

HYDROLOGY / HYDRAULICS STUDY

FOR THE:

Pala Mesa Plaza

3233 Old Highway 395

Fallbrook, CA 92028

APN: 125-050-54-00

PREPARED FOR:

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Project No: 17-047

ORIGINAL REPORT PREPARATION DATE:

June 17, 2020

REVISION DATE(S):

June 7, 2022

June 13, 2023

April 26, 2024 – Via Belmonte Addition

Post Development Mitigation Drainage Map

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ATTACHMENT 6

6a. Project Description

In addition to any prior project description, this project also proposes to make improvements to half of the section of Via Belmonte between Via de Todos Santos and Old Highway 395, including new paving, curb, gutter, and DG trail along the street.

6b. DESCRIPTION OF WATERSHED

Pre-Development Topography and Drainage Patterns

Via Belmonte drains easterly towards Old Highway 395, where there is a sump condition on the corner of the existing project site. Water sheets across the empty lot to the north of Via Belmonte and towards this sump condition. Via Belmonte has an approximate slope of 6.5%. The soil type is consistent with the rest of the project site; the western 25% is composed of Soils Type A and the remainder of the street is Soils Type C. Via Belmonte is paved with rough asphalt, and the empty lot to the north is full of grass and weeds, as well as a few trees and bushes.

A pre-developed drainage map can be found as Attachment 6f in this report.

Post-Development Topography and Drainage Patterns

The project proposes to expand Via Belmonte and repave the southerly half of the existing street, add curb, gutter, and DG trail. It also proposes to add street trees along the DG trail.

Water will sheet flow across the empty lot to the north of Via Belmonte and easterly down Via Belmonte, and then into a reverse D-25 where it will travel through pipes to a cleanout box in Basin 103. Water will also infiltrate through the street trees and into a perforated pipe to the cleanout box in Basin 103. This perforated pipe is only meant to collect overflow water to help prevent erosion of the slope along Via Belmonte. In Basin 103, there will be a cleanout and a 30" diameter, 30 foot long detention pipe. The flow of water out of this detention pipe will be controlled by a weir plate. Water leaving this detention pipe will flow into the storm drain system and into POC 109.

A post-developed drainage map can be found as Attachment 6G in this report.

6b. Rational Method Calculation Summary

The peak runoff values for the 100-year storm are calculated according to the Hydrology Manual rational method. The calculations are performed using the CivilD software. A summary of the initial calculations is summarized in the table below:

Summary Table of Drainage Discharges from the Project							
	Node Number	Q100 (cfs)	Area* (Acres)	Tc (Min)	V100 (ft/s)	C**	I** (in/hr)
PRE	POC Node 309	36.398	11.915	9.077	14.89	0.45	6.32
POST	POC Node 107	37.500	11.929	9.152	15.17	0.46	6.28
POST MITIGATED	POC Node 107	35.615	11.929	9.155	14.88	0.45	6.28

Table 1: Q100 Analysis Results

Note: the comparison of our analysis is made about the same discharge points for the project. Drainage discharging from the project to the existing 18 inches pipe.

*Note: Areas (acres) of Predeveloped and Post-developed can potentially differ because of rounding errors.

**Note: Average rainfall intensity is calculated based on $I = 7.44 * P_6 T_c^{-0.645}$. Average runoff coefficient "C" is calculated based on $Q = CIA$.

Per Table 1 (see above) The Post development flow of 37.5 cfs is higher than the Pre-Development flow of 36.398 cfs. Therefore, mitigation is to be used. Upon analysis of the Post Mitigated flow, the Mitigated flow is 35.615 cfs lower than the Predevelopment flow of 36.398 cfs showing compliance.

CivilD data and output files can be found in Attachment 3 of this report.

By observation of the results in the summary table, the proposed redevelopment of the site will have an overall decrease in the 100-year peak flow discharge from the site.

CONCLUSION

Based on the results of this report, the project does not increase the 100-year peak flow rate of the mitigated stormwater discharge from the site as flows are lower than those of the Pre-development. The project meets the County of San Diego standards for peak flow control and therefore can be concluded that this project will not impact the existing downstream storm drainage facilities.

This project does not sit within a 100-year flood hazard zone as mapped on the federal Flood Insurance Rate maps for this area.

Hydrograph Report

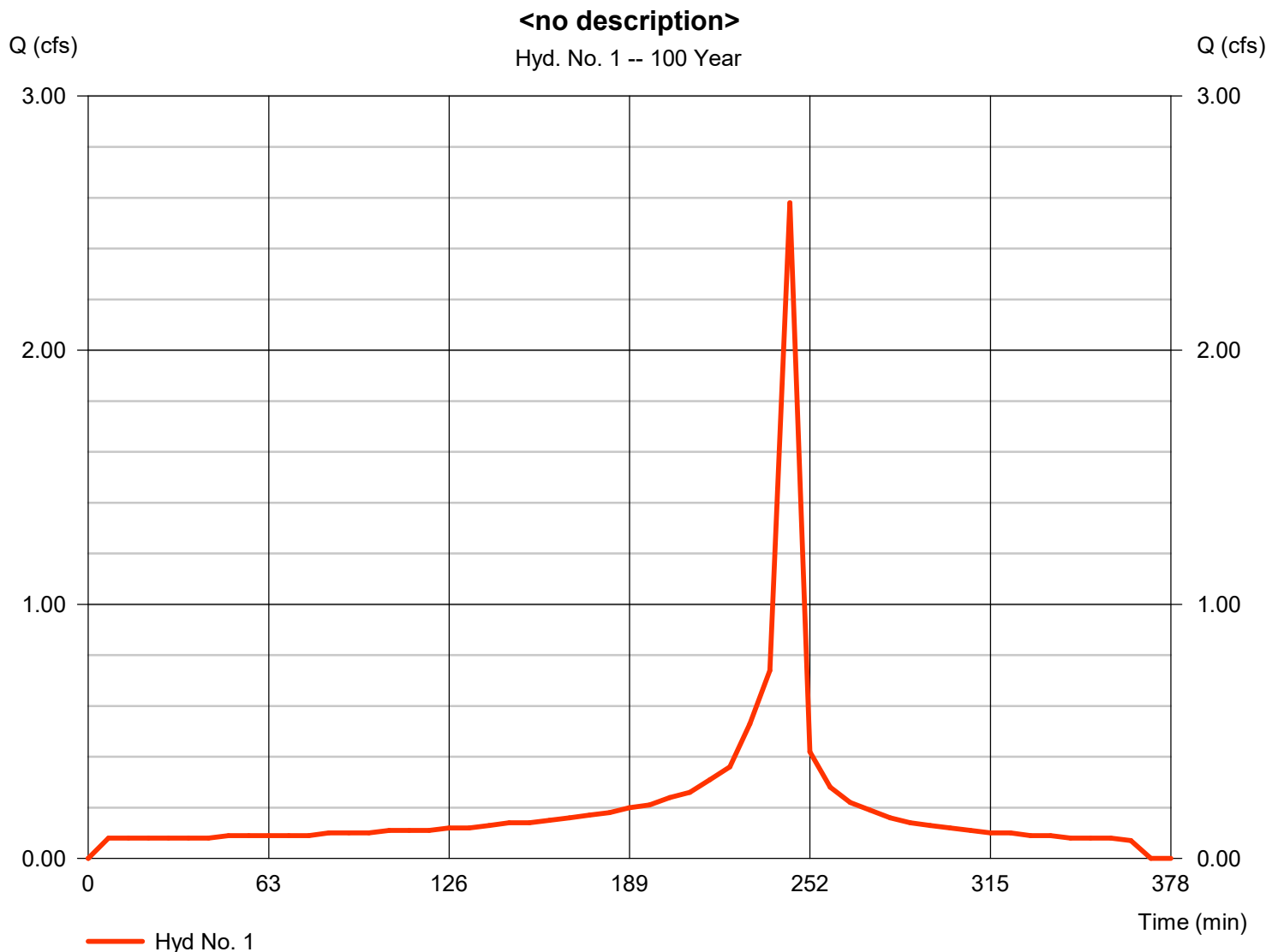
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Friday, 04 / 26 / 2024

Hyd. No. 1

<no description>

Hydrograph type	= Manual	Peak discharge	= 2.580 cfs
Storm frequency	= 100 yrs	Time to peak	= 245 min
Time interval	= 7 min	Hyd. volume	= 4,519 cuft



Hydrograph Report

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

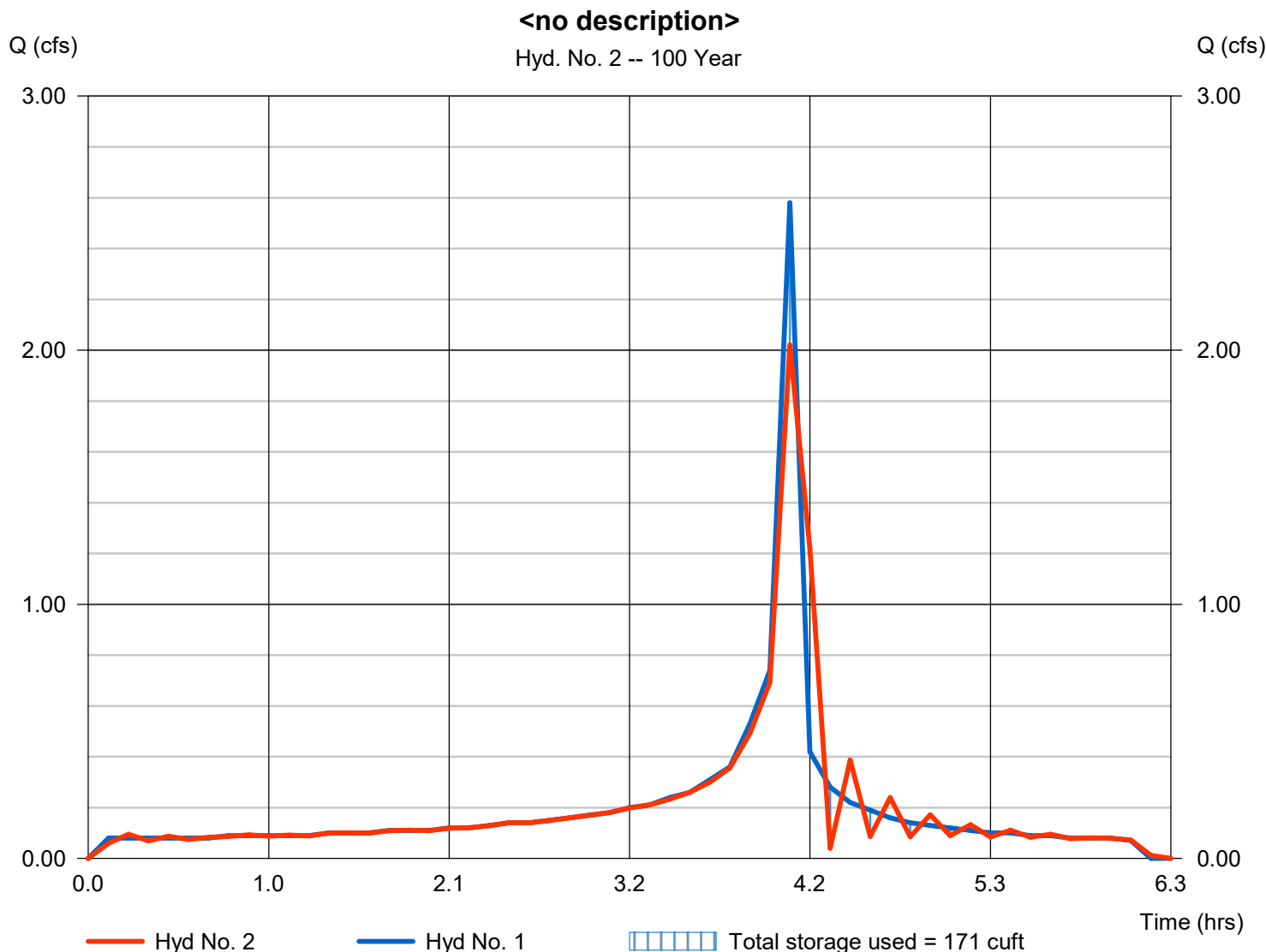
Friday, 04 / 26 / 2024

Hyd. No. 2

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 2.020 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.08 hrs
Time interval	= 7 min	Hyd. volume	= 4,520 cuft
Inflow hyd. No.	= 1 - <no description>	Max. Elevation	= 305.48 ft
Reservoir name	= Pond 3003	Max. Storage	= 171 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond 3003

Pond Data

UG Chambers -Invert elev. = 303.00 ft, Rise x Span = 2.50 x 2.50 ft, Barrel Len = 35.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	303.00	n/a	0	0
0.25	303.25	n/a	9	9
0.50	303.50	n/a	16	24
0.75	303.75	n/a	19	43
1.00	304.00	n/a	21	64
1.25	304.25	n/a	22	86
1.50	304.50	n/a	22	108
1.75	304.75	n/a	21	128
2.00	305.00	n/a	19	147
2.25	305.25	n/a	16	163
2.50	305.50	n/a	9	172

