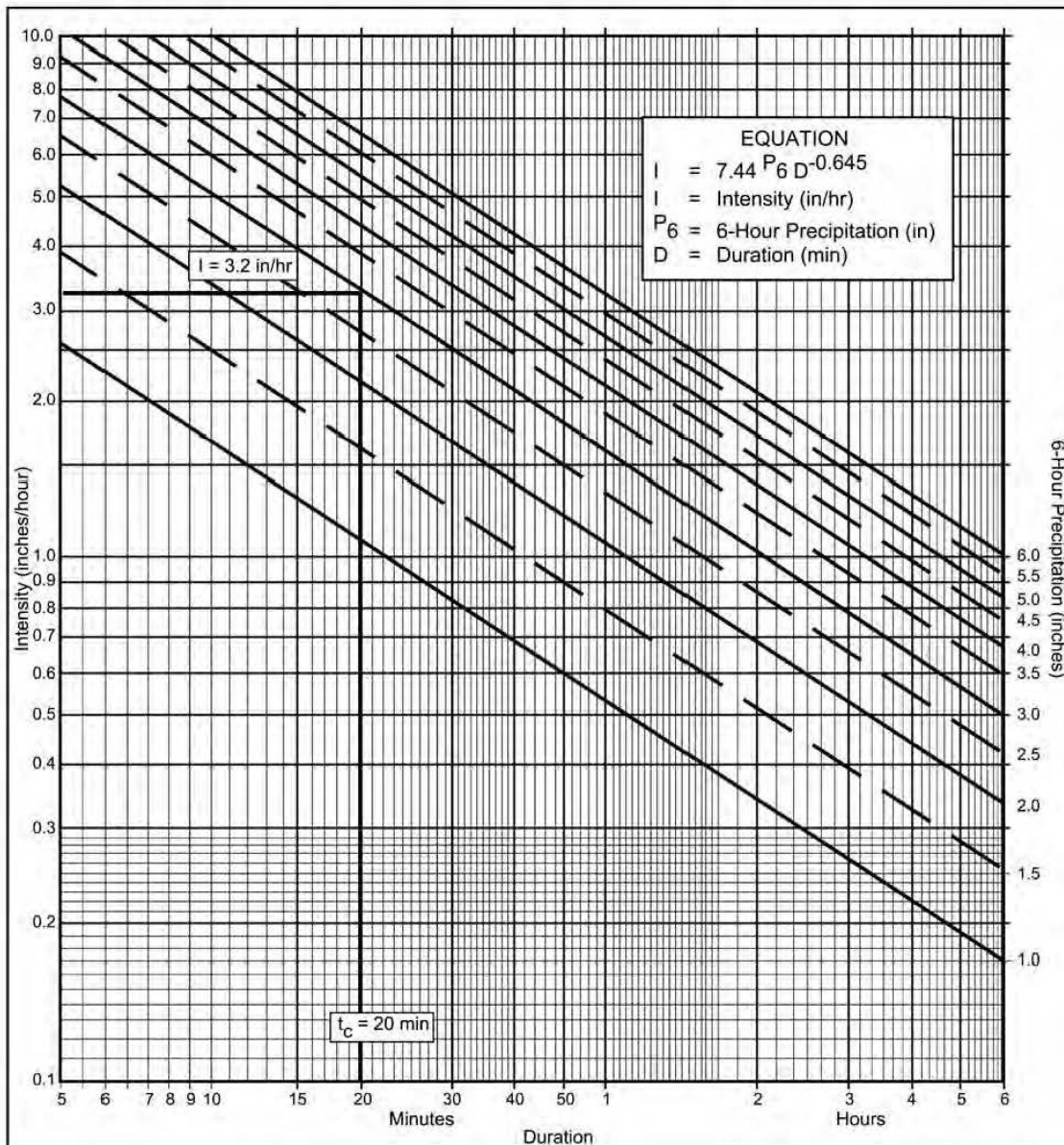
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE

3-1



Directions for Application:

- (1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).
- (2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicable to Desert).
- (3) Plot 6 hr precipitation on the right side of the chart.
- (4) Draw a line through the point parallel to the plotted lines.
- (5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

- (a) Selected frequency 50 year
- (b) $P_6 = \underline{3}$ in., $P_{24} = \underline{5.5}$ in., $\frac{P_6}{P_{24}} = \underline{54.5} \%^{(2)}$
- (c) Adjusted $P_6^{(2)} = \underline{3}$ in.
- (d) $t_x = \underline{20}$ min.
- (e) $I = \underline{3.2}$ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6 Duration	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Example

FIGURE

3-2

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

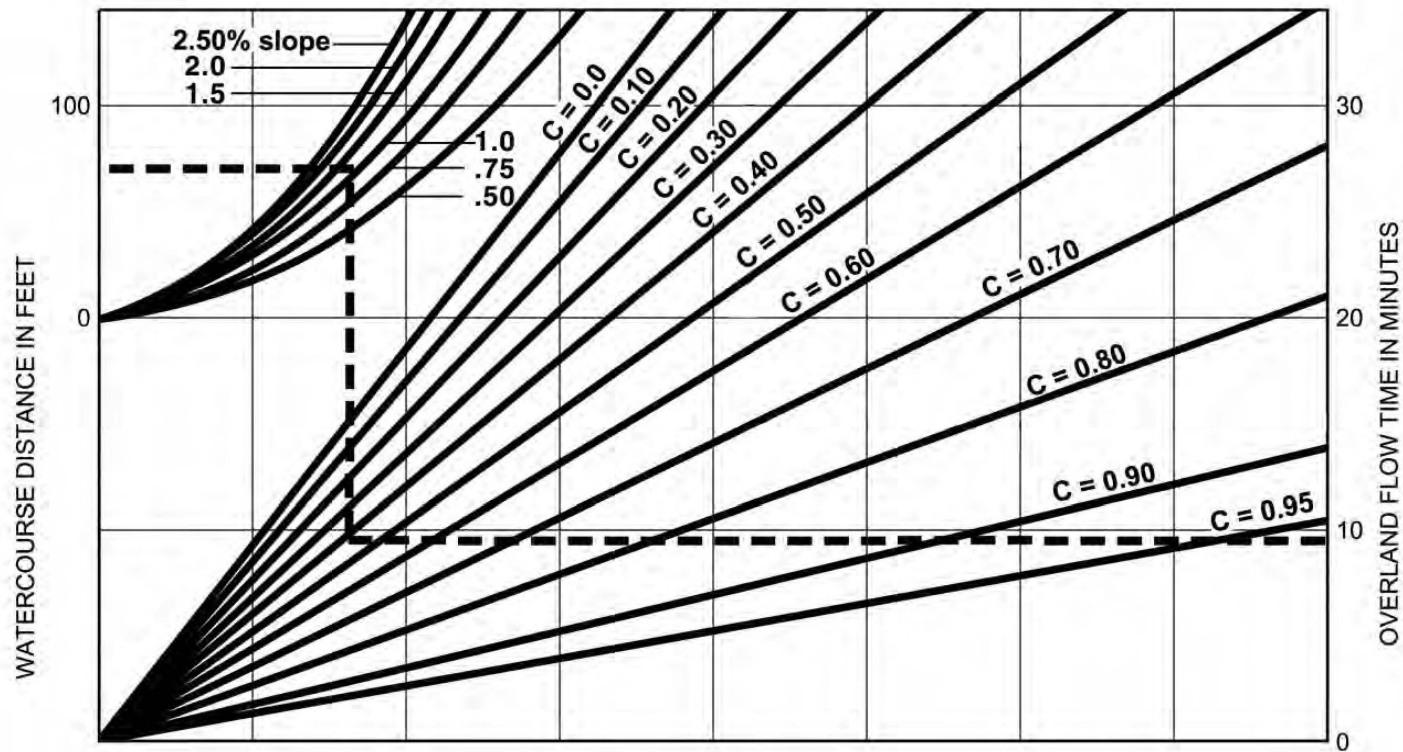
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

Table 3-2

**MAXIMUM OVERLAND FLOW LENGTH (L_M)
& INITIAL TIME OF CONCENTRATION (T_i)**

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
 Slope (s) = 1.3%
 Runoff Coefficient (C) = 0.41
 Overland Flow Time (T) = 9.5 Minutes

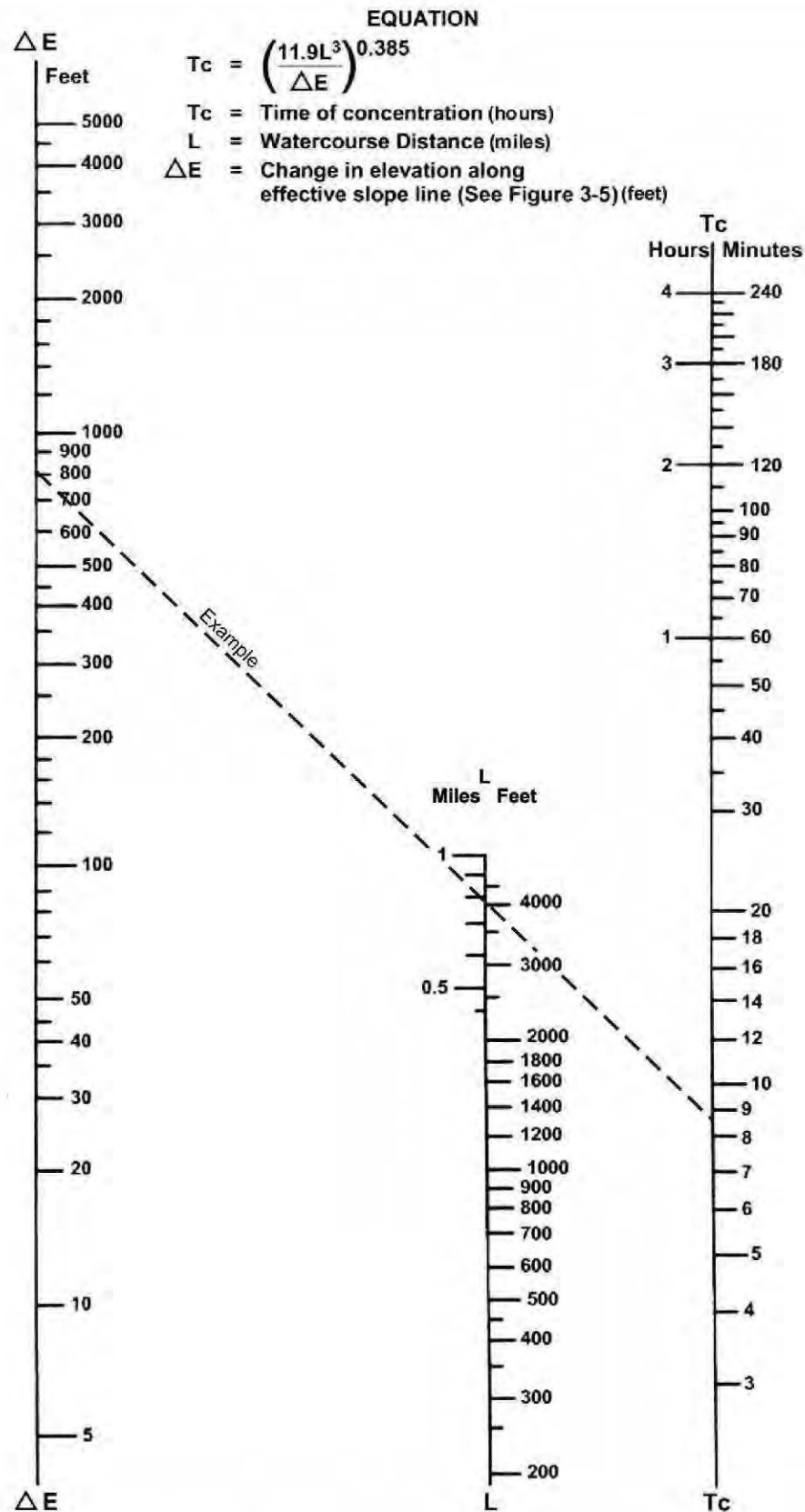
$$T = \frac{1.8 (1.1-C) \sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

Rational Formula - Overland Time of Flow Nomograph

3-3

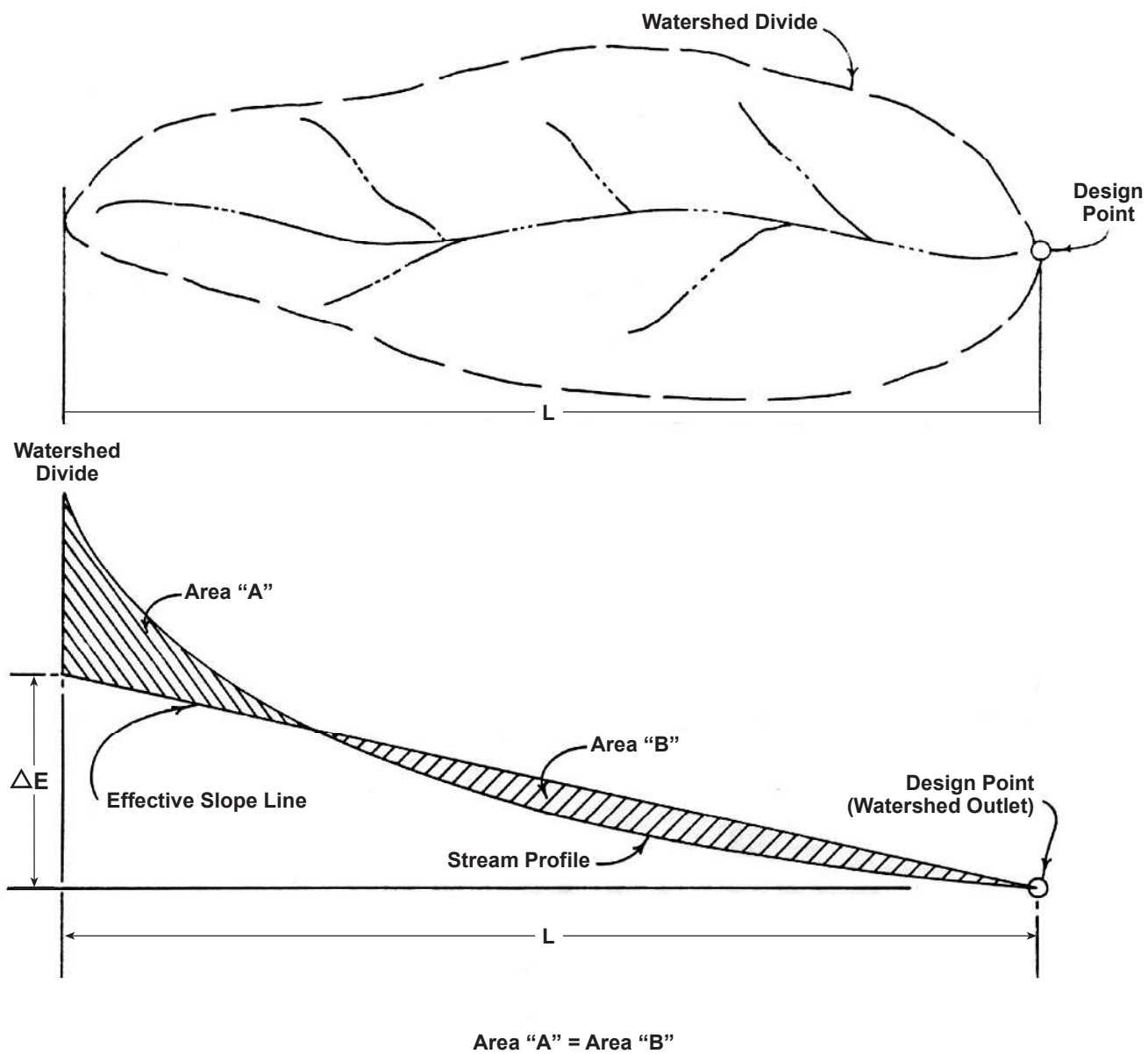


SOURCE: California Division of Highways (1941) and Kirpich (1940)

Nomograph for Determination of
Time of Concentration (T_c) or Travel Time (T_t) for Natural Watersheds

FIGURE

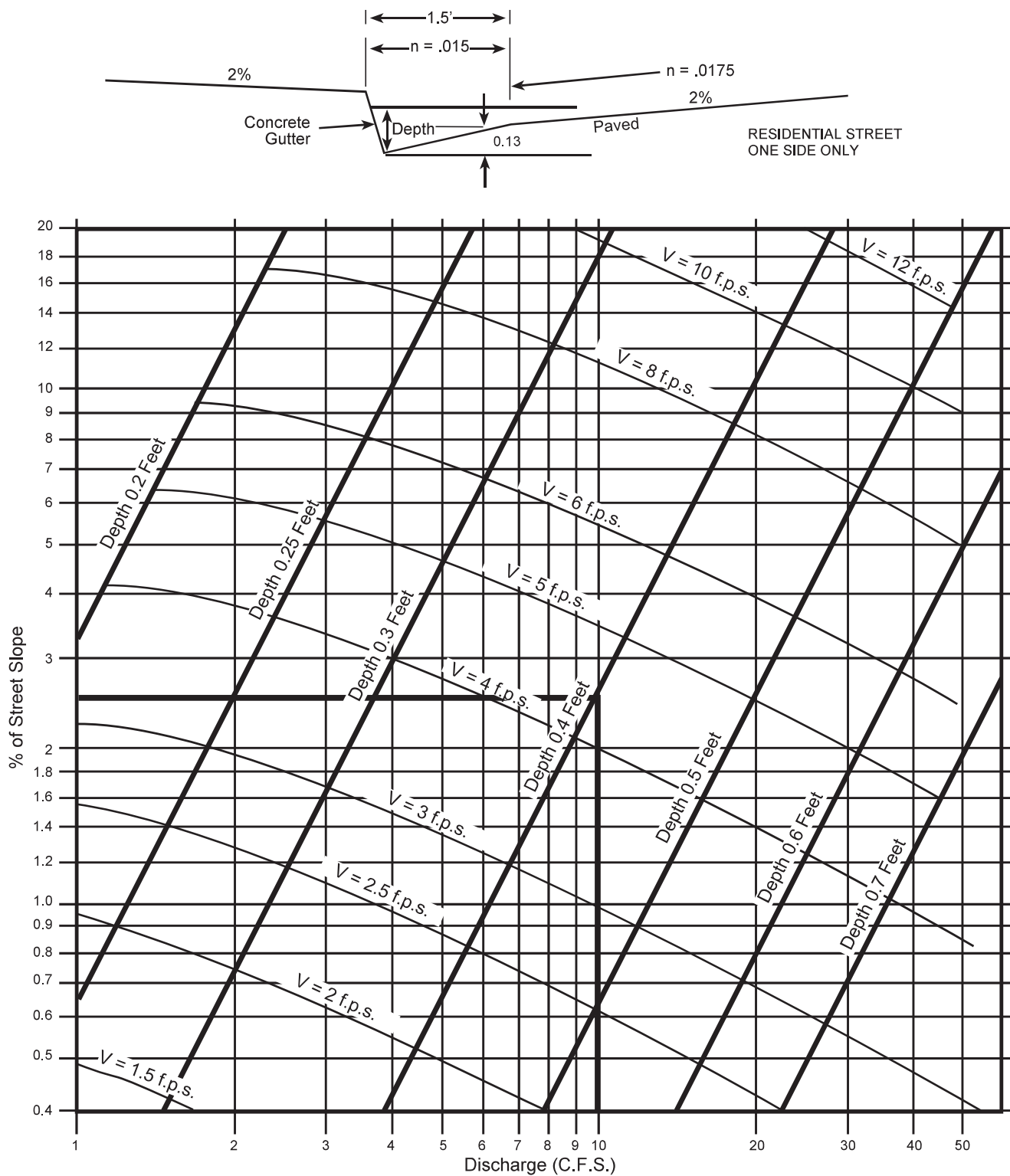
3-4



í NĒĪ ŸŮăŸĭ'±®·ĭ Ůª ~ ±² ±º Ÿ¹, ©ĭŸ- đ ħĭ ĭ + ĭ² ¼Ō® ½ đ ħĭ đ +

FIGURE

Computation of Effective Slope for Natural Watersheds



EXAMPLE:

Given: $Q = 10$ $S = 2.5\%$

Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

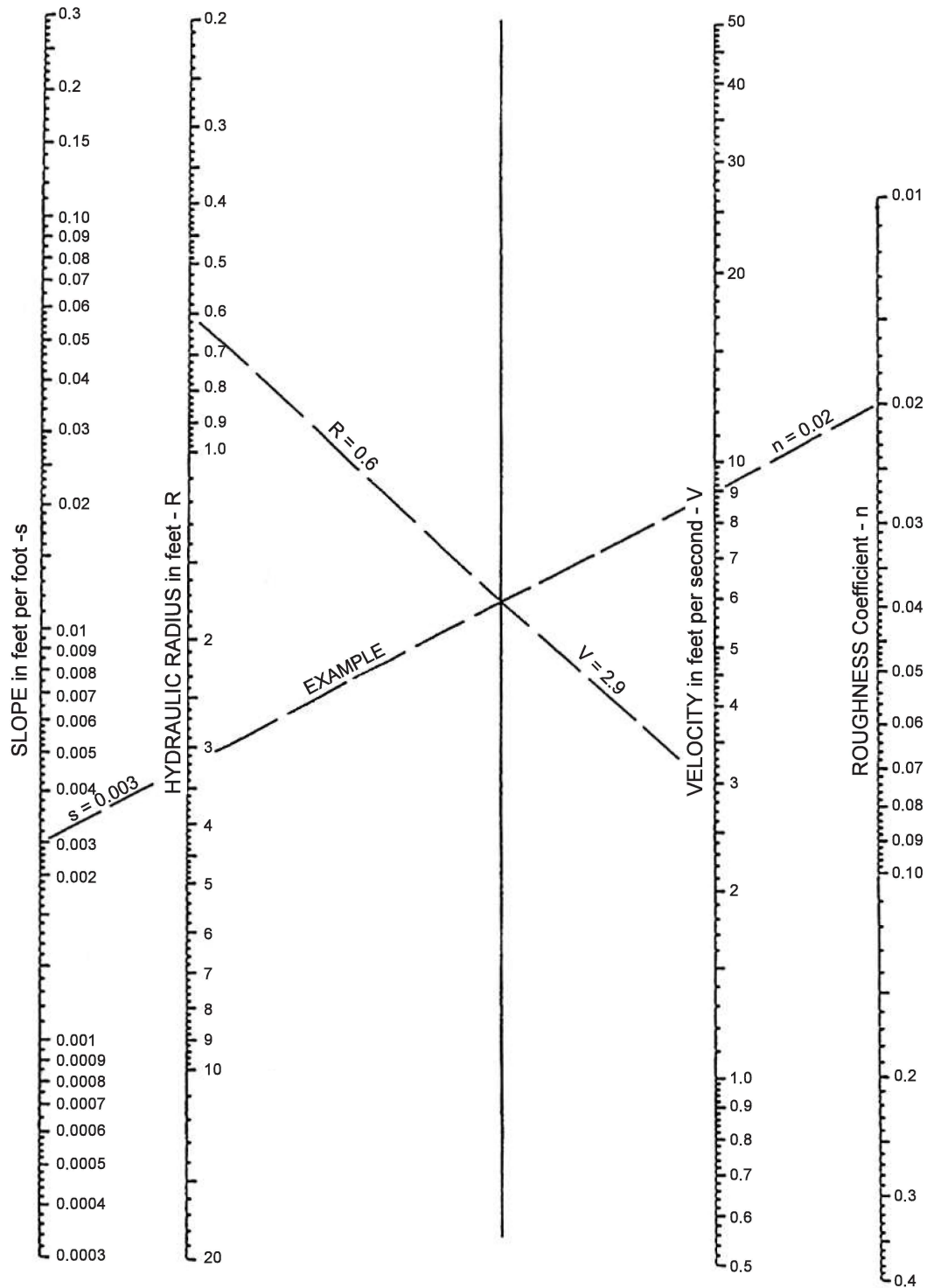
SOURCE: San Diego County Department of Special District Services Design Manual

Gutter and Roadway Discharge - Velocity Chart

FIGURE

3-6

$$\text{EQUATION: } V = \frac{1.49}{n} R^{2/3} s^{1/2}$$



GENERAL SOLUTION

SOURCE: USDOT, FHWA, HDS-3 (1961)

FIGURE

Manning's Equation Nomograph

3-7

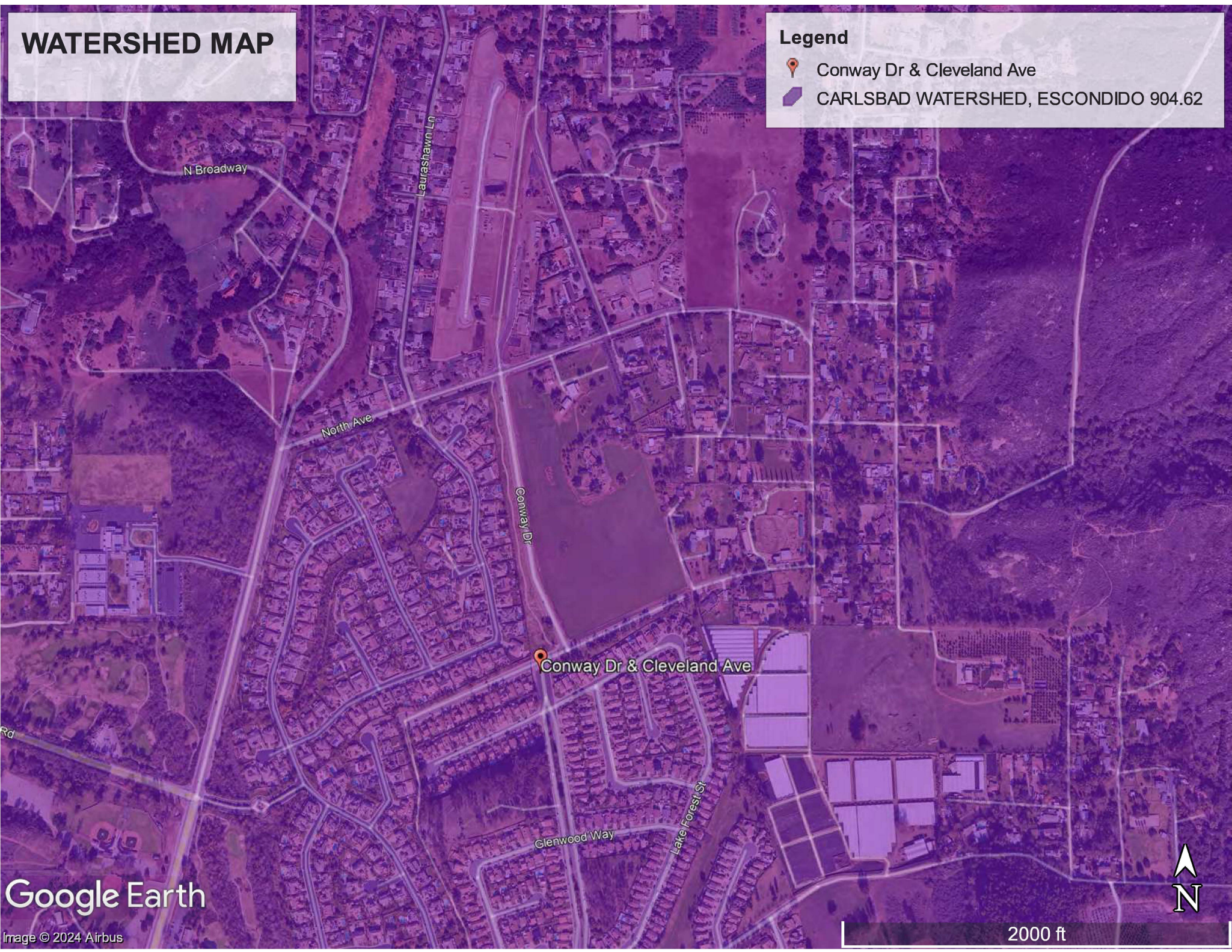
ATTACHMENT C
WATERSHED INFORMATION

Watershed Map
Soils Index Map
Point Rainfall Isopluvial

WATERSHED MAP

Legend

-  Conway Dr & Cleveland Ave
-  CARLSBAD WATERSHED, ESCONDIDO 904.62



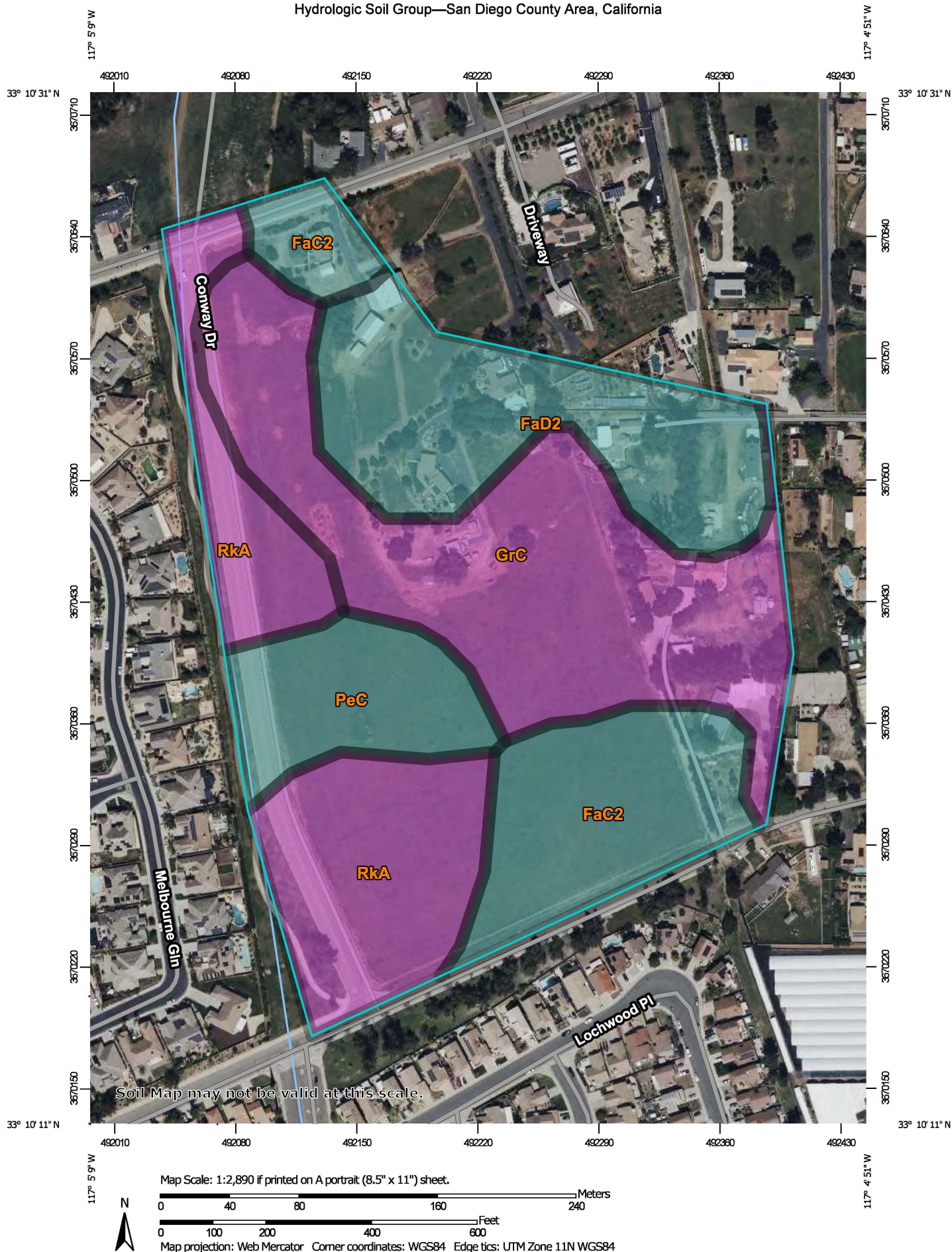
Google Earth

Image © 2024 Airbus



2000 ft

Hydrologic Soil Group—San Diego County Area, California



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

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 Diego County Area, California
 Survey Area Data: Version 20, 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: Mar 14, 2022—Mar 17, 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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FaC2	Fallbrook sandy loam, 5 to 9 percent slopes, eroded	C	4.9	16.8%
FaD2	Fallbrook sandy loam, 9 to 15 percent slopes, eroded	C	5.6	19.6%
GrC	Greenfield sandy loam, 5 to 9 percent slopes	A	9.3	32.3%
PeC	Placentia sandy loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	C	2.7	9.5%
RkA	Reiff fine sandy loam, 0 to 2 percent slopes	A	6.3	21.7%
Totals for Area of Interest			28.9	100.0%

Description

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

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

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

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

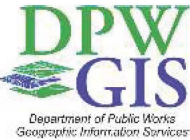
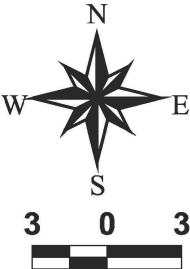
County of San Diego Hydrology Manual



Rainfall Isophuvials

100 Year Rainfall Event - 6 Hours

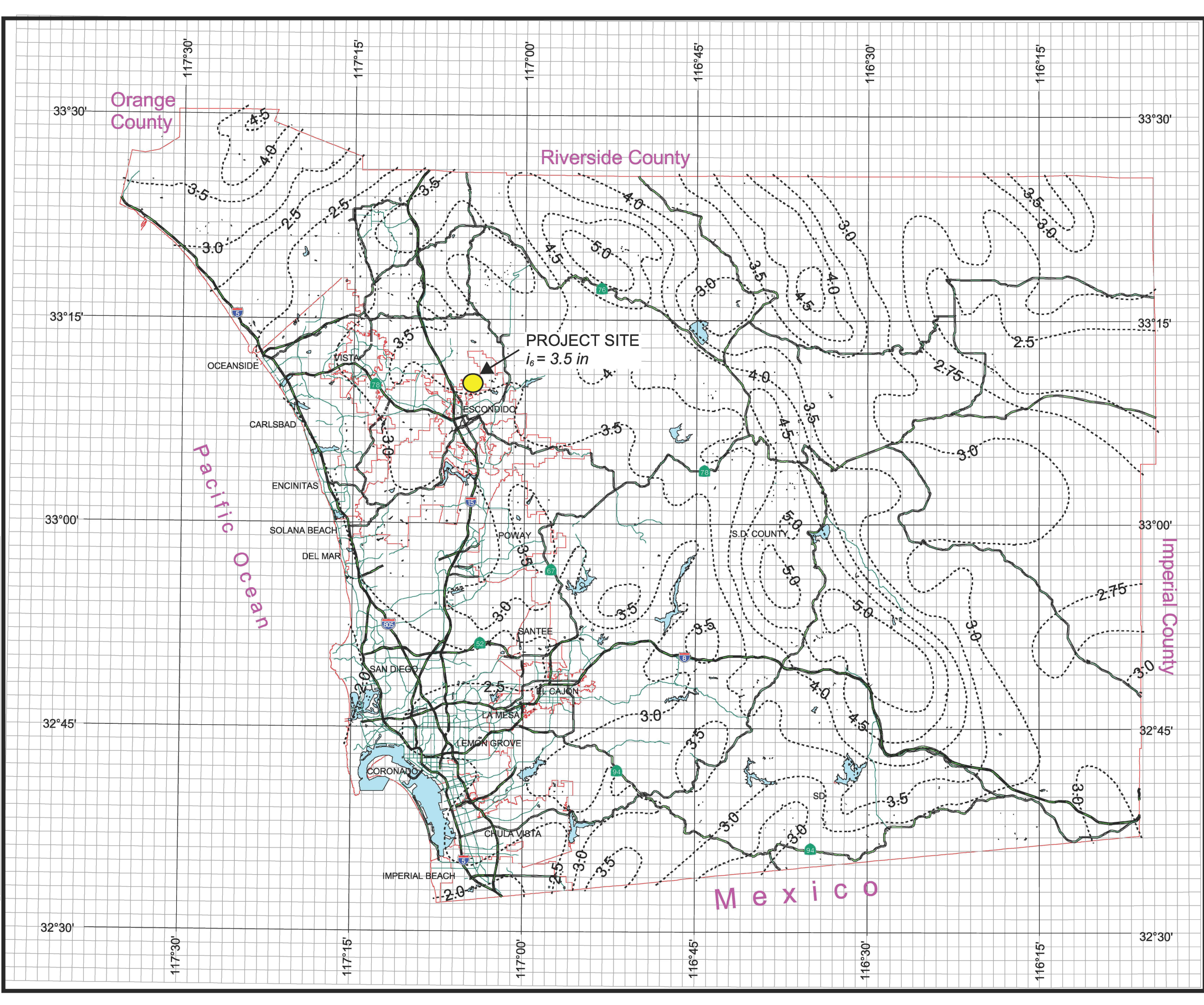
----- Isopluvial (inches)