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	Inactive	3.00	0.00
Span (in)	= 12.00	5.00	12.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 303.00	305.08	303.00	0.00
Length (ft)	= 42.90	0.04	0.04	0.00
Slope (%)	= 0.50	0.01	0.01	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	2.00	0.00	0.00
Crest El. (ft)	= 309.00	305.25	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= 1	Broad	---	---
Multi-Stage	= Yes	Yes	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).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	303.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.03	1	303.02	0.00 ic	0.00	0.00 ic	---	0.00	0.00	---	---	---	---	0.003
0.05	2	303.05	0.01 ic	0.00	0.01 ic	---	0.00	0.00	---	---	---	---	0.011
0.08	3	303.07	0.02 ic	0.00	0.02 ic	---	0.00	0.00	---	---	---	---	0.023
0.10	4	303.10	0.04 ic	0.00	0.04 ic	---	0.00	0.00	---	---	---	---	0.040
0.13	4	303.12	0.06 ic	0.00	0.06 ic	---	0.00	0.00	---	---	---	---	0.061
0.15	5	303.15	0.08 ic	0.00	0.08 ic	---	0.00	0.00	---	---	---	---	0.085
0.18	6	303.17	0.11 ic	0.00	0.11 ic	---	0.00	0.00	---	---	---	---	0.110
0.20	7	303.20	0.14 ic	0.00	0.14 ic	---	0.00	0.00	---	---	---	---	0.140
0.23	8	303.22	0.18 ic	0.00	0.17 ic	---	0.00	0.00	---	---	---	---	0.172
0.25	9	303.25	0.21 ic	0.00	0.21 ic	---	0.00	0.00	---	---	---	---	0.211
0.28	10	303.27	0.24 ic	0.00	0.24 ic	---	0.00	0.00	---	---	---	---	0.238
0.30	12	303.30	0.27 ic	0.00	0.27 ic	---	0.00	0.00	---	---	---	---	0.265
0.33	14	303.32	0.29 ic	0.00	0.29 ic	---	0.00	0.00	---	---	---	---	0.294
0.35	15	303.35	0.32 ic	0.00	0.32 ic	---	0.00	0.00	---	---	---	---	0.323
0.38	17	303.37	0.35 ic	0.00	0.35 ic	---	0.00	0.00	---	---	---	---	0.353
0.40	18	303.40	0.39 ic	0.00	0.38 ic	---	0.00	0.00	---	---	---	---	0.378
0.43	20	303.42	0.40 ic	0.00	0.40 ic	---	0.00	0.00	---	---	---	---	0.405
0.45	21	303.45	0.44 ic	0.00	0.43 ic	---	0.00	0.00	---	---	---	---	0.428
0.48	23	303.47	0.46 ic	0.00	0.46 ic	---	0.00	0.00	---	---	---	---	0.457
0.50	24	303.50	0.48 ic	0.00	0.48 ic	---	0.00	0.00	---	---	---	---	0.479
0.52	26	303.52	0.50 ic	0.00	0.50 ic	---	0.00	0.00	---	---	---	---	0.500
0.55	28	303.55	0.54 ic	0.00	0.52 ic	---	0.00	0.00	---	---	---	---	0.524
0.57	30	303.57	0.56 oc	0.00	0.55 ic	---	0.00	0.00	---	---	---	---	0.547
0.60	32	303.60	0.58 oc	0.00	0.57 ic	---	0.00	0.00	---	---	---	---	0.570
0.62	34	303.62	0.59 oc	0.00	0.59 ic	---	0.00	0.00	---	---	---	---	0.592
0.65	36	303.65	0.61 oc	0.00	0.61 ic	---	0.00	0.00	---	---	---	---	0.613
0.67	38	303.67	0.63 oc	0.00	0.63 ic	---	0.00	0.00	---	---	---	---	0.632
0.70	40	303.70	0.65 oc	0.00	0.65 ic	---	0.00	0.00	---	---	---	---	0.651
0.72	41	303.72	0.67 oc	0.00	0.67 ic	---	0.00	0.00	---	---	---	---	0.670
0.75	43	303.75	0.69 oc	0.00	0.69 ic	---	0.00	0.00	---	---	---	---	0.689
0.77	45	303.77	0.71 oc	0.00	0.71 ic	---	0.00	0.00	---	---	---	---	0.707

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Pond 3003

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.80	48	303.80	0.73 oc	0.00	0.72 ic	---	0.00	0.00	---	---	---	---	0.725
0.82	50	303.82	0.75 oc	0.00	0.74 ic	---	0.00	0.00	---	---	---	---	0.742
0.85	52	303.85	0.77 oc	0.00	0.76 ic	---	0.00	0.00	---	---	---	---	0.758
0.87	54	303.87	0.79 oc	0.00	0.77 ic	---	0.00	0.00	---	---	---	---	0.775
0.90	56	303.90	0.81 oc	0.00	0.79 ic	---	0.00	0.00	---	---	---	---	0.791
0.92	58	303.92	0.81 oc	0.00	0.81 ic	---	0.00	0.00	---	---	---	---	0.808
0.95	60	303.95	0.83 oc	0.00	0.83 ic	---	0.00	0.00	---	---	---	---	0.828
0.97	62	303.97	0.85 oc	0.00	0.84 ic	---	0.00	0.00	---	---	---	---	0.843
1.00	64	304.00	0.87 oc	0.00	0.86 ic	---	0.00	0.00	---	---	---	---	0.858
1.02	66	304.02	0.89 oc	0.00	0.87 ic	---	0.00	0.00	---	---	---	---	0.872
1.05	69	304.05	0.89 oc	0.00	0.89 ic	---	0.00	0.00	---	---	---	---	0.888
1.07	71	304.07	0.91 oc	0.00	0.91 ic	---	0.00	0.00	---	---	---	---	0.906
1.10	73	304.10	0.93 oc	0.00	0.92 ic	---	0.00	0.00	---	---	---	---	0.920
1.12	75	304.12	0.95 oc	0.00	0.93 ic	---	0.00	0.00	---	---	---	---	0.933
1.15	77	304.15	0.95 oc	0.00	0.95 ic	---	0.00	0.00	---	---	---	---	0.948
1.17	79	304.17	0.97 oc	0.00	0.97 ic	---	0.00	0.00	---	---	---	---	0.966
1.20	82	304.20	0.99 oc	0.00	0.98 ic	---	0.00	0.00	---	---	---	---	0.978
1.22	84	304.22	1.01 oc	0.00	0.99 ic	---	0.00	0.00	---	---	---	---	0.991
1.25	86	304.25	1.01 oc	0.00	1.01 ic	---	0.00	0.00	---	---	---	---	1.008
1.27	88	304.27	1.03 oc	0.00	1.02 ic	---	0.00	0.00	---	---	---	---	1.021
1.30	90	304.30	1.05 oc	0.00	1.03 ic	---	0.00	0.00	---	---	---	---	1.034
1.32	92	304.32	1.05 oc	0.00	1.05 ic	---	0.00	0.00	---	---	---	---	1.048
1.35	95	304.35	1.07 oc	0.00	1.06 ic	---	0.00	0.00	---	---	---	---	1.063
1.37	97	304.37	1.09 oc	0.00	1.07 ic	---	0.00	0.00	---	---	---	---	1.074
1.40	99	304.40	1.09 oc	0.00	1.09 ic	---	0.00	0.00	---	---	---	---	1.087
1.42	101	304.42	1.11 oc	0.00	1.10 ic	---	0.00	0.00	---	---	---	---	1.103
1.45	103	304.45	1.13 oc	0.00	1.11 ic	---	0.00	0.00	---	---	---	---	1.114
1.47	106	304.47	1.13 oc	0.00	1.13 ic	---	0.00	0.00	---	---	---	---	1.126
1.50	108	304.50	1.14 oc	0.00	1.14 ic	---	0.00	0.00	---	---	---	---	1.141
1.52	110	304.52	1.16 oc	0.00	1.15 ic	---	0.00	0.00	---	---	---	---	1.152
1.55	112	304.55	1.16 oc	0.00	1.16 ic	---	0.00	0.00	---	---	---	---	1.164
1.57	114	304.57	1.18 oc	0.00	1.18 ic	---	0.00	0.00	---	---	---	---	1.178
1.60	116	304.60	1.20 oc	0.00	1.19 ic	---	0.00	0.00	---	---	---	---	1.189
1.62	118	304.62	1.20 oc	0.00	1.20 ic	---	0.00	0.00	---	---	---	---	1.201
1.65	120	304.65	1.22 oc	0.00	1.21 ic	---	0.00	0.00	---	---	---	---	1.215
1.67	122	304.67	1.24 oc	0.00	1.22 ic	---	0.00	0.00	---	---	---	---	1.225
1.70	124	304.70	1.24 oc	0.00	1.24 ic	---	0.00	0.00	---	---	---	---	1.238
1.72	126	304.72	1.26 oc	0.00	1.25 ic	---	0.00	0.00	---	---	---	---	1.250
1.75	128	304.75	1.27 oc	0.00	1.26 ic	---	0.00	0.00	---	---	---	---	1.260
1.77	130	304.77	1.27 oc	0.00	1.27 ic	---	0.00	0.00	---	---	---	---	1.274
1.80	132	304.80	1.29 oc	0.00	1.28 ic	---	0.00	0.00	---	---	---	---	1.284
1.82	134	304.82	1.31 oc	0.00	1.29 ic	---	0.00	0.00	---	---	---	---	1.294
1.85	136	304.85	1.31 oc	0.00	1.31 ic	---	0.00	0.00	---	---	---	---	1.308
1.87	138	304.87	1.33 oc	0.00	1.32 ic	---	0.00	0.00	---	---	---	---	1.318
1.90	140	304.90	1.34 oc	0.00	1.33 ic	---	0.00	0.00	---	---	---	---	1.327
1.92	142	304.92	1.34 oc	0.00	1.34 ic	---	0.00	0.00	---	---	---	---	1.341
1.95	144	304.95	1.36 oc	0.00	1.35 ic	---	0.00	0.00	---	---	---	---	1.350
1.97	145	304.97	1.36 oc	0.00	1.36 ic	---	0.00	0.00	---	---	---	---	1.361
2.00	147	305.00	1.38 oc	0.00	1.37 ic	---	0.00	0.00	---	---	---	---	1.373
2.03	149	305.02	1.39 oc	0.00	1.38 ic	---	0.00	0.00	---	---	---	---	1.383
2.05	150	305.05	1.39 oc	0.00	1.39 ic	---	0.00	0.00	---	---	---	---	1.393
2.08	152	305.07	1.41 oc	0.00	1.40 ic	---	0.00	0.00	---	---	---	---	1.405
2.10	154	305.10	1.42 oc	0.00	1.41 ic	---	0.00	0.00	---	---	---	---	1.414
2.13	155	305.12	1.42 oc	0.00	1.42 ic	---	0.00	0.00	---	---	---	---	1.425
2.15	157	305.15	1.44 oc	0.00	1.44 ic	---	0.00	0.00	---	---	---	---	1.436
2.18	158	305.17	1.46 oc	0.00	1.44 ic	---	0.00	0.00	---	---	---	---	1.445
2.20	160	305.20	1.46 oc	0.00	1.46 ic	---	0.00	0.00	---	---	---	---	1.455
2.23	161	305.22	1.47 oc	0.00	1.47 ic	---	0.00	0.00	---	---	---	---	1.466
2.25	163	305.25	1.48 oc	0.00	1.48 ic	---	0.00	0.00	---	---	---	---	1.475
2.28	164	305.27	1.51 oc	0.00	1.48 ic	---	0.00	0.02	---	---	---	---	1.502
2.30	165	305.30	1.55 oc	0.00	1.48 ic	---	0.00	0.06	---	---	---	---	1.542
2.33	166	305.32	1.60 oc	0.00	1.48 ic	---	0.00	0.11	---	---	---	---	1.590
2.35	166	305.35	1.65 oc	0.00	1.48 ic	---	0.00	0.16	---	---	---	---	1.645
2.38	167	305.37	1.71 oc	0.00	1.47 ic	---	0.00	0.23	---	---	---	---	1.704
2.40	168	305.40	1.76 oc	0.00	1.46 ic	---	0.00	0.30	---	---	---	---	1.762
2.43	169	305.42	1.81 oc	0.00	1.43 ic	---	0.00	0.38	---	---	---	---	1.808
2.45	170	305.45	1.89 oc	0.00	1.43 ic	---	0.00	0.46	---	---	---	---	1.894
2.48	171	305.47	1.98 oc	0.00	1.43 ic	---	0.00	0.55	---	---	---	---	1.984
2.50	172	305.50	2.08 oc	0.00	1.43 ic	---	0.00	0.65	---	---	---	---	2.078

...End

CALCULATION AFTER THE DETENTION STRUCTURE

The purpose of the detention structure is to alter the peak flow and or time to peak of a given storm so it will not have a negative impact on the downstream facilities. There are different methods on how to use the resulting values of the outflow hydrograph.

For the purposes of this example there will be an association of the following values:

Q_{in} = Is equal to the inflow value that will enter the basin before storage

Q_{out} = Is equal to the outflow value that will exit the basin after storage

T_{cin} = Is equal to the Time of Concentration flowing into the basin before detention

T_{cout} = Is equal to the Time of Concentration exiting the basin after detention

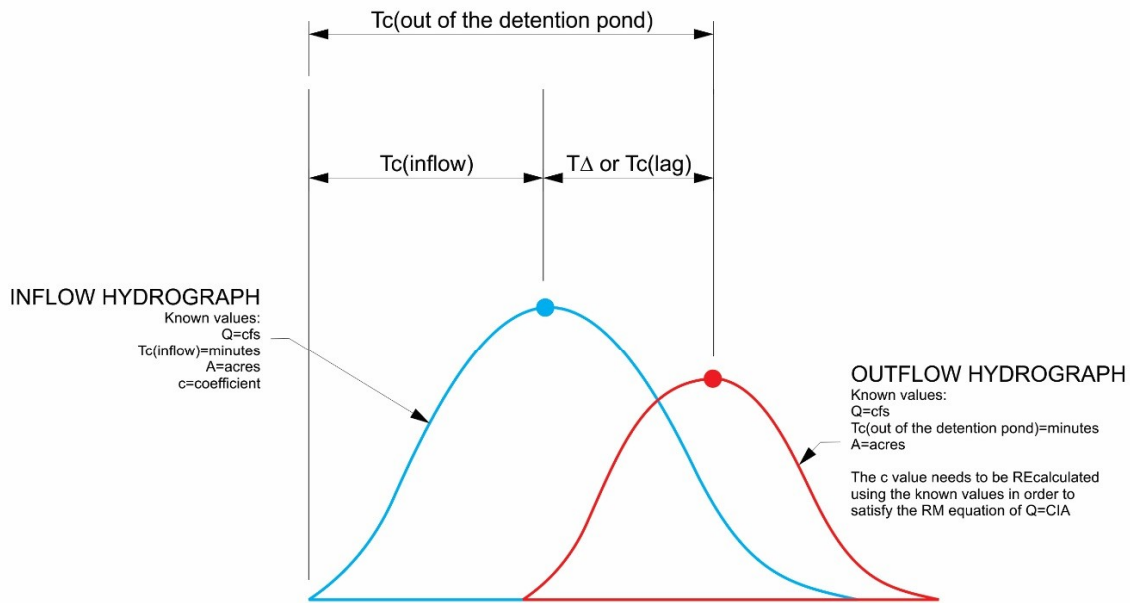
A = Area of the tributary area being examined; (This value does not change)

c_{inflow} = The runoff coefficient going into the basin for detention

c_{out} = The runoff coefficient recalculated taking into account water stored in pond for detention

One method is to keep the value of c_{inflow} and solve for the I =intensity & T_c (outflow). In this interpretation, we will get a T_c that will not match the value of the $T_{c(out\ of\ the\ detention\ structure)}$ of the outflow hydrograph that was calculated using the detention pond. The T_c Using this method shows a disruption on the oneness & continuity of the outflow hydrograph & the formula $Q=cIA$.