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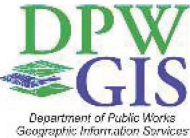
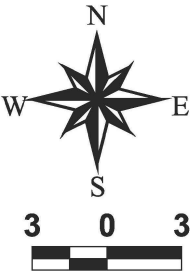
County of San Diego Hydrology Manual



Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

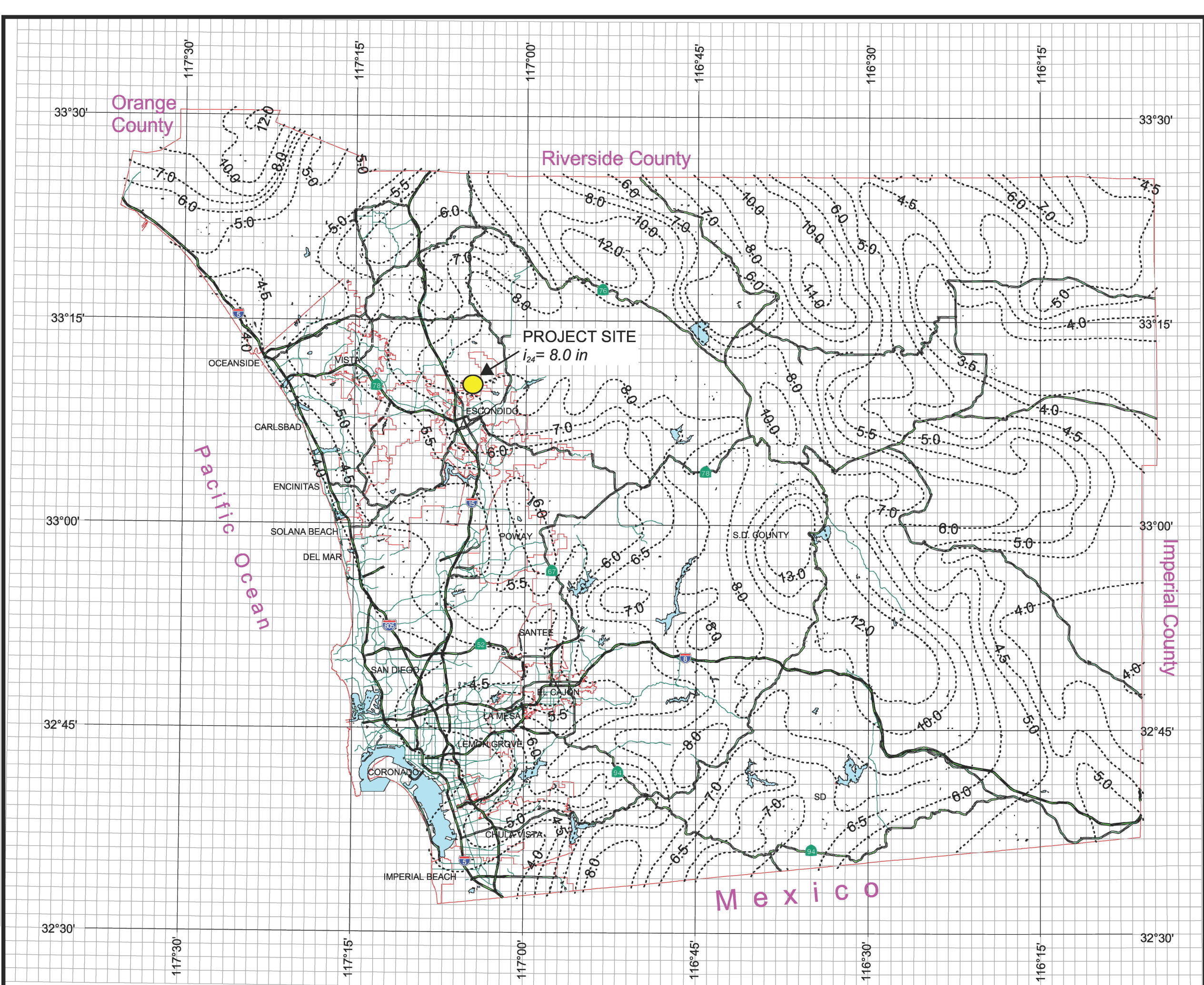
----- Isopluvial (inches)



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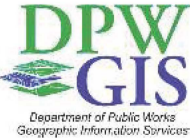
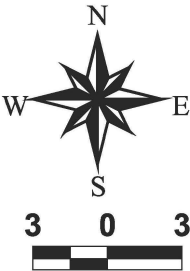
County of San Diego Hydrology Manual



Rainfall Isopluvials

50 Year Rainfall Event - 6 Hours

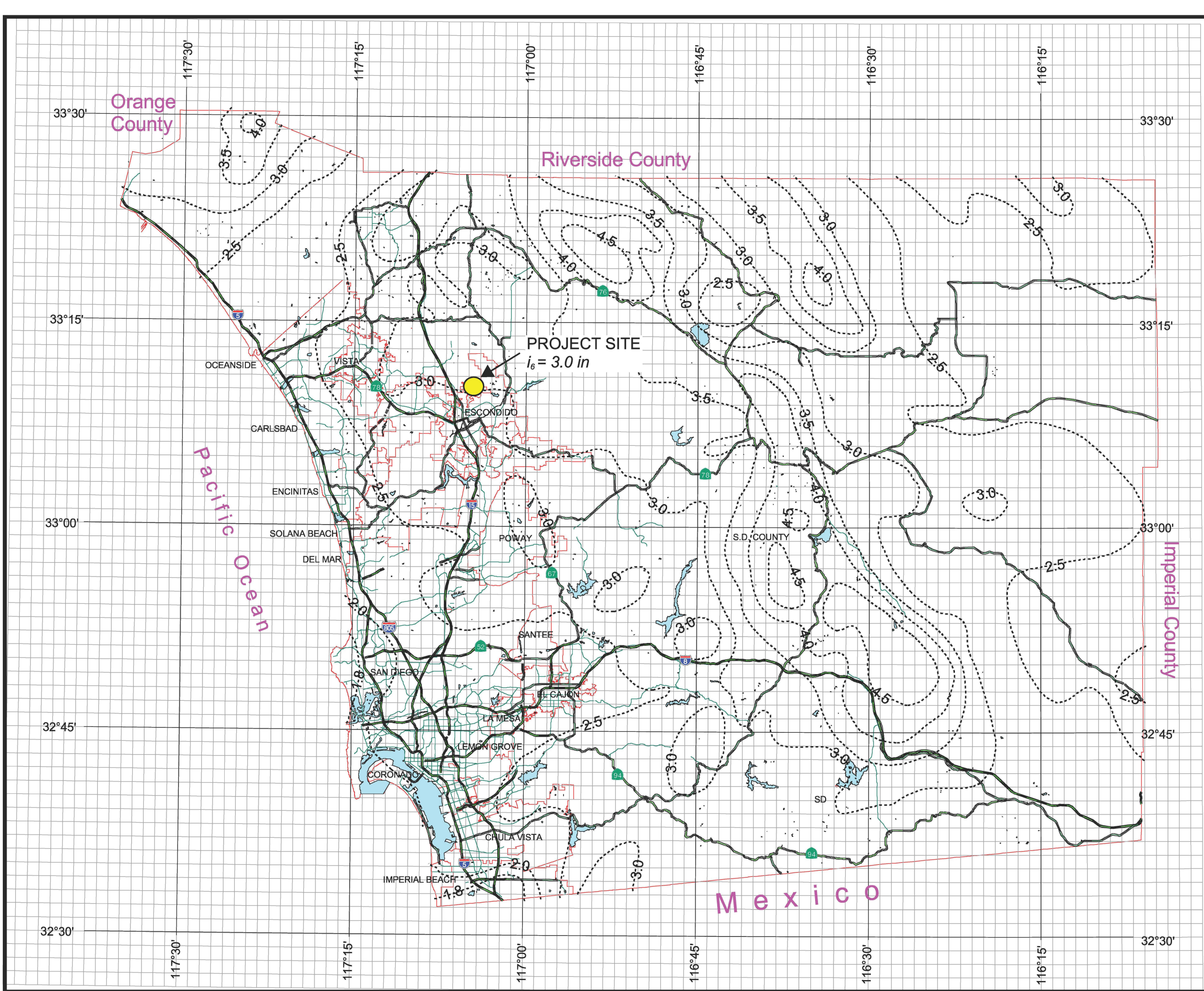
----- Isopluvial (inches)



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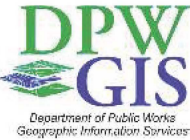
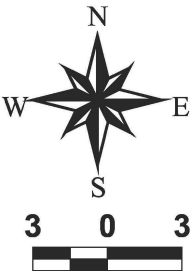
County of San Diego Hydrology Manual



Rainfall Isophuvials

50 Year Rainfall Event - 24 Hours

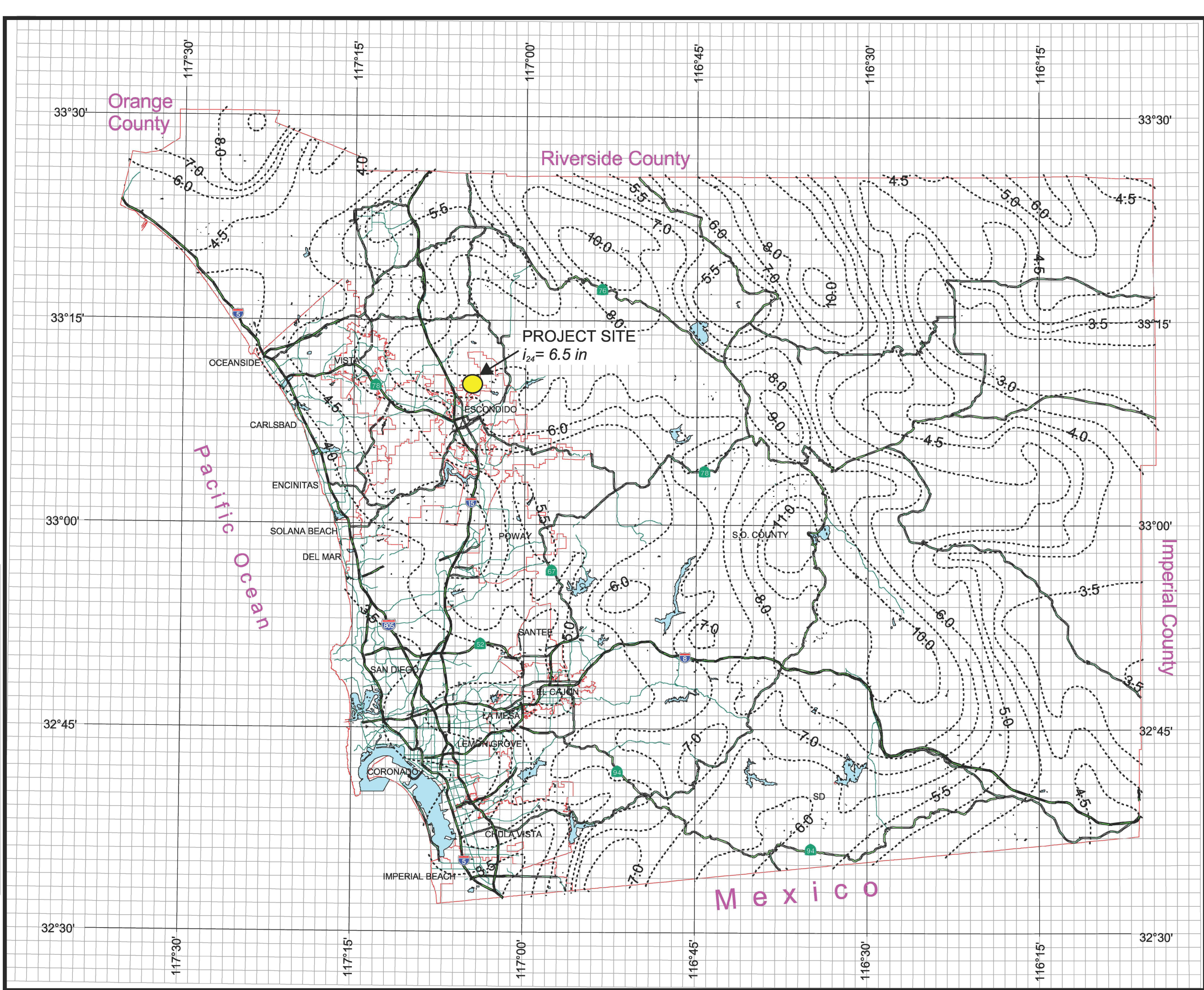
----- Isopluvial (inches)



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ATTACHMENT D

50 Year Pre Development Calculations

Steps Taken To Analyze This Condition

The Rational Method as outlined in section 3 of the June 2003 San Diego County Hydrology Manual is followed here. The software that we are using is the “*Rational Hydrology Method, San Diego County (2003 Manual)*” module of the CIVILCADD/CIVIL DESIGN Engineering software version 7.9.

Please see the subsequent pages for the calculations. These calculations are for the Q50. The results are outlined/summarized in Section 8.


```

1
2 San Diego County Rational Hydrology Program
3
4 CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
5
6 Rational method hydrology program based on
7 San Diego County Flood Control Division 2003 hydrology manual
8 Rational Hydrology Study Date: 11/26/24
9 -----
10 24021 CONWAY DRIVE
11 PRE-DEVELOPMENT
12 Q50 YEAR
13 POC-1
14 -----
15 ***** Hydrology Study Control Information *****
16 -----
17
18
19
20 Program License Serial Number 6332
21 -----
22
23 Rational hydrology study storm event year is 50.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 3.000
28 24 hour precipitation(inches) = 6.500
29 P6/P24 = 46.2%
30 San Diego hydrology manual 'C' values used
31
32
33 *****
34 Process from Point/Station 101.000 to Point/Station 102.000
35 **** INITIAL AREA EVALUATION ****
36 -----
37 Decimal fraction soil group A = 0.000
38 Decimal fraction soil group B = 0.000
39 Decimal fraction soil group C = 1.000
40 Decimal fraction soil group D = 0.000
41 [LOW DENSITY RESIDENTIAL ]
42 (1.0 DU/A or Less )
43 Impervious value, Ai = 0.100
44 Sub-Area C Value = 0.360
45 Initial subarea total flow distance = 100.000 (Ft.)
46 Highest elevation = 840.000 (Ft.)
47 Lowest elevation = 836.000 (Ft.)
48 Elevation difference = 4.000 (Ft.) Slope = 4.000 %
49 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50 The maximum overland flow distance is 100.00 (Ft)
51 for the top area slope value of 4.00 %, in a development type of
52 1.0 DU/A or Less
53 In Accordance With Figure 3-3
54 Initial Area Time of Concentration = 8.39 minutes
55  $TC = [1.8 * (1.1 - C) * \text{distance (Ft.)}^{.5} / (\% \text{ slope}^{(1/3)})]$ 
56  $TC = [1.8 * (1.1 - 0.3600) * (100.000^{.5}) / (4.000^{(1/3)})] = 8.39$ 
57 Rainfall intensity (I) = 5.660 (In/Hr) for a 50.0 year storm
58 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
59 Subarea runoff = 0.155 (CFS)
60 Total initial stream area = 0.076 (Ac.)
61
62
63 *****
64 Process from Point/Station 102.000 to Point/Station 103.000
65 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
66 -----
67 Estimated mean flow rate at midpoint of channel = 5.400 (CFS)
68 Depth of flow = 0.227 (Ft.), Average velocity = 4.195 (Ft/s)
69 ***** Irregular Channel Data *****

```

```

70 -----
71 Information entered for subchannel number 1 :
72 Point number      'X' coordinate      'Y' coordinate
73     1              0.00              2.00
74     2              50.00              0.00
75     3             100.00              2.00
76 Manning's 'N' friction factor =    0.030
77 -----
78 Sub-Channel flow =      5.400 (CFS)
79 '      ' flow top width =     11.347 (Ft.)
80 '      ' velocity=      4.195 (Ft/s)
81 '      ' area =       1.287 (Sq.Ft)
82 '      ' Froude number =      2.195
83
84 Upstream point elevation =   836.000 (Ft.)
85 Downstream point elevation =   766.000 (Ft.)
86 Flow length =    535.600 (Ft.)
87 Travel time =     2.13 min.
88 Time of concentration =    10.52 min.
89 Depth of flow =     0.227 (Ft.)
90 Average velocity =     4.195 (Ft/s)
91 Total irregular channel flow =     5.400 (CFS)
92 Irregular channel normal depth above invert elev. =     0.227 (Ft.)
93 Average velocity of channel(s) =     4.195 (Ft/s)
94 Adding area flow to channel
95 Rainfall intensity (I) =     4.892 (In/Hr) for a    50.0 year storm
96 Decimal fraction soil group A = 0.600
97 Decimal fraction soil group B = 0.000
98 Decimal fraction soil group C = 0.400
99 Decimal fraction soil group D = 0.000
100 [LOW DENSITY RESIDENTIAL
101 (1.0 DU/A or Less
102 Impervious value, Ai = 0.100
103 Sub-Area C Value = 0.306
104 Rainfall intensity =     4.892 (In/Hr) for a    50.0 year storm
105 Effective runoff coefficient used for total area
106 (Q=KCIA) is C = 0.307 CA =     2.162
107 Subarea runoff =     10.422 (CFS) for     6.976 (Ac.)
108 Total runoff =     10.577 (CFS) Total area =     7.052 (Ac.)
109 Depth of flow =     0.292 (Ft.), Average velocity =     4.962 (Ft/s)
110
111
112 *****
113 Process from Point/Station    103.000 to Point/Station    104.000
114 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
115
116 -----
117 Estimated mean flow rate at midpoint of channel =     10.606 (CFS)
118 Depth of flow =     0.503 (Ft.), Average velocity =     2.566 (Ft/s)
119 ***** Irregular Channel Data *****
120 -----
121 Information entered for subchannel number 1 :
122 Point number      'X' coordinate      'Y' coordinate
123     1              0.00              0.52
124     2             19.50              0.13
125     3             21.00              0.00
126     4             21.00              0.50
127     5             31.00              1.00
128 Manning's 'N' friction factor =     0.015
129 -----
130 Sub-Channel flow =     10.607 (CFS)
131 '      ' flow top width =     20.201 (Ft.)
132 '      ' velocity=      2.566 (Ft/s)
133 '      ' area =       4.133 (Sq.Ft)
134 '      ' Froude number =      1.000
135
136 Upstream point elevation =   766.000 (Ft.)
137 Downstream point elevation =   762.000 (Ft.)
138 Flow length =    695.000 (Ft.)
139 Travel time =     4.51 min.

```

```

139 Time of concentration = 15.03 min.
140 Depth of flow = 0.503 (Ft.)
141 Average velocity = 2.566 (Ft/s)
142 Total irregular channel flow = 10.606 (CFS)
143 Irregular channel normal depth above invert elev. = 0.503 (Ft.)
144 Average velocity of channel(s) = 2.566 (Ft/s)
145 Adding area flow to channel
146 Rainfall intensity (I) = 3.886 (In/Hr) for a 50.0 year storm
147 Decimal fraction soil group A = 0.750
148 Decimal fraction soil group B = 0.000
149 Decimal fraction soil group C = 0.250
150 Decimal fraction soil group D = 0.000
151 [LOW DENSITY RESIDENTIAL ]
152 (1.0 DU/A or Less )
153 Impervious value, Ai = 0.100
154 Sub-Area C Value = 0.292
155 The area added to the existing stream causes a
156 a lower flow rate of Q = 9.108 (CFS)
157 therefore the upstream flow rate of Q = 10.577 (CFS) is being used
158 Rainfall intensity = 3.886 (In/Hr) for a 50.0 year storm
159 Effective runoff coefficient used for total area
160 (Q=KCIA) is C = 0.305 CA = 2.344
161 Subarea runoff = 0.000 (CFS) for 0.621 (Ac.)
162 Total runoff = 10.577 (CFS) Total area = 7.673 (Ac.)
163 Depth of flow = 0.502 (Ft.), Average velocity = 2.565 (Ft/s)
164
165
166 *****
167 Process from Point/Station 104.000 to Point/Station 203.000
168 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
169
170 -----
171 Depth of flow = 0.496 (Ft.), Average velocity = 2.649 (Ft/s)
172 ***** Irregular Channel Data *****
173 -----
174 Information entered for subchannel number 1 :
175 Point number 'X' coordinate 'Y' coordinate
176 1 0.00 0.52
177 2 19.50 0.13
178 3 21.00 0.00
179 4 21.00 0.50
180 5 31.00 1.00
181 Manning's 'N' friction factor = 0.015
182 -----
183 Sub-Channel flow = 10.577 (CFS)
184 ' ' flow top width = 19.794 (Ft.)
185 ' ' velocity = 2.649 (Ft/s)
186 ' ' area = 3.993 (Sq.Ft)
187 ' ' Froude number = 1.039
188
189 Upstream point elevation = 762.000 (Ft.)
190 Downstream point elevation = 759.500 (Ft.)
191 Flow length = 400.000 (Ft.)
192 Travel time = 2.52 min.
193 Time of concentration = 17.55 min.
194 Depth of flow = 0.496 (Ft.)
195 Average velocity = 2.649 (Ft/s)
196 Total irregular channel flow = 10.577 (CFS)
197 Irregular channel normal depth above invert elev. = 0.496 (Ft.)
198 Average velocity of channel(s) = 2.649 (Ft/s)
199
200 *****
201 Process from Point/Station 203.000 to Point/Station 203.000
202 **** CONFLUENCE OF MINOR STREAMS ****
203
204 -----
205 Along Main Stream number: 1 in normal stream number 1
206 Stream flow area = 7.673 (Ac.)
207 Runoff from this stream = 10.577 (CFS)
208 Time of concentration = 17.55 min.

```

```

208 Rainfall intensity =      3.517(In/Hr)
209
210
211 *****
212 Process from Point/Station      201.000 to Point/Station      202.000
213 **** INITIAL AREA EVALUATION ****
214
215 -----
216 Decimal fraction soil group A = 0.000
217 Decimal fraction soil group B = 0.000
218 Decimal fraction soil group C = 1.000
219 Decimal fraction soil group D = 0.000
220 [LOW DENSITY RESIDENTIAL
221 (1.0 DU/A or Less
222 )
223 Impervious value, Ai = 0.100
224 Sub-Area C Value = 0.360
225 Initial subarea total flow distance = 100.000(Ft.)
226 Highest elevation = 840.000(Ft.)
227 Lowest elevation = 834.000(Ft.)
228 Elevation difference = 6.000(Ft.) Slope = 6.000 %
229 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
230 The maximum overland flow distance is 100.00 (Ft)
231 for the top area slope value of 6.00 %, in a development type of
232 1.0 DU/A or Less
233 In Accordance With Figure 3-3
234 Initial Area Time of Concentration = 7.33 minutes
235 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
236 TC = [1.8*(1.1-0.3600)*( 100.000^.5)/( 6.000^(1/3)]= 7.33
237 Rainfall intensity (I) = 6.176(In/Hr) for a 50.0 year storm
238 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
239 Subarea runoff = 0.409(CFS)
240 Total initial stream area = 0.184(Ac.)
241
242 *****
243 Process from Point/Station      202.000 to Point/Station      203.000
244 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
245
246 -----
247 Estimated mean flow rate at midpoint of channel = 8.256(CFS)
248 Depth of flow = 0.307(Ft.), Average velocity = 3.501(Ft/s)
249 ***** Irregular Channel Data *****
250 -----
251 Information entered for subchannel number 1 :
252 Point number 'X' coordinate 'Y' coordinate
253 1 0.00 2.00
254 2 50.00 0.00
255 3 100.00 2.00
256 Manning's 'N' friction factor = 0.030
257 -----
258 Sub-Channel flow = 8.256(CFS)
259 ' ' flow top width = 15.357(Ft.)
260 ' ' velocity= 3.501(Ft/s)
261 ' ' area = 2.358(Sq.Ft)
262 ' ' Froude number = 1.574
263
264 Upstream point elevation = 834.000(Ft.)
265 Downstream point elevation = 759.500(Ft.)
266 Flow length = 1225.400(Ft.)
267 Travel time = 5.83 min.
268 Time of concentration = 13.16 min.
269 Depth of flow = 0.307(Ft.)
270 Average velocity = 3.501(Ft/s)
271 Total irregular channel flow = 8.256(CFS)
272 Irregular channel normal depth above invert elev. = 0.307(Ft.)
273 Average velocity of channel(s) = 3.501(Ft/s)
274 Adding area flow to channel
275 Rainfall intensity (I) = 4.233(In/Hr) for a 50.0 year storm
276 Decimal fraction soil group A = 0.600
277 Decimal fraction soil group B = 0.000
278 Decimal fraction soil group C = 0.400

```



```

277 Decimal fraction soil group D = 0.000
278 [LOW DENSITY RESIDENTIAL ]
279 (1.0 DU/A or Less )
280 Impervious value, Ai = 0.100
281 Sub-Area C Value = 0.306
282 Rainfall intensity = 4.233(In/Hr) for a 50.0 year storm
283 Effective runoff coefficient used for total area
284 (Q=KCIA) is C = 0.307 CA = 3.788
285 Subarea runoff = 15.624(CFS) for 12.161(Ac.)
286 Total runoff = 16.034(CFS) Total area = 12.345(Ac.)
287 Depth of flow = 0.394(Ft.), Average velocity = 4.132(Ft/s)
288
289
290 *****
291 Process from Point/Station 203.000 to Point/Station 203.000
292 **** CONFLUENCE OF MINOR STREAMS ****
293
294 Along Main Stream number: 1 in normal stream number 2
295 Stream flow area = 12.345(Ac.)
296 Runoff from this stream = 16.034(CFS)
297 Time of concentration = 13.16 min.
298 Rainfall intensity = 4.233(In/Hr)
299 Summary of stream data:
300
301 Stream Flow rate TC Rainfall Intensity
302 No. (CFS) (min) (In/Hr)
303
304
305 1 10.577 17.55 3.517
306 2 16.034 13.16 4.233
307 Qmax(1) =
308 1.000 * 1.000 * 10.577) +
309 0.831 * 1.000 * 16.034) + = 23.897
310 Qmax(2) =
311 1.000 * 0.750 * 10.577) +
312 1.000 * 1.000 * 16.034) + = 23.968
313
314 Total of 2 streams to confluence:
315 Flow rates before confluence point:
316 10.577 16.034
317 Maximum flow rates at confluence using above data:
318 23.897 23.968
319 Area of streams before confluence:
320 7.673 12.345
321 Results of confluence:
322 Total flow rate = 23.968(CFS)
323 Time of concentration = 13.165 min.
324 Effective stream area after confluence = 20.018(Ac.)
325 End of computations, total study area = 20.018 (Ac.)
326
327
328

```

```

1
2 San Diego County Rational Hydrology Program
3
4 CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
5
6 Rational method hydrology program based on
7 San Diego County Flood Control Division 2003 hydrology manual
8 Rational Hydrology Study Date: 11/26/24
9 -----
10 24021 CONWAY DRIVE
11 PRE-DEVELOPMENT
12 Q50 YEAR
13 POC-2
14 -----
15 ***** Hydrology Study Control Information *****
16 -----
17
18
19
20 Program License Serial Number 6332
21 -----
22
23 Rational hydrology study storm event year is 50.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 3.000
28 24 hour precipitation(inches) = 6.500
29 P6/P24 = 46.2%
30 San Diego hydrology manual 'C' values used
31
32
33 +-----+
34 Process from Point/Station 301.000 to Point/Station 302.000
35 **** INITIAL AREA EVALUATION ****
36
37 -----
38 Decimal fraction soil group A = 0.000
39 Decimal fraction soil group B = 0.000
40 Decimal fraction soil group C = 1.000
41 Decimal fraction soil group D = 0.000
42 [LOW DENSITY RESIDENTIAL ]
43 (1.0 DU/A or Less )
44 Impervious value, Ai = 0.100
45 Sub-Area C Value = 0.360
46 Initial subarea total flow distance = 85.000 (Ft.)
47 Highest elevation = 783.000 (Ft.)
48 Lowest elevation = 780.500 (Ft.)
49 Elevation difference = 2.500 (Ft.) Slope = 2.941 %
50 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
51 The maximum overland flow distance is 100.00 (Ft)
52 for the top area slope value of 2.94 %, in a development type of
53 1.0 DU/A or Less
54 In Accordance With Figure 3-3
55 Initial Area Time of Concentration = 9.30 minutes
56 TC = [1.8*(1.1-C)*distance (Ft.)^.5]/(% slope^(1/3))
57 TC = [1.8*(1.1-0.3600)*( 100.000^.5)/( 2.941^(1/3))]= 9.30
58 Rainfall intensity (I) = 5.298 (In/Hr) for a 50.0 year storm
59 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
60 Subarea runoff = 0.483 (CFS)
61 Total initial stream area = 0.253 (Ac.)
62
63 +-----+
64 Process from Point/Station 302.000 to Point/Station 303.000
65 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
66
67 -----
68 Estimated mean flow rate at midpoint of channel = 1.264 (CFS)
69 Depth of flow = 0.226 (Ft.), Average velocity = 2.479 (Ft/s)
70 ***** Irregular Channel Data *****

```

```

70 -----
71 Information entered for subchannel number 1 :
72 Point number      'X' coordinate      'Y' coordinate
73      1              0.00              1.00
74      2             10.00              0.00
75      3             20.00              1.00
76 Manning's 'N' friction factor =    0.030
77 -----
78 Sub-Channel flow =    1.264 (CFS)
79 '      ' flow top width =    4.516 (Ft.)
80 '      ' velocity=    2.479 (Ft/s)
81 '      ' area =    0.510 (Sq.Ft)
82 '      ' Froude number =    1.300
83
84 Upstream point elevation =    780.500 (Ft.)
85 Downstream point elevation =    772.000 (Ft.)
86 Flow length =    184.000 (Ft.)
87 Travel time =    1.24 min.
88 Time of concentration =    10.53 min.
89 Depth of flow =    0.226 (Ft.)
90 Average velocity =    2.479 (Ft/s)
91 Total irregular channel flow =    1.264 (CFS)
92 Irregular channel normal depth above invert elev. =    0.226 (Ft.)
93 Average velocity of channel(s) =    2.479 (Ft/s)
94 Adding area flow to channel
95 Rainfall intensity (I) =    4.888 (In/Hr) for a    50.0 year storm
96 Decimal fraction soil group A =    0.000
97 Decimal fraction soil group B =    0.000
98 Decimal fraction soil group C =    1.000
99 Decimal fraction soil group D =    0.000
100 [LOW DENSITY RESIDENTIAL
101 (1.0 DU/A or Less
102 Impervious value, Ai =    0.100
103 Sub-Area C Value =    0.360
104 Rainfall intensity =    4.888 (In/Hr) for a    50.0 year storm
105 Effective runoff coefficient used for total area
106 (Q=KCIA) is C =    0.360 CA =    0.401
107 Subarea runoff =    1.479 (CFS) for    0.862 (Ac.)
108 Total runoff =    1.962 (CFS) Total area =    1.115 (Ac.)
109 Depth of flow =    0.266 (Ft.), Average velocity =    2.767 (Ft/s)
110 End of computations, total study area =    1.115 (Ac.)
111
112
113

```

ATTACHMENT E

50 Year POST DEVELOPED Q CALCULATIONS

Steps Taken To Analyze This Condition

The Rational Method as outlined in section 3 of the June 2003 San Diego County Hydrology Manual is followed here. The software that we are using is the “*Rational Hydrology Method, San Diego County (2003 Manual)*” module of the CIVILCADD/CIVIL DESIGN Engineering software version 7.9.

Please see the subsequent pages for the calculations. These calculations are for the Q50. The results are outlined/summarized in Section 8.


```

1
2 San Diego County Rational Hydrology Program
3
4 CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
5
6 Rational method hydrology program based on
7 San Diego County Flood Control Division 2003 hydrology manual
8 Rational Hydrology Study Date: 11/27/24
9 -----
10 24021 CONWAY DRIVE
11 POST-DEVELOPMENT
12 Q50 YR
13 POC-1
14 -----
15 ***** Hydrology Study Control Information *****
16 -----
17
18
19
20 Program License Serial Number 6332
21 -----
22
23 Rational hydrology study storm event year is 50.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 3.000
28 24 hour precipitation(inches) = 6.500
29 P6/P24 = 46.2%
30 San Diego hydrology manual 'C' values used
31
32
33 *****
34 Process from Point/Station 101.000 to Point/Station 102.000
35 **** INITIAL AREA EVALUATION ****
36 -----
37 Decimal fraction soil group A = 0.000
38 Decimal fraction soil group B = 0.000
39 Decimal fraction soil group C = 1.000
40 Decimal fraction soil group D = 0.000
41 [LOW DENSITY RESIDENTIAL ]
42 (1.0 DU/A or Less )
43 Impervious value, Ai = 0.100
44 Sub-Area C Value = 0.360
45 Initial subarea total flow distance = 100.000 (Ft.)
46 Highest elevation = 840.000 (Ft.)
47 Lowest elevation = 836.000 (Ft.)
48 Elevation difference = 4.000 (Ft.) Slope = 4.000 %
49 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50 The maximum overland flow distance is 100.00 (Ft)
51 for the top area slope value of 4.00 %, in a development type of
52 1.0 DU/A or Less
53 In Accordance With Figure 3-3
54 Initial Area Time of Concentration = 8.39 minutes
55  $TC = [1.8 * (1.1 - C) * \text{distance (Ft.)}^{.5} / (\% \text{ slope}^{(1/3)})]$ 
56  $TC = [1.8 * (1.1 - 0.3600) * (100.000^{.5}) / (4.000^{(1/3)})] = 8.39$ 
57 Rainfall intensity (I) = 5.660 (In/Hr) for a 50.0 year storm
58 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
59 Subarea runoff = 0.155 (CFS)
60 Total initial stream area = 0.076 (Ac.)
61
62
63 *****
64 Process from Point/Station 102.000 to Point/Station 103.000
65 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
66 -----
67 Estimated mean flow rate at midpoint of channel = 3.696 (CFS)
68 Depth of flow = 0.197 (Ft.), Average velocity = 3.815 (Ft/s)
69 ***** Irregular Channel Data *****

```

```

70 -----
71 Information entered for subchannel number 1 :
72 Point number      'X' coordinate      'Y' coordinate
73     1              0.00              2.00
74     2              50.00              0.00
75     3             100.00              2.00
76 Manning's 'N' friction factor =    0.030
77 -----
78 Sub-Channel flow =      3.696 (CFS)
79 '      ' flow top width =      9.842 (Ft.)
80 '      ' velocity=      3.815 (Ft/s)
81 '      ' area =      0.969 (Sq.Ft)
82 '      ' Froude number =      2.143
83
84 Upstream point elevation =    836.000 (Ft.)
85 Downstream point elevation =    766.000 (Ft.)
86 Flow length =    535.600 (Ft.)
87 Travel time =      2.34 min.
88 Time of concentration =    10.73 min.
89 Depth of flow =      0.197 (Ft.)
90 Average velocity =      3.815 (Ft/s)
91 Total irregular channel flow =      3.696 (CFS)
92 Irregular channel normal depth above invert elev. =      0.197 (Ft.)
93 Average velocity of channel(s) =      3.815 (Ft/s)
94 Adding area flow to channel
95 Rainfall intensity (I) =      4.830 (In/Hr) for a    50.0 year storm
96 Decimal fraction soil group A =    0.600
97 Decimal fraction soil group B =    0.000
98 Decimal fraction soil group C =    0.400
99 Decimal fraction soil group D =    0.000
100 [LOW DENSITY RESIDENTIAL
101 (1.0 DU/A or Less
102 Impervious value, Ai =    0.100
103 Sub-Area C Value =    0.306
104 Rainfall intensity =      4.830 (In/Hr) for a    50.0 year storm
105 Effective runoff coefficient used for total area
106 (Q=KCIA) is C =    0.307 CA =      1.479
107 Subarea runoff =      6.987 (CFS) for      4.743 (Ac.)
108 Total runoff =      7.142 (CFS) Total area =      4.819 (Ac.)
109 Depth of flow =      0.252 (Ft.), Average velocity =      4.498 (Ft/s)
110
111
112 *****
113 Process from Point/Station    103.000 to Point/Station    104.000
114 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
115
116 -----
117 Estimated mean flow rate at midpoint of channel =      7.189 (CFS)
118 Depth of flow =      0.447 (Ft.), Average velocity =      2.333 (Ft/s)
119 ***** Irregular Channel Data *****
120 -----
121 Information entered for subchannel number 1 :
122 Point number      'X' coordinate      'Y' coordinate
123     1              0.00              0.52
124     2             19.50              0.13
125     3             21.00              0.00
126     4             21.00              0.50
127     5             31.00              1.00
128 Manning's 'N' friction factor =      0.015
129 -----
130 Sub-Channel flow =      7.189 (CFS)
131 '      ' flow top width =     17.340 (Ft.)
132 '      ' velocity=      2.333 (Ft/s)
133 '      ' area =      3.082 (Sq.Ft)
134 '      ' Froude number =      0.975
135
136 Upstream point elevation =    766.000 (Ft.)
137 Downstream point elevation =    762.910 (Ft.)
138 Flow length =    537.900 (Ft.)
139 Travel time =      3.84 min.