The second method; that is the method we are using is to recalculate the c =coefficient based on the fix values of the outflow hydrograph to achieve a c_{out} . This value uses the c_{inflow} from the flow into the detention basin and then is recalculated by the output of the hydrograph software using $Q=cIA$; translated as $c=Q/IA$. This method preserves the formula $Q=cIA$ & does not alter the $T_{c(out\ of\ the\ detention\ structure)}$. This method shows that in order to maintain mathematical integrity of the rational equation ($Q=CIA$), the detention structure alters the runoff coefficient which is the only unknown in the equation. It is noted that the designer feels it is important to hold the value of T_c and the Q values that are calculated from the hydrograph.



GRAPHICAL DIAGRAM OF THE HYDROGRAPH COMING OUT OF THE DETENTION POND

The routing of the runoff through the detention structure gives us the $Q_{(\text{out of the detention structure})}$ and $T\Delta$ time lag between $Q_{(\text{inflow})}$ & $Q_{(\text{out of the detention structure})}$.

The known fix values coming out of the detention structure are:

- $Q = \text{cfs}$
- $T_c(\text{out of the detention structure}) = \text{minutes}$
- $A = \text{acres}$
- *Please note that c =coefficient is not given directly from the resulting hydrograph coming out of the detention pond.*

In order to satisfy the rational equation of $Q=CIA$ (see Section 3 of the 2003 San Diego County Hydrology Manual) coming out of the detention structure, we will calculate the only unknown value of the equation which is the outlet runoff coefficient, $C_{(\text{outlet})}$. By using the $T_c(\text{out of the detention structure})$ we can solve for the intensity, I . With the intensity (I) value calculated, we can solve for the outlet runoff coefficient, $C_{(\text{outlet})}$.

The following equations are used in

$$\text{this stage: } Q = CIA \quad I = \frac{Q}{CA}$$

$$7.44P_6D^{-0.645}$$

Where:

$Q_{(\text{out of the detention structure})} = \text{runoff (cfs), known value}$

$T_{c(\text{inflow})} = \text{detention structure inflow time of concentration (D)}$
(minutes)

$T\Delta = \text{time lag between } Q_{(\text{inflow})} \text{ \& } Q_{(\text{out of the detention structure})}$

(minutes) $T_{c(\text{out of the detention structure})} = T_{c(\text{inflow})} + T\Delta$ (minutes)

P_6 = 6 hour precipitation (inches), known value.

I = intensity (inches/hour), calculated based on the value of $T_{c(\text{out of the detention structure})}$

A = tributary area of the detention structure (acres),

known value $C_{(\text{outflow})}$ = runoff coefficient (unitless),

value to be solved

CALCULATIONS For Nodes 802 to 802; BMP-802			
LINE	ITEM	AT THE OUTFLOW OF NODE 802	REMARKS
1	P6 inch	3.5	KNOWN VALUE
2	TC (inflow) mins	14.06	KNOWN VALUE
3	TC (lag) mins	0	FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins	14.06	LINE 2+3
5	I inches/hour	4.734	FROM THE INTENSITY FORMULA
6	Q(outflow)	1.801	KNOWN VALUE
7	A (inflow=outflow)	0.97	KNOWN VALUE
8	c(inflow)	0.582	KNOWN VALUE FROM THE CONTRIBUTING BASIN(S)
9	c(outflow)	0.392	CALCULATED FROM $C=Q/IA$

CALCULATIONS For Nodes 3003 to 103; BMP-103			
LINE	ITEM	AT THE OUTFLOW OF NODE 802	REMARKS
1	P6 inch	3.5	KNOWN VALUE
2	TC (inflow) mins	7.36	KNOWN VALUE
3	TC (lag) mins	0	FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins	7.36	LINE 2+3
5	I inches/hour	7.186	FROM THE INTENSITY FORMULA
6	Q(outflow)	2.02	KNOWN VALUE
7	A (inflow=outflow)	0.78	KNOWN VALUE
8	c(inflow)	0.461	KNOWN VALUE FROM THE CONTRIBUTING BASIN(S)
9	c(outflow)	0.360	CALCULATED FROM $C=Q/IA$

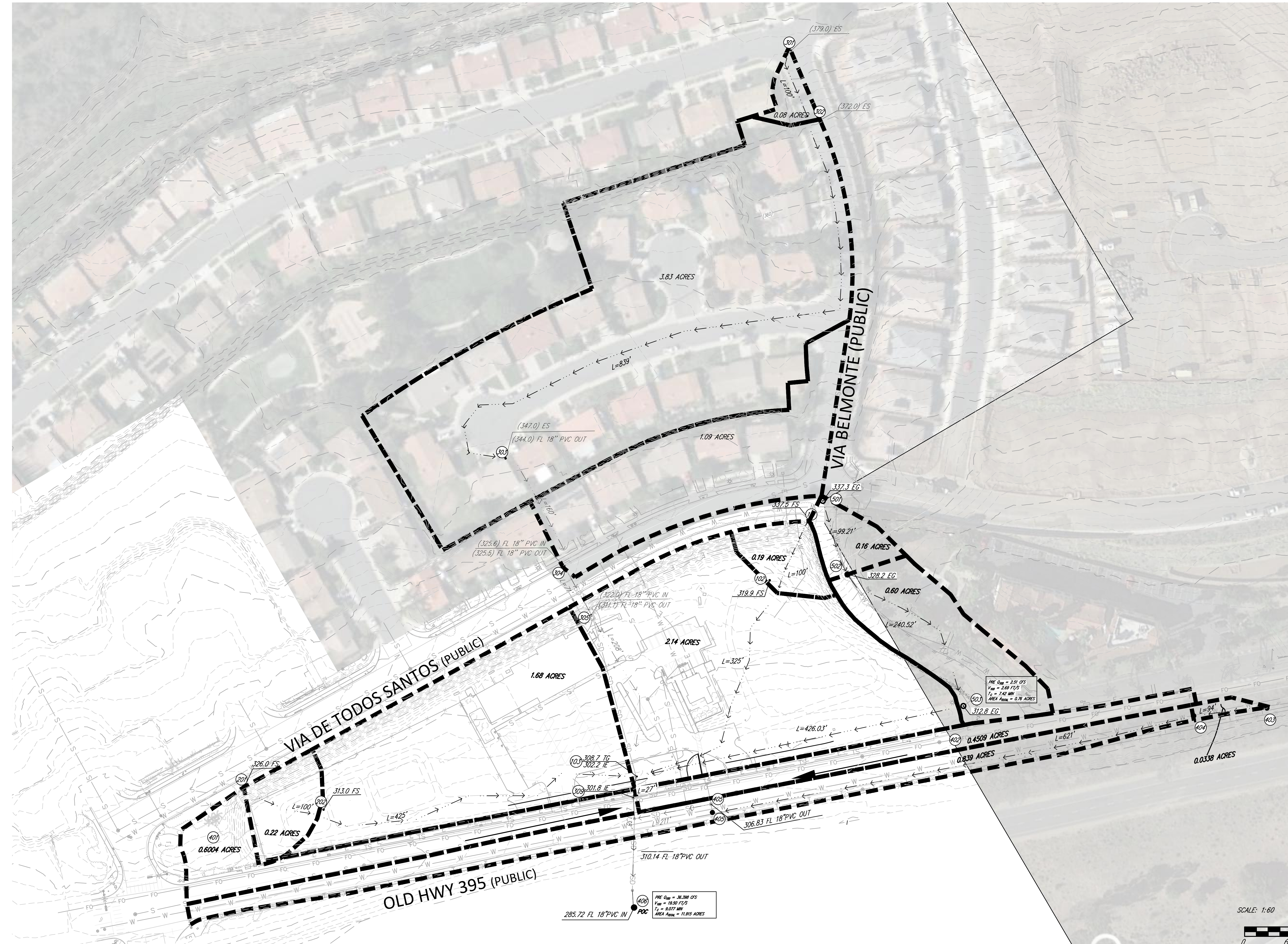
The preceding highlighted data are then used to continue the calculations downstream of the detention structure.

In summary these are the steps of the calculations presented here:

1. Hydrologic methods of calculation as laid out in the 2003 San Diego Hydrology Manual was used upstream of the detention structure. These includes the methods of determining c , T_c and confluence of a junction. The c values used in the proposed conditions range from “undisturbed natural terrain” to “low & high density residential” whichever is

appropriate for the contributing basin.

2. At the outflow of the detention structure, the c value was recalculated using the resulting values of the outflow hydrograph. This method preserves the values of T_c (out of the detention structure), A & $Q_{\text{(outflow)}}$. Methods and software satisfy the formula $Q=cIA$ & the 2003 San Diego Hydrology Manual. This step shows that in order to maintain mathematical integrity of the rational equation ($Q=cIA$), the detention structure alters the runoff coefficient which is the only unknown in the equation.
3. The values determined in step 2 were used in the continuation of the calculations using the Hydrologic methods of calculation as laid out in the 2003 San Diego Hydrology Manual downstream of the detention structure. These includes the methods of determining c , T_c and confluence of a junction. The c values used in the proposed conditions range from “undisturbed natural terrain” to “low & high density residential” whichever is appropriate for the contributing basin.

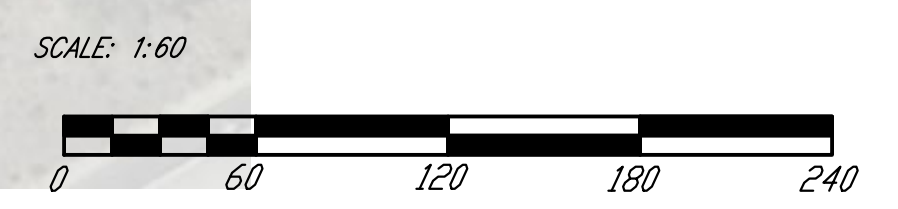
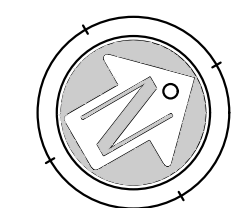


LEGEND

HYD BASIN BOUNDARY	-----
NODE NUMBER	(101)
SURFACE FLOW	----->
PIPE FLOW	----->
STREET FLOW	----->

HYDROLOGIC SOIL GROUP
 THE HYDROLOGICAL SOIL GROUPS FOR THIS SITE ARE TYPE (A & C)

NOTE:
 APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 20'

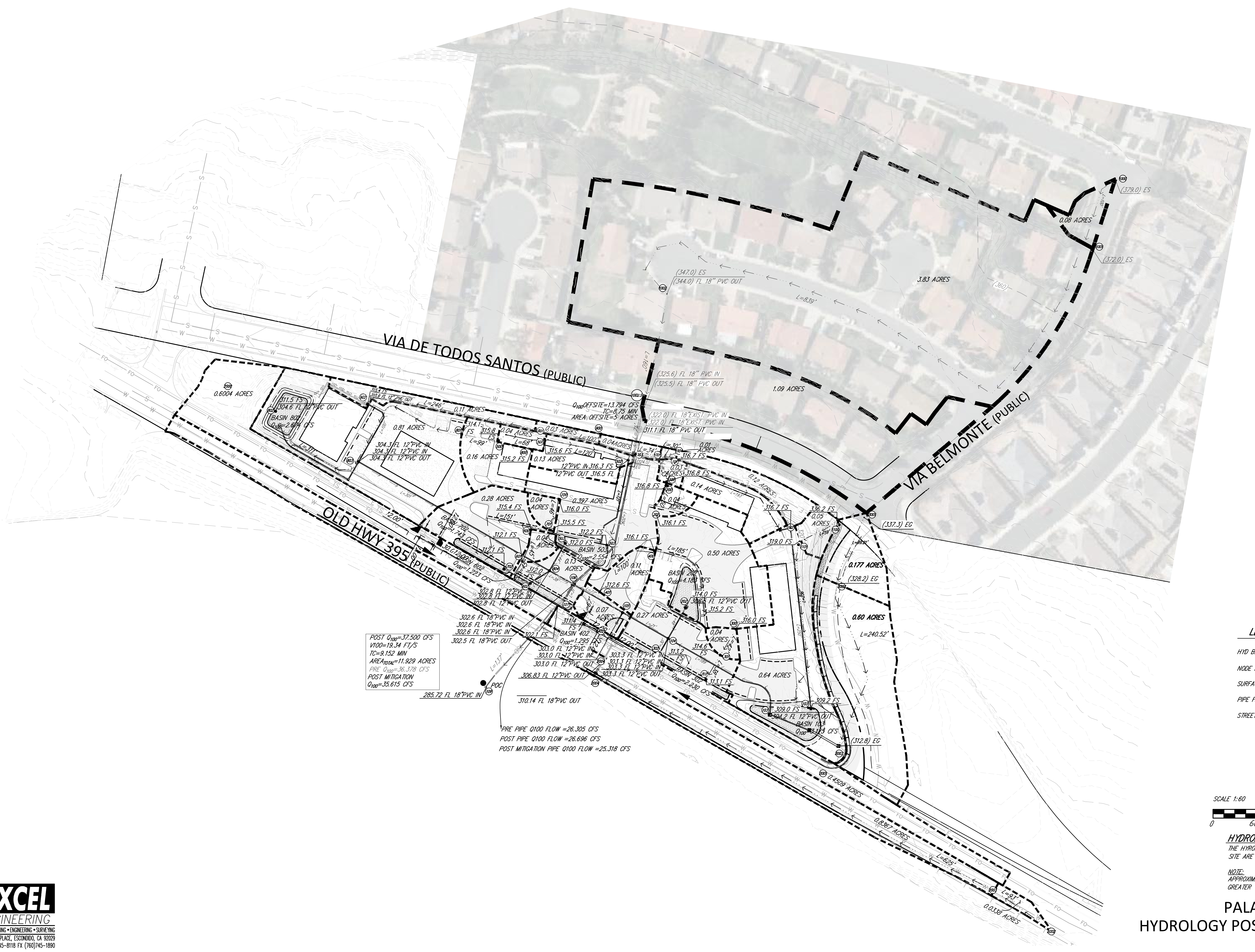


**PALA MESA PLAZA
 HYDROLOGY PRE DEVELOPMENT EXHIBIT**

K:\19\190205\Engineering\SDP\SDP_01\Storm\Working Files\Street\Trees\Hydro\190205-Postdev-current-adjust.dwg 6/16/2024 3:14 PM ORIGINAL PLOT SIZE: -----