```

```

139 Time of concentration = 14.57 min.
140 Depth of flow = 0.447(Ft.)
141 Average velocity = 2.333(Ft/s)
142 Total irregular channel flow = 7.189(CFS)
143 Irregular channel normal depth above invert elev. = 0.447(Ft.)
144 Average velocity of channel(s) = 2.333(Ft/s)
145 Adding area flow to channel
146 Rainfall intensity (I) = 3.965(In/Hr) for a 50.0 year storm
147 Decimal fraction soil group A = 0.900
148 Decimal fraction soil group B = 0.000
149 Decimal fraction soil group C = 0.100
150 Decimal fraction soil group D = 0.000
151 [LOW DENSITY RESIDENTIAL ]
152 (1.0 DU/A or Less )
153 Impervious value, Ai = 0.100
154 Sub-Area C Value = 0.279
155 The area added to the existing stream causes a
156 a lower flow rate of Q = 6.426(CFS)
157 therefore the upstream flow rate of Q = 7.142(CFS) is being used
158 Rainfall intensity = 3.965(In/Hr) for a 50.0 year storm
159 Effective runoff coefficient used for total area
160 (Q=KCIA) is C = 0.304 CA = 1.621
161 Subarea runoff = 0.000(CFS) for 0.510(Ac.)
162 Total runoff = 7.142(CFS) Total area = 5.329(Ac.)
163 Depth of flow = 0.446(Ft.), Average velocity = 2.329(Ft/s)
164
165
166 *****
167 Process from Point/Station 104.000 to Point/Station 104.000
168 **** CONFLUENCE OF MINOR STREAMS ****
169
170 -----
171 Along Main Stream number: 1 in normal stream number 1
172 Stream flow area = 5.329(Ac.)
173 Runoff from this stream = 7.142(CFS)
174 Time of concentration = 14.57 min.
175 Rainfall intensity = 3.965(In/Hr)
176
177 *****
178 Process from Point/Station 201.000 to Point/Station 202.000
179 **** INITIAL AREA EVALUATION ****
180
181 -----
182 Decimal fraction soil group A = 0.000
183 Decimal fraction soil group B = 0.000
184 Decimal fraction soil group C = 1.000
185 Decimal fraction soil group D = 0.000
186 [LOW DENSITY RESIDENTIAL ]
187 (1.0 DU/A or Less )
188 Impervious value, Ai = 0.100
189 Sub-Area C Value = 0.360
190 Initial subarea total flow distance = 100.000(Ft.)
191 Highest elevation = 840.000(Ft.)
192 Lowest elevation = 834.000(Ft.)
193 Elevation difference = 6.000(Ft.) Slope = 6.000 %
194 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
195 The maximum overland flow distance is 100.00 (Ft)
196 for the top area slope value of 6.00 %, in a development type of
197 1.0 DU/A or Less
198 In Accordance With Figure 3-3
199 Initial Area Time of Concentration = 7.33 minutes
200 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
201 TC = [1.8*(1.1-0.3600)*( 100.000^.5)/( 6.000^(1/3))]= 7.33
202 Rainfall intensity (I) = 6.176(In/Hr) for a 50.0 year storm
203 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
204 Subarea runoff = 0.409(CFS)
205 Total initial stream area = 0.184(Ac.)
206
207 *****

```

```

208 Process from Point/Station      202.000 to Point/Station      203.000
209 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
210
211 Estimated mean flow rate at midpoint of channel =      2.605 (CFS)
212 Depth of flow =    0.168 (Ft.), Average velocity =    3.686 (Ft/s)
213 ***** Irregular Channel Data *****
214 -----
215 Information entered for subchannel number 1 :
216 Point number      'X' coordinate      'Y' coordinate
217      1              0.00              2.00
218      2              50.00              0.00
219      3             100.00              2.00
220 Manning's 'N' friction factor =    0.030
221 -----
222 Sub-Channel flow =      2.605 (CFS)
223 '      ' flow top width =      8.407 (Ft.)
224 '      ' velocity=      3.686 (Ft/s)
225 '      ' area =      0.707 (Sq.Ft)
226 '      ' Froude number =      2.240
227
228 Upstream point elevation =    834.000 (Ft.)
229 Downstream point elevation =    790.370 (Ft.)
230 Flow length =    289.900 (Ft.)
231 Travel time =    1.31 min.
232 Time of concentration =    8.64 min.
233 Depth of flow =    0.168 (Ft.)
234 Average velocity =    3.686 (Ft/s)
235 Total irregular channel flow =      2.605 (CFS)
236 Irregular channel normal depth above invert elev. =    0.168 (Ft.)
237 Average velocity of channel(s) =    3.686 (Ft/s)
238 Adding area flow to channel
239 Rainfall intensity (I) =    5.554 (In/Hr) for a    50.0 year storm
240 Decimal fraction soil group A = 0.800
241 Decimal fraction soil group B = 0.000
242 Decimal fraction soil group C = 0.200
243 Decimal fraction soil group D = 0.000
244 [LOW DENSITY RESIDENTIAL
245 (1.0 DU/A or Less
246 Impervious value, Ai = 0.100
247 Sub-Area C Value = 0.288
248 Rainfall intensity =    5.554 (In/Hr) for a    50.0 year storm
249 Effective runoff coefficient used for total area
250 (Q=KCIA) is C = 0.293 CA =    0.854
251 Subarea runoff =    4.332 (CFS) for    2.734 (Ac.)
252 Total runoff =    4.741 (CFS) Total area =    2.918 (Ac.)
253 Depth of flow =    0.210 (Ft.), Average velocity =    4.281 (Ft/s)
254
255
256 *****
257 Process from Point/Station      203.000 to Point/Station      104.000
258 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
259
260 Depth of flow =    0.745 (Ft.), Average velocity =    8.553 (Ft/s)
261 ***** Irregular Channel Data *****
262 -----
263 Information entered for subchannel number 1 :
264 Point number      'X' coordinate      'Y' coordinate
265      1              0.00              1.00
266      2              1.00              0.00
267      3              2.00              1.00
268 Manning's 'N' friction factor =    0.015
269 -----
270 Sub-Channel flow =      4.741 (CFS)
271 '      ' flow top width =      1.489 (Ft.)
272 '      ' velocity=      8.553 (Ft/s)
273 '      ' area =      0.554 (Sq.Ft)
274 '      ' Froude number =      2.470
275
276 Upstream point elevation =    790.370 (Ft.)

```



```

277 Downstream point elevation = 762.910 (Ft.)
278 Flow length = 621.500 (Ft.)
279 Travel time = 1.21 min.
280 Time of concentration = 9.85 min.
281 Depth of flow = 0.745 (Ft.)
282 Average velocity = 8.553 (Ft/s)
283 Total irregular channel flow = 4.741 (CFS)
284 Irregular channel normal depth above invert elev. = 0.745 (Ft.)
285 Average velocity of channel(s) = 8.553 (Ft/s)
286
287
288 ++++++
289 Process from Point/Station 104.000 to Point/Station 104.000
290 **** CONFLUENCE OF MINOR STREAMS ****
291
292 Along Main Stream number: 1 in normal stream number 2
293 Stream flow area = 2.918 (Ac.)
294 Runoff from this stream = 4.741 (CFS)
295 Time of concentration = 9.85 min.
296 Rainfall intensity = 5.103 (In/Hr)
297 Summary of stream data:
298
299 Stream Flow rate TC Rainfall Intensity
300 No. (CFS) (min) (In/Hr)
301
302
303 1 7.142 14.57 3.965
304 2 4.741 9.85 5.103
305 Qmax(1) =
306 1.000 * 1.000 * 7.142) +
307 0.777 * 1.000 * 4.741) + = 10.825
308 Qmax(2) =
309 1.000 * 0.676 * 7.142) +
310 1.000 * 1.000 * 4.741) + = 9.569
311
312 Total of 2 streams to confluence:
313 Flow rates before confluence point:
314 7.142 4.741
315 Maximum flow rates at confluence using above data:
316 10.825 9.569
317 Area of streams before confluence:
318 5.329 2.918
319 Results of confluence:
320 Total flow rate = 10.825 (CFS)
321 Time of concentration = 14.574 min.
322 Effective stream area after confluence = 8.247 (Ac.)
323
324
325 ++++++
326 Process from Point/Station 104.000 to Point/Station 204.000
327 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
328
329 Estimated mean flow rate at midpoint of channel = 10.874 (CFS)
330 Depth of flow = 0.502 (Ft.), Average velocity = 2.644 (Ft/s)
331 ***** Irregular Channel Data *****
332 -----
333 Information entered for subchannel number 1 :
334 Point number 'X' coordinate 'Y' coordinate
335 1 0.00 0.52
336 2 19.50 0.13
337 3 21.00 0.00
338 4 21.00 0.50
339 5 31.00 1.00
340 Manning's 'N' friction factor = 0.015
341 -----
342 Sub-Channel flow = 10.874 (CFS)
343 ' ' flow top width = 20.133 (Ft.)
344 ' ' velocity = 2.644 (Ft/s)
345 ' ' area = 4.113 (Sq.Ft)

```

```

346         '         '         Froude number =         1.031
347
348 Upstream point elevation =         762.910(Ft.)
349 Downstream point elevation =         759.500(Ft.)
350 Flow length =         557.300(Ft.)
351 Travel time =         3.51 min.
352 Time of concentration =         18.09 min.
353 Depth of flow =         0.502(Ft.)
354 Average velocity =         2.644(Ft/s)
355 Total irregular channel flow =         10.874(CFS)
356 Irregular channel normal depth above invert elev. =         0.502(Ft.)
357 Average velocity of channel(s) =         2.644(Ft/s)
358 Adding area flow to channel
359 Rainfall intensity (I) =         3.449(In/Hr) for a         50.0 year storm
360 Decimal fraction soil group A = 0.400
361 Decimal fraction soil group B = 0.000
362 Decimal fraction soil group C = 0.600
363 Decimal fraction soil group D = 0.000
364 [LOW DENSITY RESIDENTIAL
365 (2.9 DU/A or Less
366 Impervious value, Ai = 0.250
367 Sub-Area C Value = 0.422
368 The area added to the existing stream causes a
369 a lower flow rate of Q =         10.261(CFS)
370 therefore the upstream flow rate of Q =         10.825(CFS) is being used
371 Rainfall intensity =         3.449(In/Hr) for a         50.0 year storm
372 Effective runoff coefficient used for total area
373 (Q=KCIA) is C = 0.315 CA =         2.975
374 Subarea runoff =         0.000(CFS) for         1.186(Ac.)
375 Total runoff =         10.825(CFS) Total area =         9.433(Ac.)
376 Depth of flow =         0.501(Ft.), Average velocity =         2.642(Ft/s)
377
378
379 *****
380 Process from Point/Station         204.000 to Point/Station         204.000
381 **** CONFLUENCE OF MAIN STREAMS ****
382
383 The following data inside Main Stream is listed:
384 In Main Stream number: 1
385 Stream flow area =         9.433(Ac.)
386 Runoff from this stream =         10.825(CFS)
387 Time of concentration =         18.09 min.
388 Rainfall intensity =         3.449(In/Hr)
389 Program is now starting with Main Stream No. 2
390
391
392 *****
393 Process from Point/Station         301.000 to Point/Station         302.000
394 **** INITIAL AREA EVALUATION ****
395
396 Decimal fraction soil group A = 0.000
397 Decimal fraction soil group B = 0.000
398 Decimal fraction soil group C = 1.000
399 Decimal fraction soil group D = 0.000
400 [LOW DENSITY RESIDENTIAL
401 (2.9 DU/A or Less
402 Impervious value, Ai = 0.250
403 Sub-Area C Value = 0.450
404 Initial subarea total flow distance =         70.000(Ft.)
405 Highest elevation =         784.000(Ft.)
406 Lowest elevation =         783.300(Ft.)
407 Elevation difference =         0.700(Ft.) Slope =         1.000 %
408 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
409 The maximum overland flow distance is 70.00 (Ft)
410 for the top area slope value of         1.00 %, in a development type of
411         2.9 DU/A or Less
412 In Accordance With Figure 3-3
413 Initial Area Time of Concentration =         9.79 minutes
414 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]

```

```

415 TC = [1.8*(1.1-0.4500)* ( 70.000^0.5)/( 1.000^(1/3))]= 9.79
416 Rainfall intensity (I) = 5.125(In/Hr) for a 50.0 year storm
417 Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
418 Subarea runoff = 0.334(CFS)
419 Total initial stream area = 0.145(Ac.)
420
421
422 *****
423 Process from Point/Station 302.000 to Point/Station 303.000
424 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
425
426 -----
427 Estimated mean flow rate at midpoint of channel = 2.628(CFS)
428 Depth of flow = 0.257(Ft.), Average velocity = 2.759(Ft/s)
429 ***** Irregular Channel Data *****
430 -----
431 Information entered for subchannel number 1 :
432 Point number 'X' coordinate 'Y' coordinate
433 1 0.00 0.33
434 2 16.50 0.13
435 3 18.00 0.00
436 4 18.00 0.50
437 5 23.50 0.58
438 Manning's 'N' friction factor = 0.015
439 -----
440 Sub-Channel flow = 2.628(CFS)
441 ' ' flow top width = 11.973(Ft.)
442 ' ' velocity= 2.759(Ft/s)
443 ' ' area = 0.953(Sq.Ft)
444 ' ' Froude number = 1.723
445
446 Upstream point elevation = 783.300(Ft.)
447 Downstream point elevation = 764.900(Ft.)
448 Flow length = 788.900(Ft.)
449 Travel time = 4.77 min.
450 Time of concentration = 14.56 min.
451 Depth of flow = 0.257(Ft.)
452 Average velocity = 2.759(Ft/s)
453 Total irregular channel flow = 2.628(CFS)
454 Irregular channel normal depth above invert elev. = 0.257(Ft.)
455 Average velocity of channel(s) = 2.759(Ft/s)
456 Adding area flow to channel
457 Rainfall intensity (I) = 3.968(In/Hr) for a 50.0 year storm
458 Decimal fraction soil group A = 0.700
459 Decimal fraction soil group B = 0.000
460 Decimal fraction soil group C = 0.300
461 Decimal fraction soil group D = 0.000
462 [LOW DENSITY RESIDENTIAL ]
463 (2.9 DU/A or Less )
464 Impervious value, Ai = 0.250
465 Sub-Area C Value = 0.401
466 Rainfall intensity = 3.968(In/Hr) for a 50.0 year storm
467 Effective runoff coefficient used for total area
468 (Q=KCIA) is C = 0.403 CA = 1.221
469 Subarea runoff = 4.508(CFS) for 2.881(Ac.)
470 Total runoff = 4.843(CFS) Total area = 3.026(Ac.)
471 Depth of flow = 0.298(Ft.), Average velocity = 3.189(Ft/s)
472
473 *****
474 Process from Point/Station 303.000 to Point/Station 304.000
475 **** PIPEFLOW TRAVEL TIME (User specified size) ****
476
477 -----
478 Upstream point/station elevation = 762.220(Ft.)
479 Downstream point/station elevation = 762.040(Ft.)
480 Pipe length = 36.00(Ft.) Slope = 0.0050 Manning's N = 0.013
481 No. of pipes = 1 Required pipe flow = 4.843(CFS)
482 Given pipe size = 18.00(In.)
483 Calculated individual pipe flow = 4.843(CFS)
484 Normal flow depth in pipe = 10.59(In.)

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484 Flow top width inside pipe = 17.72(In.)
485 Critical Depth = 10.15(In.)
486 Pipe flow velocity = 4.48(Ft/s)
487 Travel time through pipe = 0.13 min.
488 Time of concentration (TC) = 14.69 min.
489
490
491 *****
492 Process from Point/Station 304.000 to Point/Station 304.000
493 **** SUBAREA FLOW ADDITION ****
494
495 Rainfall intensity (I) = 3.944(In/Hr) for a 50.0 year storm
496 Decimal fraction soil group A = 0.400
497 Decimal fraction soil group B = 0.000
498 Decimal fraction soil group C = 0.600
499 Decimal fraction soil group D = 0.000
500 [LOW DENSITY RESIDENTIAL ]
501 (2.9 DU/A or Less )
502 Impervious value, Ai = 0.250
503 Sub-Area C Value = 0.422
504 Time of concentration = 14.69 min.
505 Rainfall intensity = 3.944(In/Hr) for a 50.0 year storm
506 Effective runoff coefficient used for total area
507 (Q=KCIA) is C = 0.410 CA = 1.929
508 Subarea runoff = 2.768(CFS) for 1.680(Ac.)
509 Total runoff = 7.611(CFS) Total area = 4.706(Ac.)
510
511
512 *****
513 Process from Point/Station 304.000 to Point/Station 305.000
514 **** PIPEFLOW TRAVEL TIME (User specified size) ****
515
516 Upstream point/station elevation = 761.840(Ft.)
517 Downstream point/station elevation = 761.300(Ft.)
518 Pipe length = 107.10(Ft.) Slope = 0.0050 Manning's N = 0.013
519 No. of pipes = 1 Required pipe flow = 7.611(CFS)
520 Given pipe size = 24.00(In.)
521 Calculated individual pipe flow = 7.611(CFS)
522 Normal flow depth in pipe = 11.63(In.)
523 Flow top width inside pipe = 23.99(In.)
524 Critical Depth = 11.76(In.)
525 Pipe flow velocity = 5.04(Ft/s)
526 Travel time through pipe = 0.35 min.
527 Time of concentration (TC) = 15.04 min.
528
529
530 *****
531 Process from Point/Station 305.000 to Point/Station 306.000
532 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
533
534 Depth of flow = 1.307(Ft.), Average velocity = 4.716(Ft/s)
535 !!Warning: Water is above left or right bank elevations
536 ***** Irregular Channel Data *****
537 -----
538 Information entered for subchannel number 1 :
539 Point number 'X' coordinate 'Y' coordinate
540 1 0.00 1.00
541 2 1.00 0.00
542 3 2.00 1.00
543 Manning's 'N' friction factor = 0.015
544 -----
545 Sub-Channel flow = 7.611(CFS)
546 ' ' flow top width = 2.000(Ft.)
547 ' ' velocity= 4.716(Ft/s)
548 ' ' area = 1.614(Sq.Ft)
549 ' ' Froude number = 0.925
550
551 Upstream point elevation = 761.300(Ft.)
552 Downstream point elevation = 760.500(Ft.)

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553 Flow length = 167.000(Ft.)
554 Travel time = 0.59 min.
555 Time of concentration = 15.63 min.
556 Depth of flow = 1.307(Ft.)
557 Average velocity = 4.716(Ft/s)
558 Total irregular channel flow = 7.611(CFS)
559 Irregular channel normal depth above invert elev. = 1.307(Ft.)
560 Average velocity of channel(s) = 4.716(Ft/s)
561 !!Warning: Water is above left or right bank elevations
562
563
564 ++++++
565 Process from Point/Station 306.000 to Point/Station 306.000
566 **** SUBAREA FLOW ADDITION ****
567
568 Rainfall intensity (I) = 3.789(In/Hr) for a 50.0 year storm
569 Decimal fraction soil group A = 0.600
570 Decimal fraction soil group B = 0.000
571 Decimal fraction soil group C = 0.400
572 Decimal fraction soil group D = 0.000
573 [LOW DENSITY RESIDENTIAL ]
574 (2.9 DU/A or Less )
575 Impervious value, Ai = 0.250
576 Sub-Area C Value = 0.408
577 Time of concentration = 15.63 min.
578 Rainfall intensity = 3.789(In/Hr) for a 50.0 year storm
579 Effective runoff coefficient used for total area
580 (Q=KCIA) is C = 0.409 CA = 3.618
581 Subarea runoff = 6.097(CFS) for 4.138(Ac.)
582 Total runoff = 13.708(CFS) Total area = 8.844(Ac.)
583
584
585 ++++++
586 Process from Point/Station 306.000 to Point/Station 306.000
587 **** 6 HOUR HYDROGRAPH ****
588
589 ++++++
590 Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003
591
592
593 Time of Concentration = 15.63
594 Basin Area = 18.28 Acres
595 6 Hour Rainfall = 3.000 Inches
596 Runoff Coefficient = 0.198
597 Peak Discharge = 13.71 CFS
598 Time (Min) Discharge (CFS)
599 0 0.000
600 15 0.652
601 30 0.671
602 45 0.712
603 60 0.736
604 75 0.789
605 90 0.820
606 105 0.891
607 120 0.933
608 135 1.035
609 150 1.097
610 165 1.258
611 180 1.364
612 195 1.667
613 210 1.899
614 225 2.788
615 240 3.928
616 255 13.708
617 270 2.236
618 285 1.496
619 300 1.170
620 315 0.980
621 330 0.853

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622		345		0.761				
623		360		0.691				
624		375		0.635				
625	+++++							
626		6	-	H O U R		S T O R M		
627		R u n o f f		H y d r o g r a p h				
628	-----							
629		Hydrograph in	1	Minute intervals ((CFS))				
630								
631	-----							
632	Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	3.4	6.9	10.3
633	-----							
634	0+ 0	0.0000		0.00	Q			
635	0+ 1	0.0001		0.04	Q			
636	0+ 2	0.0002		0.09	Q			
637	0+ 3	0.0004		0.13	Q			
638	0+ 4	0.0006		0.17	Q			
639	0+ 5	0.0009		0.22	Q			
640	0+ 6	0.0013		0.26	Q			
641	0+ 7	0.0017		0.30	Q			
642	0+ 8	0.0022		0.35	VQ			
643	0+ 9	0.0027		0.39	VQ			
644	0+10	0.0033		0.43	VQ			
645	0+11	0.0040		0.48	VQ			
646	0+12	0.0047		0.52	VQ			
647	0+13	0.0055		0.57	VQ			
648	0+14	0.0063		0.61	VQ			
649	0+15	0.0072		0.65	VQ			
650	0+16	0.0081		0.65	VQ			
651	0+17	0.0090		0.65	VQ			
652	0+18	0.0099		0.66	VQ			
653	0+19	0.0108		0.66	VQ			
654	0+20	0.0117		0.66	VQ			
655	0+21	0.0126		0.66	VQ			
656	0+22	0.0135		0.66	VQ			
657	0+23	0.0144		0.66	VQ			
658	0+24	0.0154		0.66	VQ			
659	0+25	0.0163		0.66	VQ			
660	0+26	0.0172		0.67	VQ			
661	0+27	0.0181		0.67	VQ			
662	0+28	0.0190		0.67	VQ			
663	0+29	0.0199		0.67	VQ			
664	0+30	0.0209		0.67	VQ			
665	0+31	0.0218		0.67	VQ			
666	0+32	0.0227		0.68	Q			
667	0+33	0.0237		0.68	Q			
668	0+34	0.0246		0.68	Q			
669	0+35	0.0255		0.68	Q			
670	0+36	0.0265		0.69	VQ			
671	0+37	0.0274		0.69	VQ			
672	0+38	0.0284		0.69	VQ			
673	0+39	0.0294		0.70	VQ			
674	0+40	0.0303		0.70	VQ			
675	0+41	0.0313		0.70	VQ			
676	0+42	0.0323		0.70	VQ			
677	0+43	0.0332		0.71	VQ			
678	0+44	0.0342		0.71	VQ			
679	0+45	0.0352		0.71	VQ			
680	0+46	0.0362		0.71	VQ			
681	0+47	0.0372		0.72	VQ			
682	0+48	0.0381		0.72	VQ			
683	0+49	0.0391		0.72	VQ			
684	0+50	0.0401		0.72	VQ			
685	0+51	0.0411		0.72	VQ			
686	0+52	0.0421		0.72	VQ			
687	0+53	0.0431		0.72	VQ			
688	0+54	0.0441		0.73	VQ			
689	0+55	0.0451		0.73	Q			
690	0+56	0.0461		0.73	Q			

691	0+57	0.0471	0.73	Q				
692	0+58	0.0481	0.73	Q				
693	0+59	0.0492	0.73	Q				
694	1+ 0	0.0502	0.74	Q				
695	1+ 1	0.0512	0.74	Q				
696	1+ 2	0.0522	0.74	Q				
697	1+ 3	0.0532	0.75	Q				
698	1+ 4	0.0543	0.75	Q				
699	1+ 5	0.0553	0.75	Q				
700	1+ 6	0.0564	0.76	Q				
701	1+ 7	0.0574	0.76	Q				
702	1+ 8	0.0585	0.76	Q				
703	1+ 9	0.0595	0.77	Q				
704	1+10	0.0606	0.77	Q				
705	1+11	0.0616	0.77	Q				
706	1+12	0.0627	0.78	Q				
707	1+13	0.0638	0.78	Q				
708	1+14	0.0649	0.79	Q				
709	1+15	0.0660	0.79	Q				
710	1+16	0.0670	0.79	Q				
711	1+17	0.0681	0.79	QV				
712	1+18	0.0692	0.80	QV				
713	1+19	0.0703	0.80	QV				
714	1+20	0.0714	0.80	QV				
715	1+21	0.0725	0.80	QV				
716	1+22	0.0736	0.80	QV				
717	1+23	0.0748	0.81	QV				
718	1+24	0.0759	0.81	QV				
719	1+25	0.0770	0.81	QV				
720	1+26	0.0781	0.81	QV				
721	1+27	0.0792	0.81	QV				
722	1+28	0.0803	0.82	QV				
723	1+29	0.0815	0.82	QV				
724	1+30	0.0826	0.82	QV				
725	1+31	0.0837	0.82	QV				
726	1+32	0.0849	0.83	QV				
727	1+33	0.0860	0.83	QV				
728	1+34	0.0872	0.84	QV				
729	1+35	0.0883	0.84	QV				
730	1+36	0.0895	0.85	QV				
731	1+37	0.0907	0.85	Q V				
732	1+38	0.0919	0.86	Q V				
733	1+39	0.0931	0.86	Q V				
734	1+40	0.0942	0.87	Q V				
735	1+41	0.0954	0.87	Q V				
736	1+42	0.0967	0.88	Q V				
737	1+43	0.0979	0.88	Q V				
738	1+44	0.0991	0.89	Q V				
739	1+45	0.1003	0.89	Q V				
740	1+46	0.1015	0.89	Q V				
741	1+47	0.1028	0.90	Q V				
742	1+48	0.1040	0.90	Q V				
743	1+49	0.1053	0.90	Q V				
744	1+50	0.1065	0.90	Q V				
745	1+51	0.1078	0.91	Q V				
746	1+52	0.1090	0.91	Q V				
747	1+53	0.1103	0.91	Q V				
748	1+54	0.1115	0.92	Q V				
749	1+55	0.1128	0.92	Q V				
750	1+56	0.1141	0.92	Q V				
751	1+57	0.1153	0.92	Q V				
752	1+58	0.1166	0.93	Q V				
753	1+59	0.1179	0.93	Q V				
754	2+ 0	0.1192	0.93	Q V				
755	2+ 1	0.1205	0.94	Q V				
756	2+ 2	0.1218	0.95	Q V				
757	2+ 3	0.1231	0.95	Q V				
758	2+ 4	0.1244	0.96	Q V				
759	2+ 5	0.1257	0.97	Q V				

760	2+ 6	0.1271	0.97	Q	V				
761	2+ 7	0.1284	0.98	Q	V				
762	2+ 8	0.1298	0.99	Q	V				
763	2+ 9	0.1312	0.99	Q	V				
764	2+10	0.1325	1.00	Q	V				
765	2+11	0.1339	1.01	Q	V				
766	2+12	0.1353	1.01	Q	V				
767	2+13	0.1367	1.02	Q	V				
768	2+14	0.1382	1.03	Q	V				
769	2+15	0.1396	1.03	Q	V				
770	2+16	0.1410	1.04	Q	V				
771	2+17	0.1424	1.04	Q	V				
772	2+18	0.1439	1.05	Q	V				
773	2+19	0.1453	1.05	Q	V				
774	2+20	0.1468	1.06	Q	V				
775	2+21	0.1483	1.06	Q	V				
776	2+22	0.1497	1.06	Q	V				
777	2+23	0.1512	1.07	Q	V				
778	2+24	0.1527	1.07	Q	V				
779	2+25	0.1541	1.08	Q	V				
780	2+26	0.1556	1.08	Q	V				
781	2+27	0.1571	1.08	Q	V				
782	2+28	0.1586	1.09	Q	V				
783	2+29	0.1601	1.09	Q	V				
784	2+30	0.1616	1.10	Q	V				
785	2+31	0.1632	1.11	Q	V				
786	2+32	0.1647	1.12	Q	V				
787	2+33	0.1663	1.13	Q	V				
788	2+34	0.1678	1.14	Q	V				
789	2+35	0.1694	1.15	Q	V				
790	2+36	0.1710	1.16	Q	V				
791	2+37	0.1726	1.17	Q	V				
792	2+38	0.1743	1.18	Q	V				
793	2+39	0.1759	1.19	Q	V				
794	2+40	0.1776	1.20	Q	V				
795	2+41	0.1792	1.21	Q	V				
796	2+42	0.1809	1.23	Q	V				
797	2+43	0.1826	1.24	Q	V				
798	2+44	0.1844	1.25	Q	V				
799	2+45	0.1861	1.26	Q	V				
800	2+46	0.1878	1.26	Q	V				
801	2+47	0.1896	1.27	Q	V				
802	2+48	0.1913	1.28	Q	V				
803	2+49	0.1931	1.29	Q	V				
804	2+50	0.1949	1.29	Q	V				
805	2+51	0.1967	1.30	Q	V				
806	2+52	0.1985	1.31	Q	V				
807	2+53	0.2003	1.31	Q	V				
808	2+54	0.2021	1.32	Q	V				
809	2+55	0.2039	1.33	Q	V				
810	2+56	0.2058	1.34	Q	V				
811	2+57	0.2076	1.34	Q	V				
812	2+58	0.2095	1.35	Q	V				
813	2+59	0.2114	1.36	Q	V				
814	3+ 0	0.2132	1.36	Q	V				
815	3+ 1	0.2151	1.38	Q	V				
816	3+ 2	0.2171	1.40	Q	V				
817	3+ 3	0.2190	1.42	Q	V				
818	3+ 4	0.2210	1.44	Q	V				
819	3+ 5	0.2230	1.46	Q	V				
820	3+ 6	0.2251	1.48	Q	V				
821	3+ 7	0.2272	1.51	Q	V				
822	3+ 8	0.2293	1.53	Q	V				
823	3+ 9	0.2314	1.55	Q	V				
824	3+10	0.2336	1.57	Q	V				
825	3+11	0.2357	1.59	Q	V				
826	3+12	0.2379	1.61	Q	V				
827	3+13	0.2402	1.63	Q	V				
828	3+14	0.2425	1.65	Q	V				

829	3+15	0.2448	1.67	Q	V				
830	3+16	0.2471	1.68	Q	V				
831	3+17	0.2494	1.70	Q	V				
832	3+18	0.2518	1.71	Q	V				
833	3+19	0.2541	1.73	Q	V				
834	3+20	0.2566	1.74	Q	V				
835	3+21	0.2590	1.76	Q	V				
836	3+22	0.2614	1.77	Q	V				
837	3+23	0.2639	1.79	Q	V				
838	3+24	0.2664	1.81	Q	V				
839	3+25	0.2689	1.82	Q	V				
840	3+26	0.2714	1.84	Q	V				
841	3+27	0.2740	1.85	Q	V				
842	3+28	0.2765	1.87	Q	V				
843	3+29	0.2791	1.88	Q	V				
844	3+30	0.2817	1.90	Q	V				
845	3+31	0.2844	1.96	Q	V				
846	3+32	0.2872	2.02	Q	V				
847	3+33	0.2901	2.08	Q	V				
848	3+34	0.2930	2.14	Q	V				
849	3+35	0.2960	2.19	Q	V				
850	3+36	0.2991	2.25	Q	V				
851	3+37	0.3023	2.31	Q	V				
852	3+38	0.3056	2.37	Q	V				
853	3+39	0.3090	2.43	Q	V				
854	3+40	0.3124	2.49	Q	V				
855	3+41	0.3159	2.55	Q	V				
856	3+42	0.3195	2.61	Q	V				
857	3+43	0.3232	2.67	Q	V				
858	3+44	0.3269	2.73	Q	V				
859	3+45	0.3308	2.79	Q	V				
860	3+46	0.3347	2.86	Q	V				
861	3+47	0.3388	2.94	Q	V				
862	3+48	0.3429	3.02	Q	V				
863	3+49	0.3472	3.09	Q	V				
864	3+50	0.3515	3.17	Q	V				
865	3+51	0.3560	3.24	Q	V				
866	3+52	0.3606	3.32	Q	V				
867	3+53	0.3653	3.40	Q	V				
868	3+54	0.3700	3.47	Q	V				
869	3+55	0.3749	3.55	Q	V				
870	3+56	0.3799	3.62	Q	V				
871	3+57	0.3850	3.70	Q	V				
872	3+58	0.3902	3.78	Q	V				
873	3+59	0.3955	3.85	Q	V				
874	4+ 0	0.4009	3.93	Q	V				
875	4+ 1	0.4072	4.58		Q	V			
876	4+ 2	0.4144	5.23		Q	V			
877	4+ 3	0.4225	5.88		Q	V			
878	4+ 4	0.4315	6.54		Q	V			
879	4+ 5	0.4414	7.19		Q	V			
880	4+ 6	0.4522	7.84		Q	V			
881	4+ 7	0.4639	8.49		Q	V			
882	4+ 8	0.4765	9.14		Q	V			
883	4+ 9	0.4900	9.80		Q	V			
884	4+10	0.5044	10.45		Q	V			
885	4+11	0.5197	11.10		Q	V			
886	4+12	0.5359	11.75		Q	V			
887	4+13	0.5530	12.40		Q	V			
888	4+14	0.5710	13.06		Q	V			
889	4+15	0.5899	13.71		Q	V			
890	4+16	0.6077	12.94		Q	V			
891	4+17	0.6245	12.18		Q	V			
892	4+18	0.6402	11.41		Q	V			
893	4+19	0.6548	10.65		Q	V			
894	4+20	0.6685	9.88		Q	V			
895	4+21	0.6810	9.12		Q	V			
896	4+22	0.6925	8.35		Q	V			
897	4+23	0.7030	7.59		Q	V			

898	4+24	0.7124	6.82																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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967	5+33	0.8564	0.83	Q			V
968	5+34	0.8576	0.83	Q			V
969	5+35	0.8587	0.82	Q			V
970	5+36	0.8598	0.82	Q			V
971	5+37	0.8610	0.81	Q			V
972	5+38	0.8621	0.80	Q			V
973	5+39	0.8632	0.80	Q			V
974	5+40	0.8643	0.79	Q			V
975	5+41	0.8653	0.79	Q			V
976	5+42	0.8664	0.78	Q			V
977	5+43	0.8675	0.77	Q			V
978	5+44	0.8685	0.77	Q			V
979	5+45	0.8696	0.76	Q			V
980	5+46	0.8706	0.76	Q			V
981	5+47	0.8717	0.75	Q			V
982	5+48	0.8727	0.75	Q			V
983	5+49	0.8737	0.74	Q			V
984	5+50	0.8747	0.74	Q			V
985	5+51	0.8757	0.73	Q			V
986	5+52	0.8767	0.73	Q			V
987	5+53	0.8777	0.72	Q			V
988	5+54	0.8787	0.72	Q			V
989	5+55	0.8797	0.71	Q			V
990	5+56	0.8807	0.71	Q			V
991	5+57	0.8817	0.70	Q			V
992	5+58	0.8826	0.70	Q			V
993	5+59	0.8836	0.70	Q			V
994	6+ 0	0.8845	0.69	Q			V
995	6+ 1	0.8855	0.69	Q			V
996	6+ 2	0.8864	0.68	Q			V
997	6+ 3	0.8874	0.68	Q			V
998	6+ 4	0.8883	0.68	Q			V
999	6+ 5	0.8892	0.67	Q			V
1000	6+ 6	0.8901	0.67	Q			V
1001	6+ 7	0.8911	0.66	Q			V
1002	6+ 8	0.8920	0.66	Q			V
1003	6+ 9	0.8929	0.66	Q			V
1004	6+10	0.8938	0.65	Q			V
1005	6+11	0.8947	0.65	Q			V
1006	6+12	0.8956	0.65	Q			V
1007	6+13	0.8964	0.64	Q			V
1008	6+14	0.8973	0.64	Q			V
1009	6+15	0.8982	0.64	Q			V

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Process from Point/Station      306.000 to Point/Station      408.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
-----
Upstream point/station elevation =  757.560 (Ft.)
Downstream point/station elevation =  757.490 (Ft.)
Pipe length =  15.05 (Ft.) Slope =  0.0047 Manning's N = 0.013
No. of pipes = 1 Required pipe flow =  13.708 (CFS)
Given pipe size =  24.00 (In.)
Calculated individual pipe flow =  13.708 (CFS)
Normal flow depth in pipe =  17.63 (In.)
Flow top width inside pipe =  21.20 (In.)
Critical Depth =  15.99 (In.)
Pipe flow velocity =  5.55 (Ft/s)
Travel time through pipe =  0.05 min.
Time of concentration (TC) =  15.68 min.
*****

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1036 Process from Point/Station      408.000 to Point/Station      408.000
1037 **** CONFLUENCE OF MINOR STREAMS ****
1038
1039 Along Main Stream number: 2 in normal stream number 1
1040 Stream flow area =      8.844 (Ac.)
1041 Runoff from this stream =     13.708 (CFS)
1042 Time of concentration =     15.68 min.
1043 Rainfall intensity =      3.782 (In/Hr)
1044
1045
1046 *****
1047 Process from Point/Station      401.000 to Point/Station      402.000
1048 **** INITIAL AREA EVALUATION ****
1049
1050 Decimal fraction soil group A = 0.000
1051 Decimal fraction soil group B = 0.000
1052 Decimal fraction soil group C = 1.000
1053 Decimal fraction soil group D = 0.000
1054 [LOW DENSITY RESIDENTIAL
1055 (1.0 DU/A or Less
1056 Impervious value, Ai = 0.100
1057 Sub-Area C Value = 0.360
1058 Initial subarea total flow distance = 100.000 (Ft.)
1059 Highest elevation = 828.000 (Ft.)
1060 Lowest elevation = 815.000 (Ft.)
1061 Elevation difference = 13.000 (Ft.) Slope = 13.000 %
1062 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
1063 The maximum overland flow distance is 100.00 (Ft)
1064 for the top area slope value of 13.00 %, in a development type of
1065 1.0 DU/A or Less
1066 In Accordance With Figure 3-3
1067 Initial Area Time of Concentration = 5.66 minutes
1068 TC = [1.8*(1.1-C)*distance (Ft.)^.5]/(% slope^(1/3)]
1069 TC = [1.8*(1.1-0.3600)*( 100.000^.5)/( 13.000^(1/3)]= 5.66
1070 Rainfall intensity (I) = 7.293 (In/Hr) for a 50.0 year storm
1071 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
1072 Subarea runoff = 0.320 (CFS)
1073 Total initial stream area = 0.122 (Ac.)
1074
1075
1076 *****
1077 Process from Point/Station      402.000 to Point/Station      403.000
1078 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
1079
1080 Estimated mean flow rate at midpoint of channel = 1.994 (CFS)
1081 Depth of flow = 0.235 (Ft.), Average velocity = 3.602 (Ft/s)
1082 ***** Irregular Channel Data *****
1083 -----
1084 Information entered for subchannel number 1 :
1085 Point number      'X' coordinate      'Y' coordinate
1086      1              0.00              1.00
1087      2             10.00              0.00
1088      3             20.00              1.00
1089 Manning's 'N' friction factor = 0.030
1090 -----
1091 Sub-Channel flow = 1.994 (CFS)
1092      '      '      flow top width = 4.706 (Ft.)
1093      '      '      velocity= 3.602 (Ft/s)
1094      '      '      area = 0.554 (Sq.Ft)
1095      '      '      Froude number = 1.851
1096
1097 Upstream point elevation = 815.000 (Ft.)
1098 Downstream point elevation = 791.000 (Ft.)
1099 Flow length = 259.850 (Ft.)
1100 Travel time = 1.20 min.
1101 Time of concentration = 6.87 min.
1102 Depth of flow = 0.235 (Ft.)
1103 Average velocity = 3.602 (Ft/s)
1104 Total irregular channel flow = 1.994 (CFS)

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1105 Irregular channel normal depth above invert elev. = 0.235(Ft.)
1106 Average velocity of channel(s) = 3.602(Ft/s)
1107 Adding area flow to channel
1108 Rainfall intensity (I) = 6.441(In/Hr) for a 50.0 year storm
1109 Decimal fraction soil group A = 0.600
1110 Decimal fraction soil group B = 0.000
1111 Decimal fraction soil group C = 0.400
1112 Decimal fraction soil group D = 0.000
1113 [LOW DENSITY RESIDENTIAL ]
1114 (1.0 DU/A or Less )
1115 Impervious value, Ai = 0.100
1116 Sub-Area C Value = 0.306
1117 Rainfall intensity = 6.441(In/Hr) for a 50.0 year storm
1118 Effective runoff coefficient used for total area
1119 (Q=KCIA) is C = 0.310 CA = 0.558
1120 Subarea runoff = 3.272(CFS) for 1.679(Ac.)
1121 Total runoff = 3.592(CFS) Total area = 1.801(Ac.)
1122 Depth of flow = 0.293(Ft.), Average velocity = 4.173(Ft/s)
1123
1124
1125 *****
1126 Process from Point/Station 403.000 to Point/Station 404.000
1127 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
1128
1129 -----
1129 Depth of flow = 0.716(Ft.), Average velocity = 7.001(Ft/s)
1130 ***** Irregular Channel Data *****
1131 -----
1132 Information entered for subchannel number 1 :
1133 Point number 'X' coordinate 'Y' coordinate
1134 1 0.00 1.00
1135 2 1.00 0.00
1136 3 2.00 1.00
1137 Manning's 'N' friction factor = 0.015
1138 -----
1139 Sub-Channel flow = 3.592(CFS)
1140 ' ' flow top width = 1.433(Ft.)
1141 ' ' velocity= 7.001(Ft/s)
1142 ' ' area = 0.513(Sq.Ft)
1143 ' ' Froude number = 2.061
1144
1145 Upstream point elevation = 791.000(Ft.)
1146 Downstream point elevation = 781.500(Ft.)
1147 Flow length = 304.820(Ft.)
1148 Travel time = 0.73 min.
1149 Time of concentration = 7.59 min.
1150 Depth of flow = 0.716(Ft.)
1151 Average velocity = 7.001(Ft/s)
1152 Total irregular channel flow = 3.592(CFS)
1153 Irregular channel normal depth above invert elev. = 0.716(Ft.)
1154 Average velocity of channel(s) = 7.001(Ft/s)
1155
1156
1157 *****
1158 Process from Point/Station 404.000 to Point/Station 405.000
1159 **** PIPEFLOW TRAVEL TIME (User specified size) ****
1160
1161 -----
1161 Upstream point/station elevation = 775.420(Ft.)
1162 Downstream point/station elevation = 773.810(Ft.)
1163 Pipe length = 164.90(Ft.) Slope = 0.0098 Manning's N = 0.013
1164 No. of pipes = 1 Required pipe flow = 3.592(CFS)
1165 Given pipe size = 18.00(In.)
1166 Calculated individual pipe flow = 3.592(CFS)
1167 Normal flow depth in pipe = 7.31(In.)
1168 Flow top width inside pipe = 17.68(In.)
1169 Critical Depth = 8.68(In.)
1170 Pipe flow velocity = 5.34(Ft/s)
1171 Travel time through pipe = 0.51 min.
1172 Time of concentration (TC) = 8.11 min.
1173

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1174
1175 *****
1176 Process from Point/Station      405.000 to Point/Station      406.000
1177 **** PIPEFLOW TRAVEL TIME (User specified size) ****
1178
1179 Upstream point/station elevation =  773.610 (Ft.)
1180 Downstream point/station elevation =  772.150 (Ft.)
1181 Pipe length =  150.00 (Ft.) Slope =  0.0097 Manning's N = 0.013
1182 No. of pipes = 1 Required pipe flow =  3.592 (CFS)
1183 Given pipe size =  18.00 (In.)
1184 Calculated individual pipe flow =  3.592 (CFS)
1185 Normal flow depth in pipe =  7.31 (In.)
1186 Flow top width inside pipe =  17.68 (In.)
1187 Critical Depth =  8.68 (In.)
1188 Pipe flow velocity =  5.33 (Ft/s)
1189 Travel time through pipe =  0.47 min.
1190 Time of concentration (TC) =  8.58 min.
1191
1192
1193 *****
1194 Process from Point/Station      406.000 to Point/Station      407.000
1195 **** PIPEFLOW TRAVEL TIME (User specified size) ****
1196
1197 Upstream point/station elevation =  771.950 (Ft.)
1198 Downstream point/station elevation =  759.100 (Ft.)
1199 Pipe length =  387.10 (Ft.) Slope =  0.0332 Manning's N = 0.013
1200 No. of pipes = 1 Required pipe flow =  3.592 (CFS)
1201 Given pipe size =  18.00 (In.)
1202 Calculated individual pipe flow =  3.592 (CFS)
1203 Normal flow depth in pipe =  5.29 (In.)
1204 Flow top width inside pipe =  16.40 (In.)
1205 Critical Depth =  8.68 (In.)
1206 Pipe flow velocity =  8.31 (Ft/s)
1207 Travel time through pipe =  0.78 min.
1208 Time of concentration (TC) =  9.35 min.
1209
1210
1211 *****
1212 Process from Point/Station      407.000 to Point/Station      408.000
1213 **** PIPEFLOW TRAVEL TIME (User specified size) ****
1214
1215 Upstream point/station elevation =  758.900 (Ft.)
1216 Downstream point/station elevation =  757.490 (Ft.)
1217 Pipe length =  141.20 (Ft.) Slope =  0.0100 Manning's N = 0.013
1218 No. of pipes = 1 Required pipe flow =  3.592 (CFS)
1219 Given pipe size =  18.00 (In.)
1220 Calculated individual pipe flow =  3.592 (CFS)
1221 Normal flow depth in pipe =  7.26 (In.)
1222 Flow top width inside pipe =  17.66 (In.)
1223 Critical Depth =  8.68 (In.)
1224 Pipe flow velocity =  5.38 (Ft/s)
1225 Travel time through pipe =  0.44 min.
1226 Time of concentration (TC) =  9.79 min.
1227
1228
1229 *****
1230 Process from Point/Station      408.000 to Point/Station      408.000
1231 **** CONFLUENCE OF MINOR STREAMS ****
1232
1233 Along Main Stream number: 2 in normal stream number 2
1234 Stream flow area =  1.801 (Ac.)
1235 Runoff from this stream =  3.592 (CFS)
1236 Time of concentration =  9.79 min.
1237 Rainfall intensity =  5.124 (In/Hr)
1238 Summary of stream data:
1239
1240 Stream    Flow rate    TC    Rainfall Intensity
1241 No.        (CFS)      (min)      (In/Hr)
1242

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1243
1244 1      13.708      15.68      3.782
1245 2      3.592      9.79      5.124
1246 Qmax(1) =
1247      1.000 *      1.000 *      13.708) +
1248      0.738 *      1.000 *      3.592) + =      16.359
1249 Qmax(2) =
1250      1.000 *      0.624 *      13.708) +
1251      1.000 *      1.000 *      3.592) + =      12.152
1252
1253 Total of 2 streams to confluence:
1254 Flow rates before confluence point:
1255      13.708      3.592
1256 Maximum flow rates at confluence using above data:
1257      16.359      12.152
1258 Area of streams before confluence:
1259      8.844      1.801
1260 Results of confluence:
1261 Total flow rate =      16.359 (CFS)
1262 Time of concentration =      15.679 min.
1263 Effective stream area after confluence =      10.645 (Ac.)
1264
1265
1266 *****
1267 Process from Point/Station      408.000 to Point/Station      204.000
1268 **** PIPEFLOW TRAVEL TIME (User specified size) ****
1269
1270 Upstream point/station elevation =      757.290 (Ft.)
1271 Downstream point/station elevation =      757.150 (Ft.)
1272 Pipe length =      27.40 (Ft.) Slope =      0.0051 Manning's N =      0.013
1273 No. of pipes = 1 Required pipe flow =      16.359 (CFS)
1274 Given pipe size =      24.00 (In.)
1275 NOTE: Normal flow is pressure flow in user selected pipe size.
1276 The approximate hydraulic grade line above the pipe invert is
1277      0.635 (Ft.) at the headworks or inlet of the pipe(s)
1278 Pipe friction loss =      0.143 (Ft.)
1279 Minor friction loss =      0.632 (Ft.) K-factor =      1.50
1280 Pipe flow velocity =      5.21 (Ft/s)
1281 Travel time through pipe =      0.09 min.
1282 Time of concentration (TC) =      15.77 min.
1283
1284
1285 *****
1286 Process from Point/Station      204.000 to Point/Station      204.000
1287 **** CONFLUENCE OF MAIN STREAMS ****
1288
1289 The following data inside Main Stream is listed:
1290 In Main Stream number: 2
1291 Stream flow area =      10.645 (Ac.)
1292 Runoff from this stream =      16.359 (CFS)
1293 Time of concentration =      15.77 min.
1294 Rainfall intensity =      3.768 (In/Hr)
1295 Summary of stream data:
1296
1297 Stream Flow rate TC Rainfall Intensity
1298 No. (CFS) (min) (In/Hr)
1299
1300
1301 1      10.825      18.09      3.449
1302 2      16.359      15.77      3.768
1303 Qmax(1) =
1304      1.000 *      1.000 *      10.825) +
1305      0.915 *      1.000 *      16.359) + =      25.798
1306 Qmax(2) =
1307      1.000 *      0.872 *      10.825) +
1308      1.000 *      1.000 *      16.359) + =      25.795
1309
1310 Total of 2 main streams to confluence:
1311 Flow rates before confluence point:

```

```
1312         10.825      16.359
1313 Maximum flow rates at confluence using above data:
1314         25.798      25.795
1315 Area of streams before confluence:
1316         9.433      10.645
1317
1318
1319 Results of confluence:
1320 Total flow rate =      25.798 (CFS)
1321 Time of concentration =    18.087 min.
1322 Effective stream area after confluence =    20.078 (Ac.)
1323 End of computations, total study area =    20.078 (Ac.)
1324
1325
1326
```



```

1
2 San Diego County Rational Hydrology Program
3
4 CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
5
6 Rational method hydrology program based on
7 San Diego County Flood Control Division 2003 hydrology manual
8 Rational Hydrology Study Date: 12/02/24
9 -----
10 24021 CONWAY DRIVE
11 POST-DEVELOPMENT
12 Q50 YR
13 POC-2
14 -----
15 ***** Hydrology Study Control Information *****
16 -----
17
18
19
20 Program License Serial Number 6332
21 -----
22
23 Rational hydrology study storm event year is 50.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 3.000
28 24 hour precipitation(inches) = 6.500
29 P6/P24 = 46.2%
30 San Diego hydrology manual 'C' values used
31
32
33 +-----+
34 Process from Point/Station 501.000 to Point/Station 502.000
35 **** INITIAL AREA EVALUATION ****
36
37 -----
38 Decimal fraction soil group A = 0.000
39 Decimal fraction soil group B = 0.000
40 Decimal fraction soil group C = 1.000
41 Decimal fraction soil group D = 0.000
42 [LOW DENSITY RESIDENTIAL ]
43 (2.9 DU/A or Less )
44 Impervious value, Ai = 0.250
45 Sub-Area C Value = 0.450
46 Initial subarea total flow distance = 70.000 (Ft.)
47 Highest elevation = 784.000 (Ft.)
48 Lowest elevation = 783.300 (Ft.)
49 Elevation difference = 0.700 (Ft.) Slope = 1.000 %
50 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
51 The maximum overland flow distance is 70.00 (Ft)
52 for the top area slope value of 1.00 %, in a development type of
53 2.9 DU/A or Less
54 In Accordance With Figure 3-3
55 Initial Area Time of Concentration = 9.79 minutes
56 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
57 TC = [1.8*(1.1-0.4500)*( 70.000^.5)/( 1.000^(1/3))]= 9.79
58 Rainfall intensity (I) = 5.125 (In/Hr) for a 50.0 year storm
59 Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
60 Subarea runoff = 0.334 (CFS)
61 Total initial stream area = 0.145 (Ac.)
62
63 +-----+
64 Process from Point/Station 502.000 to Point/Station 503.000
65 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
66
67 -----
68 Estimated mean flow rate at midpoint of channel = 0.944 (CFS)
69 Depth of flow = 0.208 (Ft.), Average velocity = 2.365 (Ft/s)
70 ***** Irregular Channel Data *****

```

```

70 -----
71 Information entered for subchannel number 1 :
72 Point number      'X' coordinate      'Y' coordinate
73     1              0.00              0.69
74     2             34.50              0.13
75     3             36.00              0.00
76     4             36.00              0.50
77     5             41.50              0.58
78 Manning's 'N' friction factor =    0.015
79 -----
80 Sub-Channel flow =    0.944 (CFS)
81   '   '   flow top width =    6.277 (Ft.)
82   '   '   velocity=    2.365 (Ft/s)
83   '   '   area =    0.399 (Sq.Ft)
84   '   '   Froude number =    1.653
85
86 Upstream point elevation =    783.300 (Ft.)
87 Downstream point elevation =    777.800 (Ft.)
88 Flow length =    234.100 (Ft.)
89 Travel time =    1.65 min.
90 Time of concentration =    11.44 min.
91 Depth of flow =    0.208 (Ft.)
92 Average velocity =    2.365 (Ft/s)
93 Total irregular channel flow =    0.944 (CFS)
94 Irregular channel normal depth above invert elev. =    0.208 (Ft.)
95 Average velocity of channel(s) =    2.365 (Ft/s)
96 Adding area flow to channel
97 Rainfall intensity (I) =    4.635 (In/Hr) for a    50.0 year storm
98 Decimal fraction soil group A =    0.000
99 Decimal fraction soil group B =    0.000
100 Decimal fraction soil group C =    1.000
101 Decimal fraction soil group D =    0.000
102 [LOW DENSITY RESIDENTIAL                      ]
103 (2.9 DU/A or Less                      )
104 Impervious value, Ai =    0.250
105 Sub-Area C Value =    0.450
106 Rainfall intensity =    4.635 (In/Hr) for a    50.0 year storm
107 Effective runoff coefficient used for total area
108 (Q=KCIA) is C =    0.450    CA =    0.318
109 Subarea runoff =    1.140 (CFS) for    0.562 (Ac.)
110 Total runoff =    1.475 (CFS)    Total area =    0.707 (Ac.)
111 Depth of flow =    0.231 (Ft.), Average velocity =    2.602 (Ft/s)
112
113
114 *****
115 Process from Point/Station    503.000 to Point/Station    504.000
116 **** PIPEFLOW TRAVEL TIME (User specified size) ****
117
118 -----
119 Upstream point/station elevation =    775.240 (Ft.)
120 Downstream point/station elevation =    774.950 (Ft.)
121 Pipe length =    21.30 (Ft.) Slope =    0.0136    Manning's N =    0.013
122 No. of pipes =    1    Required pipe flow =    1.475 (CFS)
123 Given pipe size =    12.00 (In.)
124 Calculated individual pipe flow =    1.475 (CFS)
125 Normal flow depth in pipe =    4.94 (In.)
126 Flow top width inside pipe =    11.81 (In.)
127 Critical Depth =    6.18 (In.)
128 Pipe flow velocity =    4.84 (Ft/s)
129 Travel time through pipe =    0.07 min.
130 Time of concentration (TC) =    11.51 min.
131
132
133 *****
134 Process from Point/Station    504.000 to Point/Station    504.000
135 **** 6 HOUR HYDROGRAPH ****
136
137 -----
138 Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003

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139
140 Time of Concentration = 11.51
141 Basin Area = 0.71 Acres
142 6 Hour Rainfall = 3.000 Inches
143 Runoff Coefficient = 0.450
144 Peak Discharge = 1.47 CFS
145 Time (Min) Discharge (CFS)
146 0 0.000
147 11 0.057
148 22 0.058
149 33 0.061
150 44 0.062
151 55 0.065
152 66 0.066
153 77 0.070
154 88 0.072
155 99 0.077
156 110 0.079
157 121 0.085
158 132 0.088
159 143 0.096
160 154 0.100
161 165 0.111
162 176 0.118
163 187 0.135
164 198 0.146
165 209 0.179
166 220 0.204
167 231 0.299
168 242 0.422
169 253 1.475
170 264 0.240
171 275 0.161
172 286 0.126
173 297 0.105
174 308 0.092
175 319 0.082
176 330 0.074
177 341 0.068
178 352 0.063
179 363 0.059

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6 - 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 1 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	0.4	0.7	1.1	1.5
0+ 0	0.0000	0.00	Q				
0+ 1	0.0000	0.01	Q				
0+ 2	0.0000	0.01	Q				
0+ 3	0.0000	0.02	Q				
0+ 4	0.0001	0.02	Q				
0+ 5	0.0001	0.03	Q				
0+ 6	0.0001	0.03	Q				
0+ 7	0.0002	0.04	Q				
0+ 8	0.0003	0.04	VQ				
0+ 9	0.0003	0.05	VQ				
0+10	0.0004	0.05	VQ				
0+11	0.0005	0.06	VQ				
0+12	0.0005	0.06	VQ				
0+13	0.0006	0.06	VQ				
0+14	0.0007	0.06	VQ				
0+15	0.0008	0.06	VQ				
0+16	0.0009	0.06	VQ				
0+17	0.0009	0.06	VQ				
0+18	0.0010	0.06	VQ				

208	0+19	0.0011	0.06	VQ				
209	0+20	0.0012	0.06	VQ				
210	0+21	0.0013	0.06	VQ				
211	0+22	0.0013	0.06	VQ				
212	0+23	0.0014	0.06	VQ				
213	0+24	0.0015	0.06	VQ				
214	0+25	0.0016	0.06	VQ				
215	0+26	0.0017	0.06	VQ				
216	0+27	0.0017	0.06	VQ				
217	0+28	0.0018	0.06	VQ				
218	0+29	0.0019	0.06	VQ				
219	0+30	0.0020	0.06	Q				
220	0+31	0.0021	0.06	Q				
221	0+32	0.0022	0.06	Q				
222	0+33	0.0022	0.06	Q				
223	0+34	0.0023	0.06	Q				
224	0+35	0.0024	0.06	Q				
225	0+36	0.0025	0.06	Q				
226	0+37	0.0026	0.06	Q				
227	0+38	0.0027	0.06	Q				
228	0+39	0.0027	0.06	Q				
229	0+40	0.0028	0.06	Q				
230	0+41	0.0029	0.06	Q				
231	0+42	0.0030	0.06	Q				
232	0+43	0.0031	0.06	Q				
233	0+44	0.0032	0.06	Q				
234	0+45	0.0033	0.06	Q				
235	0+46	0.0033	0.06	Q				
236	0+47	0.0034	0.06	Q				
237	0+48	0.0035	0.06	Q				
238	0+49	0.0036	0.06	Q				
239	0+50	0.0037	0.06	Q				
240	0+51	0.0038	0.06	Q				
241	0+52	0.0039	0.06	Q				
242	0+53	0.0040	0.06	QV				
243	0+54	0.0040	0.06	QV				
244	0+55	0.0041	0.06	QV				
245	0+56	0.0042	0.06	QV				
246	0+57	0.0043	0.07	QV				
247	0+58	0.0044	0.07	QV				
248	0+59	0.0045	0.07	QV				
249	1+ 0	0.0046	0.07	QV				
250	1+ 1	0.0047	0.07	QV				
251	1+ 2	0.0048	0.07	QV				
252	1+ 3	0.0049	0.07	QV				
253	1+ 4	0.0049	0.07	QV				
254	1+ 5	0.0050	0.07	QV				
255	1+ 6	0.0051	0.07	QV				
256	1+ 7	0.0052	0.07	QV				
257	1+ 8	0.0053	0.07	QV				
258	1+ 9	0.0054	0.07	QV				
259	1+10	0.0055	0.07	QV				
260	1+11	0.0056	0.07	QV				
261	1+12	0.0057	0.07	QV				
262	1+13	0.0058	0.07	QV				
263	1+14	0.0059	0.07	Q V				
264	1+15	0.0060	0.07	Q V				
265	1+16	0.0061	0.07	Q V				
266	1+17	0.0062	0.07	Q V				
267	1+18	0.0063	0.07	Q V				
268	1+19	0.0064	0.07	Q V				
269	1+20	0.0065	0.07	Q V				
270	1+21	0.0066	0.07	Q V				
271	1+22	0.0066	0.07	Q V				
272	1+23	0.0067	0.07	Q V				
273	1+24	0.0068	0.07	Q V				
274	1+25	0.0069	0.07	Q V				
275	1+26	0.0070	0.07	Q V				
276	1+27	0.0071	0.07	Q V				

277	1+28	0.0072	0.07	Q V				
278	1+29	0.0073	0.07	Q V				
279	1+30	0.0074	0.07	Q V				
280	1+31	0.0075	0.07	Q V				
281	1+32	0.0076	0.07	Q V				
282	1+33	0.0077	0.07	QV				
283	1+34	0.0078	0.07	Q V				
284	1+35	0.0080	0.07	Q V				
285	1+36	0.0081	0.08	Q V				
286	1+37	0.0082	0.08	Q V				
287	1+38	0.0083	0.08	Q V				
288	1+39	0.0084	0.08	Q V				
289	1+40	0.0085	0.08	Q V				
290	1+41	0.0086	0.08	Q V				
291	1+42	0.0087	0.08	Q V				
292	1+43	0.0088	0.08	Q V				
293	1+44	0.0089	0.08	Q V				
294	1+45	0.0090	0.08	Q V				
295	1+46	0.0091	0.08	Q V				
296	1+47	0.0092	0.08	Q V				
297	1+48	0.0093	0.08	Q V				
298	1+49	0.0094	0.08	Q V				
299	1+50	0.0096	0.08	Q V				
300	1+51	0.0097	0.08	Q V				
301	1+52	0.0098	0.08	Q V				
302	1+53	0.0099	0.08	Q V				
303	1+54	0.0100	0.08	Q V				
304	1+55	0.0101	0.08	Q V				
305	1+56	0.0102	0.08	Q V				
306	1+57	0.0103	0.08	Q V				
307	1+58	0.0104	0.08	Q V				
308	1+59	0.0106	0.08	Q V				
309	2+ 0	0.0107	0.08	Q V				
310	2+ 1	0.0108	0.08	Q V				
311	2+ 2	0.0109	0.09	Q V				
312	2+ 3	0.0110	0.09	Q V				
313	2+ 4	0.0111	0.09	Q V				
314	2+ 5	0.0113	0.09	Q V				
315	2+ 6	0.0114	0.09	Q V				
316	2+ 7	0.0115	0.09	Q V				
317	2+ 8	0.0116	0.09	Q V				
318	2+ 9	0.0117	0.09	Q V				
319	2+10	0.0119	0.09	Q V				
320	2+11	0.0120	0.09	Q V				
321	2+12	0.0121	0.09	Q V				
322	2+13	0.0122	0.09	Q V				
323	2+14	0.0124	0.09	Q V				
324	2+15	0.0125	0.09	Q V				
325	2+16	0.0126	0.09	Q V				
326	2+17	0.0127	0.09	Q V				
327	2+18	0.0129	0.09	Q V				
328	2+19	0.0130	0.09	Q V				
329	2+20	0.0131	0.09	Q V				
330	2+21	0.0132	0.09	Q V				
331	2+22	0.0134	0.09	Q V				
332	2+23	0.0135	0.10	Q V				
333	2+24	0.0136	0.10	Q V				
334	2+25	0.0138	0.10	Q V				
335	2+26	0.0139	0.10	Q V				
336	2+27	0.0140	0.10	Q V				
337	2+28	0.0142	0.10	Q V				
338	2+29	0.0143	0.10	Q V				
339	2+30	0.0144	0.10	Q V				
340	2+31	0.0146	0.10	Q V				
341	2+32	0.0147	0.10	Q V				
342	2+33	0.0149	0.10	Q V				
343	2+34	0.0150	0.10	Q V				
344	2+35	0.0151	0.10	Q V				
345	2+36	0.0153	0.10	Q V				

346	2+37	0.0154	0.10	Q	V				
347	2+38	0.0156	0.10	Q	V				
348	2+39	0.0157	0.11	Q	V				
349	2+40	0.0158	0.11	Q	V				
350	2+41	0.0160	0.11	Q	V				
351	2+42	0.0161	0.11	Q	V				
352	2+43	0.0163	0.11	Q	V				
353	2+44	0.0164	0.11	Q	V				
354	2+45	0.0166	0.11	Q	V				
355	2+46	0.0168	0.11	Q	V				
356	2+47	0.0169	0.11	Q	V				
357	2+48	0.0171	0.11	Q	V				
358	2+49	0.0172	0.11	Q	V				
359	2+50	0.0174	0.11	Q	V				
360	2+51	0.0175	0.11	Q	V				
361	2+52	0.0177	0.12	Q	V				
362	2+53	0.0179	0.12	Q	V				
363	2+54	0.0180	0.12	Q	V				
364	2+55	0.0182	0.12	Q	V				
365	2+56	0.0183	0.12	Q	V				
366	2+57	0.0185	0.12	Q	V				
367	2+58	0.0187	0.12	Q	V				
368	2+59	0.0188	0.12	Q	V				
369	3+ 0	0.0190	0.12	Q	V				
370	3+ 1	0.0192	0.13	Q	V				
371	3+ 2	0.0194	0.13	Q	V				
372	3+ 3	0.0195	0.13	Q	V				
373	3+ 4	0.0197	0.13	Q	V				
374	3+ 5	0.0199	0.13	Q	V				
375	3+ 6	0.0201	0.13	Q	V				
376	3+ 7	0.0203	0.14	Q	V				
377	3+ 8	0.0205	0.14	Q	V				
378	3+ 9	0.0206	0.14	Q	V				
379	3+10	0.0208	0.14	Q	V				
380	3+11	0.0210	0.14	Q	V				
381	3+12	0.0212	0.14	Q	V				
382	3+13	0.0214	0.14	Q	V				
383	3+14	0.0216	0.14	Q	V				
384	3+15	0.0218	0.14	Q	V				
385	3+16	0.0220	0.14	Q	V				
386	3+17	0.0222	0.15	Q	V				
387	3+18	0.0224	0.15	Q	V				
388	3+19	0.0226	0.15	Q	V				
389	3+20	0.0228	0.15	Q	V				
390	3+21	0.0230	0.16	Q	V				
391	3+22	0.0233	0.16	Q	V				
392	3+23	0.0235	0.16	Q	V				
393	3+24	0.0237	0.16	Q	V				
394	3+25	0.0239	0.17	Q	V				
395	3+26	0.0242	0.17	Q	V				
396	3+27	0.0244	0.17	Q	V				
397	3+28	0.0247	0.18	Q	V				
398	3+29	0.0249	0.18	Q	V				
399	3+30	0.0251	0.18	Q	V				
400	3+31	0.0254	0.18	Q	V				
401	3+32	0.0257	0.19	Q	V				
402	3+33	0.0259	0.19	Q	V				
403	3+34	0.0262	0.19	Q	V				
404	3+35	0.0264	0.19	Q	V				
405	3+36	0.0267	0.19	Q	V				
406	3+37	0.0270	0.20	Q	V				
407	3+38	0.0273	0.20	Q	V				
408	3+39	0.0275	0.20	Q	V				
409	3+40	0.0278	0.20	Q	V				
410	3+41	0.0281	0.21	Q	V				
411	3+42	0.0284	0.22	Q	V				
412	3+43	0.0287	0.23	Q	V				
413	3+44	0.0291	0.24	Q	V				
414	3+45	0.0294	0.25	Q	V				

415	3+46	0.0298	0.26		Q		V			
416	3+47	0.0301	0.26		Q		V			
417	3+48	0.0305	0.27		Q		V			
418	3+49	0.0309	0.28		Q		V			
419	3+50	0.0313	0.29		Q		V			
420	3+51	0.0317	0.30		Q		V			
421	3+52	0.0321	0.31		Q		V			
422	3+53	0.0326	0.32		Q		V			
423	3+54	0.0330	0.33		Q		V			
424	3+55	0.0335	0.34		Q		V			
425	3+56	0.0340	0.36		Q		V			
426	3+57	0.0345	0.37		Q		V			
427	3+58	0.0350	0.38		Q		V			
428	3+59	0.0355	0.39		Q		V			
429	4+ 0	0.0361	0.40		Q		V			
430	4+ 1	0.0367	0.41		Q		V			
431	4+ 2	0.0372	0.42		Q		V			
432	4+ 3	0.0380	0.52			Q	V			
433	4+ 4	0.0388	0.61			Q	V			
434	4+ 5	0.0398	0.71				V			
435	4+ 6	0.0409	0.80				V			
436	4+ 7	0.0421	0.90				V	Q		
437	4+ 8	0.0435	1.00				V		Q	
438	4+ 9	0.0450	1.09				V		Q	
439	4+10	0.0466	1.19				V			Q
440	4+11	0.0484	1.28				V			Q
441	4+12	0.0503	1.38				V			Q
442	4+13	0.0523	1.47				V			Q
443	4+14	0.0542	1.36				V			
444	4+15	0.0559	1.25				V			
445	4+16	0.0575	1.14				V			
446	4+17	0.0589	1.03				V			
447	4+18	0.0602	0.91				V			
448	4+19	0.0613	0.80				V			
449	4+20	0.0622	0.69				V			
450	4+21	0.0630	0.58				V			
451	4+22	0.0637	0.46				V			
452	4+23	0.0641	0.35		Q		V			
453	4+24	0.0645	0.24		Q		V			
454	4+25	0.0648	0.23		Q		V			
455	4+26	0.0651	0.23		Q		V			
456	4+27	0.0654	0.22		Q		V			
457	4+28	0.0657	0.21		Q		V			
458	4+29	0.0660	0.20		Q		V			
459	4+30	0.0663	0.20		Q		V			
460	4+31	0.0665	0.19		Q		V			
461	4+32	0.0668	0.18		Q		V			
462	4+33	0.0670	0.18		Q		V			
463	4+34	0.0672	0.17		Q		V			
464	4+35	0.0675	0.16		Q		V			
465	4+36	0.0677	0.16		Q		V			
466	4+37	0.0679	0.15		Q		V			
467	4+38	0.0681	0.15		Q		V			
468	4+39	0.0683	0.15		Q		V			
469	4+40	0.0685	0.14		Q		V			
470	4+41	0.0687	0.14	Q					V	
471	4+42	0.0689	0.14	Q					V	
472	4+43	0.0691	0.14	Q					V	
473	4+44	0.0693	0.13	Q					V	
474	4+45	0.0694	0.13	Q					V	
475	4+46	0.0696	0.13	Q					V	
476	4+47	0.0698	0.12	Q					V	
477	4+48	0.0699	0.12	Q					V	
478	4+49	0.0701	0.12	Q					V	
479	4+50	0.0703	0.12	Q					V	
480	4+51	0.0704	0.12	Q					V	
481	4+52	0.0706	0.11	Q					V	
482	4+53	0.0707	0.11	Q					V	
483	4+54	0.0709	0.11	Q					V	

484	4+55	0.0710	0.11	Q				V
485	4+56	0.0712	0.11	Q				V
486	4+57	0.0713	0.11	Q				V
487	4+58	0.0715	0.10	Q				V
488	4+59	0.0716	0.10	Q				V
489	5+ 0	0.0718	0.10	Q				V
490	5+ 1	0.0719	0.10	Q				V
491	5+ 2	0.0720	0.10	Q				V
492	5+ 3	0.0722	0.10	Q				V
493	5+ 4	0.0723	0.10	Q				V
494	5+ 5	0.0724	0.10	Q				V
495	5+ 6	0.0726	0.09	Q				V
496	5+ 7	0.0727	0.09	Q				V
497	5+ 8	0.0728	0.09	Q				V
498	5+ 9	0.0729	0.09	Q				V
499	5+10	0.0731	0.09	Q				V
500	5+11	0.0732	0.09	Q				V
501	5+12	0.0733	0.09	Q				V
502	5+13	0.0734	0.09	Q				V
503	5+14	0.0736	0.09	Q				V
504	5+15	0.0737	0.09	Q				V
505	5+16	0.0738	0.08	Q				V
506	5+17	0.0739	0.08	Q				V
507	5+18	0.0740	0.08	Q				V
508	5+19	0.0741	0.08	Q				V
509	5+20	0.0742	0.08	Q				V
510	5+21	0.0744	0.08	Q				V
511	5+22	0.0745	0.08	Q				V
512	5+23	0.0746	0.08	Q				V
513	5+24	0.0747	0.08	Q				V
514	5+25	0.0748	0.08	Q				V
515	5+26	0.0749	0.08	Q				V
516	5+27	0.0750	0.08	Q				V
517	5+28	0.0751	0.08	Q				V
518	5+29	0.0752	0.07	Q				V
519	5+30	0.0753	0.07	Q				V
520	5+31	0.0754	0.07	Q				V
521	5+32	0.0755	0.07	Q				V
522	5+33	0.0756	0.07	Q				V
523	5+34	0.0757	0.07	Q				V
524	5+35	0.0758	0.07	Q				V
525	5+36	0.0759	0.07	Q				V
526	5+37	0.0760	0.07	Q				V
527	5+38	0.0761	0.07	Q				V
528	5+39	0.0762	0.07	Q				V
529	5+40	0.0763	0.07	Q				V
530	5+41	0.0764	0.07	Q				V
531	5+42	0.0765	0.07	Q				V
532	5+43	0.0766	0.07	Q				V
533	5+44	0.0767	0.07	Q				V
534	5+45	0.0768	0.07	Q				V
535	5+46	0.0768	0.07	Q				V
536	5+47	0.0769	0.07	Q				V
537	5+48	0.0770	0.07	Q				V
538	5+49	0.0771	0.06	Q				V
539	5+50	0.0772	0.06	Q				V
540	5+51	0.0773	0.06	Q				V
541	5+52	0.0774	0.06	Q				V
542	5+53	0.0775	0.06	Q				V
543	5+54	0.0775	0.06	Q				V
544	5+55	0.0776	0.06	Q				V
545	5+56	0.0777	0.06	Q				V
546	5+57	0.0778	0.06	Q				V
547	5+58	0.0779	0.06	Q				V
548	5+59	0.0780	0.06	Q				V
549	6+ 0	0.0781	0.06	Q				V
550	6+ 1	0.0781	0.06	Q				V
551	6+ 2	0.0782	0.06	Q				V
552	6+ 3	0.0783	0.06	Q				V


```

553 -----
554
555
556
557
558
559
560 *****
561 Process from Point/Station      504.000 to Point/Station      505.000
562 **** PIPEFLOW TRAVEL TIME (User specified size) ****
563
564 Upstream point/station elevation =  772.700 (Ft.)
565 Downstream point/station elevation =  772.600 (Ft.)
566 Pipe length =  12.00 (Ft.) Slope =  0.0083 Manning's N = 0.013
567 No. of pipes = 1 Required pipe flow =  1.475 (CFS)
568 Given pipe size =  12.00 (In.)
569 Calculated individual pipe flow =  1.475 (CFS)
570 Normal flow depth in pipe =  5.67 (In.)
571 Flow top width inside pipe =  11.98 (In.)
572 Critical Depth =  6.18 (In.)
573 Pipe flow velocity =  4.04 (Ft/s)
574 Travel time through pipe =  0.05 min.
575 Time of concentration (TC) =  11.56 min.
576
577
578 *****
579 Process from Point/Station      505.000 to Point/Station      506.000
580 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
581
582 Depth of flow =  0.352 (Ft.), Average velocity =  3.426 (Ft/s)
583 !!Warning: Water is above left or right bank elevations
584 ***** Irregular Channel Data *****
585 -----
586 Information entered for subchannel number 1 :
587 Point number      'X' coordinate      'Y' coordinate
588      1              0.00              0.13
589      2              1.50              0.00
590      3              1.50              0.50
591      4              2.00              0.51
592 Manning's 'N' friction factor =  0.015
593 -----
594 Sub-Channel flow =  1.475 (CFS)
595      '      '      flow top width =  1.500 (Ft.)
596      '      '      velocity=  3.426 (Ft/s)
597      '      '      area =  0.430 (Sq.Ft)
598      '      '      Froude number =  1.127
599
600 Upstream point elevation =  772.600 (Ft.)
601 Downstream point elevation =  772.000 (Ft.)
602 Flow length =  71.400 (Ft.)
603 Travel time =  0.35 min.
604 Time of concentration =  11.91 min.
605 Depth of flow =  0.352 (Ft.)
606 Average velocity =  3.426 (Ft/s)
607 Total irregular channel flow =  1.475 (CFS)
608 Irregular channel normal depth above invert elev. =  0.352 (Ft.)
609 Average velocity of channel(s) =  3.426 (Ft/s)
610 !!Warning: Water is above left or right bank elevations
611
612
613 *****
614 Process from Point/Station      506.000 to Point/Station      506.000
615 **** SUBAREA FLOW ADDITION ****
616
617 Rainfall intensity (I) =  4.516 (In/Hr) for a  50.0 year storm
618 Decimal fraction soil group A =  0.000
619 Decimal fraction soil group B =  0.000
620 Decimal fraction soil group C =  1.000
621 Decimal fraction soil group D =  0.000

```

```
622 [LOW DENSITY RESIDENTIAL ]
623 (2.9 DU/A or Less )
624 Impervious value, Ai = 0.250
625 Sub-Area C Value = 0.450
626 Time of concentration = 11.91 min.
627 Rainfall intensity = 4.516(In/Hr) for a 50.0 year storm
628 Effective runoff coefficient used for total area
629 (Q=KCIA) is C = 0.450 CA = 0.463
630 Subarea runoff = 0.617(CFS) for 0.322(Ac.)
631 Total runoff = 2.091(CFS) Total area = 1.029(Ac.)
632 End of computations, total study area = 1.029 (Ac.)
633
634
635
```

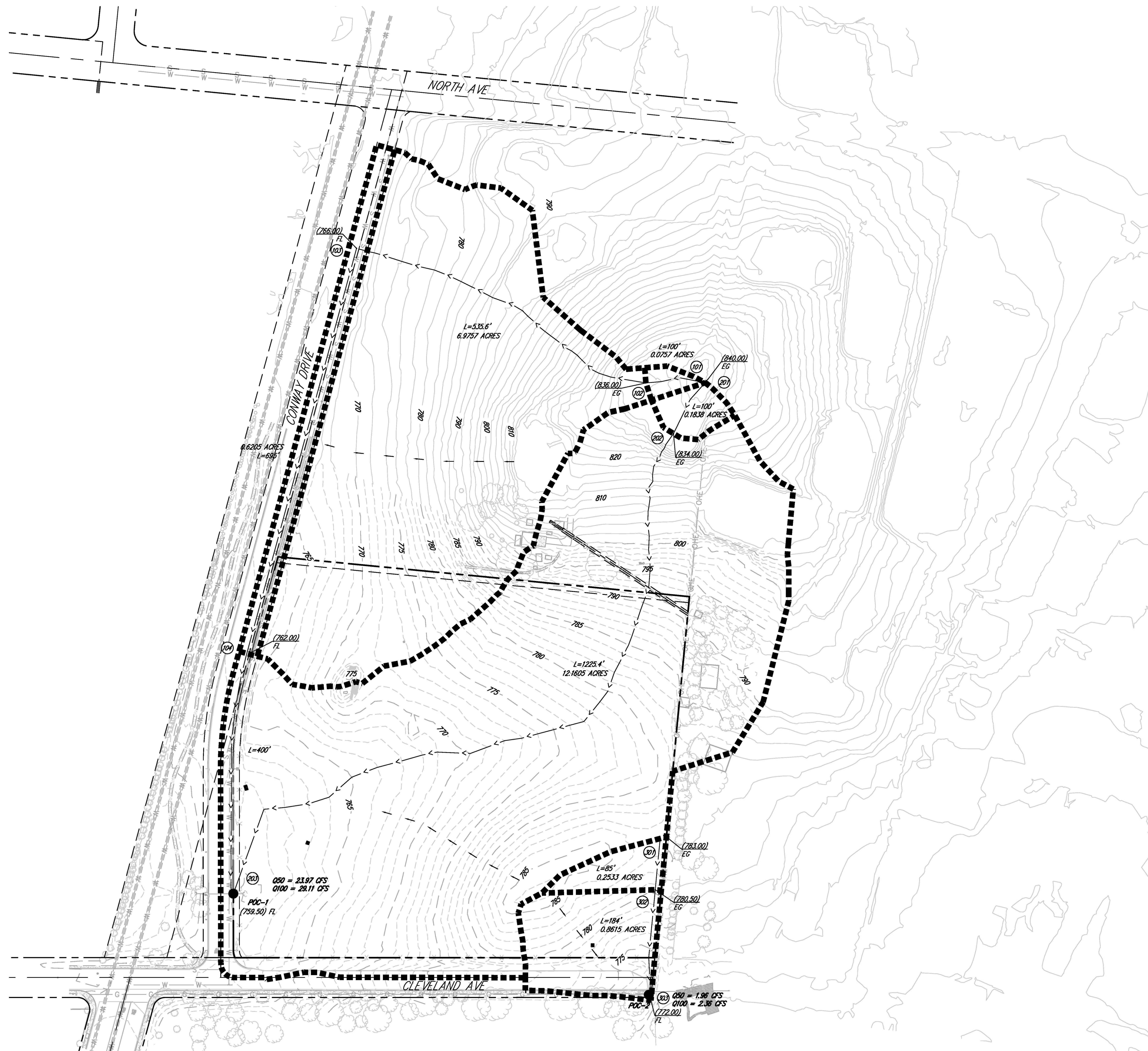
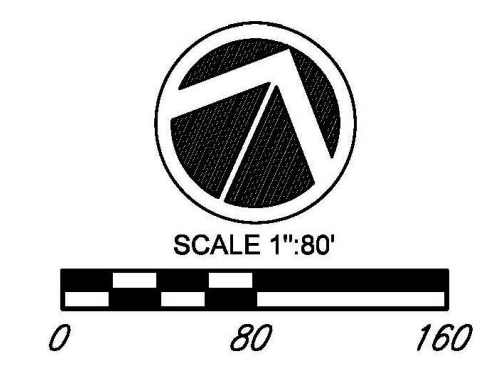
ATTACHMENT F

100 Year Pre Development Calculations and Map

Steps Taken To Analyze This Condition

The Rational Method as outlined in section 3 of the June 2003 San Diego County Hydrology Manual is followed here. The software that we are using is the “*Rational Hydrology Method, San Diego County (2003 Manual)*” module of the CIVILCADD/CIVIL DESIGN Engineering software version 7.9.

Please see the subsequent pages for the calculations. These calculations are for the Q100. The results are outlined/summarized in Section 8.



- LEGEND**
- ⑩# NODE #
 - POC (POINT OF CONFLUENCE)
 - DIRECTION OF FLOW
 - - - BASIN BOUNDARY
 - ... FLOW PATH

CONWAY DRIVE
HYDROLOGY PRE DEVELOPMENT EXHIBIT
ONSITE CONDITION


```

1
2 San Diego County Rational Hydrology Program
3
4 CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
5
6 Rational method hydrology program based on
7 San Diego County Flood Control Division 2003 hydrology manual
8 Rational Hydrology Study Date: 11/26/24
9 -----
10 24021 CONWAY DRIVE
11 PRE-DEVELOPMENT
12 Q100 YEAR
13 POC-1
14 -----
15 ***** Hydrology Study Control Information *****
16 -----
17
18
19
20 Program License Serial Number 6332
21 -----
22
23 Rational hydrology study storm event year is 100.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 3.500
28 24 hour precipitation(inches) = 8.000
29 P6/P24 = 43.8%
30 Adjusted 6 hour precipitation (inches) = 3.600
31 Adjusted P6/P24 = 45.0%
32 San Diego hydrology manual 'C' values used
33
34
35 *****
36 Process from Point/Station 101.000 to Point/Station 102.000
37 **** INITIAL AREA EVALUATION ****
38
39 -----
40 Decimal fraction soil group A = 0.000
41 Decimal fraction soil group B = 0.000
42 Decimal fraction soil group C = 1.000
43 Decimal fraction soil group D = 0.000
44 [LOW DENSITY RESIDENTIAL ]
45 (1.0 DU/A or Less )
46 Impervious value, Ai = 0.100
47 Sub-Area C Value = 0.360
48 Initial subarea total flow distance = 100.000 (Ft.)
49 Highest elevation = 840.000 (Ft.)
50 Lowest elevation = 836.000 (Ft.)
51 Elevation difference = 4.000 (Ft.) Slope = 4.000 %
52 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
53 The maximum overland flow distance is 100.00 (Ft)
54 for the top area slope value of 4.00 %, in a development type of
55 1.0 DU/A or Less
56 In Accordance With Figure 3-3
57 Initial Area Time of Concentration = 8.39 minutes
58 TC = [1.8*(1.1-C)*distance (Ft.)^.5]/(% slope^(1/3))
59 TC = [1.8*(1.1-0.3600)*( 100.000^.5)/( 4.000^(1/3))]= 8.39
60 Rainfall intensity (I) = 6.792 (In/Hr) for a 100.0 year storm
61 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
62 Subarea runoff = 0.186 (CFS)
63 Total initial stream area = 0.076 (Ac.)
64
65 *****
66 Process from Point/Station 102.000 to Point/Station 103.000
67 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
68
69 -----
70 Estimated mean flow rate at midpoint of channel = 6.518 (CFS)

```

```

70 Depth of flow = 0.244(Ft.), Average velocity = 4.397(Ft/s)
71 ***** Irregular Channel Data *****
72 -----
73 Information entered for subchannel number 1 :
74 Point number      'X' coordinate      'Y' coordinate
75      1              0.00              2.00
76      2              50.00              0.00
77      3              100.00             2.00
78 Manning's 'N' friction factor = 0.030
79 -----
80 Sub-Channel flow = 6.518(CFS)
81      '      '      flow top width = 12.176(Ft.)
82      '      '      velocity= 4.397(Ft/s)
83      '      '      area = 1.482(Sq.Ft)
84      '      '      Froude number = 2.220
85
86 Upstream point elevation = 836.000(Ft.)
87 Downstream point elevation = 766.000(Ft.)
88 Flow length = 535.600(Ft.)
89 Travel time = 2.03 min.
90 Time of concentration = 10.42 min.
91 Depth of flow = 0.244(Ft.)
92 Average velocity = 4.397(Ft/s)
93 Total irregular channel flow = 6.518(CFS)
94 Irregular channel normal depth above invert elev. = 0.244(Ft.)
95 Average velocity of channel(s) = 4.397(Ft/s)
96 Adding area flow to channel
97 Rainfall intensity (I) = 5.906(In/Hr) for a 100.0 year storm
98 Decimal fraction soil group A = 0.600
99 Decimal fraction soil group B = 0.000
100 Decimal fraction soil group C = 0.400
101 Decimal fraction soil group D = 0.000
102 [LOW DENSITY RESIDENTIAL ]
103 (1.0 DU/A or Less )
104 Impervious value, Ai = 0.100
105 Sub-Area C Value = 0.306
106 Rainfall intensity = 5.906(In/Hr) for a 100.0 year storm
107 Effective runoff coefficient used for total area
108 (Q=KCIA) is C = 0.307 CA = 2.162
109 Subarea runoff = 12.584(CFS) for 6.976(Ac.)
110 Total runoff = 12.769(CFS) Total area = 7.052(Ac.)
111 Depth of flow = 0.313(Ft.), Average velocity = 5.202(Ft/s)
112
113
114 *****
115 Process from Point/Station 103.000 to Point/Station 104.000
116 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
117
118 !!Warning: Water is above left or right bank elevations
119 !!Warning: Water is above left or right bank elevations
120 !!Warning: Water is above left or right bank elevations
121 !!Warning: Water is above left or right bank elevations
122 !!Warning: Water is above left or right bank elevations
123 Estimated mean flow rate at midpoint of channel = 12.805(CFS)
124 Depth of flow = 0.532(Ft.), Average velocity = 2.694(Ft/s)
125 !!Warning: Water is above left or right bank elevations
126 ***** Irregular Channel Data *****
127 -----
128 Information entered for subchannel number 1 :
129 Point number      'X' coordinate      'Y' coordinate
130      1              0.00              0.52
131      2              19.50              0.13
132      3              21.00              0.00
133      4              21.00              0.50
134      5              31.00              1.00
135 Manning's 'N' friction factor = 0.015
136 -----
137 Sub-Channel flow = 12.805(CFS)
138      '      '      flow top width = 21.646(Ft.)

```

```

139      '      '      velocity=      2.694 (Ft/s)
140      '      '      area =      4.754 (Sq.Ft)
141      '      '      Froude number =      1.013
142
143      Upstream point elevation =      766.000 (Ft.)
144      Downstream point elevation =      762.000 (Ft.)
145      Flow length =      695.000 (Ft.)
146      Travel time =      4.30 min.
147      Time of concentration =      14.72 min.
148      Depth of flow =      0.532 (Ft.)
149      Average velocity =      2.694 (Ft/s)
150      Total irregular channel flow =      12.805 (CFS)
151      Irregular channel normal depth above invert elev. =      0.532 (Ft.)
152      Average velocity of channel(s) =      2.694 (Ft/s)
153      !!Warning: Water is above left or right bank elevations
154      Adding area flow to channel
155      Rainfall intensity (I) =      4.727 (In/Hr) for a      100.0 year storm
156      Decimal fraction soil group A =      0.750
157      Decimal fraction soil group B =      0.000
158      Decimal fraction soil group C =      0.250
159      Decimal fraction soil group D =      0.000
160      [LOW DENSITY RESIDENTIAL      ]
161      (1.0 DU/A or Less      )
162      Impervious value, Ai =      0.100
163      Sub-Area C Value =      0.292
164      The area added to the existing stream causes a
165      a lower flow rate of Q =      11.077 (CFS)
166      therefore the upstream flow rate of Q =      12.769 (CFS) is being used
167      Rainfall intensity =      4.727 (In/Hr) for a      100.0 year storm
168      Effective runoff coefficient used for total area
169      (Q=KCIA) is C =      0.305      CA =      2.344
170      Subarea runoff =      0.000 (CFS) for      0.621 (Ac.)
171      Total runoff =      12.769 (CFS)      Total area =      7.673 (Ac.)
172      Depth of flow =      0.532 (Ft.), Average velocity =      2.691 (Ft/s)
173      !!Warning: Water is above left or right bank elevations
174
175
176      +*****+
177      Process from Point/Station      104.000 to Point/Station      203.000
178      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
179
180      -----
181      Depth of flow =      0.526 (Ft.), Average velocity =      2.764 (Ft/s)
182      !!Warning: Water is above left or right bank elevations
183      ***** Irregular Channel Data *****
184      -----
185      Information entered for subchannel number 1 :
186      Point number      'X' coordinate      'Y' coordinate
187      1      0.00      0.52
188      2      19.50      0.13
189      3      21.00      0.00
190      4      21.00      0.50
191      5      31.00      1.00
192      Manning's 'N' friction factor =      0.015
193      -----
194      Sub-Channel flow =      12.770 (CFS)
195      '      '      flow top width =      21.522 (Ft.)
196      '      '      velocity=      2.764 (Ft/s)
197      '      '      area =      4.620 (Sq.Ft)
198      '      '      Froude number =      1.051
199
200      Upstream point elevation =      762.000 (Ft.)
201      Downstream point elevation =      759.500 (Ft.)
202      Flow length =      400.000 (Ft.)
203      Travel time =      2.41 min.
204      Time of concentration =      17.13 min.
205      Depth of flow =      0.526 (Ft.)
206      Average velocity =      2.764 (Ft/s)
207      Total irregular channel flow =      12.769 (CFS)
208      Irregular channel normal depth above invert elev. =      0.526 (Ft.)

```

```

208 Average velocity of channel(s) = 2.764 (Ft/s)
209 !!Warning: Water is above left or right bank elevations
210
211
212 ++++++
213 Process from Point/Station 203.000 to Point/Station 203.000
214 **** CONFLUENCE OF MINOR STREAMS ****
215
216 -----
216 Along Main Stream number: 1 in normal stream number 1
217 Stream flow area = 7.673 (Ac.)
218 Runoff from this stream = 12.769 (CFS)
219 Time of concentration = 17.13 min.
220 Rainfall intensity = 4.286 (In/Hr)
221
222
223 ++++++
224 Process from Point/Station 201.000 to Point/Station 202.000
225 **** INITIAL AREA EVALUATION ****
226
227 -----
227 Decimal fraction soil group A = 0.000
228 Decimal fraction soil group B = 0.000
229 Decimal fraction soil group C = 1.000
230 Decimal fraction soil group D = 0.000
231 [LOW DENSITY RESIDENTIAL ]
232 (1.0 DU/A or Less )
233 Impervious value, Ai = 0.100
234 Sub-Area C Value = 0.360
235 Initial subarea total flow distance = 100.000 (Ft.)
236 Highest elevation = 840.000 (Ft.)
237 Lowest elevation = 834.000 (Ft.)
238 Elevation difference = 6.000 (Ft.) Slope = 6.000 %
239 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
240 The maximum overland flow distance is 100.00 (Ft)
241 for the top area slope value of 6.00 %, in a development type of
242 1.0 DU/A or Less
243 In Accordance With Figure 3-3
244 Initial Area Time of Concentration = 7.33 minutes
245 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
246 TC = [1.8*(1.1-0.3600)*( 100.000^.5)/( 6.000^(1/3))]= 7.33
247 Rainfall intensity (I) = 7.411 (In/Hr) for a 100.0 year storm
248 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
249 Subarea runoff = 0.491 (CFS)
250 Total initial stream area = 0.184 (Ac.)
251
252
253 ++++++
254 Process from Point/Station 202.000 to Point/Station 203.000
255 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
256
257 -----
257 Estimated mean flow rate at midpoint of channel = 10.039 (CFS)
258 Depth of flow = 0.331 (Ft.), Average velocity = 3.676 (Ft/s)
259 ***** Irregular Channel Data *****
260 -----
261 Information entered for subchannel number 1 :
262 Point number 'X' coordinate 'Y' coordinate
263 1 0.00 2.00
264 2 50.00 0.00
265 3 100.00 2.00
266 Manning's 'N' friction factor = 0.030
267 -----
268 Sub-Channel flow = 10.039 (CFS)
269 ' ' flow top width = 16.526 (Ft.)
270 ' ' velocity= 3.676 (Ft/s)
271 ' ' area = 2.731 (Sq.Ft)
272 ' ' Froude number = 1.594
273
274 Upstream point elevation = 834.000 (Ft.)
275 Downstream point elevation = 759.500 (Ft.)
276 Flow length = 1225.400 (Ft.)

```



```

277 Travel time = 5.56 min.
278 Time of concentration = 12.89 min.
279 Depth of flow = 0.331(Ft.)
280 Average velocity = 3.676(Ft/s)
281 Total irregular channel flow = 10.039(CFS)
282 Irregular channel normal depth above invert elev. = 0.331(Ft.)
283 Average velocity of channel(s) = 3.676(Ft/s)
284 Adding area flow to channel
285 Rainfall intensity (I) = 5.150(In/Hr) for a 100.0 year storm
286 Decimal fraction soil group A = 0.600
287 Decimal fraction soil group B = 0.000
288 Decimal fraction soil group C = 0.400
289 Decimal fraction soil group D = 0.000
290 [LOW DENSITY RESIDENTIAL ]
291 (1.0 DU/A or Less )
292 Impervious value, Ai = 0.100
293 Sub-Area C Value = 0.306
294 Rainfall intensity = 5.150(In/Hr) for a 100.0 year storm
295 Effective runoff coefficient used for total area
296 (Q=KCIA) is C = 0.307 CA = 3.788
297 Subarea runoff = 19.016(CFS) for 12.161(Ac.)
298 Total runoff = 19.507(CFS) Total area = 12.345(Ac.)
299 Depth of flow = 0.424(Ft.), Average velocity = 4.340(Ft/s)
300
301
302 ++++++
303 Process from Point/Station 203.000 to Point/Station 203.000
304 **** CONFLUENCE OF MINOR STREAMS ****
305
306 Along Main Stream number: 1 in normal stream number 2
307 Stream flow area = 12.345(Ac.)
308 Runoff from this stream = 19.507(CFS)
309 Time of concentration = 12.89 min.
310 Rainfall intensity = 5.150(In/Hr)
311 Summary of stream data:
312
313 Stream Flow rate TC Rainfall Intensity
314 No. (CFS) (min) (In/Hr)
315
316
317 1 12.769 17.13 4.286
318 2 19.507 12.89 5.150
319 Qmax(1) =
320 1.000 * 1.000 * 12.769) +
321 0.832 * 1.000 * 19.507) + = 29.002
322 Qmax(2) =
323 1.000 * 0.752 * 12.769) +
324 1.000 * 1.000 * 19.507) + = 29.111
325
326 Total of 2 streams to confluence:
327 Flow rates before confluence point:
328 12.769 19.507
329 Maximum flow rates at confluence using above data:
330 29.002 29.111
331 Area of streams before confluence:
332 7.673 12.345
333 Results of confluence:
334 Total flow rate = 29.111(CFS)
335 Time of concentration = 12.886 min.
336 Effective stream area after confluence = 20.018(Ac.)
337 End of computations, total study area = 20.018 (Ac.)
338
339
340

```

```

1
2 San Diego County Rational Hydrology Program
3
4 CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
5
6 Rational method hydrology program based on
7 San Diego County Flood Control Division 2003 hydrology manual
8 Rational Hydrology Study Date: 11/26/24
9 -----
10 24021 CONWAY DRIVE
11 PRE-DEVELOPMENT
12 Q100 YEAR
13 POC-2
14 -----
15 ***** Hydrology Study Control Information *****
16 -----
17
18
19
20 Program License Serial Number 6332
21
22 -----
23 Rational hydrology study storm event year is 100.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 3.500
28 24 hour precipitation(inches) = 8.000
29 P6/P24 = 43.8%
30 Adjusted 6 hour precipitation (inches) = 3.600
31 Adjusted P6/P24 = 45.0%
32 San Diego hydrology manual 'C' values used
33
34
35 *****
36 Process from Point/Station 301.000 to Point/Station 302.000
37 **** INITIAL AREA EVALUATION ****
38
39 -----
40 Decimal fraction soil group A = 0.000
41 Decimal fraction soil group B = 0.000
42 Decimal fraction soil group C = 1.000
43 Decimal fraction soil group D = 0.000
44 [LOW DENSITY RESIDENTIAL ]
45 (1.0 DU/A or Less )
46 Impervious value, Ai = 0.100
47 Sub-Area C Value = 0.360
48 Initial subarea total flow distance = 85.000 (Ft.)
49 Highest elevation = 783.000 (Ft.)
50 Lowest elevation = 780.500 (Ft.)
51 Elevation difference = 2.500 (Ft.) Slope = 2.941 %
52 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
53 The maximum overland flow distance is 100.00 (Ft)
54 for the top area slope value of 2.94 %, in a development type of
55 1.0 DU/A or Less
56 In Accordance With Figure 3-3
57 Initial Area Time of Concentration = 9.30 minutes
58 TC = [1.8*(1.1-C)*distance (Ft.)^.5]/(% slope^(1/3))
59 TC = [1.8*(1.1-0.3600)*( 100.000^.5)/( 2.941^(1/3))]= 9.30
60 Rainfall intensity (I) = 6.358 (In/Hr) for a 100.0 year storm
61 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
62 Subarea runoff = 0.579 (CFS)
63 Total initial stream area = 0.253 (Ac.)
64
65 *****
66 Process from Point/Station 302.000 to Point/Station 303.000
67 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
68
69 -----
70 Estimated mean flow rate at midpoint of channel = 1.518 (CFS)

```

```

70 Depth of flow = 0.242(Ft.), Average velocity = 2.595(Ft/s)
71 ***** Irregular Channel Data *****
72 -----
73 Information entered for subchannel number 1 :
74 Point number      'X' coordinate      'Y' coordinate
75      1              0.00              1.00
76      2             10.00              0.00
77      3             20.00              1.00
78 Manning's 'N' friction factor = 0.030
79 -----
80 Sub-Channel flow = 1.518(CFS)
81      '      '      flow top width = 4.838(Ft.)
82      '      '      velocity= 2.595(Ft/s)
83      '      '      area = 0.585(Sq.Ft)
84      '      '      Froude number = 1.315
85
86 Upstream point elevation = 780.500(Ft.)
87 Downstream point elevation = 772.000(Ft.)
88 Flow length = 184.000(Ft.)
89 Travel time = 1.18 min.
90 Time of concentration = 10.48 min.
91 Depth of flow = 0.242(Ft.)
92 Average velocity = 2.595(Ft/s)
93 Total irregular channel flow = 1.518(CFS)
94 Irregular channel normal depth above invert elev. = 0.242(Ft.)
95 Average velocity of channel(s) = 2.595(Ft/s)
96 Adding area flow to channel
97 Rainfall intensity (I) = 5.885(In/Hr) for a 100.0 year storm
98 Decimal fraction soil group A = 0.000
99 Decimal fraction soil group B = 0.000
100 Decimal fraction soil group C = 1.000
101 Decimal fraction soil group D = 0.000
102 [LOW DENSITY RESIDENTIAL ]
103 (1.0 DU/A or Less )
104 Impervious value, Ai = 0.100
105 Sub-Area C Value = 0.360
106 Rainfall intensity = 5.885(In/Hr) for a 100.0 year storm
107 Effective runoff coefficient used for total area
108 (Q=KCIA) is C = 0.360 CA = 0.401
109 Subarea runoff = 1.783(CFS) for 0.862(Ac.)
110 Total runoff = 2.362(CFS) Total area = 1.115(Ac.)
111 Depth of flow = 0.285(Ft.), Average velocity = 2.898(Ft/s)
112 End of computations, total study area = 1.115 (Ac.)
113
114
115

```

ATTACHMENT G

100 Year POST DEVELOPED Q CALCULATIONS

Steps Taken To Analyze This Condition

The Rational Method as outlined in section 3 of the June 2003 San Diego County Hydrology Manual is followed here. The software that we are using is the "*Rational Hydrology Method, San Diego County (2003 Manual)*" module of the CIVILCADD/CIVIL DESIGN Engineering software version 7.9.

Please see the subsequent pages for the calculations. These calculations are for the Q100. The results are outlined/summarized in Section 8.


```

1
2 San Diego County Rational Hydrology Program
3
4 CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
5
6 Rational method hydrology program based on
7 San Diego County Flood Control Division 2003 hydrology manual
8 Rational Hydrology Study Date: 11/27/24
9 -----
10 24021 CONWAY DRIVE
11 POST-DEVELOPMENT
12 Q100 YR
13 POC-1
14 -----
15 ***** Hydrology Study Control Information *****
16 -----
17
18
19
20 Program License Serial Number 6332
21 -----
22
23 Rational hydrology study storm event year is 100.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 3.500
28 24 hour precipitation(inches) = 8.000
29 P6/P24 = 43.8%
30 Adjusted 6 hour precipitation (inches) = 3.600
31 Adjusted P6/P24 = 45.0%
32 San Diego hydrology manual 'C' values used
33
34
35 *****
36 Process from Point/Station 101.000 to Point/Station 102.000
37 **** INITIAL AREA EVALUATION ****
38
39 -----
40 Decimal fraction soil group A = 0.000
41 Decimal fraction soil group B = 0.000
42 Decimal fraction soil group C = 1.000
43 Decimal fraction soil group D = 0.000
44 [LOW DENSITY RESIDENTIAL ]
45 (1.0 DU/A or Less )
46 Impervious value, Ai = 0.100
47 Sub-Area C Value = 0.360
48 Initial subarea total flow distance = 100.000 (Ft.)
49 Highest elevation = 840.000 (Ft.)
50 Lowest elevation = 836.000 (Ft.)
51 Elevation difference = 4.000 (Ft.) Slope = 4.000 %
52 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
53 The maximum overland flow distance is 100.00 (Ft)
54 for the top area slope value of 4.00 %, in a development type of
55 1.0 DU/A or Less
56 In Accordance With Figure 3-3
57 Initial Area Time of Concentration = 8.39 minutes
58 TC = [1.8*(1.1-C)*distance (Ft.)^.5]/(% slope^(1/3))
59 TC = [1.8*(1.1-0.3600)*( 100.000^.5)/( 4.000^(1/3))]= 8.39
60 Rainfall intensity (I) = 6.792 (In/Hr) for a 100.0 year storm
61 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
62 Subarea runoff = 0.186 (CFS)
63 Total initial stream area = 0.076 (Ac.)
64
65 *****
66 Process from Point/Station 102.000 to Point/Station 103.000
67 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
68
69 -----
70 Estimated mean flow rate at midpoint of channel = 4.434 (CFS)

```

```

70 Depth of flow = 0.211(Ft.), Average velocity = 3.993(Ft/s)
71 ***** Irregular Channel Data *****
72 -----
73 Information entered for subchannel number 1 :
74 Point number      'X' coordinate      'Y' coordinate
75 1                0.00                2.00
76 2                50.00                0.00
77 3                100.00               2.00
78 Manning's 'N' friction factor = 0.030
79 -----
80 Sub-Channel flow = 4.434(CFS)
81 '      ' flow top width = 10.538(Ft.)
82 '      ' velocity= 3.993(Ft/s)
83 '      ' area = 1.110(Sq.Ft)
84 '      ' Froude number = 2.168
85
86 Upstream point elevation = 836.000(Ft.)
87 Downstream point elevation = 766.000(Ft.)
88 Flow length = 535.600(Ft.)
89 Travel time = 2.24 min.
90 Time of concentration = 10.63 min.
91 Depth of flow = 0.211(Ft.)
92 Average velocity = 3.993(Ft/s)
93 Total irregular channel flow = 4.434(CFS)
94 Irregular channel normal depth above invert elev. = 0.211(Ft.)
95 Average velocity of channel(s) = 3.993(Ft/s)
96 Adding area flow to channel
97 Rainfall intensity (I) = 5.832(In/Hr) for a 100.0 year storm
98 Decimal fraction soil group A = 0.600
99 Decimal fraction soil group B = 0.000
100 Decimal fraction soil group C = 0.400
101 Decimal fraction soil group D = 0.000
102 [LOW DENSITY RESIDENTIAL ]
103 (1.0 DU/A or Less )
104 Impervious value, Ai = 0.100
105 Sub-Area C Value = 0.306
106 Rainfall intensity = 5.832(In/Hr) for a 100.0 year storm
107 Effective runoff coefficient used for total area
108 (Q=KCIA) is C = 0.307 CA = 1.479
109 Subarea runoff = 8.439(CFS) for 4.743(Ac.)
110 Total runoff = 8.624(CFS) Total area = 4.819(Ac.)
111 Depth of flow = 0.270(Ft.), Average velocity = 4.715(Ft/s)
112
113
114 *****
115 Process from Point/Station 103.000 to Point/Station 104.000
116 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
117
118 -----
119 Estimated mean flow rate at midpoint of channel = 8.653(CFS)
120 Depth of flow = 0.472(Ft.), Average velocity = 2.442(Ft/s)
121 ***** Irregular Channel Data *****
122 -----
123 Information entered for subchannel number 1 :
124 Point number      'X' coordinate      'Y' coordinate
125 1                0.00                0.52
126 2                19.50               0.13
127 3                21.00                0.00
128 4                21.00                0.50
129 5                31.00                1.00
130 Manning's 'N' friction factor = 0.015
131 -----
132 Sub-Channel flow = 8.653(CFS)
133 '      ' flow top width = 18.624(Ft.)
134 '      ' velocity= 2.442(Ft/s)
135 '      ' area = 3.543(Sq.Ft)
136 '      ' Froude number = 0.987
137
138 Upstream point elevation = 766.000(Ft.)
139 Downstream point elevation = 762.910(Ft.)

```

```

139 Flow length = 537.900(Ft.)
140 Travel time = 3.67 min.
141 Time of concentration = 14.30 min.
142 Depth of flow = 0.472(Ft.)
143 Average velocity = 2.442(Ft/s)
144 Total irregular channel flow = 8.653(CFS)
145 Irregular channel normal depth above invert elev. = 0.472(Ft.)
146 Average velocity of channel(s) = 2.442(Ft/s)
147 Adding area flow to channel
148 Rainfall intensity (I) = 4.816(In/Hr) for a 100.0 year storm
149 Decimal fraction soil group A = 0.900
150 Decimal fraction soil group B = 0.000
151 Decimal fraction soil group C = 0.100
152 Decimal fraction soil group D = 0.000
153 [LOW DENSITY RESIDENTIAL ]
154 (1.0 DU/A or Less )
155 Impervious value, Ai = 0.100
156 Sub-Area C Value = 0.279
157 The area added to the existing stream causes a
158 a lower flow rate of Q = 7.807(CFS)
159 therefore the upstream flow rate of Q = 8.624(CFS) is being used
160 Rainfall intensity = 4.816(In/Hr) for a 100.0 year storm
161 Effective runoff coefficient used for total area
162 (Q=KCIA) is C = 0.304 CA = 1.621
163 Subarea runoff = 0.000(CFS) for 0.510(Ac.)
164 Total runoff = 8.624(CFS) Total area = 5.329(Ac.)
165 Depth of flow = 0.472(Ft.), Average velocity = 2.440(Ft/s)
166
167
168 *****
169 Process from Point/Station 104.000 to Point/Station 104.000
170 **** CONFLUENCE OF MINOR STREAMS ****
171
172 Along Main Stream number: 1 in normal stream number 1
173 Stream flow area = 5.329(Ac.)
174 Runoff from this stream = 8.624(CFS)
175 Time of concentration = 14.30 min.
176 Rainfall intensity = 4.816(In/Hr)
177
178
179 *****
180 Process from Point/Station 201.000 to Point/Station 202.000
181 **** INITIAL AREA EVALUATION ****
182
183 Decimal fraction soil group A = 0.000
184 Decimal fraction soil group B = 0.000
185 Decimal fraction soil group C = 1.000
186 Decimal fraction soil group D = 0.000
187 [LOW DENSITY RESIDENTIAL ]
188 (1.0 DU/A or Less )
189 Impervious value, Ai = 0.100
190 Sub-Area C Value = 0.360
191 Initial subarea total flow distance = 100.000(Ft.)
192 Highest elevation = 840.000(Ft.)
193 Lowest elevation = 834.000(Ft.)
194 Elevation difference = 6.000(Ft.) Slope = 6.000 %
195 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
196 The maximum overland flow distance is 100.00 (Ft)
197 for the top area slope value of 6.00 %, in a development type of
198 1.0 DU/A or Less
199 In Accordance With Figure 3-3
200 Initial Area Time of Concentration = 7.33 minutes
201 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
202 TC = [1.8*(1.1-0.3600)*( 100.000^.5)]/( 6.000^(1/3))= 7.33
203 Rainfall intensity (I) = 7.411(In/Hr) for a 100.0 year storm
204 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
205 Subarea runoff = 0.491(CFS)
206 Total initial stream area = 0.184(Ac.)
207

```