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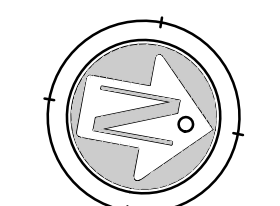


POST Q_{100} = 37,500 CFS
 V_{100} = 19.34 FT/S
TC = 9.152 MIN
AREA₁₀₀ = 11.929 ACRES
PRE Q_{100} = 36,378 CFS
POST MITIGATION
 Q_{100} = 35,615 CFS

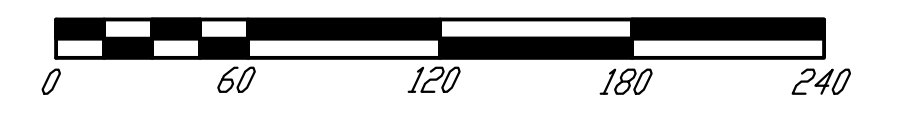
PRE PIPE Q_{100} FLOW = 26,305 CFS
POST PIPE Q_{100} FLOW = 26,696 CFS
POST MITIGATION PIPE Q_{100} FLOW = 25,318 CFS

LEGEND

- HYD BASIN BOUNDARY
- NODE NUMBER
- SURFACE FLOW
- PIPE FLOW
- STREET FLOW



SCALE 1:60



HYDROLOGIC SOIL GROUP
THE HYDROLOGIC SOIL GROUPS FOR THIS SITE ARE TYPE (A & C)

NOTE:
APPROXIMATE DEPTH TO GROUNDWATER IS GREATER THAN 20'

**PALA MESA PLAZA
HYDROLOGY POST DEVELOPMENT EXHIBIT**

6h. CivilD Pre-Development Via Belmonte Calculations

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2014 Version 9.0

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 04/22/24

19025 Pre Dev
100 yr study - Belmonte Addition
19025belmonte

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

Program License Serial Number 6332

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.500
24 hour precipitation(inches) = 6.000
P6/P24 = 58.3%
San Diego hydrology manual 'C' values used

Process from Point/Station 501.000 to Point/Station 502.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL]
(4.3 DU/A or Less)
Impervious value, Ai = 0.300
Sub-Area C Value = 0.410
Initial subarea total flow distance = 99.210(Ft.)
Highest elevation = 337.300(Ft.)
Lowest elevation = 328.200(Ft.)
Elevation difference = 9.100(Ft.) Slope = 9.172 %

INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 9.17 %, in a development type of
4.3 DU/A or Less

In Accordance With Figure 3-3
Initial Area Time of Concentration = 5.93 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^{.5}]/(% slope^(1/3))
TC = [1.8*(1.1-0.4100)*(100.000^{.5})/(9.172^(1/3))] = 5.93
Rainfall intensity (I) = 8.258(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff = 0.542(CFS)
Total initial stream area = 0.160(Ac.)

Process from Point/Station 502.000 to Point/Station 503.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

```

67 Estimated mean flow rate at midpoint of channel = 1.557(CFS)
68 Depth of flow = 0.143(Ft.), Average velocity = 2.690(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 0.50
74 2 26.00 0.00
75 3 27.00 0.20
76 Manning's 'N' friction factor = 0.024
77 -----
78 Sub-Channel flow = 1.557(CFS)
79 ' ' flow top width = 8.125(Ft.)
80 ' ' velocity = 2.690(Ft/s)
81 ' ' area = 0.579(Sq.Ft)
82 ' ' Froude number = 1.776
83
84 Upstream point elevation = 328.200(Ft.)
85 Downstream point elevation = 312.800(Ft.)
86 Flow length = 240.520(Ft.)
87 Travel time = 1.49 min.
88 Time of concentration = 7.42 min.
89 Depth of flow = 0.143(Ft.)
90 Average velocity = 2.690(Ft/s)
91 Total irregular channel flow = 1.557(CFS)
92 Irregular channel normal depth above invert elev. = 0.143(Ft.)
93 Average velocity of channel(s) = 2.690(Ft/s)
94 Adding area flow to channel
95 Rainfall intensity (I) = 7.146(In/Hr) for a 100.0 year storm
96 Decimal fraction soil group A = 0.050
97 Decimal fraction soil group B = 0.000
98 Decimal fraction soil group C = 0.950
99 Decimal fraction soil group D = 0.000
100 [MEDIUM DENSITY RESIDENTIAL ]
101 (4.3 DU/A or Less )
102 Impervious value, Ai = 0.300
103 Sub-Area C Value = 0.476
104 Rainfall intensity = 7.146(In/Hr) for a 100.0 year storm
105 Effective runoff coefficient used for total area
106 (Q=KCIA) is C = 0.462 CA = 0.351
107 Subarea runoff = 1.970(CFS) for 0.600(Ac.)
108 Total runoff = 2.512(CFS) Total area = 0.760(Ac.)
109 Depth of flow = 0.171(Ft.), Average velocity = 3.031(Ft/s)
110 End of computations, total study area = 0.760 (Ac.)
111
112
113

```

6i. CivilD Pre-Development Onsite Calculations

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2014 Version 9.0

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 04/24/24

19025 Pre Dev
100 Year Study Onsite
19025Pre100Onsite
offsite ud to onsite

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

Program License Serial Number 6332

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.500
24 hour precipitation(inches) = 6.000
P6/P24 = 58.3%
San Diego hydrology manual 'C' values used

+-----+
Process from Point/Station 101.000 to Point/Station 102.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.900
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL]
(4.3 DU/A or Less)
Impervious value, Ai = 0.300
Sub-Area C Value = 0.417
Initial subarea total flow distance = 100.000 (Ft.)
Highest elevation = 337.500 (Ft.)
Lowest elevation = 319.900 (Ft.)
Elevation difference = 17.600 (Ft.) Slope = 17.600 %
Top of Initial Area Slope adjusted by User to 30.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 30.00 %, in a development type of
4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 3.96 minutes
TC = $[1.8 * (1.1 - C) * \text{distance (Ft.)}^{.5} / (\% \text{ slope}^{(1/3)})]$
TC = $[1.8 * (1.1 - 0.4170) * (100.000^{.5}) / (30.000^{(1/3)})] = 3.96$
Calculated TC of 3.957 minutes is less than 5 minutes,
resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) = 9.222 (In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.417
Subarea runoff = 0.731 (CFS)
Total initial stream area = 0.190 (Ac.)

+-----+
Process from Point/Station 102.000 to Point/Station 103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

```

70
71 Estimated mean flow rate at midpoint of channel = 4.743 (CFS)
72 Depth of flow = 0.278 (Ft.), Average velocity = 2.463 (Ft/s)
73 ***** Irregular Channel Data *****
74 -----
75 Information entered for subchannel number 1 :
76 Point number 'X' coordinate 'Y' coordinate
77 1 0.00 1.00
78 2 25.00 0.00
79 3 50.00 1.00
80 Manning's 'N' friction factor = 0.030
81 -----
82 Sub-Channel flow = 4.743 (CFS)
83 ' ' flow top width = 13.876 (Ft.)
84 ' ' velocity = 2.463 (Ft/s)
85 ' ' area = 1.925 (Sq.Ft)
86 ' ' Froude number = 1.165
87
88 Upstream point elevation = 319.900 (Ft.)
89 Downstream point elevation = 308.700 (Ft.)
90 Flow length = 325.000 (Ft.)
91 Travel time = 2.20 min.
92 Time of concentration = 6.16 min.
93 Depth of flow = 0.278 (Ft.)
94 Average velocity = 2.463 (Ft/s)
95 Total irregular channel flow = 4.743 (CFS)
96 Irregular channel normal depth above invert elev. = 0.278 (Ft.)
97 Average velocity of channel(s) = 2.463 (Ft/s)
98 Adding area flow to channel
99 Rainfall intensity (I) = 8.064 (In/Hr) for a 100.0 year storm
100 Decimal fraction soil group A = 0.200
101 Decimal fraction soil group B = 0.000
102 Decimal fraction soil group C = 0.800
103 Decimal fraction soil group D = 0.000
104 [MEDIUM DENSITY RESIDENTIAL ]
105 (4.3 DU/A or Less )
106 Impervious value, Ai = 0.300
107 Sub-Area C Value = 0.466
108 Rainfall intensity = 8.064 (In/Hr) for a 100.0 year storm
109 Effective runoff coefficient used for total area
110 (Q=KCIA) is C = 0.462 CA = 1.076
111 Subarea runoff = 7.950 (CFS) for 2.140 (Ac.)
112 Total runoff = 8.681 (CFS) Total area = 2.330 (Ac.)
113 Depth of flow = 0.348 (Ft.), Average velocity = 2.865 (Ft/s)
114
115
116 +-----+
117 Process from Point/Station 103.000 to Point/Station 103.000
118 **** CONFLUENCE OF MINOR STREAMS ****
119
120 -----
121 Along Main Stream number: 1 in normal stream number 1
122 Stream flow area = 2.330 (Ac.)
123 Runoff from this stream = 8.681 (CFS)
124 Time of concentration = 6.16 min.
125 Rainfall intensity = 8.064 (In/Hr)
126
127 +-----+
128 Process from Point/Station 201.000 to Point/Station 202.000
129 **** INITIAL AREA EVALUATION ****
130
131 -----
132 Decimal fraction soil group A = 0.550
133 Decimal fraction soil group B = 0.000
134 Decimal fraction soil group C = 0.450
135 Decimal fraction soil group D = 0.000
136 [MEDIUM DENSITY RESIDENTIAL ]
137 (4.3 DU/A or Less )
138 Impervious value, Ai = 0.300
139 Sub-Area C Value = 0.442

```

```

139 Initial subarea total flow distance = 100.000(Ft.)
140 Highest elevation = 326.000(Ft.)
141 Lowest elevation = 313.000(Ft.)
142 Elevation difference = 13.000(Ft.) Slope = 13.000 %
143 Top of Initial Area Slope adjusted by User to 30.000 %
144 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
145 The maximum overland flow distance is 100.00 (Ft)
146 for the top area slope value of 30.00 %, in a development type of
147 4.3 DU/A or Less
148 In Accordance With Figure 3-3
149 Initial Area Time of Concentration = 3.81 minutes
150 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
151 TC = [1.8*(1.1-0.4415)*( 100.000^.5)/( 30.000^(1/3)]= 3.81
152 Calculated TC of 3.815 minutes is less than 5 minutes,
153 resetting TC to 5.0 minutes for rainfall intensity calculations
154 Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm
155 Effective runoff coefficient used for area (Q=KCIA) is C = 0.442
156 Subarea runoff = 0.896(CFS)
157 Total initial stream area = 0.220(Ac.)
158
159
160 ++++++
161 Process from Point/Station 202.000 to Point/Station 103.000
162 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
163
164 -----
165 Estimated mean flow rate at midpoint of channel = 3.310(CFS)
166 Depth of flow = 0.305(Ft.), Average velocity = 1.422(Ft/s)
167 ***** Irregular Channel Data *****
168 -----
169 Information entered for subchannel number 1 :
170 Point number 'X' coordinate 'Y' coordinate
171 1 0.00 1.00
172 2 25.00 0.00
173 3 50.00 1.00
174 Manning's 'N' friction factor = 0.030
175 -----
176 Sub-Channel flow = 3.310(CFS)
177 ' ' flow top width = 15.257(Ft.)
178 ' ' velocity= 1.422(Ft/s)
179 ' ' area = 2.328(Sq.Ft)
180 ' ' Froude number = 0.641
181
182 Upstream point elevation = 313.000(Ft.)
183 Downstream point elevation = 308.700(Ft.)
184 Flow length = 425.000(Ft.)
185 Travel time = 4.98 min.
186 Time of concentration = 8.80 min.
187 Depth of flow = 0.305(Ft.)
188 Average velocity = 1.422(Ft/s)
189 Total irregular channel flow = 3.310(CFS)
190 Irregular channel normal depth above invert elev. = 0.305(Ft.)
191 Average velocity of channel(s) = 1.422(Ft/s)
192 Adding area flow to channel
193 Rainfall intensity (I) = 6.406(In/Hr) for a 100.0 year storm
194 Decimal fraction soil group A = 0.200
195 Decimal fraction soil group B = 0.000
196 Decimal fraction soil group C = 0.800
197 Decimal fraction soil group D = 0.000
198 [MEDIUM DENSITY RESIDENTIAL ]
199 (4.3 DU/A or Less )
200 Impervious value, Ai = 0.300
201 Sub-Area C Value = 0.466
202 Rainfall intensity = 6.406(In/Hr) for a 100.0 year storm
203 Effective runoff coefficient used for total area
204 (Q=KCIA) is C = 0.463 CA = 0.880
205 Subarea runoff = 4.741(CFS) for 1.680(Ac.)
206 Total runoff = 5.637(CFS) Total area = 1.900(Ac.)
207 Depth of flow = 0.373(Ft.), Average velocity = 1.624(Ft/s)

```

```

208
209 ++++++
210 Process from Point/Station      103.000 to Point/Station      103.000
211 **** CONFLUENCE OF MINOR STREAMS ****
212
213 -----
214 Along Main Stream number: 1 in normal stream number 2
215 Stream flow area =      1.900 (Ac.)
216 Runoff from this stream =      5.637 (CFS)
217 Time of concentration =      8.80 min.
218 Rainfall intensity =      6.406 (In/Hr)
219
220 ++++++
221 Process from Point/Station      305.000 to Point/Station      305.000
222 **** USER DEFINED FLOW INFORMATION AT A POINT ****
223
224 -----
225 Decimal fraction soil group A = 1.000
226 Decimal fraction soil group B = 0.000
227 Decimal fraction soil group C = 0.000
228 Decimal fraction soil group D = 0.000
229 [MEDIUM DENSITY RESIDENTIAL ]
230 (7.3 DU/A or Less )
231 Impervious value, Ai = 0.400
232 Sub-Area C Value = 0.480
233 Rainfall intensity (I) =      6.428 (In/Hr) for a 100.0 year storm
234 User specified values are as follows:
235 TC = 8.75 min. Rain intensity =      6.43 (In/Hr)
236 Total area =      5.000 (Ac.) Total runoff =      13.794 (CFS)
237
238 ++++++
239 Process from Point/Station      305.000 to Point/Station      103.000
240 **** PIPEFLOW TRAVEL TIME (User specified size) ****
241
242 -----
243 Upstream point/station elevation = 311.100 (Ft.)
244 Downstream point/station elevation = 302.200 (Ft.)
245 Pipe length = 208.00 (Ft.) Slope = 0.0428 Manning's N = 0.013
246 No. of pipes = 1 Required pipe flow = 13.794 (CFS)
247 Given pipe size = 12.00 (In.)
248 NOTE: Normal flow is pressure flow in user selected pipe size.
249 The approximate hydraulic grade line above the pipe invert is
250 29.453 (Ft.) at the headworks or inlet of the pipe(s)
251 Pipe friction loss = 31.169 (Ft.)
252 Minor friction loss = 7.185 (Ft.) K-factor = 1.50
253 Pipe flow velocity = 17.56 (Ft/s)
254 Travel time through pipe = 0.20 min.
255 Time of concentration (TC) = 8.95 min.
256
257 ++++++
258 Process from Point/Station      103.000 to Point/Station      103.000
259 **** CONFLUENCE OF MINOR STREAMS ****
260
261 -----
262 Along Main Stream number: 1 in normal stream number 3
263 Stream flow area =      5.000 (Ac.)
264 Runoff from this stream =      13.794 (CFS)
265 Time of concentration =      8.95 min.
266 Rainfall intensity =      6.336 (In/Hr)
267
268 ++++++
269 Process from Point/Station      503.000 to Point/Station      103.000
270 **** USER DEFINED FLOW INFORMATION AT A POINT ****
271
272 -----
273 Decimal fraction soil group A = 0.270
274 Decimal fraction soil group B = 0.000
275 Decimal fraction soil group C = 0.730
276 Decimal fraction soil group D = 0.000
277 [MEDIUM DENSITY RESIDENTIAL ]

```

277 (4.3 DU/A or Less)
 278 Impervious value, Ai = 0.300
 279 Sub-Area C Value = 0.461
 280 Rainfall intensity (I) = 7.149(In/Hr) for a 100.0 year storm
 281 User specified values are as follows:
 282 TC = 7.42 min. Rain intensity = 7.15(In/Hr)
 283 Total area = 0.760(Ac.) Total runoff = 2.512(CFS)
 284
 285

286 +++++
 287 Process from Point/Station 103.000 to Point/Station 103.000
 288 **** CONFLUENCE OF MINOR STREAMS ****
 289

290 Along Main Stream number: 1 in normal stream number 4
 291 Stream flow area = 0.760(Ac.)
 292 Runoff from this stream = 2.512(CFS)
 293 Time of concentration = 7.42 min.
 294 Rainfall intensity = 7.149(In/Hr)
 295 Summary of stream data:
 296

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	8.681	6.16	8.064
2	5.637	8.80	6.406
3	13.794	8.95	6.336
4	2.512	7.42	7.149

305 Qmax(1) =
 306 1.000 * 1.000 * 8.681) +
 307 1.000 * 0.700 * 5.637) +
 308 1.000 * 0.688 * 13.794) +
 309 1.000 * 0.830 * 2.512) + = 24.199
 310

311 Qmax(2) =
 312 0.794 * 1.000 * 8.681) +
 313 1.000 * 1.000 * 5.637) +
 314 1.000 * 0.983 * 13.794) +
 315 0.896 * 1.000 * 2.512) + = 28.345
 316

317 Qmax(3) =
 318 0.786 * 1.000 * 8.681) +
 319 0.989 * 1.000 * 5.637) +
 320 1.000 * 1.000 * 13.794) +
 321 0.886 * 1.000 * 2.512) + = 28.416
 322

323 Qmax(4) =
 324 0.886 * 1.000 * 8.681) +
 325 1.000 * 0.844 * 5.637) +
 326 1.000 * 0.829 * 13.794) +
 327 1.000 * 1.000 * 2.512) + = 26.402
 328

329 Total of 4 streams to confluence:
 330 Flow rates before confluence point:
 331 8.681 5.637 13.794 2.512
 332 Maximum flow rates at confluence using above data:
 333 24.199 28.345 28.416 26.402
 334 Area of streams before confluence:
 335 2.330 1.900 5.000 0.760
 336

337 Results of confluence:
 338 Total flow rate = 28.416(CFS)
 339 Time of concentration = 8.947 min.
 340 Effective stream area after confluence = 9.990(Ac.)
 341

342 +++++
 343 Process from Point/Station 103.000 to Point/Station 309.000
 344 **** PIPEFLOW TRAVEL TIME (User specified size) ****
 345

346 Upstream point/station elevation = 302.200(Ft.)
 347 Downstream point/station elevation = 301.800(Ft.)
 348 Pipe length = 27.00(Ft.) Slope = 0.0148 Manning's N = 0.013
 349

346 No. of pipes = 1 Required pipe flow = 28.416(CFS)
347 Given pipe size = 18.00(In.)
348 NOTE: Normal flow is pressure flow in user selected pipe size.
349 The approximate hydraulic grade line above the pipe invert is
350 7.598(Ft.) at the headworks or inlet of the pipe(s)
351 Pipe friction loss = 1.975(Ft.)
352 Minor friction loss = 6.023(Ft.) K-factor = 1.50
353 Pipe flow velocity = 16.08(Ft/s)
354 Travel time through pipe = 0.03 min.
355 Time of concentration (TC) = 8.98 min.

356
357
358 ++++++
359 Process from Point/Station 309.000 to Point/Station 406.000
360 **** PIPEFLOW TRAVEL TIME (User specified size) ****

361
362 Upstream point/station elevation = 301.800(Ft.)
363 Downstream point/station elevation = 285.720(Ft.)
364 Pipe length = 137.00(Ft.) Slope = 0.1174 Manning's N = 0.013
365 No. of pipes = 1 Required pipe flow = 28.416(CFS)
366 Given pipe size = 18.00(In.)
367 Calculated individual pipe flow = 28.416(CFS)
368 Normal flow depth in pipe = 12.07(In.)
369 Flow top width inside pipe = 16.92(In.)
370 Critical depth could not be calculated.
371 Pipe flow velocity = 22.57(Ft/s)
372 Travel time through pipe = 0.10 min.
373 Time of concentration (TC) = 9.08 min.

374
375
376 ++++++
377 Process from Point/Station 406.000 to Point/Station 406.000
378 **** CONFLUENCE OF MINOR STREAMS ****

379
380 Along Main Stream number: 1 in normal stream number 1
381 Stream flow area = 9.990(Ac.)
382 Runoff from this stream = 28.416(CFS)
383 Time of concentration = 9.08 min.
384 Rainfall intensity = 6.277(In/Hr)

385
386
387 ++++++
388 Process from Point/Station 403.000 to Point/Station 404.000
389 **** INITIAL AREA EVALUATION ****

390
391 Decimal fraction soil group A = 0.000
392 Decimal fraction soil group B = 0.000
393 Decimal fraction soil group C = 1.000
394 Decimal fraction soil group D = 0.000
395 [COMMERCIAL area type]
396 (General Commercial)
397 Impervious value, Ai = 0.850
398 Sub-Area C Value = 0.810
399 Initial subarea total flow distance = 94.000(Ft.)
400 Highest elevation = 318.000(Ft.)
401 Lowest elevation = 316.300(Ft.)
402 Elevation difference = 1.700(Ft.) Slope = 1.809 %
403 Top of Initial Area Slope adjusted by User to 1.400 %
404 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
405 The maximum overland flow distance is 60.00 (Ft)
406 for the top area slope value of 1.40 %, in a development type of
407 General Commercial
408 In Accordance With Figure 3-3
409 Initial Area Time of Concentration = 3.61 minutes
410 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5} / (% slope^{(1/3)})]$
411 $TC = [1.8 * (1.1 - 0.8100) * (60.000^{.5}) / (1.400^{(1/3)})] = 3.61$
412 Calculated TC of 3.614 minutes is less than 5 minutes,
413 resetting TC to 5.0 minutes for rainfall intensity calculations
414 Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm

```

415 Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
416 Subarea runoff = 0.254 (CFS)
417 Total initial stream area = 0.034 (Ac.)
418
419
420 ++++++
421 Process from Point/Station 404.000 to Point/Station 405.000
422 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
423
424 -----
424 Estimated mean flow rate at midpoint of channel = 2.197 (CFS)
425 Depth of flow = 0.242 (Ft.), Average velocity = 1.791 (Ft/s)
426 ***** Irregular Channel Data *****
427 -----
428 Information entered for subchannel number 1 :
429 Point number 'X' coordinate 'Y' coordinate
430 1 0.00 0.31
431 2 26.00 0.13
432 3 27.50 0.00
433 4 27.50 0.50
434 Manning's 'N' friction factor = 0.013
435 -----
436 Sub-Channel flow = 2.197 (CFS)
437 ' ' flow top width = 17.814 (Ft.)
438 ' ' velocity = 1.791 (Ft/s)
439 ' ' area = 1.227 (Sq.Ft)
440 ' ' Froude number = 1.203
441
442 Upstream point elevation = 316.300 (Ft.)
443 Downstream point elevation = 310.800 (Ft.)
444 Flow length = 621.000 (Ft.)
445 Travel time = 5.78 min.
446 Time of concentration = 9.39 min.
447 Depth of flow = 0.242 (Ft.)
448 Average velocity = 1.791 (Ft/s)
449 Total irregular channel flow = 2.197 (CFS)
450 Irregular channel normal depth above invert elev. = 0.242 (Ft.)
451 Average velocity of channel(s) = 1.791 (Ft/s)
452 Adding area flow to channel
453 Rainfall intensity (I) = 6.140 (In/Hr) for a 100.0 year storm
454 User specified 'C' value of 0.762 given for subarea
455 Rainfall intensity = 6.140 (In/Hr) for a 100.0 year storm
456 Effective runoff coefficient used for total area
457 (Q=KCIA) is C = 0.764 CA = 0.665
458 Subarea runoff = 3.831 (CFS) for 0.837 (Ac.)
459 Total runoff = 4.085 (CFS) Total area = 0.871 (Ac.)
460 Depth of flow = 0.279 (Ft.), Average velocity = 2.078 (Ft/s)
461
462
463 ++++++
464 Process from Point/Station 401.000 to Point/Station 406.000
465 **** SUBAREA FLOW ADDITION ****
466
467 -----
467 Rainfall intensity (I) = 6.140 (In/Hr) for a 100.0 year storm
468 Decimal fraction soil group A = 0.100
469 Decimal fraction soil group B = 0.000
470 Decimal fraction soil group C = 0.900
471 Decimal fraction soil group D = 0.000
472 [MEDIUM DENSITY RESIDENTIAL ]
473 (14.5 DU/A or Less )
474 Impervious value, Ai = 0.500
475 Sub-Area C Value = 0.595
476 Time of concentration = 9.39 min.
477 Rainfall intensity = 6.140 (In/Hr) for a 100.0 year storm
478 Effective runoff coefficient used for total area
479 (Q=KCIA) is C = 0.695 CA = 1.022
480 Subarea runoff = 2.192 (CFS) for 0.600 (Ac.)
481 Total runoff = 6.277 (CFS) Total area = 1.471 (Ac.)
482
483

```

484 ++++++

485 Process from Point/Station 402.000 to Point/Station 406.000

486 **** SUBAREA FLOW ADDITION ****

488 Rainfall intensity (I) = 6.140 (In/Hr) for a 100.0 year storm

489 Decimal fraction soil group A = 0.000

490 Decimal fraction soil group B = 0.000

491 Decimal fraction soil group C = 1.000

492 Decimal fraction soil group D = 0.000

493 [COMMERCIAL area type]

494 (Neighborhood Commercial)

495 Impervious value, Ai = 0.800

496 Sub-Area C Value = 0.780

497 Time of concentration = 9.39 min.

498 Rainfall intensity = 6.140 (In/Hr) for a 100.0 year storm

499 Effective runoff coefficient used for total area

500 (Q=KCIA) is C = 0.715 CA = 1.374

501 Subarea runoff = 2.160 (CFS) for 0.451 (Ac.)

502 Total runoff = 8.437 (CFS) Total area = 1.922 (Ac.)

505 ++++++

506 Process from Point/Station 405.000 to Point/Station 406.000

507 **** PIPEFLOW TRAVEL TIME (User specified size) ****

509 Upstream point/station elevation = 306.830 (Ft.)

510 Downstream point/station elevation = 285.720 (Ft.)

511 Pipe length = 211.00 (Ft.) Slope = 0.1000 Manning's N = 0.013

512 No. of pipes = 1 Required pipe flow = 8.437 (CFS)

513 Given pipe size = 18.00 (In.)

514 Calculated individual pipe flow = 8.437 (CFS)

515 Normal flow depth in pipe = 6.19 (In.)

516 Flow top width inside pipe = 17.10 (In.)

517 Critical Depth = 13.50 (In.)

518 Pipe flow velocity = 15.70 (Ft/s)

519 Travel time through pipe = 0.22 min.

520 Time of concentration (TC) = 9.62 min.

523 ++++++

524 Process from Point/Station 406.000 to Point/Station 406.000

525 **** CONFLUENCE OF MINOR STREAMS ****

527 Along Main Stream number: 1 in normal stream number 2

528 Stream flow area = 1.922 (Ac.)

529 Runoff from this stream = 8.437 (CFS)

530 Time of concentration = 9.62 min.

531 Rainfall intensity = 6.047 (In/Hr)

532 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	28.416	9.08	6.277
2	8.437	9.62	6.047
Qmax (1) =			
	1.000 *	1.000 *	28.416) +
	1.000 *	0.944 *	8.437) + = 36.378
Qmax (2) =			
	0.963 *	1.000 *	28.416) +
	1.000 *	1.000 *	8.437) + = 35.811

547 Total of 2 streams to confluence:

548 Flow rates before confluence point:

549 28.416 8.437

550 Maximum flow rates at confluence using above data:

551 36.378 35.811

552 Area of streams before confluence:

553 9.990 1.922
554 Results of confluence:
555 Total flow rate = 36.378 (CFS)
556 Time of concentration = 9.077 min.
557 Effective stream area after confluence = 11.912 (Ac.)
558 End of computations, total study area = 11.912 (Ac.)
559
560
561

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2014 Version 9.0

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 04/24/24

19025 Post Dev
100 yr study - Belmonte Addition
19025belmontepost

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

Program License Serial Number 6332

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.500
24 hour precipitation(inches) = 6.000
P6/P24 = 58.3%
San Diego hydrology manual 'C' values used

+++++
Process from Point/Station 3001.000 to Point/Station 3002.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL]
(4.3 DU/A or Less)
Impervious value, Ai = 0.300
Sub-Area C Value = 0.410
Initial subarea total flow distance = 99.210 (Ft.)
Highest elevation = 337.300 (Ft.)
Lowest elevation = 328.200 (Ft.)
Elevation difference = 9.100 (Ft.) Slope = 9.172 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 9.17 %, in a development type of
4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 5.93 minutes
TC = [1.8*(1.1-C)*distance (Ft.)^.5]/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*(100.000^.5)]/(9.172^(1/3)]= 5.93
Rainfall intensity (I) = 8.258 (In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff = 0.599 (CFS)
Total initial stream area = 0.177 (Ac.)