```

208
209 *****
210 Process from Point/Station      202.000 to Point/Station      203.000
211 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
212
213 -----
214 Estimated mean flow rate at midpoint of channel =      3.138 (CFS)
215 Depth of flow =    0.180 (Ft.), Average velocity =    3.861 (Ft/s)
216      ***** Irregular Channel Data *****
217 -----
218 Information entered for subchannel number 1 :
219 Point number      'X' coordinate      'Y' coordinate
220      1              0.00              2.00
221      2              50.00              0.00
222      3             100.00              2.00
223 Manning's 'N' friction factor =    0.030
224 -----
225 Sub-Channel flow =      3.138 (CFS)
226      '      '      flow top width =      9.015 (Ft.)
227      '      '      velocity=      3.861 (Ft/s)
228      '      '      area =      0.813 (Sq.Ft)
229      '      '      Froude number =      2.266
230
231 Upstream point elevation =    834.000 (Ft.)
232 Downstream point elevation =    790.370 (Ft.)
233 Flow length =    289.900 (Ft.)
234 Travel time =      1.25 min.
235 Time of concentration =      8.58 min.
236 Depth of flow =    0.180 (Ft.)
237 Average velocity =    3.861 (Ft/s)
238 Total irregular channel flow =      3.138 (CFS)
239 Irregular channel normal depth above invert elev. =    0.180 (Ft.)
240 Average velocity of channel(s) =    3.861 (Ft/s)
241 Adding area flow to channel
242 Rainfall intensity (I) =      6.695 (In/Hr) for a    100.0 year storm
243 Decimal fraction soil group A = 0.800
244 Decimal fraction soil group B = 0.000
245 Decimal fraction soil group C = 0.200
246 Decimal fraction soil group D = 0.000
247 [LOW DENSITY RESIDENTIAL      ]
248 (1.0 DU/A or Less      )
249 Impervious value, Ai = 0.100
250 Sub-Area C Value = 0.288
251 Rainfall intensity =      6.695 (In/Hr) for a    100.0 year storm
252 Effective runoff coefficient used for total area
253 (Q=KCIA) is C = 0.293 CA =    0.854
254 Subarea runoff =      5.224 (CFS) for      2.734 (Ac.)
255 Total runoff =      5.715 (CFS) Total area =      2.918 (Ac.)
256 Depth of flow =    0.226 (Ft.), Average velocity =    4.486 (Ft/s)
257
258 *****
259 Process from Point/Station      203.000 to Point/Station      104.000
260 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
261
262 -----
263 Depth of flow =    0.799 (Ft.), Average velocity =    8.962 (Ft/s)
264      ***** Irregular Channel Data *****
265 -----
266 Information entered for subchannel number 1 :
267 Point number      'X' coordinate      'Y' coordinate
268      1              0.00              1.00
269      2              1.00              0.00
270      3              2.00              1.00
271 Manning's 'N' friction factor =    0.015
272 -----
273 Sub-Channel flow =      5.715 (CFS)
274      '      '      flow top width =      1.597 (Ft.)
275      '      '      velocity=      8.962 (Ft/s)
276      '      '      area =      0.638 (Sq.Ft)
277      '      '      Froude number =      2.499

```



```

277
278 Upstream point elevation = 790.370 (Ft.)
279 Downstream point elevation = 762.910 (Ft.)
280 Flow length = 621.500 (Ft.)
281 Travel time = 1.16 min.
282 Time of concentration = 9.74 min.
283 Depth of flow = 0.799 (Ft.)
284 Average velocity = 8.962 (Ft/s)
285 Total irregular channel flow = 5.715 (CFS)
286 Irregular channel normal depth above invert elev. = 0.799 (Ft.)
287 Average velocity of channel(s) = 8.962 (Ft/s)
288
289
290 *****
291 Process from Point/Station 104.000 to Point/Station 104.000
292 **** CONFLUENCE OF MINOR STREAMS ****
293
294 Along Main Stream number: 1 in normal stream number 2
295 Stream flow area = 2.918 (Ac.)
296 Runoff from this stream = 5.715 (CFS)
297 Time of concentration = 9.74 min.
298 Rainfall intensity = 6.171 (In/Hr)
299 Summary of stream data:
300
301 Stream Flow rate TC Rainfall Intensity
302 No. (CFS) (min) (In/Hr)
303
304
305 1 8.624 14.30 4.816
306 2 5.715 9.74 6.171
307 Qmax(1) =
308 1.000 * 1.000 * 8.624) +
309 0.781 * 1.000 * 5.715) + = 13.085
310 Qmax(2) =
311 1.000 * 0.681 * 8.624) +
312 1.000 * 1.000 * 5.715) + = 11.588
313
314 Total of 2 streams to confluence:
315 Flow rates before confluence point:
316 8.624 5.715
317 Maximum flow rates at confluence using above data:
318 13.085 11.588
319 Area of streams before confluence:
320 5.329 2.918
321 Results of confluence:
322 Total flow rate = 13.085 (CFS)
323 Time of concentration = 14.298 min.
324 Effective stream area after confluence = 8.247 (Ac.)
325
326
327 *****
328 Process from Point/Station 104.000 to Point/Station 204.000
329 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
330
331 !!Warning: Water is above left or right bank elevations
332 !!Warning: Water is above left or right bank elevations
333 !!Warning: Water is above left or right bank elevations
334 !!Warning: Water is above left or right bank elevations
335 !!Warning: Water is above left or right bank elevations
336 !!Warning: Water is above left or right bank elevations
337 Estimated mean flow rate at midpoint of channel = 13.114 (CFS)
338 Depth of flow = 0.531 (Ft.), Average velocity = 2.771 (Ft/s)
339 !!Warning: Water is above left or right bank elevations
340 ***** Irregular Channel Data *****
341 -----
342 Information entered for subchannel number 1 :
343 Point number 'X' coordinate 'Y' coordinate
344 1 0.00 0.52
345 2 19.50 0.13

```

```

346         3          21.00          0.00
347         4          21.00          0.50
348         5          31.00          1.00
349 Manning's 'N' friction factor = 0.015
350 -----
351 Sub-Channel flow = 13.115(CFS)
352 ' ' flow top width = 21.627(Ft.)
353 ' ' velocity= 2.771(Ft/s)
354 ' ' area = 4.733(Sq.Ft)
355 ' ' Froude number = 1.044
356
357 Upstream point elevation = 762.910(Ft.)
358 Downstream point elevation = 759.500(Ft.)
359 Flow length = 557.300(Ft.)
360 Travel time = 3.35 min.
361 Time of concentration = 17.65 min.
362 Depth of flow = 0.531(Ft.)
363 Average velocity = 2.771(Ft/s)
364 Total irregular channel flow = 13.114(CFS)
365 Irregular channel normal depth above invert elev. = 0.531(Ft.)
366 Average velocity of channel(s) = 2.771(Ft/s)
367 !!Warning: Water is above left or right bank elevations
368 Adding area flow to channel
369 Rainfall intensity (I) = 4.205(In/Hr) for a 100.0 year storm
370 Decimal fraction soil group A = 0.400
371 Decimal fraction soil group B = 0.000
372 Decimal fraction soil group C = 0.600
373 Decimal fraction soil group D = 0.000
374 [LOW DENSITY RESIDENTIAL ]
375 (2.9 DU/A or Less )
376 Impervious value, Ai = 0.250
377 Sub-Area C Value = 0.422
378 The area added to the existing stream causes a
379 a lower flow rate of Q = 12.509(CFS)
380 therefore the upstream flow rate of Q = 13.085(CFS) is being used
381 Rainfall intensity = 4.205(In/Hr) for a 100.0 year storm
382 Effective runoff coefficient used for total area
383 (Q=KCIA) is C = 0.315 CA = 2.975
384 Subarea runoff = 0.000(CFS) for 1.186(Ac.)
385 Total runoff = 13.085(CFS) Total area = 9.433(Ac.)
386 Depth of flow = 0.531(Ft.), Average velocity = 2.769(Ft/s)
387 !!Warning: Water is above left or right bank elevations
388
389
390 *****
391 Process from Point/Station 204.000 to Point/Station 204.000
392 **** CONFLUENCE OF MAIN STREAMS ****
393
394 The following data inside Main Stream is listed:
395 In Main Stream number: 1
396 Stream flow area = 9.433(Ac.)
397 Runoff from this stream = 13.085(CFS)
398 Time of concentration = 17.65 min.
399 Rainfall intensity = 4.205(In/Hr)
400 Program is now starting with Main Stream No. 2
401
402
403 *****
404 Process from Point/Station 301.000 to Point/Station 302.000
405 **** INITIAL AREA EVALUATION ****
406
407 Decimal fraction soil group A = 0.000
408 Decimal fraction soil group B = 0.000
409 Decimal fraction soil group C = 1.000
410 Decimal fraction soil group D = 0.000
411 [LOW DENSITY RESIDENTIAL ]
412 (2.9 DU/A or Less )
413 Impervious value, Ai = 0.250
414 Sub-Area C Value = 0.450

```

```

415 Initial subarea total flow distance = 70.000(Ft.)
416 Highest elevation = 784.000(Ft.)
417 Lowest elevation = 783.300(Ft.)
418 Elevation difference = 0.700(Ft.) Slope = 1.000 %
419 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
420 The maximum overland flow distance is 70.00 (Ft)
421 for the top area slope value of 1.00 %, in a development type of
422 2.9 DU/A or Less
423 In Accordance With Figure 3-3
424 Initial Area Time of Concentration = 9.79 minutes
425  $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})]$ 
426  $TC = [1.8 * (1.1 - 0.4500) * (70.000^{.5})] / (1.000^{(1/3)}) = 9.79$ 
427 Rainfall intensity (I) = 6.150(In/Hr) for a 100.0 year storm
428 Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
429 Subarea runoff = 0.401(CFS)
430 Total initial stream area = 0.145(Ac.)
431
432
433 ++++++
434 Process from Point/Station 302.000 to Point/Station 303.000
435 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
436
437 -----
438 Estimated mean flow rate at midpoint of channel = 3.180(CFS)
439 Depth of flow = 0.269(Ft.), Average velocity = 2.885(Ft/s)
440 ***** Irregular Channel Data *****
441 -----
442 Information entered for subchannel number 1 :
443 Point number 'X' coordinate 'Y' coordinate
444 1 0.00 0.33
445 2 16.50 0.13
446 3 18.00 0.00
447 4 18.00 0.50
448 5 23.50 0.58
449 Manning's 'N' friction factor = 0.015
450 -----
451 Sub-Channel flow = 3.180(CFS)
452 ' ' flow top width = 12.962(Ft.)
453 ' ' velocity = 2.885(Ft/s)
454 ' ' area = 1.102(Sq.Ft)
455 ' ' Froude number = 1.743
456
457 Upstream point elevation = 783.300(Ft.)
458 Downstream point elevation = 764.900(Ft.)
459 Flow length = 788.900(Ft.)
460 Travel time = 4.56 min.
461 Time of concentration = 14.35 min.
462 Depth of flow = 0.269(Ft.)
463 Average velocity = 2.885(Ft/s)
464 Total irregular channel flow = 3.180(CFS)
465 Irregular channel normal depth above invert elev. = 0.269(Ft.)
466 Average velocity of channel(s) = 2.885(Ft/s)
467 Adding area flow to channel
468 Rainfall intensity (I) = 4.806(In/Hr) for a 100.0 year storm
469 Decimal fraction soil group A = 0.700
470 Decimal fraction soil group B = 0.000
471 Decimal fraction soil group C = 0.300
472 Decimal fraction soil group D = 0.000
473 [LOW DENSITY RESIDENTIAL ]
474 (2.9 DU/A or Less )
475 Impervious value, Ai = 0.250
476 Sub-Area C Value = 0.401
477 Rainfall intensity = 4.806(In/Hr) for a 100.0 year storm
478 Effective runoff coefficient used for total area
479 (Q=KCIA) is C = 0.403 CA = 1.221
480 Subarea runoff = 5.464(CFS) for 2.881(Ac.)
481 Total runoff = 5.866(CFS) Total area = 3.026(Ac.)
482 Depth of flow = 0.313(Ft.), Average velocity = 3.340(Ft/s)
483

```

```

484 *****
485 Process from Point/Station      303.000 to Point/Station      304.000
486 **** PIPEFLOW TRAVEL TIME (User specified size) ****
487
488 Upstream point/station elevation =  762.220 (Ft.)
489 Downstream point/station elevation =  762.040 (Ft.)
490 Pipe length =  36.00 (Ft.) Slope =  0.0050 Manning's N = 0.013
491 No. of pipes = 1 Required pipe flow =  5.866 (CFS)
492 Given pipe size =  18.00 (In.)
493 Calculated individual pipe flow =  5.866 (CFS)
494 Normal flow depth in pipe =  12.07 (In.)
495 Flow top width inside pipe =  16.92 (In.)
496 Critical Depth =  11.22 (In.)
497 Pipe flow velocity =  4.66 (Ft/s)
498 Travel time through pipe =  0.13 min.
499 Time of concentration (TC) =  14.48 min.
500
501
502 *****
503 Process from Point/Station      304.000 to Point/Station      304.000
504 **** SUBAREA FLOW ADDITION ****
505
506 Rainfall intensity (I) =  4.778 (In/Hr) for a  100.0 year storm
507 Decimal fraction soil group A = 0.400
508 Decimal fraction soil group B = 0.000
509 Decimal fraction soil group C = 0.600
510 Decimal fraction soil group D = 0.000
511 [LOW DENSITY RESIDENTIAL
512 (2.9 DU/A or Less
513 Impervious value, Ai = 0.250
514 Sub-Area C Value = 0.422
515 Time of concentration =  14.48 min.
516 Rainfall intensity =  4.778 (In/Hr) for a  100.0 year storm
517 Effective runoff coefficient used for total area
518 (Q=KCIA) is C = 0.410 CA =  1.929
519 Subarea runoff =  3.354 (CFS) for  1.680 (Ac.)
520 Total runoff =  9.220 (CFS) Total area =  4.706 (Ac.)
521
522
523 *****
524 Process from Point/Station      304.000 to Point/Station      305.000
525 **** PIPEFLOW TRAVEL TIME (User specified size) ****
526
527 Upstream point/station elevation =  761.840 (Ft.)
528 Downstream point/station elevation =  761.300 (Ft.)
529 Pipe length =  107.10 (Ft.) Slope =  0.0050 Manning's N = 0.013
530 No. of pipes = 1 Required pipe flow =  9.220 (CFS)
531 Given pipe size =  24.00 (In.)
532 Calculated individual pipe flow =  9.220 (CFS)
533 Normal flow depth in pipe =  13.03 (In.)
534 Flow top width inside pipe =  23.91 (In.)
535 Critical Depth =  13.01 (In.)
536 Pipe flow velocity =  5.29 (Ft/s)
537 Travel time through pipe =  0.34 min.
538 Time of concentration (TC) =  14.81 min.
539
540
541 *****
542 Process from Point/Station      305.000 to Point/Station      306.000
543 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
544
545 Depth of flow =  1.405 (Ft.), Average velocity =  5.093 (Ft/s)
546 !!Warning: Water is above left or right bank elevations
547 ***** Irregular Channel Data *****
548 -----
549 Information entered for subchannel number 1 :
550 Point number      'X' coordinate      'Y' coordinate
551      1              0.00              1.00
552      2              1.00              0.00

```



```

553      3      2.00      1.00
554 Manning's 'N' friction factor = 0.015
555 -----
556 Sub-Channel flow = 9.220 (CFS)
557 ' ' flow top width = 2.000 (Ft.)
558 ' ' velocity= 5.093 (Ft/s)
559 ' ' area = 1.810 (Sq.Ft)
560 ' ' Froude number = 0.943
561
562 Upstream point elevation = 761.300 (Ft.)
563 Downstream point elevation = 760.500 (Ft.)
564 Flow length = 167.000 (Ft.)
565 Travel time = 0.55 min.
566 Time of concentration = 15.36 min.
567 Depth of flow = 1.405 (Ft.)
568 Average velocity = 5.093 (Ft/s)
569 Total irregular channel flow = 9.220 (CFS)
570 Irregular channel normal depth above invert elev. = 1.405 (Ft.)
571 Average velocity of channel(s) = 5.093 (Ft/s)
572 !!Warning: Water is above left or right bank elevations
573
574
575 *****
576 Process from Point/Station 306.000 to Point/Station 306.000
577 **** SUBAREA FLOW ADDITION ****
578
579 Rainfall intensity (I) = 4.599 (In/Hr) for a 100.0 year storm
580 Decimal fraction soil group A = 0.600
581 Decimal fraction soil group B = 0.000
582 Decimal fraction soil group C = 0.400
583 Decimal fraction soil group D = 0.000
584 [LOW DENSITY RESIDENTIAL ]
585 (2.9 DU/A or Less )
586 Impervious value, Ai = 0.250
587 Sub-Area C Value = 0.408
588 Time of concentration = 15.36 min.
589 Rainfall intensity = 4.599 (In/Hr) for a 100.0 year storm
590 Effective runoff coefficient used for total area
591 (Q=KCIA) is C = 0.409 CA = 3.618
592 Subarea runoff = 7.419 (CFS) for 4.138 (Ac.)
593 Total runoff = 16.638 (CFS) Total area = 8.844 (Ac.)
594
595
596 *****
597 Process from Point/Station 306.000 to Point/Station 408.000
598 **** PIPEFLOW TRAVEL TIME (User specified size) ****
599
600 Upstream point/station elevation = 757.560 (Ft.)
601 Downstream point/station elevation = 757.490 (Ft.)
602 Pipe length = 15.05 (Ft.) Slope = 0.0047 Manning's N = 0.013
603 No. of pipes = 1 Required pipe flow = 16.638 (CFS)
604 Given pipe size = 24.00 (In.)
605 NOTE: Normal flow is pressure flow in user selected pipe size.
606 The approximate hydraulic grade line above the pipe invert is
607 0.665 (Ft.) at the headworks or inlet of the pipe(s)
608 Pipe friction loss = 0.081 (Ft.)
609 Minor friction loss = 0.653 (Ft.) K-factor = 1.50
610 Pipe flow velocity = 5.30 (Ft/s)
611 Travel time through pipe = 0.05 min.
612 Time of concentration (TC) = 15.41 min.
613
614
615 *****
616 Process from Point/Station 408.000 to Point/Station 408.000
617 **** CONFLUENCE OF MINOR STREAMS ****
618
619 Along Main Stream number: 2 in normal stream number 1
620 Stream flow area = 8.844 (Ac.)
621 Runoff from this stream = 16.638 (CFS)

```

```

622 Time of concentration = 15.41 min.
623 Rainfall intensity = 4.590 (In/Hr)
624
625
626 *****
627 Process from Point/Station 401.000 to Point/Station 402.000
628 **** INITIAL AREA EVALUATION ****
629
630 Decimal fraction soil group A = 0.000
631 Decimal fraction soil group B = 0.000
632 Decimal fraction soil group C = 1.000
633 Decimal fraction soil group D = 0.000
634 [LOW DENSITY RESIDENTIAL ]
635 (1.0 DU/A or Less )
636 Impervious value, Ai = 0.100
637 Sub-Area C Value = 0.360
638 Initial subarea total flow distance = 100.000 (Ft.)
639 Highest elevation = 828.000 (Ft.)
640 Lowest elevation = 815.000 (Ft.)
641 Elevation difference = 13.000 (Ft.) Slope = 13.000 %
642 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
643 The maximum overland flow distance is 100.00 (Ft)
644 for the top area slope value of 13.00 %, in a development type of
645 1.0 DU/A or Less
646 In Accordance With Figure 3-3
647 Initial Area Time of Concentration = 5.66 minutes
648  $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5} / (% slope^{(1/3)})]$ 
649  $TC = [1.8 * (1.1 - 0.3600) * (100.000^{.5}) / (13.000^{(1/3)})] = 5.66$ 
650 Rainfall intensity (I) = 8.751 (In/Hr) for a 100.0 year storm
651 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
652 Subarea runoff = 0.384 (CFS)
653 Total initial stream area = 0.122 (Ac.)
654
655
656 *****
657 Process from Point/Station 402.000 to Point/Station 403.000
658 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
659
660 Estimated mean flow rate at midpoint of channel = 2.404 (CFS)
661 Depth of flow = 0.252 (Ft.), Average velocity = 3.774 (Ft/s)
662 ***** Irregular Channel Data *****
663 -----
664 Information entered for subchannel number 1 :
665 Point number 'X' coordinate 'Y' coordinate
666 1 0.00 1.00
667 2 10.00 0.00
668 3 20.00 1.00
669 Manning's 'N' friction factor = 0.030
670 -----
671 Sub-Channel flow = 2.404 (CFS)
672 ' ' flow top width = 5.047 (Ft.)
673 ' ' velocity = 3.774 (Ft/s)
674 ' ' area = 0.637 (Sq.Ft)
675 ' ' Froude number = 1.873
676
677 Upstream point elevation = 815.000 (Ft.)
678 Downstream point elevation = 791.000 (Ft.)
679 Flow length = 259.850 (Ft.)
680 Travel time = 1.15 min.
681 Time of concentration = 6.81 min.
682 Depth of flow = 0.252 (Ft.)
683 Average velocity = 3.774 (Ft/s)
684 Total irregular channel flow = 2.404 (CFS)
685 Irregular channel normal depth above invert elev. = 0.252 (Ft.)
686 Average velocity of channel(s) = 3.774 (Ft/s)
687 Adding area flow to channel
688 Rainfall intensity (I) = 7.770 (In/Hr) for a 100.0 year storm
689 Decimal fraction soil group A = 0.600
690 Decimal fraction soil group B = 0.000

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691 Decimal fraction soil group C = 0.400
692 Decimal fraction soil group D = 0.000
693 [LOW DENSITY RESIDENTIAL ]
694 (1.0 DU/A or Less )
695 Impervious value, Ai = 0.100
696 Sub-Area C Value = 0.306
697 Rainfall intensity = 7.770(In/Hr) for a 100.0 year storm
698 Effective runoff coefficient used for total area
699 (Q=KCIA) is C = 0.310 CA = 0.558
700 Subarea runoff = 3.949(CFS) for 1.679(Ac.)
701 Total runoff = 4.333(CFS) Total area = 1.801(Ac.)
702 Depth of flow = 0.315(Ft.), Average velocity = 4.374(Ft/s)
703
704
705 *****
706 Process from Point/Station 403.000 to Point/Station 404.000
707 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
708
709 -----
709 Depth of flow = 0.769(Ft.), Average velocity = 7.337(Ft/s)
710 ***** Irregular Channel Data *****
711 -----
712 Information entered for subchannel number 1 :
713 Point number 'X' coordinate 'Y' coordinate
714 1 0.00 1.00
715 2 1.00 0.00
716 3 2.00 1.00
717 Manning's 'N' friction factor = 0.015
718 -----
719 Sub-Channel flow = 4.333(CFS)
720 ' ' flow top width = 1.537(Ft.)
721 ' ' velocity= 7.337(Ft/s)
722 ' ' area = 0.591(Sq.Ft)
723 ' ' Froude number = 2.086
724
725 Upstream point elevation = 791.000(Ft.)
726 Downstream point elevation = 781.500(Ft.)
727 Flow length = 304.820(Ft.)
728 Travel time = 0.69 min.
729 Time of concentration = 7.50 min.
730 Depth of flow = 0.769(Ft.)
731 Average velocity = 7.337(Ft/s)
732 Total irregular channel flow = 4.333(CFS)
733 Irregular channel normal depth above invert elev. = 0.769(Ft.)
734 Average velocity of channel(s) = 7.337(Ft/s)
735
736
737 *****
738 Process from Point/Station 404.000 to Point/Station 405.000
739 **** PIPEFLOW TRAVEL TIME (User specified size) ****
740
741 -----
741 Upstream point/station elevation = 775.420(Ft.)
742 Downstream point/station elevation = 773.810(Ft.)
743 Pipe length = 164.90(Ft.) Slope = 0.0098 Manning's N = 0.013
744 No. of pipes = 1 Required pipe flow = 4.333(CFS)
745 Given pipe size = 18.00(In.)
746 Calculated individual pipe flow = 4.333(CFS)
747 Normal flow depth in pipe = 8.11(In.)
748 Flow top width inside pipe = 17.91(In.)
749 Critical Depth = 9.58(In.)
750 Pipe flow velocity = 5.61(Ft/s)
751 Travel time through pipe = 0.49 min.
752 Time of concentration (TC) = 7.99 min.
753
754
755 *****
756 Process from Point/Station 405.000 to Point/Station 406.000
757 **** PIPEFLOW TRAVEL TIME (User specified size) ****
758
759 -----
759 Upstream point/station elevation = 773.610(Ft.)

```

```

760 Downstream point/station elevation = 772.150 (Ft.)
761 Pipe length = 150.00 (Ft.) Slope = 0.0097 Manning's N = 0.013
762 No. of pipes = 1 Required pipe flow = 4.333 (CFS)
763 Given pipe size = 18.00 (In.)
764 Calculated individual pipe flow = 4.333 (CFS)
765 Normal flow depth in pipe = 8.12 (In.)
766 Flow top width inside pipe = 17.91 (In.)
767 Critical Depth = 9.58 (In.)
768 Pipe flow velocity = 5.60 (Ft/s)
769 Travel time through pipe = 0.45 min.
770 Time of concentration (TC) = 8.44 min.
771
772
773 *****
774 Process from Point/Station 406.000 to Point/Station 407.000
775 **** PIPEFLOW TRAVEL TIME (User specified size) ****
776
777 Upstream point/station elevation = 771.950 (Ft.)
778 Downstream point/station elevation = 759.100 (Ft.)
779 Pipe length = 387.10 (Ft.) Slope = 0.0332 Manning's N = 0.013
780 No. of pipes = 1 Required pipe flow = 4.333 (CFS)
781 Given pipe size = 18.00 (In.)
782 Calculated individual pipe flow = 4.333 (CFS)
783 Normal flow depth in pipe = 5.82 (In.)
784 Flow top width inside pipe = 16.84 (In.)
785 Critical Depth = 9.58 (In.)
786 Pipe flow velocity = 8.76 (Ft/s)
787 Travel time through pipe = 0.74 min.
788 Time of concentration (TC) = 9.18 min.
789
790
791 *****
792 Process from Point/Station 407.000 to Point/Station 408.000
793 **** PIPEFLOW TRAVEL TIME (User specified size) ****
794
795 Upstream point/station elevation = 758.900 (Ft.)
796 Downstream point/station elevation = 757.490 (Ft.)
797 Pipe length = 141.20 (Ft.) Slope = 0.0100 Manning's N = 0.013
798 No. of pipes = 1 Required pipe flow = 4.333 (CFS)
799 Given pipe size = 18.00 (In.)
800 Calculated individual pipe flow = 4.333 (CFS)
801 Normal flow depth in pipe = 8.06 (In.)
802 Flow top width inside pipe = 17.90 (In.)
803 Critical Depth = 9.58 (In.)
804 Pipe flow velocity = 5.66 (Ft/s)
805 Travel time through pipe = 0.42 min.
806 Time of concentration (TC) = 9.59 min.
807
808
809 *****
810 Process from Point/Station 408.000 to Point/Station 408.000
811 **** CONFLUENCE OF MINOR STREAMS ****
812
813 Along Main Stream number: 2 in normal stream number 2
814 Stream flow area = 1.801 (Ac.)
815 Runoff from this stream = 4.333 (CFS)
816 Time of concentration = 9.59 min.
817 Rainfall intensity = 6.230 (In/Hr)
818 Summary of stream data:
819
820 Stream Flow rate TC Rainfall Intensity
821 No. (CFS) (min) (In/Hr)
822
823
824 1 16.638 15.41 4.590
825 2 4.333 9.59 6.230
826 Qmax(1) =
827 1.000 * 1.000 * 16.638) +
828 0.737 * 1.000 * 4.333) + = 19.830

```



```

829 Qmax(2) =
830     1.000 *    0.623 *    16.638) +
831     1.000 *    1.000 *    4.333) + =    14.693
832
833 Total of 2 streams to confluence:
834 Flow rates before confluence point:
835     16.638    4.333
836 Maximum flow rates at confluence using above data:
837     19.830    14.693
838 Area of streams before confluence:
839     8.844    1.801
840 Results of confluence:
841 Total flow rate =    19.830 (CFS)
842 Time of concentration =    15.407 min.
843 Effective stream area after confluence =    10.645 (Ac.)
844
845
846 ++++++
847 Process from Point/Station    408.000 to Point/Station    204.000
848 **** PIPEFLOW TRAVEL TIME (User specified size) ****
849
850 Upstream point/station elevation =    757.290 (Ft.)
851 Downstream point/station elevation =    757.150 (Ft.)
852 Pipe length =    27.40 (Ft.) Slope =    0.0051 Manning's N = 0.013
853 No. of pipes = 1 Required pipe flow =    19.830 (CFS)
854 Given pipe size =    24.00 (In.)
855 NOTE: Normal flow is pressure flow in user selected pipe size.
856 The approximate hydraulic grade line above the pipe invert is
857     0.999 (Ft.) at the headworks or inlet of the pipe(s)
858 Pipe friction loss =    0.210 (Ft.)
859 Minor friction loss =    0.928 (Ft.) K-factor =    1.50
860 Pipe flow velocity =    6.31 (Ft/s)
861 Travel time through pipe =    0.07 min.
862 Time of concentration (TC) =    15.48 min.
863
864
865 ++++++
866 Process from Point/Station    204.000 to Point/Station    204.000
867 **** CONFLUENCE OF MAIN STREAMS ****
868
869 The following data inside Main Stream is listed:
870 In Main Stream number: 2
871 Stream flow area =    10.645 (Ac.)
872 Runoff from this stream =    19.830 (CFS)
873 Time of concentration =    15.48 min.
874 Rainfall intensity =    4.576 (In/Hr)
875 Summary of stream data:
876
877 Stream    Flow rate    TC    Rainfall Intensity
878 No.    (CFS)    (min)    (In/Hr)
879
880
881 1    13.085    17.65    4.205
882 2    19.830    15.48    4.576
883 Qmax(1) =
884     1.000 *    1.000 *    13.085) +
885     0.919 *    1.000 *    19.830) + =    31.306
886 Qmax(2) =
887     1.000 *    0.877 *    13.085) +
888     1.000 *    1.000 *    19.830) + =    31.306
889
890 Total of 2 main streams to confluence:
891 Flow rates before confluence point:
892     13.085    19.830
893 Maximum flow rates at confluence using above data:
894     31.306    31.306
895 Area of streams before confluence:
896     9.433    10.645
897

```

```
898
899 Results of confluence:
900 Total flow rate =      31.306 (CFS)
901 Time of concentration =    15.479 min.
902 Effective stream area after confluence =    20.078 (Ac.)
903 End of computations, total study area =    20.078 (Ac.)
904
905
906
```

```

1
2 San Diego County Rational Hydrology Program
3
4 CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
5
6 Rational method hydrology program based on
7 San Diego County Flood Control Division 2003 hydrology manual
8 Rational Hydrology Study Date: 12/02/24
9 -----
10 24021 CONWAY DRIVE
11 POST-DEVELOPMENT
12 Q100 YR
13 POC-2
14 -----
15 ***** Hydrology Study Control Information *****
16 -----
17
18
19
20 Program License Serial Number 6332
21 -----
22
23 Rational hydrology study storm event year is 100.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 3.500
28 24 hour precipitation(inches) = 8.000
29 P6/P24 = 43.8%
30 Adjusted 6 hour precipitation (inches) = 3.600
31 Adjusted P6/P24 = 45.0%
32 San Diego hydrology manual 'C' values used
33
34
35 *****
36 Process from Point/Station 501.000 to Point/Station 502.000
37 **** INITIAL AREA EVALUATION ****
38
39 -----
40 Decimal fraction soil group A = 0.000
41 Decimal fraction soil group B = 0.000
42 Decimal fraction soil group C = 1.000
43 Decimal fraction soil group D = 0.000
44 [LOW DENSITY RESIDENTIAL ]
45 (2.9 DU/A or Less )
46 Impervious value, Ai = 0.250
47 Sub-Area C Value = 0.450
48 Initial subarea total flow distance = 70.000 (Ft.)
49 Highest elevation = 784.000 (Ft.)
50 Lowest elevation = 783.300 (Ft.)
51 Elevation difference = 0.700 (Ft.) Slope = 1.000 %
52 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
53 The maximum overland flow distance is 70.00 (Ft)
54 for the top area slope value of 1.00 %, in a development type of
55 2.9 DU/A or Less
56 In Accordance With Figure 3-3
57 Initial Area Time of Concentration = 9.79 minutes
58 TC = [1.8*(1.1-C)*distance (Ft.)^.5]/(% slope^(1/3))
59 TC = [1.8*(1.1-0.4500)*( 70.000^.5)/( 1.000^(1/3))]= 9.79
60 Rainfall intensity (I) = 6.150 (In/Hr) for a 100.0 year storm
61 Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
62 Subarea runoff = 0.401 (CFS)
63 Total initial stream area = 0.145 (Ac.)
64
65 *****
66 Process from Point/Station 502.000 to Point/Station 503.000
67 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
68
69 -----
70 Estimated mean flow rate at midpoint of channel = 1.134 (CFS)

```

```

70 Depth of flow = 0.217(Ft.), Average velocity = 2.458(Ft/s)
71 ***** Irregular Channel Data *****
72 -----
73 Information entered for subchannel number 1 :
74 Point number      'X' coordinate      'Y' coordinate
75 1                0.00                0.69
76 2                34.50                0.13
77 3                36.00                0.00
78 4                36.00                0.50
79 5                41.50                0.58
80 Manning's 'N' friction factor = 0.015
81 -----
82 Sub-Channel flow = 1.134(CFS)
83 ' ' flow top width = 6.862(Ft.)
84 ' ' velocity= 2.458(Ft/s)
85 ' ' area = 0.461(Sq.Ft)
86 ' ' Froude number = 1.670
87
88 Upstream point elevation = 783.300(Ft.)
89 Downstream point elevation = 777.800(Ft.)
90 Flow length = 234.100(Ft.)
91 Travel time = 1.59 min.
92 Time of concentration = 11.38 min.
93 Depth of flow = 0.217(Ft.)
94 Average velocity = 2.458(Ft/s)
95 Total irregular channel flow = 1.134(CFS)
96 Irregular channel normal depth above invert elev. = 0.217(Ft.)
97 Average velocity of channel(s) = 2.458(Ft/s)
98 Adding area flow to channel
99 Rainfall intensity (I) = 5.582(In/Hr) for a 100.0 year storm
100 Decimal fraction soil group A = 0.000
101 Decimal fraction soil group B = 0.000
102 Decimal fraction soil group C = 1.000
103 Decimal fraction soil group D = 0.000
104 [LOW DENSITY RESIDENTIAL ]
105 (2.9 DU/A or Less )
106 Impervious value, Ai = 0.250
107 Sub-Area C Value = 0.450
108 Rainfall intensity = 5.582(In/Hr) for a 100.0 year storm
109 Effective runoff coefficient used for total area
110 (Q=KCIA) is C = 0.450 CA = 0.318
111 Subarea runoff = 1.374(CFS) for 0.562(Ac.)
112 Total runoff = 1.776(CFS) Total area = 0.707(Ac.)
113 Depth of flow = 0.242(Ft.), Average velocity = 2.713(Ft/s)
114
115
116 *****
117 Process from Point/Station 503.000 to Point/Station 504.000
118 **** PIPEFLOW TRAVEL TIME (User specified size) ****
119
120 -----
121 Upstream point/station elevation = 775.240(Ft.)
122 Downstream point/station elevation = 774.950(Ft.)
123 Pipe length = 21.30(Ft.) Slope = 0.0136 Manning's N = 0.013
124 No. of pipes = 1 Required pipe flow = 1.776(CFS)
125 Given pipe size = 12.00(In.)
126 Calculated individual pipe flow = 1.776(CFS)
127 Normal flow depth in pipe = 5.48(In.)
128 Flow top width inside pipe = 11.95(In.)
129 Critical Depth = 6.81(In.)
130 Pipe flow velocity = 5.09(Ft/s)
131 Travel time through pipe = 0.07 min.
132 Time of concentration (TC) = 11.45 min.
133
134
135 *****
136 Process from Point/Station 504.000 to Point/Station 505.000
137 **** PIPEFLOW TRAVEL TIME (User specified size) ****
138
139 -----
140 Upstream point/station elevation = 772.700(Ft.)