+++++
Process from Point/Station 3002.000 to Point/Station 3003.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 1.615 (CFS)
Depth of flow = 0.142 (Ft.), Average velocity = 2.802 (Ft/s)
***** Irregular Channel Data *****

```

70 -----
71 Information entered for subchannel number 1 :
72 Point number      'X' coordinate      'Y' coordinate
73     1              0.00              0.50
74     2              26.00              0.00
75     3              27.00              0.20
76 Manning's 'N' friction factor = 0.023
77 -----

```

```

78 Sub-Channel flow = 1.615 (CFS)
79 ' ' flow top width = 8.106 (Ft.)
80 ' ' velocity = 2.802 (Ft/s)
81 ' ' area = 0.576 (Sq.Ft)
82 ' ' Froude number = 1.852
83

```

```

84 Upstream point elevation = 328.200 (Ft.)
85 Downstream point elevation = 312.800 (Ft.)
86 Flow length = 240.520 (Ft.)
87 Travel time = 1.43 min.
88 Time of concentration = 7.36 min.
89 Depth of flow = 0.142 (Ft.)
90 Average velocity = 2.802 (Ft/s)
91 Total irregular channel flow = 1.615 (CFS)
92 Irregular channel normal depth above invert elev. = 0.142 (Ft.)
93 Average velocity of channel (s) = 2.802 (Ft/s)
94 Adding area flow to channel
95 Rainfall intensity (I) = 7.184 (In/Hr) for a 100.0 year storm
96 Decimal fraction soil group A = 0.050
97 Decimal fraction soil group B = 0.000
98 Decimal fraction soil group C = 0.950
99 Decimal fraction soil group D = 0.000

```

```

100 [MEDIUM DENSITY RESIDENTIAL
101 (4.3 DU/A or Less )
102 Impervious value, Ai = 0.300
103 Sub-Area C Value = 0.476
104 Rainfall intensity = 7.184 (In/Hr) for a 100.0 year storm
105 Effective runoff coefficient used for total area
106 (Q=KCIA) is C = 0.461 CA = 0.358
107 Subarea runoff = 1.976 (CFS) for 0.600 (Ac.)
108 Total runoff = 2.575 (CFS) Total area = 0.777 (Ac.)
109 Depth of flow = 0.169 (Ft.), Average velocity = 3.149 (Ft/s)
110
111

```

```

112 +-----+
113 Process from Point/Station 3003.000 to Point/Station 3003.000
114 **** 6 HOUR HYDROGRAPH ****
115
116 +-----+
117 Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003
118
119

```

```

120 Time of Concentration = 7.36
121 Basin Area = 0.78 Acres
122 6 Hour Rainfall = 3.500 Inches
123 Runoff Coefficient = 0.461
124 Peak Discharge = 2.58 CFS
125 Time (Min) Discharge (CFS)
126 0 0.000
127 7 0.075
128 14 0.076
129 21 0.078
130 28 0.079
131 35 0.082
132 42 0.083
133 49 0.085
134 56 0.087
135 63 0.090
136 70 0.091
137 77 0.094
138 84 0.096

```

139	91	0.100
140	98	0.102
141	105	0.106
142	112	0.109
143	119	0.114
144	126	0.117
145	133	0.123
146	140	0.127
147	147	0.135
148	154	0.139
149	161	0.149
150	168	0.155
151	175	0.168
152	182	0.176
153	189	0.196
154	196	0.207
155	203	0.238
156	210	0.258
157	217	0.315
158	224	0.359
159	231	0.527
160	238	0.742
161	245	2.575
162	252	0.423
163	259	0.283
164	266	0.221
165	273	0.185
166	280	0.161
167	287	0.144
168	294	0.131
169	301	0.120
170	308	0.111
171	315	0.104
172	322	0.098
173	329	0.093
174	336	0.088
175	343	0.084
176	350	0.081
177	357	0.077
178	364	0.074

+++++

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 0.6 1.3 1.9 2.6

Time (h+m)	Volume	Ac.Ft	Q (CFS)	0	0.6	1.3	1.9	2.6
188	0+ 0	0.0000	0.00	Q				
189	0+ 1	0.0000	0.01	Q				
190	0+ 2	0.0000	0.02	Q				
191	0+ 3	0.0001	0.03	Q				
192	0+ 4	0.0001	0.04	Q				
193	0+ 5	0.0002	0.05	Q				
194	0+ 6	0.0003	0.06	VQ				
195	0+ 7	0.0004	0.08	VQ				
196	0+ 8	0.0005	0.08	VQ				
197	0+ 9	0.0006	0.08	VQ				
198	0+10	0.0007	0.08	VQ				
199	0+11	0.0008	0.08	VQ				
200	0+12	0.0009	0.08	VQ				
201	0+13	0.0010	0.08	VQ				
202	0+14	0.0011	0.08	VQ				
203	0+15	0.0013	0.08	VQ				
204	0+16	0.0014	0.08	VQ				
205	0+17	0.0015	0.08	VQ				
206	0+18	0.0016	0.08	VQ				
207	0+19	0.0017	0.08	VQ				

208	0+20	0.0018	0.08	VQ				
209	0+21	0.0019	0.08	VQ				
210	0+22	0.0020	0.08	VQ				
211	0+23	0.0021	0.08	VQ				
212	0+24	0.0022	0.08	VQ				
213	0+25	0.0023	0.08	VQ				
214	0+26	0.0024	0.08	VQ				
215	0+27	0.0025	0.08	VQ				
216	0+28	0.0027	0.08	IQ				
217	0+29	0.0028	0.08	IQ				
218	0+30	0.0029	0.08	IQ				
219	0+31	0.0030	0.08	IQ				
220	0+32	0.0031	0.08	IQ				
221	0+33	0.0032	0.08	IQ				
222	0+34	0.0033	0.08	IQ				
223	0+35	0.0034	0.08	IQ				
224	0+36	0.0035	0.08	IQ				
225	0+37	0.0037	0.08	IQ				
226	0+38	0.0038	0.08	IQ				
227	0+39	0.0039	0.08	IQ				
228	0+40	0.0040	0.08	IQ				
229	0+41	0.0041	0.08	IQ				
230	0+42	0.0042	0.08	IQ				
231	0+43	0.0043	0.08	IQ				
232	0+44	0.0045	0.08	IQ				
233	0+45	0.0046	0.08	IQ				
234	0+46	0.0047	0.08	IQ				
235	0+47	0.0048	0.08	IQ				
236	0+48	0.0049	0.09	IQ				
237	0+49	0.0050	0.09	IQ				
238	0+50	0.0052	0.09	IQ				
239	0+51	0.0053	0.09	IQV				
240	0+52	0.0054	0.09	IQV				
241	0+53	0.0055	0.09	IQV				
242	0+54	0.0056	0.09	IQV				
243	0+55	0.0058	0.09	IQV				
244	0+56	0.0059	0.09	IQV				
245	0+57	0.0060	0.09	IQV				
246	0+58	0.0061	0.09	IQV				
247	0+59	0.0062	0.09	IQV				
248	1+ 0	0.0064	0.09	IQV				
249	1+ 1	0.0065	0.09	IQV				
250	1+ 2	0.0066	0.09	IQV				
251	1+ 3	0.0067	0.09	IQV				
252	1+ 4	0.0068	0.09	IQV				
253	1+ 5	0.0070	0.09	IQV				
254	1+ 6	0.0071	0.09	IQV				
255	1+ 7	0.0072	0.09	IQV				
256	1+ 8	0.0073	0.09	IQV				
257	1+ 9	0.0075	0.09	IQV				
258	1+10	0.0076	0.09	IQV				
259	1+11	0.0077	0.09	IQV				
260	1+12	0.0078	0.09	IQ V				
261	1+13	0.0080	0.09	IQ V				
262	1+14	0.0081	0.09	IQ V				
263	1+15	0.0082	0.09	IQ V				
264	1+16	0.0084	0.09	IQ V				
265	1+17	0.0085	0.09	IQ V				
266	1+18	0.0086	0.09	IQ V				
267	1+19	0.0088	0.09	IQ V				
268	1+20	0.0089	0.10	IQ V				
269	1+21	0.0090	0.10	IQ V				
270	1+22	0.0091	0.10	IQ V				
271	1+23	0.0093	0.10	IQ V				
272	1+24	0.0094	0.10	IQ V				
273	1+25	0.0095	0.10	IQ V				
274	1+26	0.0097	0.10	IQ V				
275	1+27	0.0098	0.10	IQ V				
276	1+28	0.0100	0.10	IQ V				

277	1+29	0.0101	0.10	I Q	V				
278	1+30	0.0102	0.10	I Q	V				
279	1+31	0.0104	0.10	I Q	V				
280	1+32	0.0105	0.10	I Q	V				
281	1+33	0.0106	0.10	I Q	V				
282	1+34	0.0108	0.10	I Q	V				
283	1+35	0.0109	0.10	I Q	V				
284	1+36	0.0111	0.10	I Q	V				
285	1+37	0.0112	0.10	I Q	V				
286	1+38	0.0113	0.10	I Q	V				
287	1+39	0.0115	0.10	I Q	V				
288	1+40	0.0116	0.10	I Q	V				
289	1+41	0.0118	0.10	I Q	V				
290	1+42	0.0119	0.10	I Q	V				
291	1+43	0.0121	0.11	I Q	V				
292	1+44	0.0122	0.11	I Q	V				
293	1+45	0.0123	0.11	I Q	V				
294	1+46	0.0125	0.11	I Q	V				
295	1+47	0.0126	0.11	I Q	V				
296	1+48	0.0128	0.11	I Q	V				
297	1+49	0.0129	0.11	I Q	V				
298	1+50	0.0131	0.11	I Q	V				
299	1+51	0.0132	0.11	I Q	V				
300	1+52	0.0134	0.11	I Q	V				
301	1+53	0.0135	0.11	I Q	V				
302	1+54	0.0137	0.11	I Q	V				
303	1+55	0.0138	0.11	I Q	V				
304	1+56	0.0140	0.11	I Q	V				
305	1+57	0.0142	0.11	I Q	V				
306	1+58	0.0143	0.11	I Q	V				
307	1+59	0.0145	0.11	I Q	V				
308	2+ 0	0.0146	0.11	I Q	V				
309	2+ 1	0.0148	0.11	I Q	V				
310	2+ 2	0.0149	0.12	I Q	V				
311	2+ 3	0.0151	0.12	I Q	V				
312	2+ 4	0.0153	0.12	I Q	V				
313	2+ 5	0.0154	0.12	I Q	V				
314	2+ 6	0.0156	0.12	I Q	V				
315	2+ 7	0.0157	0.12	I Q	V				
316	2+ 8	0.0159	0.12	I Q	V				
317	2+ 9	0.0161	0.12	I Q	V				
318	2+10	0.0162	0.12	I Q	V				
319	2+11	0.0164	0.12	I Q	V				
320	2+12	0.0166	0.12	I Q	V				
321	2+13	0.0167	0.12	I Q	V				
322	2+14	0.0169	0.12	I Q	V				
323	2+15	0.0171	0.12	I Q	V				
324	2+16	0.0173	0.12	I Q	V				
325	2+17	0.0174	0.13	I Q	V				
326	2+18	0.0176	0.13	I Q	V				
327	2+19	0.0178	0.13	I Q	V				
328	2+20	0.0180	0.13	I Q	V				
329	2+21	0.0181	0.13	I Q	V				
330	2+22	0.0183	0.13	I Q	V				
331	2+23	0.0185	0.13	I Q	V				
332	2+24	0.0187	0.13	I Q	V				
333	2+25	0.0188	0.13	I Q	V				
334	2+26	0.0190	0.13	I Q	V				
335	2+27	0.0192	0.13	I Q	V				
336	2+28	0.0194	0.14	I Q	V				
337	2+29	0.0196	0.14	I Q	V				
338	2+30	0.0198	0.14	I Q	V				
339	2+31	0.0200	0.14	I Q	V				
340	2+32	0.0202	0.14	I Q	V				
341	2+33	0.0203	0.14	I Q	V				
342	2+34	0.0205	0.14	I Q	V				
343	2+35	0.0207	0.14	I Q	V				
344	2+36	0.0209	0.14	I Q	V				
345	2+37	0.0211	0.14	I Q	V				

346	2+38	0.0213	0.14	Q	V				
347	2+39	0.0215	0.15	Q	V				
348	2+40	0.0217	0.15	Q	V				
349	2+41	0.0219	0.15	Q	V				
350	2+42	0.0221	0.15	Q	V				
351	2+43	0.0223	0.15	Q	V				
352	2+44	0.0226	0.15	Q	V				
353	2+45	0.0228	0.15	Q	V				
354	2+46	0.0230	0.15	Q	V				
355	2+47	0.0232	0.15	Q	V				
356	2+48	0.0234	0.15	Q	V				
357	2+49	0.0236	0.16	Q	V				
358	2+50	0.0238	0.16	Q	V				
359	2+51	0.0241	0.16	Q	V				
360	2+52	0.0243	0.16	Q	V				
361	2+53	0.0245	0.16	Q	V				
362	2+54	0.0247	0.17	Q	V				
363	2+55	0.0250	0.17	Q	V				
364	2+56	0.0252	0.17	Q	V				
365	2+57	0.0254	0.17	Q	V				
366	2+58	0.0257	0.17	Q	V				
367	2+59	0.0259	0.17	Q	V				
368	3+ 0	0.0262	0.17	Q	V				
369	3+ 1	0.0264	0.18	Q	V				
370	3+ 2	0.0266	0.18	Q	V				
371	3+ 3	0.0269	0.18	Q	V				
372	3+ 4	0.0271	0.18	Q	V				
373	3+ 5	0.0274	0.18	Q	V				
374	3+ 6	0.0276	0.19	Q	V				
375	3+ 7	0.0279	0.19	Q	V				
376	3+ 8	0.0282	0.19	Q	V				
377	3+ 9	0.0284	0.20	Q	V				
378	3+10	0.0287	0.20	Q	V				
379	3+11	0.0290	0.20	Q	V				
380	3+12	0.0293	0.20	Q	V				
381	3+13	0.0295	0.20	Q	V				
382	3+14	0.0298	0.20	Q	V				
383	3+15	0.0301	0.21	Q	V				
384	3+16	0.0304	0.21	Q	V				
385	3+17	0.0307	0.21	Q	V				
386	3+18	0.0310	0.22	Q	V				
387	3+19	0.0313	0.22	Q	V				
388	3+20	0.0316	0.22	Q	V				
389	3+21	0.0319	0.23	Q	V				
390	3+22	0.0322	0.23	Q	V				
391	3+23	0.0326	0.24	Q	V				
392	3+24	0.0329	0.24	Q	V				
393	3+25	0.0332	0.24	Q	V				
394	3+26	0.0336	0.25	Q	V				
395	3+27	0.0339	0.25	Q	V				
396	3+28	0.0343	0.25	Q	V				
397	3+29	0.0346	0.25	Q	V				
398	3+30	0.0350	0.26	Q	V				
399	3+31	0.0353	0.27	Q	V				
400	3+32	0.0357	0.27	Q	V				
401	3+33	0.0361	0.28	Q	V				
402	3+34	0.0365	0.29	Q	V				
403	3+35	0.0369	0.30	Q	V				
404	3+36	0.0373	0.31	Q	V				
405	3+37	0.0378	0.32	Q	V				
406	3+38	0.0382	0.32	Q	V				
407	3+39	0.0387	0.33	Q	V				
408	3+40	0.0391	0.33	Q	V				
409	3+41	0.0396	0.34	Q	V				
410	3+42	0.0401	0.35	Q	V				
411	3+43	0.0406	0.35	Q	V				
412	3+44	0.0410	0.36	Q	V				
413	3+45	0.0416	0.38	Q	V				
414	3+46	0.0421	0.41	Q	V				

415	3+47	0.0427	0.43		Q		V				
416	3+48	0.0434	0.45				V				
417	3+49	0.0440	0.48				V				
418	3+50	0.0447	0.50				V				
419	3+51	0.0454	0.53				V				
420	3+52	0.0462	0.56				V				
421	3+53	0.0470	0.59				V				
422	3+54	0.0479	0.62				V				
423	3+55	0.0488	0.65				V				
424	3+56	0.0497	0.68				V				
425	3+57	0.0507	0.71				V				
426	3+58	0.0517	0.74				V				
427	3+59	0.0531	1.00				V				
428	4+ 0	0.0548	1.27				Q	V			
429	4+ 1	0.0569	1.53					V	Q		
430	4+ 2	0.0594	1.79					V		Q	
431	4+ 3	0.0622	2.05					V			Q
432	4+ 4	0.0654	2.31					V			
433	4+ 5	0.0690	2.58					V			
434	4+ 6	0.0721	2.27					V			
435	4+ 7	0.0748	1.96					V			Q
436	4+ 8	0.0771	1.65					V			
437	4+ 9	0.0789	1.35					V			
438	4+10	0.0803	1.04					V			
439	4+11	0.0813	0.73					V			
440	4+12	0.0819	0.42					V			
441	4+13	0.0825	0.40					V			
442	4+14	0.0830	0.38					V			
443	4+15	0.0835	0.36					V			
444	4+16	0.0840	0.34					V			
445	4+17	0.0844	0.32					V			
446	4+18	0.0848	0.30					V			
447	4+19	0.0852	0.28					V			
448	4+20	0.0856	0.27					V			
449	4+21	0.0860	0.27					V			
450	4+22	0.0863	0.26					V			
451	4+23	0.0867	0.25					V			
452	4+24	0.0870	0.24					V			
453	4+25	0.0873	0.23					V			
454	4+26	0.0876	0.22					V			
455	4+27	0.0879	0.22					V			
456	4+28	0.0882	0.21					V			
457	4+29	0.0885	0.21					V			
458	4+30	0.0888	0.20					V			
459	4+31	0.0890	0.20					V			
460	4+32	0.0893	0.19					V			
461	4+33	0.0895	0.19					V			
462	4+34	0.0898	0.18					V			
463	4+35	0.0900	0.18					V			
464	4+36	0.0903	0.17					V			
465	4+37	0.0905	0.17					V			
466	4+38	0.0908	0.17					V			
467	4+39	0.0910	0.16					V			
468	4+40	0.0912	0.16					V			
469	4+41	0.0914	0.16					V			
470	4+42	0.0916	0.16					V			
471	4+43	0.0918	0.15					V			
472	4+44	0.0921	0.15					V			
473	4+45	0.0923	0.15					V			
474	4+46	0.0925	0.15					V			
475	4+47	0.0927	0.14					V			
476	4+48	0.0929	0.14					V			
477	4+49	0.0930	0.14					V			
478	4+50	0.0932	0.14					V			
479	4+51	0.0934	0.14					V			
480	4+52	0.0936	0.13					V			
481	4+53	0.0938	0.13					V			
482	4+54	0.0940	0.13					V			
483	4+55	0.0942	0.13					V			

484	4+56	0.0943	0.13	IQ	V
485	4+57	0.0945	0.13	IQ	V
486	4+58	0.0947	0.12	IQ	V
487	4+59	0.0948	0.12	IQ	V
488	5+ 0	0.0950	0.12	IQ	V
489	5+ 1	0.0952	0.12	IQ	V
490	5+ 2	0.0953	0.12	IQ	V
491	5+ 3	0.0955	0.12	IQ	V
492	5+ 4	0.0957	0.12	IQ	V
493	5+ 5	0.0958	0.12	IQ	V
494	5+ 6	0.0960	0.11	IQ	V
495	5+ 7	0.0961	0.11	IQ	V
496	5+ 8	0.0963	0.11	IQ	V
497	5+ 9	0.0964	0.11	IQ	V
498	5+10	0.0966	0.11	IQ	V
499	5+11	0.0967	0.11	IQ	V
500	5+12	0.0969	0.11	IQ	V
501	5+13	0.0970	0.11	IQ	V
502	5+14	0.0972	0.11	IQ	V
503	5+15	0.0973	0.10	IQ	V
504	5+16	0.0975	0.10	IQ	V
505	5+17	0.0976	0.10	IQ	V
506	5+18	0.0977	0.10	IQ	V
507	5+19	0.0979	0.10	IQ	V
508	5+20	0.0980	0.10	IQ	V
509	5+21	0.0982	0.10	IQ	V
510	5+22	0.0983	0.10	IQ	V
511	5+23	0.0984	0.10	IQ	V
512	5+24	0.0986	0.10	IQ	V
513	5+25	0.0987	0.10	IQ	V
514	5+26	0.0988	0.10	IQ	V
515	5+27	0.0990	0.09	IQ	V
516	5+28	0.0991	0.09	IQ	V
517	5+29	0.0992	0.09	IQ	V
518	5+30	0.0993	0.09	IQ	V
519	5+31	0.0995	0.09	IQ	V
520	5+32	0.0996	0.09	IQ	V
521	5+33	0.0997	0.09	IQ	V
522	5+34	0.0998	0.09	IQ	V
523	5+35	0.1000	0.09	IQ	V
524	5+36	0.1001	0.09	IQ	V
525	5+37	0.1002	0.09	IQ	V
526	5+38	0.1003	0.09	IQ	V
527	5+39	0.1004	0.09	IQ	V
528	5+40	0.1006	0.09	IQ	V
529	5+41	0.1007	0.09	IQ	V
530	5+42	0.1008	0.08	IQ	V
531	5+43	0.1009	0.08	IQ	V
532	5+44	0.1010	0.08	IQ	V
533	5+45	0.1011	0.08	IQ	V
534	5+46	0.1012	0.08	IQ	V
535	5+47	0.1014	0.08	IQ	V
536	5+48	0.1015	0.08	IQ	V
537	5+49	0.1016	0.08	IQ	V
538	5+50	0.1017	0.08	IQ	V
539	5+51	0.1018	0.08	IQ	V
540	5+52	0.1019	0.08	IQ	V
541	5+53	0.1020	0.08	IQ	V
542	5+54	0.1021	0.08	IQ	V
543	5+55	0.1022	0.08	IQ	V
544	5+56	0.1023	0.08	IQ	V
545	5+57	0.1025	0.08	IQ	V
546	5+58	0.1026	0.08	IQ	V
547	5+59	0.1027	0.08	IQ	V
548	6+ 0	0.1028	0.08	IQ	V
549	6+ 1	0.1029	0.08	IQ	V
550	6+ 2	0.1030	0.08	IQ	V
551	6+ 3	0.1031	0.07	IQ	V
552	6+ 4	0.1032	0.07	IQ	V

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End of computations, total study area = 0.777 (Ac.)

6j. CivilD Post Development Via Belmonte Calculations

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2014 Version 9.0

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 04/24/24

19025 Post Dev
100 yr study - Belmonte Addition
19025belmontepost

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

Program License Serial Number 6332

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.500
24 hour precipitation(inches) = 6.000
P6/P24 = 58.3%
San Diego hydrology manual 'C' values used

Process from Point/Station 3001.000 to Point/Station 3002.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL]
(4.3 DU/A or Less)
Impervious value, Ai = 0.300
Sub-Area C Value = 0.410
Initial subarea total flow distance = 99.210 (Ft.)
Highest elevation = 337.300 (Ft.)
Lowest elevation = 328.200 (Ft.)
Elevation difference = 9.100 (Ft.) Slope = 9.172 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 9.17 %, in a development type of
4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 5.93 minutes
TC = [1.8*(1.1-C)*distance (Ft.)^.5]/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*(100.000^.5)]/(9.172^(1/3)]= 5.93
Rainfall intensity (I) = 8.258 (In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff = 0.599 (CFS)
Total initial stream area = 0.177 (Ac.)

Process from Point/Station 3002.000 to Point/Station 3003.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 1.615 (CFS)
Depth of flow = 0.142 (Ft.), Average velocity = 2.802 (Ft/s)
***** Irregular Channel Data *****

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70 -----
71 Information entered for subchannel number 1 :
72 Point number      'X' coordinate      'Y' coordinate
73     1              0.00              0.50
74     2              26.00              0.00
75     3              27.00              0.20
76 Manning's 'N' friction factor = 0.023
77 -----

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78 Sub-Channel flow = 1.615 (CFS)
79 ' ' flow top width = 8.106 (Ft.)
80 ' ' velocity = 2.802 (Ft/s)
81 ' ' area = 0.576 (Sq.Ft)
82 ' ' Froude number = 1.852
83

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84 Upstream point elevation = 328.200 (Ft.)
85 Downstream point elevation = 312.800 (Ft.)
86 Flow length = 240.520 (Ft.)
87 Travel time = 1.43 min.
88 Time of concentration = 7.36 min.
89 Depth of flow = 0.142 (Ft.)
90 Average velocity = 2.802 (Ft/s)
91 Total irregular channel flow = 1.615 (CFS)
92 Irregular channel normal depth above invert elev. = 0.142 (Ft.)
93 Average velocity of channel (s) = 2.802 (Ft/s)
94 Adding area flow to channel
95 Rainfall intensity (I) = 7.184 (In/Hr) for a 100.0 year storm
96 Decimal fraction soil group A = 0.050
97 Decimal fraction soil group B = 0.000
98 Decimal fraction soil group C = 0.950
99 Decimal fraction soil group D = 0.000

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100 [MEDIUM DENSITY RESIDENTIAL
101 (4.3 DU/A or Less )
102 Impervious value, Ai = 0.300
103 Sub-Area C Value = 0.476
104 Rainfall intensity = 7.184 (In/Hr) for a 100.0 year storm
105 Effective runoff coefficient used for total area
106 (Q=KCIA) is C = 0.461 CA = 0.358
107 Subarea runoff = 1.976 (CFS) for 0.600 (Ac.)
108 Total runoff = 2.575 (CFS) Total area = 0.777 (Ac.)
109 Depth of flow = 0.169 (Ft.), Average velocity = 3.149 (Ft/s)
110
111

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112 +-----+
113 Process from Point/Station 3003.000 to Point/Station 3003.000
114 **** 6 HOUR HYDROGRAPH ****
115
116 +-----+
117 Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003
118
119