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139 Downstream point/station elevation = 772.600 (Ft.)
140 Pipe length = 12.00 (Ft.) Slope = 0.0083 Manning's N = 0.013
141 No. of pipes = 1 Required pipe flow = 1.776 (CFS)
142 Given pipe size = 12.00 (In.)
143 Calculated individual pipe flow = 1.776 (CFS)
144 Normal flow depth in pipe = 6.32 (In.)
145 Flow top width inside pipe = 11.98 (In.)
146 Critical Depth = 6.81 (In.)
147 Pipe flow velocity = 4.23 (Ft/s)
148 Travel time through pipe = 0.05 min.
149 Time of concentration (TC) = 11.49 min.
150
151
152 *****
153 Process from Point/Station 505.000 to Point/Station 506.000
154 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
155
156 -----
157 Depth of flow = 0.388 (Ft.), Average velocity = 3.662 (Ft/s)
158 !!Warning: Water is above left or right bank elevations
159 ***** Irregular Channel Data *****
160 -----
161 Information entered for subchannel number 1 :
162 Point number 'X' coordinate 'Y' coordinate
163 1 0.00 0.13
164 2 1.50 0.00
165 3 1.50 0.50
166 4 2.00 0.51
167 Manning's 'N' friction factor = 0.015
168 -----
169 Sub-Channel flow = 1.776 (CFS)
170 ' ' flow top width = 1.500 (Ft.)
171 ' ' velocity = 3.662 (Ft/s)
172 ' ' area = 0.485 (Sq.Ft)
173 ' ' Froude number = 1.135
174
175 Upstream point elevation = 772.600 (Ft.)
176 Downstream point elevation = 772.000 (Ft.)
177 Flow length = 71.400 (Ft.)
178 Travel time = 0.32 min.
179 Time of concentration = 11.82 min.
180 Depth of flow = 0.388 (Ft.)
181 Average velocity = 3.662 (Ft/s)
182 Total irregular channel flow = 1.776 (CFS)
183 Irregular channel normal depth above invert elev. = 0.388 (Ft.)
184 Average velocity of channel(s) = 3.662 (Ft/s)
185 !!Warning: Water is above left or right bank elevations
186
187 *****
188 Process from Point/Station 506.000 to Point/Station 506.000
189 **** SUBAREA FLOW ADDITION ****
190
191 -----
192 Rainfall intensity (I) = 5.446 (In/Hr) for a 100.0 year storm
193 Decimal fraction soil group A = 0.000
194 Decimal fraction soil group B = 0.000
195 Decimal fraction soil group C = 1.000
196 Decimal fraction soil group D = 0.000
197 [LOW DENSITY RESIDENTIAL ]
198 (2.9 DU/A or Less )
199 Impervious value, Ai = 0.250
200 Sub-Area C Value = 0.450
201 Time of concentration = 11.82 min.
202 Rainfall intensity = 5.446 (In/Hr) for a 100.0 year storm
203 Effective runoff coefficient used for total area
204 (Q=KCIA) is C = 0.450 CA = 0.463
205 Subarea runoff = 0.746 (CFS) for 0.322 (Ac.)
206 Total runoff = 2.522 (CFS) Total area = 1.029 (Ac.)
207 End of computations, total study area = 1.029 (Ac.)

```

ATTACHMENT H

50 Year POST DEVELOPED Q CALCULATIONS

Steps Taken To Analyze This Condition

The Rational Method as outlined in section 3 of the June 2003 San Diego County Hydrology Manual is followed here. The software that we are using is the “*Rational Hydrology Method, San Diego County (2003 Manual)*” module of the CIVILCADD/CIVIL DESIGN Engineering software version 7.9.

Please see the subsequent pages for the calculations. These calculations are for the Q50. The results are outlined/summarized in Section 8.

```

1
2 San Diego County Rational Hydrology Program
3
4 CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
5
6 Rational method hydrology program based on
7 San Diego County Flood Control Division 2003 hydrology manual
8 Rational Hydrology Study Date: 11/18/25
9 -----
10 24021 CONWAY DRIVE
11 POST-DEVELOPMENT MITIGATED
12 Q50 YR
13 POC-1
14 -----
15 ***** Hydrology Study Control Information *****
16 -----
17
18
19
20 Program License Serial Number 6332
21 -----
22
23 Rational hydrology study storm event year is 50.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 3.000
28 24 hour precipitation(inches) = 6.500
29 P6/P24 = 46.2%
30 San Diego hydrology manual 'C' values used
31
32
33 *****
34 Process from Point/Station 101.000 to Point/Station 102.000
35 **** INITIAL AREA EVALUATION ****
36 -----
37 Decimal fraction soil group A = 0.000
38 Decimal fraction soil group B = 0.000
39 Decimal fraction soil group C = 1.000
40 Decimal fraction soil group D = 0.000
41 [LOW DENSITY RESIDENTIAL ]
42 (1.0 DU/A or Less )
43 Impervious value, Ai = 0.100
44 Sub-Area C Value = 0.360
45 Initial subarea total flow distance = 100.000 (Ft.)
46 Highest elevation = 840.000 (Ft.)
47 Lowest elevation = 836.000 (Ft.)
48 Elevation difference = 4.000 (Ft.) Slope = 4.000 %
49 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50 The maximum overland flow distance is 100.00 (Ft)
51 for the top area slope value of 4.00 %, in a development type of
52 1.0 DU/A or Less
53 In Accordance With Figure 3-3
54 Initial Area Time of Concentration = 8.39 minutes
55  $TC = [1.8 * (1.1 - C) * \text{distance (Ft.)}^{.5} / (\% \text{ slope}^{(1/3)})]$ 
56  $TC = [1.8 * (1.1 - 0.3600) * (100.000^{.5}) / (4.000^{(1/3)})] = 8.39$ 
57 Rainfall intensity (I) = 5.660 (In/Hr) for a 50.0 year storm
58 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
59 Subarea runoff = 0.155 (CFS)
60 Total initial stream area = 0.076 (Ac.)
61
62
63 *****
64 Process from Point/Station 102.000 to Point/Station 103.000
65 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
66 -----
67 Estimated mean flow rate at midpoint of channel = 3.696 (CFS)
68 Depth of flow = 0.197 (Ft.), Average velocity = 3.815 (Ft/s)
69 ***** Irregular Channel Data *****

```

```

70 -----
71 Information entered for subchannel number 1 :
72 Point number      'X' coordinate      'Y' coordinate
73     1              0.00              2.00
74     2              50.00              0.00
75     3             100.00              2.00
76 Manning's 'N' friction factor =    0.030
77 -----
78 Sub-Channel flow =      3.696 (CFS)
79 '      ' flow top width =      9.842 (Ft.)
80 '      ' velocity=      3.815 (Ft/s)
81 '      ' area =      0.969 (Sq.Ft)
82 '      ' Froude number =      2.143
83
84 Upstream point elevation =    836.000 (Ft.)
85 Downstream point elevation =    766.000 (Ft.)
86 Flow length =    535.600 (Ft.)
87 Travel time =      2.34 min.
88 Time of concentration =    10.73 min.
89 Depth of flow =      0.197 (Ft.)
90 Average velocity =      3.815 (Ft/s)
91 Total irregular channel flow =      3.696 (CFS)
92 Irregular channel normal depth above invert elev. =      0.197 (Ft.)
93 Average velocity of channel(s) =      3.815 (Ft/s)
94 Adding area flow to channel
95 Rainfall intensity (I) =      4.830 (In/Hr) for a    50.0 year storm
96 Decimal fraction soil group A =    0.600
97 Decimal fraction soil group B =    0.000
98 Decimal fraction soil group C =    0.400
99 Decimal fraction soil group D =    0.000
100 [LOW DENSITY RESIDENTIAL
101 (1.0 DU/A or Less
102 Impervious value, Ai =    0.100
103 Sub-Area C Value =    0.306
104 Rainfall intensity =      4.830 (In/Hr) for a    50.0 year storm
105 Effective runoff coefficient used for total area
106 (Q=KCIA) is C =    0.307 CA =      1.479
107 Subarea runoff =      6.987 (CFS) for      4.743 (Ac.)
108 Total runoff =      7.142 (CFS) Total area =      4.819 (Ac.)
109 Depth of flow =      0.252 (Ft.), Average velocity =      4.498 (Ft/s)
110
111
112 *****
113 Process from Point/Station    103.000 to Point/Station    104.000
114 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
115
116 -----
117 Estimated mean flow rate at midpoint of channel =      7.189 (CFS)
118 Depth of flow =      0.447 (Ft.), Average velocity =      2.333 (Ft/s)
119 ***** Irregular Channel Data *****
120 -----
121 Information entered for subchannel number 1 :
122 Point number      'X' coordinate      'Y' coordinate
123     1              0.00              0.52
124     2             19.50              0.13
125     3             21.00              0.00
126     4             21.00              0.50
127     5             31.00              1.00
128 Manning's 'N' friction factor =      0.015
129 -----
130 Sub-Channel flow =      7.189 (CFS)
131 '      ' flow top width =     17.340 (Ft.)
132 '      ' velocity=      2.333 (Ft/s)
133 '      ' area =      3.082 (Sq.Ft)
134 '      ' Froude number =      0.975
135
136 Upstream point elevation =    766.000 (Ft.)
137 Downstream point elevation =    762.910 (Ft.)
138 Flow length =    537.900 (Ft.)
139 Travel time =      3.84 min.

```



```

139 Time of concentration = 14.57 min.
140 Depth of flow = 0.447(Ft.)
141 Average velocity = 2.333(Ft/s)
142 Total irregular channel flow = 7.189(CFS)
143 Irregular channel normal depth above invert elev. = 0.447(Ft.)
144 Average velocity of channel(s) = 2.333(Ft/s)
145 Adding area flow to channel
146 Rainfall intensity (I) = 3.965(In/Hr) for a 50.0 year storm
147 Decimal fraction soil group A = 0.900
148 Decimal fraction soil group B = 0.000
149 Decimal fraction soil group C = 0.100
150 Decimal fraction soil group D = 0.000
151 [LOW DENSITY RESIDENTIAL ]
152 (1.0 DU/A or Less )
153 Impervious value, Ai = 0.100
154 Sub-Area C Value = 0.279
155 The area added to the existing stream causes a
156 a lower flow rate of Q = 6.426(CFS)
157 therefore the upstream flow rate of Q = 7.142(CFS) is being used
158 Rainfall intensity = 3.965(In/Hr) for a 50.0 year storm
159 Effective runoff coefficient used for total area
160 (Q=KCIA) is C = 0.304 CA = 1.621
161 Subarea runoff = 0.000(CFS) for 0.510(Ac.)
162 Total runoff = 7.142(CFS) Total area = 5.329(Ac.)
163 Depth of flow = 0.446(Ft.), Average velocity = 2.329(Ft/s)
164
165
166 *****
167 Process from Point/Station 104.000 to Point/Station 104.000
168 **** CONFLUENCE OF MINOR STREAMS ****
169
170 -----
171 Along Main Stream number: 1 in normal stream number 1
172 Stream flow area = 5.329(Ac.)
173 Runoff from this stream = 7.142(CFS)
174 Time of concentration = 14.57 min.
175 Rainfall intensity = 3.965(In/Hr)
176
177 *****
178 Process from Point/Station 201.000 to Point/Station 202.000
179 **** INITIAL AREA EVALUATION ****
180
181 -----
182 Decimal fraction soil group A = 0.000
183 Decimal fraction soil group B = 0.000
184 Decimal fraction soil group C = 1.000
185 Decimal fraction soil group D = 0.000
186 [LOW DENSITY RESIDENTIAL ]
187 (1.0 DU/A or Less )
188 Impervious value, Ai = 0.100
189 Sub-Area C Value = 0.360
190 Initial subarea total flow distance = 100.000(Ft.)
191 Highest elevation = 840.000(Ft.)
192 Lowest elevation = 834.000(Ft.)
193 Elevation difference = 6.000(Ft.) Slope = 6.000 %
194 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
195 The maximum overland flow distance is 100.00 (Ft)
196 for the top area slope value of 6.00 %, in a development type of
197 1.0 DU/A or Less
198 In Accordance With Figure 3-3
199 Initial Area Time of Concentration = 7.33 minutes
200 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3))
201 TC = [1.8*(1.1-0.3600)*( 100.000^.5)/( 6.000^(1/3))]= 7.33
202 Rainfall intensity (I) = 6.176(In/Hr) for a 50.0 year storm
203 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
204 Subarea runoff = 0.409(CFS)
205 Total initial stream area = 0.184(Ac.)
206
207 *****

```

```

208 Process from Point/Station      202.000 to Point/Station      203.000
209 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
210
211 Estimated mean flow rate at midpoint of channel =      2.605 (CFS)
212 Depth of flow =    0.168 (Ft.), Average velocity =    3.686 (Ft/s)
213 ***** Irregular Channel Data *****
214 -----
215 Information entered for subchannel number 1 :
216 Point number      'X' coordinate      'Y' coordinate
217      1              0.00              2.00
218      2              50.00              0.00
219      3             100.00              2.00
220 Manning's 'N' friction factor =    0.030
221 -----
222 Sub-Channel flow =    2.605 (CFS)
223 '      ' flow top width =    8.407 (Ft.)
224 '      ' velocity=    3.686 (Ft/s)
225 '      ' area =    0.707 (Sq.Ft)
226 '      ' Froude number =    2.240
227
228 Upstream point elevation =    834.000 (Ft.)
229 Downstream point elevation =    790.370 (Ft.)
230 Flow length =    289.900 (Ft.)
231 Travel time =    1.31 min.
232 Time of concentration =    8.64 min.
233 Depth of flow =    0.168 (Ft.)
234 Average velocity =    3.686 (Ft/s)
235 Total irregular channel flow =    2.605 (CFS)
236 Irregular channel normal depth above invert elev. =    0.168 (Ft.)
237 Average velocity of channel(s) =    3.686 (Ft/s)
238 Adding area flow to channel
239 Rainfall intensity (I) =    5.554 (In/Hr) for a    50.0 year storm
240 Decimal fraction soil group A = 0.800
241 Decimal fraction soil group B = 0.000
242 Decimal fraction soil group C = 0.200
243 Decimal fraction soil group D = 0.000
244 [LOW DENSITY RESIDENTIAL                      ]
245 (1.0 DU/A or Less                      )
246 Impervious value, Ai = 0.100
247 Sub-Area C Value = 0.288
248 Rainfall intensity =    5.554 (In/Hr) for a    50.0 year storm
249 Effective runoff coefficient used for total area
250 (Q=KCIA) is C = 0.293 CA =    0.854
251 Subarea runoff =    4.332 (CFS) for    2.734 (Ac.)
252 Total runoff =    4.741 (CFS) Total area =    2.918 (Ac.)
253 Depth of flow =    0.210 (Ft.), Average velocity =    4.281 (Ft/s)
254
255
256 *****
257 Process from Point/Station      203.000 to Point/Station      104.000
258 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
259
260 Depth of flow =    0.745 (Ft.), Average velocity =    8.553 (Ft/s)
261 ***** Irregular Channel Data *****
262 -----
263 Information entered for subchannel number 1 :
264 Point number      'X' coordinate      'Y' coordinate
265      1              0.00              1.00
266      2              1.00              0.00
267      3              2.00              1.00
268 Manning's 'N' friction factor =    0.015
269 -----
270 Sub-Channel flow =    4.741 (CFS)
271 '      ' flow top width =    1.489 (Ft.)
272 '      ' velocity=    8.553 (Ft/s)
273 '      ' area =    0.554 (Sq.Ft)
274 '      ' Froude number =    2.470
275
276 Upstream point elevation =    790.370 (Ft.)

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```

277 Downstream point elevation = 762.910 (Ft.)
278 Flow length = 621.500 (Ft.)
279 Travel time = 1.21 min.
280 Time of concentration = 9.85 min.
281 Depth of flow = 0.745 (Ft.)
282 Average velocity = 8.553 (Ft/s)
283 Total irregular channel flow = 4.741 (CFS)
284 Irregular channel normal depth above invert elev. = 0.745 (Ft.)
285 Average velocity of channel(s) = 8.553 (Ft/s)
286
287
288 ++++++
289 Process from Point/Station 104.000 to Point/Station 104.000
290 **** CONFLUENCE OF MINOR STREAMS ****
291
292 Along Main Stream number: 1 in normal stream number 2
293 Stream flow area = 2.918 (Ac.)
294 Runoff from this stream = 4.741 (CFS)
295 Time of concentration = 9.85 min.
296 Rainfall intensity = 5.103 (In/Hr)
297 Summary of stream data:
298
299 Stream Flow rate TC Rainfall Intensity
300 No. (CFS) (min) (In/Hr)
301
302
303 1 7.142 14.57 3.965
304 2 4.741 9.85 5.103
305 Qmax(1) =
306 1.000 * 1.000 * 7.142) +
307 0.777 * 1.000 * 4.741) + = 10.825
308 Qmax(2) =
309 1.000 * 0.676 * 7.142) +
310 1.000 * 1.000 * 4.741) + = 9.569
311
312 Total of 2 streams to confluence:
313 Flow rates before confluence point:
314 7.142 4.741
315 Maximum flow rates at confluence using above data:
316 10.825 9.569
317 Area of streams before confluence:
318 5.329 2.918
319 Results of confluence:
320 Total flow rate = 10.825 (CFS)
321 Time of concentration = 14.574 min.
322 Effective stream area after confluence = 8.247 (Ac.)
323
324
325 ++++++
326 Process from Point/Station 104.000 to Point/Station 204.000
327 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
328
329 Estimated mean flow rate at midpoint of channel = 10.874 (CFS)
330 Depth of flow = 0.502 (Ft.), Average velocity = 2.644 (Ft/s)
331 ***** Irregular Channel Data *****
332 -----
333 Information entered for subchannel number 1 :
334 Point number 'X' coordinate 'Y' coordinate
335 1 0.00 0.52
336 2 19.50 0.13
337 3 21.00 0.00
338 4 21.00 0.50
339 5 31.00 1.00
340 Manning's 'N' friction factor = 0.015
341 -----
342 Sub-Channel flow = 10.874 (CFS)
343 ' ' flow top width = 20.133 (Ft.)
344 ' ' velocity = 2.644 (Ft/s)
345 ' ' area = 4.113 (Sq.Ft)

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```

346         '         '         Froude number =         1.031
347
348 Upstream point elevation = 762.910(Ft.)
349 Downstream point elevation = 759.500(Ft.)
350 Flow length = 557.300(Ft.)
351 Travel time = 3.51 min.
352 Time of concentration = 18.09 min.
353 Depth of flow = 0.502(Ft.)
354 Average velocity = 2.644(Ft/s)
355 Total irregular channel flow = 10.874(CFS)
356 Irregular channel normal depth above invert elev. = 0.502(Ft.)
357 Average velocity of channel(s) = 2.644(Ft/s)
358 Adding area flow to channel
359 Rainfall intensity (I) = 3.449(In/Hr) for a 50.0 year storm
360 Decimal fraction soil group A = 0.400
361 Decimal fraction soil group B = 0.000
362 Decimal fraction soil group C = 0.600
363 Decimal fraction soil group D = 0.000
364 [LOW DENSITY RESIDENTIAL ]
365 (2.9 DU/A or Less )
366 Impervious value, Ai = 0.250
367 Sub-Area C Value = 0.422
368 The area added to the existing stream causes a
369 a lower flow rate of Q = 10.261(CFS)
370 therefore the upstream flow rate of Q = 10.825(CFS) is being used
371 Rainfall intensity = 3.449(In/Hr) for a 50.0 year storm
372 Effective runoff coefficient used for total area
373 (Q=KCIA) is C = 0.315 CA = 2.975
374 Subarea runoff = 0.000(CFS) for 1.186(Ac.)
375 Total runoff = 10.825(CFS) Total area = 9.433(Ac.)
376 Depth of flow = 0.501(Ft.), Average velocity = 2.642(Ft/s)
377
378
379 *****
380 Process from Point/Station 204.000 to Point/Station 204.000
381 **** CONFLUENCE OF MAIN STREAMS ****
382
383 The following data inside Main Stream is listed:
384 In Main Stream number: 1
385 Stream flow area = 9.433(Ac.)
386 Runoff from this stream = 10.825(CFS)
387 Time of concentration = 18.09 min.
388 Rainfall intensity = 3.449(In/Hr)
389 Program is now starting with Main Stream No. 2
390
391
392 *****
393 Process from Point/Station 306.000 to Point/Station 306.000
394 **** USER DEFINED FLOW INFORMATION AT A POINT ****
395
396 User specified 'C' value of 0.364 given for subarea
397 Rainfall intensity (I) = 3.168(In/Hr) for a 50.0 year storm
398 User specified values are as follows:
399 TC = 20.63 min. Rain intensity = 3.17(In/Hr)
400 Total area = 8.843(Ac.) Total runoff = 10.210(CFS)
401
402
403 *****
404 Process from Point/Station 306.000 to Point/Station 408.000
405 **** PIPEFLOW TRAVEL TIME (User specified size) ****
406
407 Upstream point/station elevation = 757.560(Ft.)
408 Downstream point/station elevation = 757.490(Ft.)
409 Pipe length = 15.05(Ft.) Slope = 0.0047 Manning's N = 0.013
410 No. of pipes = 1 Required pipe flow = 10.210(CFS)
411 Given pipe size = 24.00(In.)
412 Calculated individual pipe flow = 10.210(CFS)
413 Normal flow depth in pipe = 14.25(In.)
414 Flow top width inside pipe = 23.57(In.)

```



```

415 Critical Depth = 13.73 (In.)
416 Pipe flow velocity = 5.25 (Ft/s)
417 Travel time through pipe = 0.05 min.
418 Time of concentration (TC) = 20.68 min.
419
420
421 *****
422 Process from Point/Station 408.000 to Point/Station 408.000
423 **** CONFLUENCE OF MINOR STREAMS ****
424
425 Along Main Stream number: 2 in normal stream number 1
426 Stream flow area = 8.843 (Ac.)
427 Runoff from this stream = 10.210 (CFS)
428 Time of concentration = 20.68 min.
429 Rainfall intensity = 3.164 (In/Hr)
430
431
432 *****
433 Process from Point/Station 401.000 to Point/Station 402.000
434 **** INITIAL AREA EVALUATION ****
435
436 Decimal fraction soil group A = 0.000
437 Decimal fraction soil group B = 0.000
438 Decimal fraction soil group C = 1.000
439 Decimal fraction soil group D = 0.000
440 [LOW DENSITY RESIDENTIAL ]
441 (1.0 DU/A or Less )
442 Impervious value, Ai = 0.100
443 Sub-Area C Value = 0.360
444 Initial subarea total flow distance = 100.000 (Ft.)
445 Highest elevation = 828.000 (Ft.)
446 Lowest elevation = 815.000 (Ft.)
447 Elevation difference = 13.000 (Ft.) Slope = 13.000 %
448 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
449 The maximum overland flow distance is 100.00 (Ft)
450 for the top area slope value of 13.00 %, in a development type of
451 1.0 DU/A or Less
452 In Accordance With Figure 3-3
453 Initial Area Time of Concentration = 5.66 minutes
454  $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5} / (% slope^{(1/3)})]$ 
455  $TC = [1.8 * (1.1 - 0.3600) * (100.000^{.5}) / (13.000^{(1/3)})] = 5.66$ 
456 Rainfall intensity (I) = 7.293 (In/Hr) for a 50.0 year storm
457 Effective runoff coefficient used for area (Q=KCIA) is C = 0.360
458 Subarea runoff = 0.320 (CFS)
459 Total initial stream area = 0.122 (Ac.)
460
461
462 *****
463 Process from Point/Station 402.000 to Point/Station 403.000
464 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
465
466 Estimated mean flow rate at midpoint of channel = 1.994 (CFS)
467 Depth of flow = 0.235 (Ft.), Average velocity = 3.602 (Ft/s)
468 ***** Irregular Channel Data *****
469 -----
470 Information entered for subchannel number 1 :
471 Point number 'X' coordinate 'Y' coordinate
472 1 0.00 1.00
473 2 10.00 0.00
474 3 20.00 1.00
475 Manning's 'N' friction factor = 0.030
476 -----
477 Sub-Channel flow = 1.994 (CFS)
478 ' ' flow top width = 4.706 (Ft.)
479 ' ' velocity = 3.602 (Ft/s)
480 ' ' area = 0.554 (Sq.Ft)
481 ' ' Froude number = 1.851
482
483 Upstream point elevation = 815.000 (Ft.)

```

```

484 Downstream point elevation = 791.000(Ft.)
485 Flow length = 259.850(Ft.)
486 Travel time = 1.20 min.
487 Time of concentration = 6.87 min.
488 Depth of flow = 0.235(Ft.)
489 Average velocity = 3.602(Ft/s)
490 Total irregular channel flow = 1.994(CFS)
491 Irregular channel normal depth above invert elev. = 0.235(Ft.)
492 Average velocity of channel(s) = 3.602(Ft/s)
493 Adding area flow to channel
494 Rainfall intensity (I) = 6.441(In/Hr) for a 50.0 year storm
495 Decimal fraction soil group A = 0.600
496 Decimal fraction soil group B = 0.000
497 Decimal fraction soil group C = 0.400
498 Decimal fraction soil group D = 0.000
499 [LOW DENSITY RESIDENTIAL ]
500 (1.0 DU/A or Less )
501 Impervious value, Ai = 0.100
502 Sub-Area C Value = 0.306
503 Rainfall intensity = 6.441(In/Hr) for a 50.0 year storm
504 Effective runoff coefficient used for total area
505 (Q=KCIA) is C = 0.310 CA = 0.558
506 Subarea runoff = 3.272(CFS) for 1.679(Ac.)
507 Total runoff = 3.592(CFS) Total area = 1.801(Ac.)
508 Depth of flow = 0.293(Ft.), Average velocity = 4.173(Ft/s)
509
510
511 *****
512 Process from Point/Station 403.000 to Point/Station 404.000
513 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
514
515 -----
516 Depth of flow = 0.716(Ft.), Average velocity = 7.001(Ft/s)
517 ***** Irregular Channel Data *****
518 -----
519 Information entered for subchannel number 1 :
520 Point number 'X' coordinate 'Y' coordinate
521 1 0.00 1.00
522 2 1.00 0.00
523 3 2.00 1.00
524 Manning's 'N' friction factor = 0.015
525 -----
526 Sub-Channel flow = 3.592(CFS)
527 ' ' flow top width = 1.433(Ft.)
528 ' ' velocity= 7.001(Ft/s)
529 ' ' area = 0.513(Sq.Ft)
530 ' ' Froude number = 2.061
531
532 Upstream point elevation = 791.000(Ft.)
533 Downstream point elevation = 781.500(Ft.)
534 Flow length = 304.820(Ft.)
535 Travel time = 0.73 min.
536 Time of concentration = 7.59 min.
537 Depth of flow = 0.716(Ft.)
538 Average velocity = 7.001(Ft/s)
539 Total irregular channel flow = 3.592(CFS)
540 Irregular channel normal depth above invert elev. = 0.716(Ft.)
541 Average velocity of channel(s) = 7.001(Ft/s)
542
543 *****
544 Process from Point/Station 404.000 to Point/Station 405.000
545 **** PIPEFLOW TRAVEL TIME (User specified size) ****
546
547 -----
548 Upstream point/station elevation = 775.420(Ft.)
549 Downstream point/station elevation = 773.810(Ft.)
550 Pipe length = 164.90(Ft.) Slope = 0.0098 Manning's N = 0.013
551 No. of pipes = 1 Required pipe flow = 3.592(CFS)
552 Given pipe size = 18.00(In.)
553 Calculated individual pipe flow = 3.592(CFS)

```

```

553 Normal flow depth in pipe = 7.31(In.)
554 Flow top width inside pipe = 17.68(In.)
555 Critical Depth = 8.68(In.)
556 Pipe flow velocity = 5.34(Ft/s)
557 Travel time through pipe = 0.51 min.
558 Time of concentration (TC) = 8.11 min.
559
560
561 *****
562 Process from Point/Station 405.000 to Point/Station 406.000
563 **** PIPEFLOW TRAVEL TIME (User specified size) ****
564
565 Upstream point/station elevation = 773.610(Ft.)
566 Downstream point/station elevation = 772.150(Ft.)
567 Pipe length = 150.00(Ft.) Slope = 0.0097 Manning's N = 0.013
568 No. of pipes = 1 Required pipe flow = 3.592(CFS)
569 Given pipe size = 18.00(In.)
570 Calculated individual pipe flow = 3.592(CFS)
571 Normal flow depth in pipe = 7.31(In.)
572 Flow top width inside pipe = 17.68(In.)
573 Critical Depth = 8.68(In.)
574 Pipe flow velocity = 5.33(Ft/s)
575 Travel time through pipe = 0.47 min.
576 Time of concentration (TC) = 8.58 min.
577
578
579 *****
580 Process from Point/Station 406.000 to Point/Station 407.000
581 **** PIPEFLOW TRAVEL TIME (User specified size) ****
582
583 Upstream point/station elevation = 771.950(Ft.)
584 Downstream point/station elevation = 759.100(Ft.)
585 Pipe length = 387.10(Ft.) Slope = 0.0332 Manning's N = 0.013
586 No. of pipes = 1 Required pipe flow = 3.592(CFS)
587 Given pipe size = 18.00(In.)
588 Calculated individual pipe flow = 3.592(CFS)
589 Normal flow depth in pipe = 5.29(In.)
590 Flow top width inside pipe = 16.40(In.)
591 Critical Depth = 8.68(In.)
592 Pipe flow velocity = 8.31(Ft/s)
593 Travel time through pipe = 0.78 min.
594 Time of concentration (TC) = 9.35 min.
595
596
597 *****
598 Process from Point/Station 407.000 to Point/Station 408.000
599 **** PIPEFLOW TRAVEL TIME (User specified size) ****
600
601 Upstream point/station elevation = 758.900(Ft.)
602 Downstream point/station elevation = 757.490(Ft.)
603 Pipe length = 141.20(Ft.) Slope = 0.0100 Manning's N = 0.013
604 No. of pipes = 1 Required pipe flow = 3.592(CFS)
605 Given pipe size = 18.00(In.)
606 Calculated individual pipe flow = 3.592(CFS)
607 Normal flow depth in pipe = 7.26(In.)
608 Flow top width inside pipe = 17.66(In.)
609 Critical Depth = 8.68(In.)
610 Pipe flow velocity = 5.38(Ft/s)
611 Travel time through pipe = 0.44 min.
612 Time of concentration (TC) = 9.79 min.
613
614
615 *****
616 Process from Point/Station 408.000 to Point/Station 408.000
617 **** CONFLUENCE OF MINOR STREAMS ****
618
619 Along Main Stream number: 2 in normal stream number 2
620 Stream flow area = 1.801(Ac.)
621 Runoff from this stream = 3.592(CFS)

```

```

622 Time of concentration = 9.79 min.
623 Rainfall intensity = 5.124 (In/Hr)
624 Summary of stream data:
625
626 Stream Flow rate TC Rainfall Intensity
627 No. (CFS) (min) (In/Hr)
628
629
630 1 10.210 20.68 3.164
631 2 3.592 9.79 5.124
632 Qmax(1) =
633 1.000 * 1.000 * 10.210) +
634 0.617 * 1.000 * 3.592) + = 12.428
635 Qmax(2) =
636 1.000 * 0.473 * 10.210) +
637 1.000 * 1.000 * 3.592) + = 8.427
638
639 Total of 2 streams to confluence:
640 Flow rates before confluence point:
641 10.210 3.592
642 Maximum flow rates at confluence using above data:
643 12.428 8.427
644 Area of streams before confluence:
645 8.843 1.801
646 Results of confluence:
647 Total flow rate = 12.428 (CFS)
648 Time of concentration = 20.678 min.
649 Effective stream area after confluence = 10.644 (Ac.)
650
651
652 *****
653 Process from Point/Station 408.000 to Point/Station 204.000
654 **** PIPEFLOW TRAVEL TIME (User specified size) ****
655
656 Upstream point/station elevation = 757.290 (Ft.)
657 Downstream point/station elevation = 757.150 (Ft.)
658 Pipe length = 27.40 (Ft.) Slope = 0.0051 Manning's N = 0.013
659 No. of pipes = 1 Required pipe flow = 12.428 (CFS)
660 Given pipe size = 24.00 (In.)
661 Calculated individual pipe flow = 12.428 (CFS)
662 Normal flow depth in pipe = 15.77 (In.)
663 Flow top width inside pipe = 22.78 (In.)
664 Critical Depth = 15.21 (In.)
665 Pipe flow velocity = 5.68 (Ft/s)
666 Travel time through pipe = 0.08 min.
667 Time of concentration (TC) = 20.76 min.
668
669
670 *****
671 Process from Point/Station 204.000 to Point/Station 204.000
672 **** CONFLUENCE OF MAIN STREAMS ****
673
674 The following data inside Main Stream is listed:
675 In Main Stream number: 2
676 Stream flow area = 10.644 (Ac.)
677 Runoff from this stream = 12.428 (CFS)
678 Time of concentration = 20.76 min.
679 Rainfall intensity = 3.156 (In/Hr)
680 Summary of stream data:
681
682 Stream Flow rate TC Rainfall Intensity
683 No. (CFS) (min) (In/Hr)
684
685
686 1 10.825 18.09 3.449
687 2 12.428 20.76 3.156
688 Qmax(1) =
689 1.000 * 1.000 * 10.825) +
690 1.000 * 0.871 * 12.428) + = 21.654

```



```

691 Qmax(2) =
692     0.915 *    1.000 *    10.825) +
693     1.000 *    1.000 *    12.428) + =    22.333
694
695 Total of 2 main streams to confluence:
696 Flow rates before confluence point:
697     10.825     12.428
698 Maximum flow rates at confluence using above data:
699     21.654     22.333
700 Area of streams before confluence:
701     9.433     10.644
702
703
704 Results of confluence:
705 Total flow rate =    22.333 (CFS)
706 Time of concentration =    20.758 min.
707 Effective stream area after confluence =    20.077 (Ac.)
708 End of computations, total study area =    20.077 (Ac.)
709
710
711

```

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 11/18/25

24021 CONWAY DRIVE
POST-DEVELOPMENT MITIGATED
Q50 YR
POC-2

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

Program License Serial Number 6332

Rational hydrology study storm event year is 50.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.000
24 hour precipitation(inches) = 6.500
P6/P24 = 46.2%
San Diego hydrology manual 'C' values used

Process from Point/Station 504.000 to Point/Station 505.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 772.700(Ft.)
Downstream point/station elevation = 772.600(Ft.)
Pipe length = 12.00(Ft.) Slope = 0.0083 Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.000(CFS)
Given pipe size = 12.00(In.)
Calculated individual pipe flow = 0.000(CFS)
Normal flow depth in pipe = 0.08(In.)
Flow top width inside pipe = 1.89(In.)
Critical depth could not be calculated.
Pipe flow velocity = 0.27(Ft/s)
Travel time through pipe = 0.74 min.
Time of concentration (TC) = 0.74 min.

Process from Point/Station 504.000 to Point/Station 504.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.441 given for subarea
Rainfall intensity (I) = 4.163(In/Hr) for a 50.0 year storm
User specified values are as follows:
TC = 13.51 min. Rain intensity = 4.16(In/Hr)
Total area = 0.707(Ac.) Total runoff = 1.299(CFS)

Process from Point/Station 505.000 to Point/Station 506.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Depth of flow = 0.330(Ft.), Average velocity = 3.272(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 0.13
 2 1.50 0.00
 3 1.50 0.50
 4 2.00 0.51
 Manning's 'N' friction factor = 0.015

 Sub-Channel flow = 1.299(CFS)
 flow top width = 1.500(Ft.)
 velocity = 3.272(Ft/s)
 area = 0.397(Sq.Ft)
 Froude number = 1.121

Upstream point elevation = 772.600(Ft.)
 Downstream point elevation = 772.000(Ft.)
 Flow length = 71.400(Ft.)
 Travel time = 0.36 min.
 Time of concentration = 13.87 min.
 Depth of flow = 0.330(Ft.)
 Average velocity = 3.272(Ft/s)
 Total irregular channel flow = 1.299(CFS)
 Irregular channel normal depth above invert elev. = 0.330(Ft.)
 Average velocity of channel(s) = 3.272(Ft/s)
 !!Warning: Water is above left or right bank elevations

 Process from Point/Station 506.000 to Point/Station 506.000
 **** SUBAREA FLOW ADDITION ****

Rainfall intensity (I) = 4.092(In/Hr) for a 50.0 year storm
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 1.000
 Decimal fraction soil group D = 0.000
 [LOW DENSITY RESIDENTIAL]
 (2.9 DU/A or Less)
 Impervious value, Ai = 0.250
 Sub-Area C Value = 0.450
 Time of concentration = 13.87 min.
 Rainfall intensity = 4.092(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for total area
 (Q=KCIA) is C = 0.444 CA = 0.457
 Subarea runoff = 0.570(CFS) for 0.322(Ac.)
 Total runoff = 1.869(CFS) Total area = 1.029(Ac.)
 End of computations, total study area = 1.029 (Ac.)

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023



Legend

<u>Hyd.</u>	<u>Origin</u>	<u>Description</u>
1	Manual	Node 306 Hydrograph Inflow
2	Reservoir	Node 306 Outflow

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	Manual	----	----	----	----	----	----	----	13.71	----	Node 306 Hydrograph Inflow
2	Reservoir	1	----	----	----	----	----	----	10.21	----	Node 306 Outflow

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

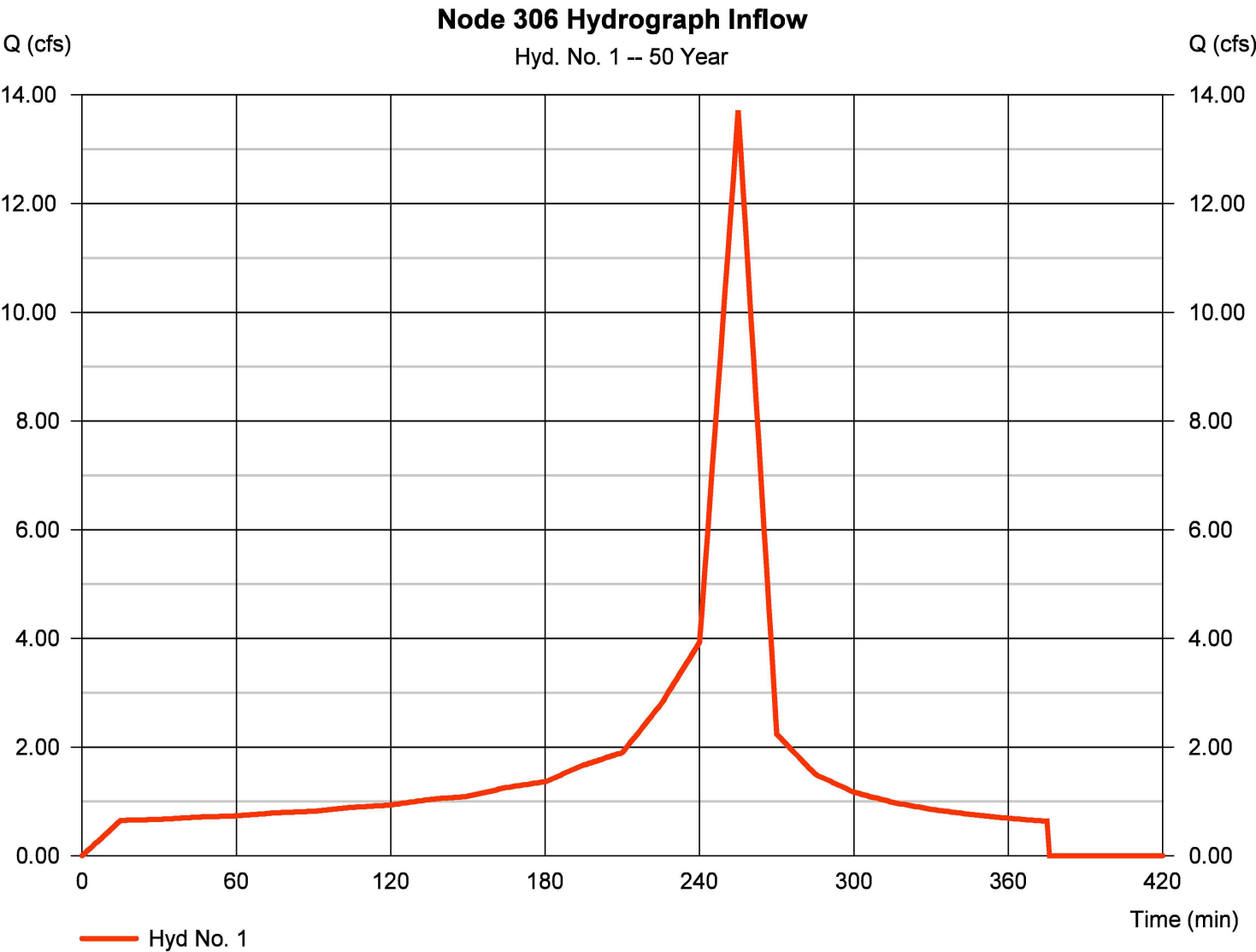
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	13.71	1	255	39,122	-----	-----	-----	Node 306 Hydrograph Inflow
2	Reservoir	10.21	1	260	39,121	1	761.97	5,838	Node 306 Outflow
Detention Basin Node 306.gpw					Return Period: 50 Year			Tuesday, 11 / 18 / 2025	

Hydrograph Report

Hyd. No. 1

Node 306 Hydrograph Inflow

Hydrograph type	= Manual	Peak discharge	= 13.71 cfs
Storm frequency	= 50 yrs	Time to peak	= 255 min
Time interval	= 1 min	Hyd. volume	= 39,122 cuft



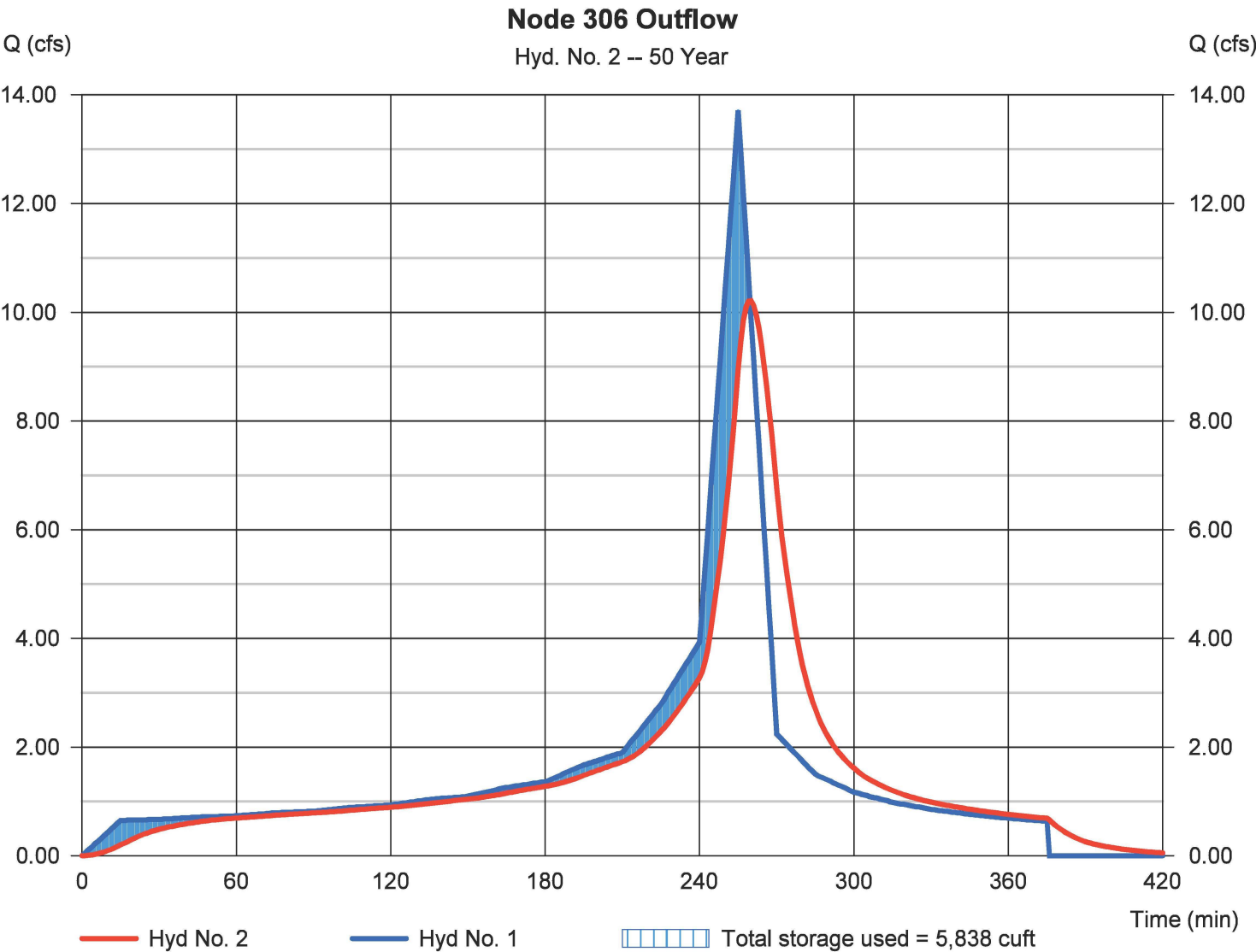
Hydrograph Report

Hyd. No. 2

Node 306 Outflow

Hydrograph type	= Reservoir	Peak discharge	= 10.21 cfs
Storm frequency	= 50 yrs	Time to peak	= 260 min
Time interval	= 1 min	Hyd. volume	= 39,121 cuft
Inflow hyd. No.	= 1 - Node 306 Hydrograph Inflow	Max. Elevation	= 761.97 ft
Reservoir name	= Detention Basin POC-1	Max. Storage	= 5,838 cuft

Storage Indication method used. Outflow includes exfiltration.



Pond No. 1 - Detention Basin POC-1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 761.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	761.50	12,004	0	0
0.25	761.75	12,352	3,044	3,044
0.50	762.00	12,705	3,132	6,176
0.75	762.25	13,061	3,220	9,396
1.00	762.50	13,301	3,295	12,691

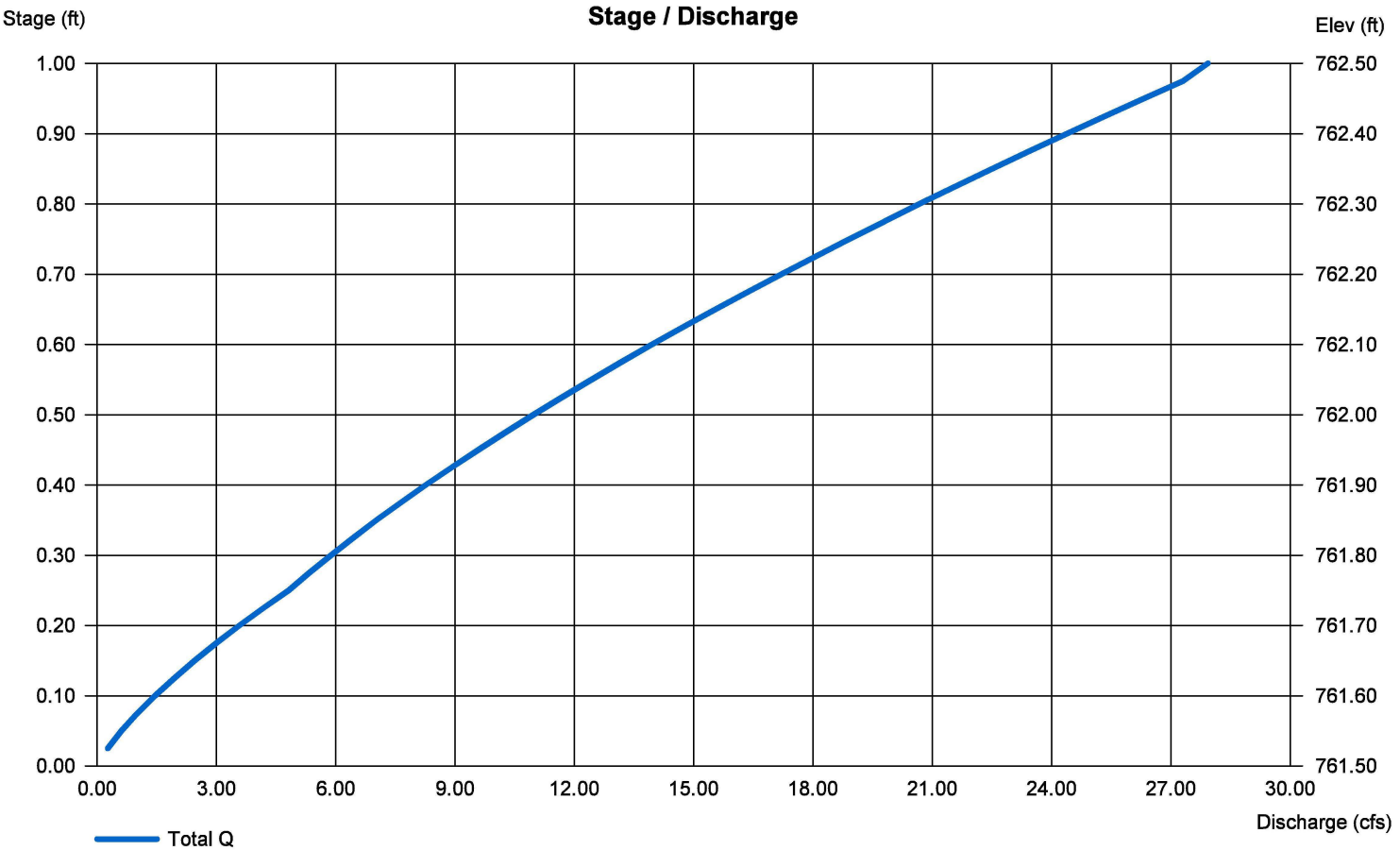
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	2.00	Inactive	0.00
Span (in)	= 24.00	2.00	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 757.56	758.00	0.00	0.00
Length (ft)	= 15.05	0.04	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 761.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 5.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Tuesday, 11 / 18 / 2025

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	69.8703	13.1000	0.8658	-----
3	0.0000	0.0000	0.0000	-----
5	79.2597	14.6000	0.8369	-----
10	88.2351	15.5000	0.8279	-----
25	102.6072	16.5000	0.8217	-----
50	114.8193	17.2000	0.8199	-----
100	127.1596	17.8000	0.8186	-----

File name: SampleFHA.idf

$$\text{Intensity} = B / (T_c + D)^E$$

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

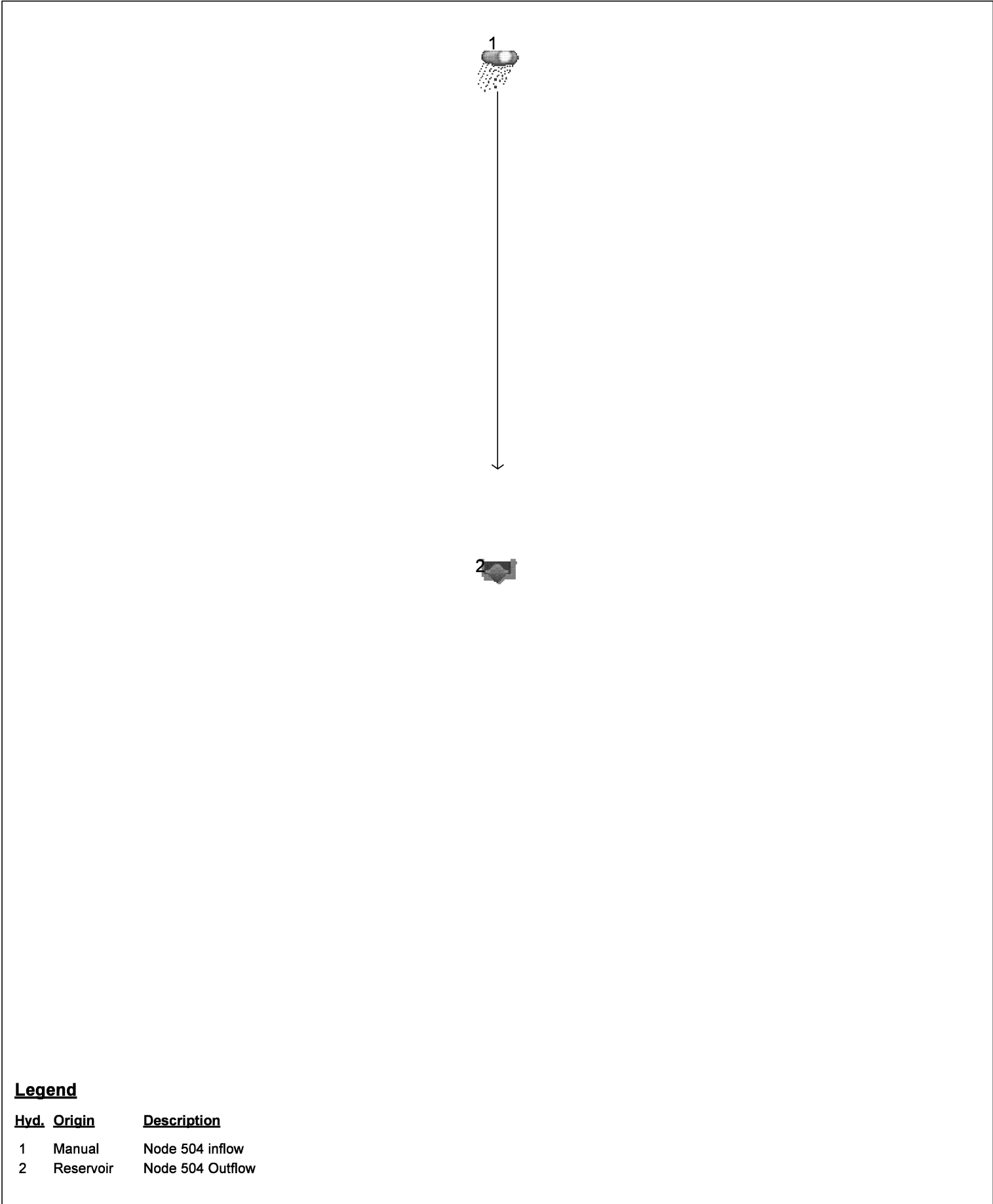
Tc = time in minutes. Values may exceed 60.

Precip. file name: Sample.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	2.20	0.00	3.30	4.25	5.77	6.80	7.95
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023



Legend

Hyd.	Origin	Description
1	Manual	Node 504 inflow
2	Reservoir	Node 504 Outflow

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	Manual	----	----	----	----	----	----	----	1.470	----	Node 504 inflow
2	Reservoir	1	----	----	----	----	----	----	1.299	----	Node 504 Outflow

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

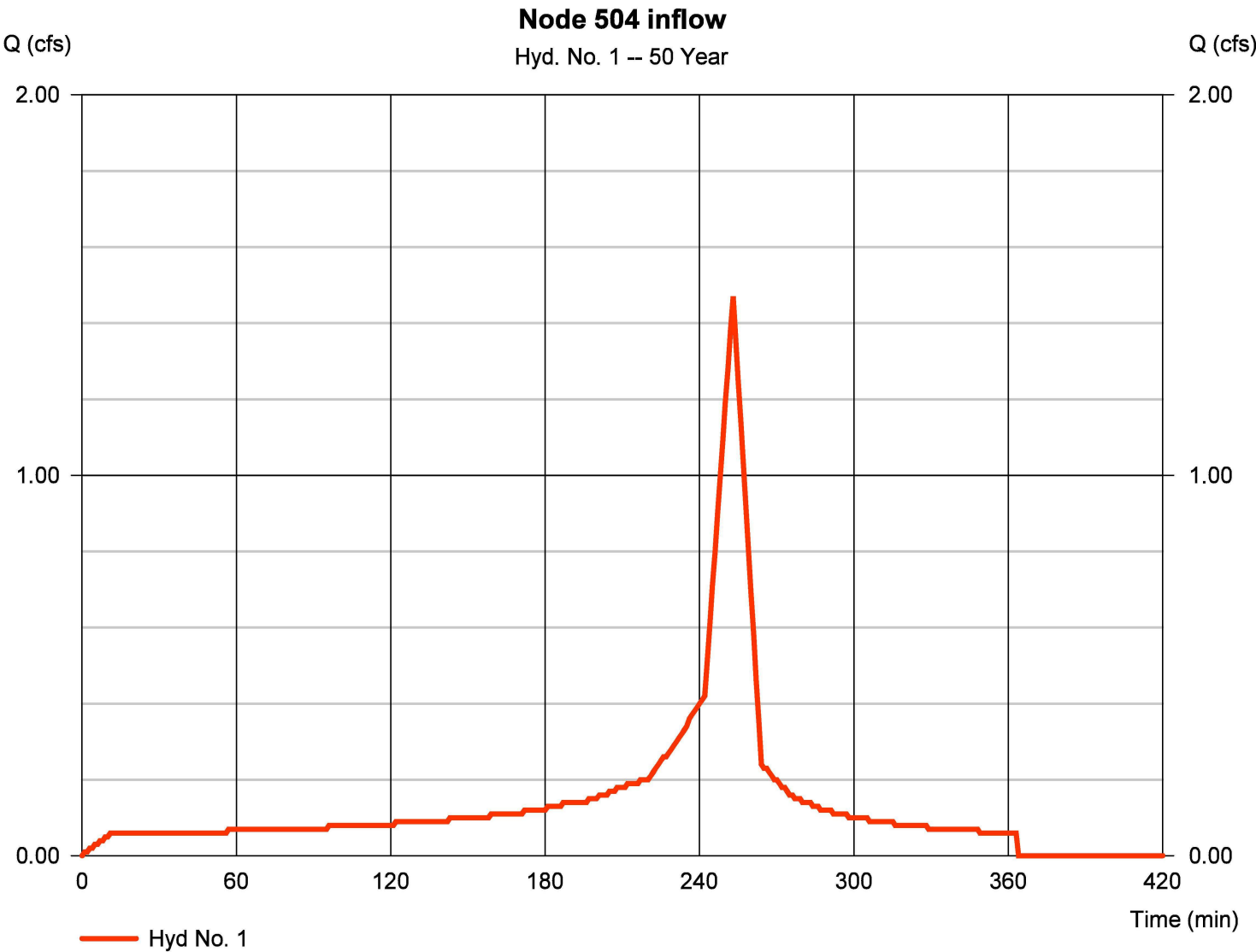
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	1.470	1	253	3,414	-----	-----	-----	Node 504 inflow
2	Reservoir	1.299	1	255	3,414	1	776.08	272	Node 504 Outflow
Detention Basin Node 504.gpw					Return Period: 50 Year			Tuesday, 11 / 18 / 2025	

Hydrograph Report

Hyd. No. 1

Node 504 inflow

Hydrograph type	= Manual	Peak discharge	= 1.470 cfs
Storm frequency	= 50 yrs	Time to peak	= 253 min
Time interval	= 1 min	Hyd. volume	= 3,414 cuft



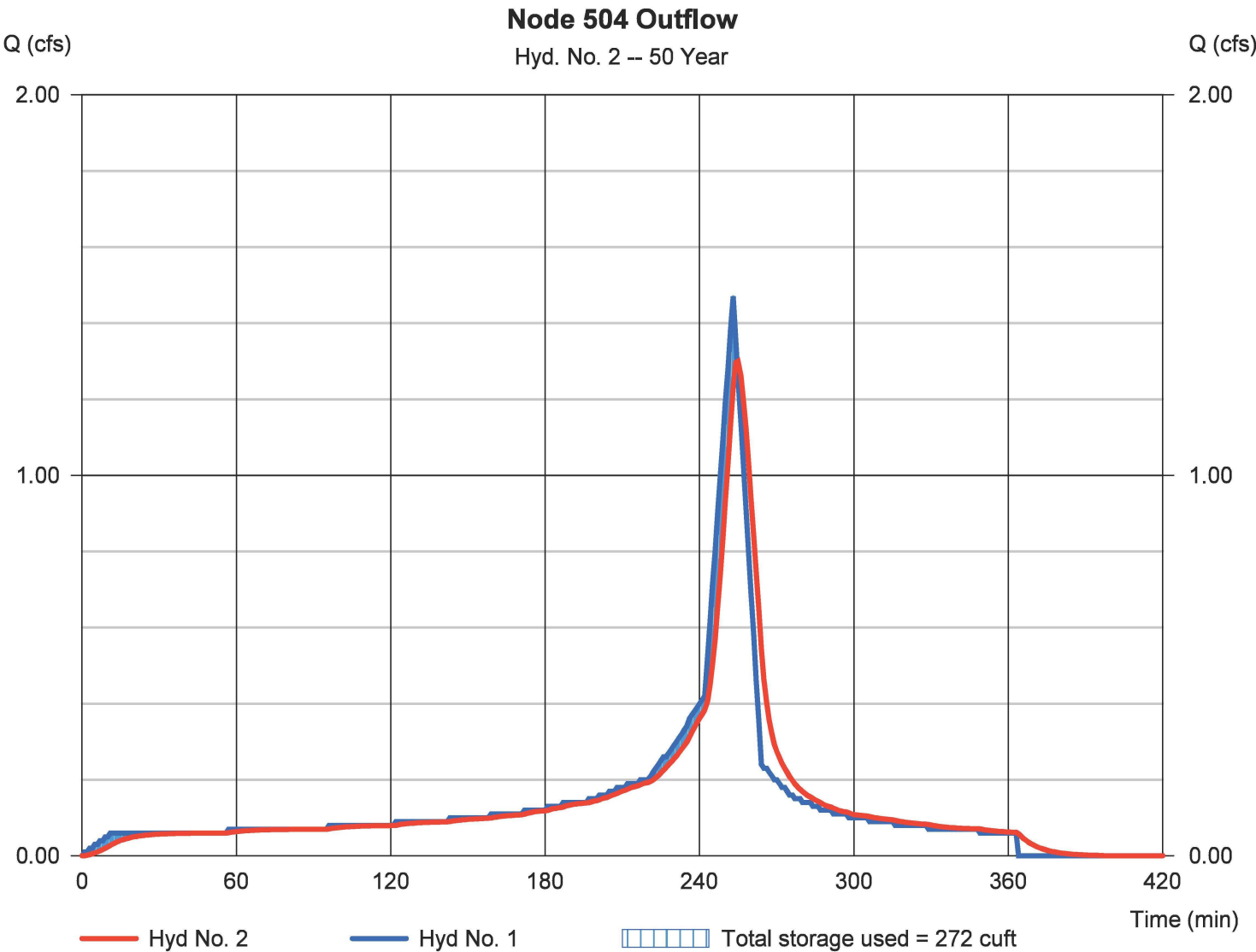
Hydrograph Report

Hyd. No. 2

Node 504 Outflow

Hydrograph type	= Reservoir	Peak discharge	= 1.299 cfs
Storm frequency	= 50 yrs	Time to peak	= 255 min
Time interval	= 1 min	Hyd. volume	= 3,414 cuft
Inflow hyd. No.	= 1 - Node 504 inflow	Max. Elevation	= 776.08 ft
Reservoir name	= Detention Basin Node 504	Max. Storage	= 272 cuft

Storage Indication method used.



Pond No. 1 - Detention Basin Node 504

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 775.95 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	775.95	1,960	0	0
0.25	776.20	2,133	511	511
0.50	776.45	2,310	555	1,067
0.75	776.70	2,492	600	1,667
1.00	776.95	2,615	638	2,305

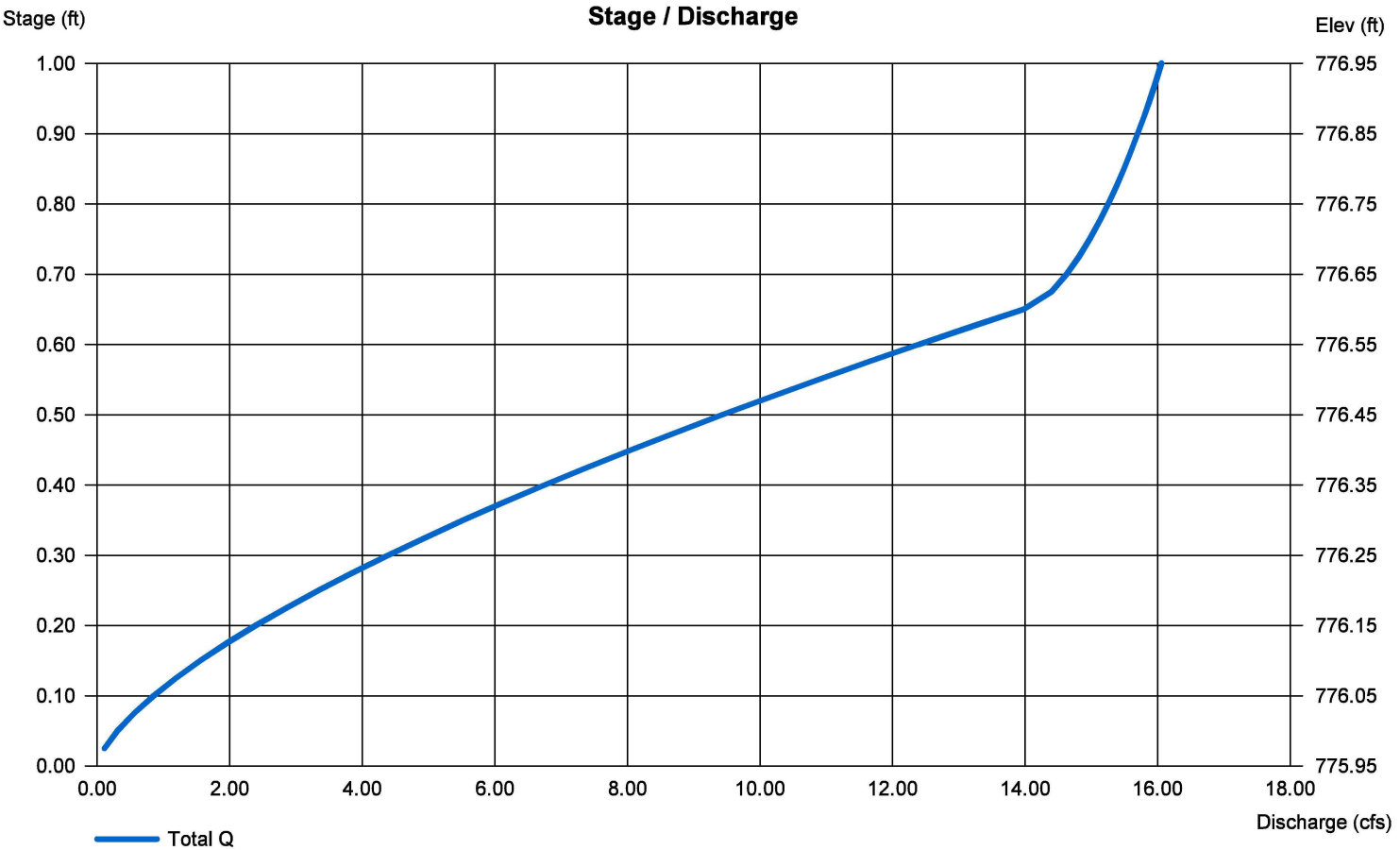
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.75	Inactive	0.00
Span (in)	= 18.00	0.75	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 772.45	772.45	0.00	0.00
Length (ft)	= 12.00	0.04	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 775.95	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Tuesday, 11 / 18 / 2025

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	69.8703	13.1000	0.8658	-----
3	0.0000	0.0000	0.0000	-----
5	79.2597	14.6000	0.8369	-----
10	88.2351	15.5000	0.8279	-----
25	102.6072	16.5000	0.8217	-----
50	114.8193	17.2000	0.8199	-----
100	127.1596	17.8000	0.8186	-----

File name: SampleFHA.idf

$$\text{Intensity} = B / (T_c + D)^E$$

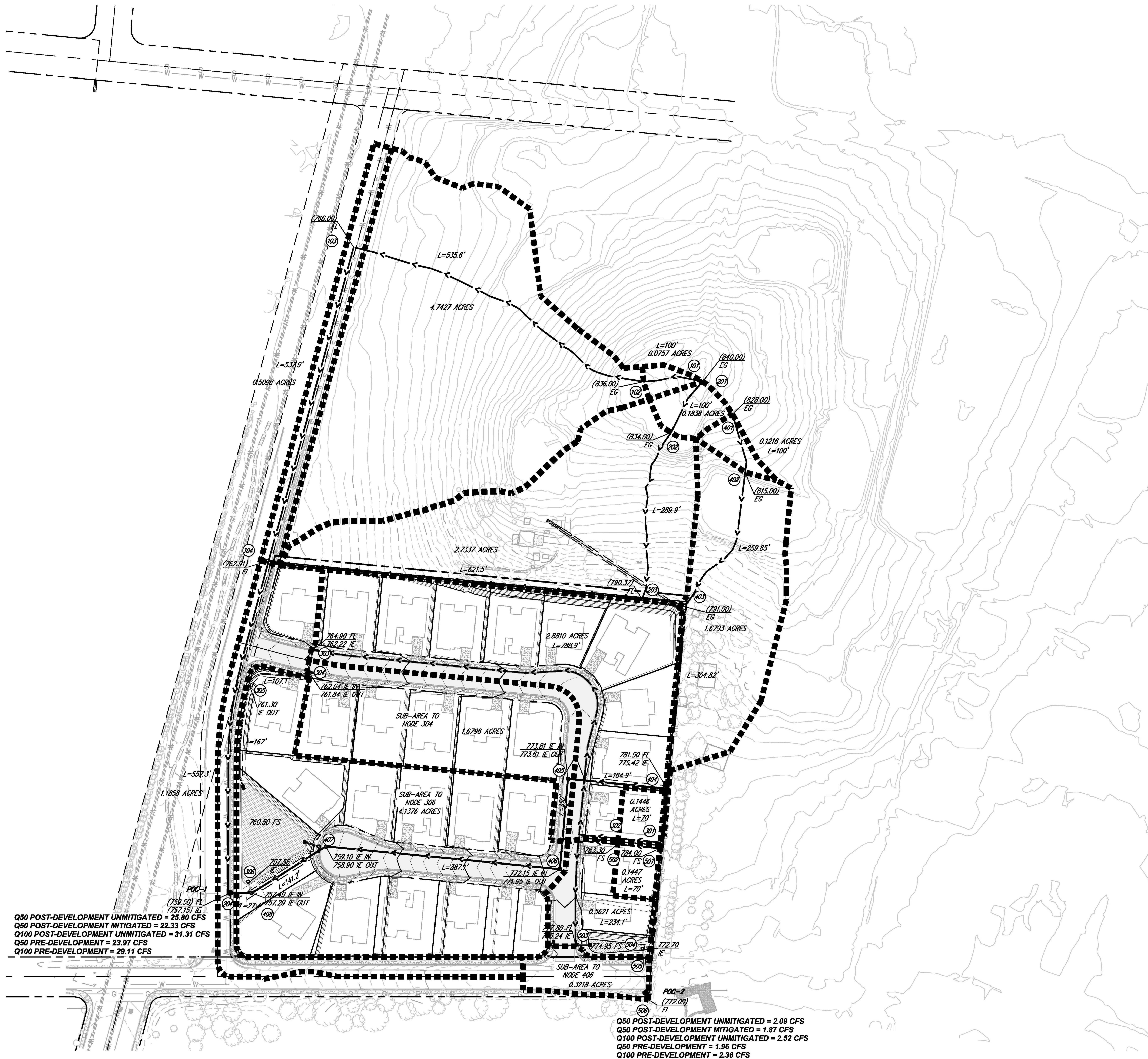
Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

Precip. file name: Sample.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	2.20	0.00	3.30	4.25	5.77	6.80	7.95
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10

ATTACHMENT I
POST DEVELOPED HYDROLOGY MAP



Q50 POST-DEVELOPMENT UNMITIGATED = 25.80 CFS
Q50 POST-DEVELOPMENT MITIGATED = 22.33 CFS
Q100 POST-DEVELOPMENT UNMITIGATED = 31.31 CFS
Q50 PRE-DEVELOPMENT = 23.97 CFS
Q100 PRE-DEVELOPMENT = 29.11 CFS

Q50 POST-DEVELOPMENT UNMITIGATED = 2.09 CFS
Q50 POST-DEVELOPMENT MITIGATED = 1.87 CFS
Q100 POST-DEVELOPMENT UNMITIGATED = 2.52 CFS
Q50 PRE-DEVELOPMENT = 1.96 CFS
Q100 PRE-DEVELOPMENT = 2.36 CFS