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120 Time of Concentration = 7.36
121 Basin Area = 0.78 Acres
122 6 Hour Rainfall = 3.500 Inches
123 Runoff Coefficient = 0.461
124 Peak Discharge = 2.58 CFS
125 Time (Min) Discharge (CFS)
126 0 0.000
127 7 0.075
128 14 0.076
129 21 0.078
130 28 0.079
131 35 0.082
132 42 0.083
133 49 0.085
134 56 0.087
135 63 0.090
136 70 0.091
137 77 0.094
138 84 0.096

```


139	91	0.100
140	98	0.102
141	105	0.106
142	112	0.109
143	119	0.114
144	126	0.117
145	133	0.123
146	140	0.127
147	147	0.135
148	154	0.139
149	161	0.149
150	168	0.155
151	175	0.168
152	182	0.176
153	189	0.196
154	196	0.207
155	203	0.238
156	210	0.258
157	217	0.315
158	224	0.359
159	231	0.527
160	238	0.742
161	245	2.575
162	252	0.423
163	259	0.283
164	266	0.221
165	273	0.185
166	280	0.161
167	287	0.144
168	294	0.131
169	301	0.120
170	308	0.111
171	315	0.104
172	322	0.098
173	329	0.093
174	336	0.088
175	343	0.084
176	350	0.081
177	357	0.077
178	364	0.074

+++++

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 0.6 1.3 1.9 2.6

188	0+ 0	0.0000	0.00	Q				
189	0+ 1	0.0000	0.01	Q				
190	0+ 2	0.0000	0.02	Q				
191	0+ 3	0.0001	0.03	Q				
192	0+ 4	0.0001	0.04	Q				
193	0+ 5	0.0002	0.05	Q				
194	0+ 6	0.0003	0.06	VQ				
195	0+ 7	0.0004	0.08	VQ				
196	0+ 8	0.0005	0.08	VQ				
197	0+ 9	0.0006	0.08	VQ				
198	0+10	0.0007	0.08	VQ				
199	0+11	0.0008	0.08	VQ				
200	0+12	0.0009	0.08	VQ				
201	0+13	0.0010	0.08	VQ				
202	0+14	0.0011	0.08	VQ				
203	0+15	0.0013	0.08	VQ				
204	0+16	0.0014	0.08	VQ				
205	0+17	0.0015	0.08	VQ				
206	0+18	0.0016	0.08	VQ				
207	0+19	0.0017	0.08	VQ				

208	0+20	0.0018	0.08	VQ				
209	0+21	0.0019	0.08	VQ				
210	0+22	0.0020	0.08	VQ				
211	0+23	0.0021	0.08	VQ				
212	0+24	0.0022	0.08	VQ				
213	0+25	0.0023	0.08	VQ				
214	0+26	0.0024	0.08	VQ				
215	0+27	0.0025	0.08	VQ				
216	0+28	0.0027	0.08	IQ				
217	0+29	0.0028	0.08	IQ				
218	0+30	0.0029	0.08	IQ				
219	0+31	0.0030	0.08	IQ				
220	0+32	0.0031	0.08	IQ				
221	0+33	0.0032	0.08	IQ				
222	0+34	0.0033	0.08	IQ				
223	0+35	0.0034	0.08	IQ				
224	0+36	0.0035	0.08	IQ				
225	0+37	0.0037	0.08	IQ				
226	0+38	0.0038	0.08	IQ				
227	0+39	0.0039	0.08	IQ				
228	0+40	0.0040	0.08	IQ				
229	0+41	0.0041	0.08	IQ				
230	0+42	0.0042	0.08	IQ				
231	0+43	0.0043	0.08	IQ				
232	0+44	0.0045	0.08	IQ				
233	0+45	0.0046	0.08	IQ				
234	0+46	0.0047	0.08	IQ				
235	0+47	0.0048	0.08	IQ				
236	0+48	0.0049	0.09	IQ				
237	0+49	0.0050	0.09	IQ				
238	0+50	0.0052	0.09	IQ				
239	0+51	0.0053	0.09	IQV				
240	0+52	0.0054	0.09	IQV				
241	0+53	0.0055	0.09	IQV				
242	0+54	0.0056	0.09	IQV				
243	0+55	0.0058	0.09	IQV				
244	0+56	0.0059	0.09	IQV				
245	0+57	0.0060	0.09	IQV				
246	0+58	0.0061	0.09	IQV				
247	0+59	0.0062	0.09	IQV				
248	1+ 0	0.0064	0.09	IQV				
249	1+ 1	0.0065	0.09	IQV				
250	1+ 2	0.0066	0.09	IQV				
251	1+ 3	0.0067	0.09	IQV				
252	1+ 4	0.0068	0.09	IQV				
253	1+ 5	0.0070	0.09	IQV				
254	1+ 6	0.0071	0.09	IQV				
255	1+ 7	0.0072	0.09	IQV				
256	1+ 8	0.0073	0.09	IQV				
257	1+ 9	0.0075	0.09	IQV				
258	1+10	0.0076	0.09	IQV				
259	1+11	0.0077	0.09	IQV				
260	1+12	0.0078	0.09	IQ V				
261	1+13	0.0080	0.09	IQ V				
262	1+14	0.0081	0.09	IQ V				
263	1+15	0.0082	0.09	IQ V				
264	1+16	0.0084	0.09	IQ V				
265	1+17	0.0085	0.09	IQ V				
266	1+18	0.0086	0.09	IQ V				
267	1+19	0.0088	0.09	IQ V				
268	1+20	0.0089	0.10	IQ V				
269	1+21	0.0090	0.10	IQ V				
270	1+22	0.0091	0.10	IQ V				
271	1+23	0.0093	0.10	IQ V				
272	1+24	0.0094	0.10	IQ V				
273	1+25	0.0095	0.10	IQ V				
274	1+26	0.0097	0.10	IQ V				
275	1+27	0.0098	0.10	IQ V				
276	1+28	0.0100	0.10	IQ V				

277	1+29	0.0101	0.10	I Q	V				
278	1+30	0.0102	0.10	I Q	V				
279	1+31	0.0104	0.10	I Q	V				
280	1+32	0.0105	0.10	I Q	V				
281	1+33	0.0106	0.10	I Q	V				
282	1+34	0.0108	0.10	I Q	V				
283	1+35	0.0109	0.10	I Q	V				
284	1+36	0.0111	0.10	I Q	V				
285	1+37	0.0112	0.10	I Q	V				
286	1+38	0.0113	0.10	I Q	V				
287	1+39	0.0115	0.10	I Q	V				
288	1+40	0.0116	0.10	I Q	V				
289	1+41	0.0118	0.10	I Q	V				
290	1+42	0.0119	0.10	I Q	V				
291	1+43	0.0121	0.11	I Q	V				
292	1+44	0.0122	0.11	I Q	V				
293	1+45	0.0123	0.11	I Q	V				
294	1+46	0.0125	0.11	I Q	V				
295	1+47	0.0126	0.11	I Q	V				
296	1+48	0.0128	0.11	I Q	V				
297	1+49	0.0129	0.11	I Q	V				
298	1+50	0.0131	0.11	I Q	V				
299	1+51	0.0132	0.11	I Q	V				
300	1+52	0.0134	0.11	I Q	V				
301	1+53	0.0135	0.11	I Q	V				
302	1+54	0.0137	0.11	I Q	V				
303	1+55	0.0138	0.11	I Q	V				
304	1+56	0.0140	0.11	I Q	V				
305	1+57	0.0142	0.11	I Q	V				
306	1+58	0.0143	0.11	I Q	V				
307	1+59	0.0145	0.11	I Q	V				
308	2+ 0	0.0146	0.11	I Q	V				
309	2+ 1	0.0148	0.11	I Q	V				
310	2+ 2	0.0149	0.12	I Q	V				
311	2+ 3	0.0151	0.12	I Q	V				
312	2+ 4	0.0153	0.12	I Q	V				
313	2+ 5	0.0154	0.12	I Q	V				
314	2+ 6	0.0156	0.12	I Q	V				
315	2+ 7	0.0157	0.12	I Q	V				
316	2+ 8	0.0159	0.12	I Q	V				
317	2+ 9	0.0161	0.12	I Q	V				
318	2+10	0.0162	0.12	I Q	V				
319	2+11	0.0164	0.12	I Q	V				
320	2+12	0.0166	0.12	I Q	V				
321	2+13	0.0167	0.12	I Q	V				
322	2+14	0.0169	0.12	I Q	V				
323	2+15	0.0171	0.12	I Q	V				
324	2+16	0.0173	0.12	I Q	V				
325	2+17	0.0174	0.13	I Q	V				
326	2+18	0.0176	0.13	I Q	V				
327	2+19	0.0178	0.13	I Q	V				
328	2+20	0.0180	0.13	I Q	V				
329	2+21	0.0181	0.13	I Q	V				
330	2+22	0.0183	0.13	I Q	V				
331	2+23	0.0185	0.13	I Q	V				
332	2+24	0.0187	0.13	I Q	V				
333	2+25	0.0188	0.13	I Q	V				
334	2+26	0.0190	0.13	I Q	V				
335	2+27	0.0192	0.13	I Q	V				
336	2+28	0.0194	0.14	I Q	V				
337	2+29	0.0196	0.14	I Q	V				
338	2+30	0.0198	0.14	I Q	V				
339	2+31	0.0200	0.14	I Q	V				
340	2+32	0.0202	0.14	I Q	V				
341	2+33	0.0203	0.14	I Q	V				
342	2+34	0.0205	0.14	I Q	V				
343	2+35	0.0207	0.14	I Q	V				
344	2+36	0.0209	0.14	I Q	V				
345	2+37	0.0211	0.14	I Q	V				

346	2+38	0.0213	0.14	Q	V				
347	2+39	0.0215	0.15	Q	V				
348	2+40	0.0217	0.15	Q	V				
349	2+41	0.0219	0.15	Q	V				
350	2+42	0.0221	0.15	Q	V				
351	2+43	0.0223	0.15	Q	V				
352	2+44	0.0226	0.15	Q	V				
353	2+45	0.0228	0.15	Q	V				
354	2+46	0.0230	0.15	Q	V				
355	2+47	0.0232	0.15	Q	V				
356	2+48	0.0234	0.15	Q	V				
357	2+49	0.0236	0.16	Q	V				
358	2+50	0.0238	0.16	Q	V				
359	2+51	0.0241	0.16	Q	V				
360	2+52	0.0243	0.16	Q	V				
361	2+53	0.0245	0.16	Q	V				
362	2+54	0.0247	0.17	Q	V				
363	2+55	0.0250	0.17	Q	V				
364	2+56	0.0252	0.17	Q	V				
365	2+57	0.0254	0.17	Q	V				
366	2+58	0.0257	0.17	Q	V				
367	2+59	0.0259	0.17	Q	V				
368	3+ 0	0.0262	0.17	Q	V				
369	3+ 1	0.0264	0.18	Q	V				
370	3+ 2	0.0266	0.18	Q	V				
371	3+ 3	0.0269	0.18	Q	V				
372	3+ 4	0.0271	0.18	Q	V				
373	3+ 5	0.0274	0.18	Q	V				
374	3+ 6	0.0276	0.19	Q	V				
375	3+ 7	0.0279	0.19	Q	V				
376	3+ 8	0.0282	0.19	Q	V				
377	3+ 9	0.0284	0.20	Q	V				
378	3+10	0.0287	0.20	Q	V				
379	3+11	0.0290	0.20	Q	V				
380	3+12	0.0293	0.20	Q	V				
381	3+13	0.0295	0.20	Q	V				
382	3+14	0.0298	0.20	Q	V				
383	3+15	0.0301	0.21	Q	V				
384	3+16	0.0304	0.21	Q	V				
385	3+17	0.0307	0.21	Q	V				
386	3+18	0.0310	0.22	Q	V				
387	3+19	0.0313	0.22	Q	V				
388	3+20	0.0316	0.22	Q	V				
389	3+21	0.0319	0.23	Q	V				
390	3+22	0.0322	0.23	Q	V				
391	3+23	0.0326	0.24	Q	V				
392	3+24	0.0329	0.24	Q	V				
393	3+25	0.0332	0.24	Q	V				
394	3+26	0.0336	0.25	Q	V				
395	3+27	0.0339	0.25	Q	V				
396	3+28	0.0343	0.25	Q	V				
397	3+29	0.0346	0.25	Q	V				
398	3+30	0.0350	0.26	Q	V				
399	3+31	0.0353	0.27	Q	V				
400	3+32	0.0357	0.27	Q	V				
401	3+33	0.0361	0.28	Q	V				
402	3+34	0.0365	0.29	Q	V				
403	3+35	0.0369	0.30	Q	V				
404	3+36	0.0373	0.31	Q	V				
405	3+37	0.0378	0.32	Q	V				
406	3+38	0.0382	0.32	Q	V				
407	3+39	0.0387	0.33	Q	V				
408	3+40	0.0391	0.33	Q	V				
409	3+41	0.0396	0.34	Q	V				
410	3+42	0.0401	0.35	Q	V				
411	3+43	0.0406	0.35	Q	V				
412	3+44	0.0410	0.36	Q	V				
413	3+45	0.0416	0.38	Q	V				
414	3+46	0.0421	0.41	Q	V				

415	3+47	0.0427	0.43		Q		V			
416	3+48	0.0434	0.45				V			
417	3+49	0.0440	0.48				V			
418	3+50	0.0447	0.50				V			
419	3+51	0.0454	0.53				V			
420	3+52	0.0462	0.56				V			
421	3+53	0.0470	0.59				V			
422	3+54	0.0479	0.62				V			
423	3+55	0.0488	0.65				V			
424	3+56	0.0497	0.68				V			
425	3+57	0.0507	0.71				V			
426	3+58	0.0517	0.74				V			
427	3+59	0.0531	1.00				V			
428	4+ 0	0.0548	1.27				Q	V		
429	4+ 1	0.0569	1.53					V	Q	
430	4+ 2	0.0594	1.79					V		Q
431	4+ 3	0.0622	2.05					V		Q
432	4+ 4	0.0654	2.31					V		Q
433	4+ 5	0.0690	2.58					V		Q
434	4+ 6	0.0721	2.27					V		Q
435	4+ 7	0.0748	1.96					V	Q	
436	4+ 8	0.0771	1.65					Q	V	
437	4+ 9	0.0789	1.35					Q	V	
438	4+10	0.0803	1.04				Q		V	
439	4+11	0.0813	0.73						V	
440	4+12	0.0819	0.42						V	
441	4+13	0.0825	0.40						V	
442	4+14	0.0830	0.38						V	
443	4+15	0.0835	0.36						V	
444	4+16	0.0840	0.34						V	
445	4+17	0.0844	0.32						V	
446	4+18	0.0848	0.30						V	
447	4+19	0.0852	0.28						V	
448	4+20	0.0856	0.27						V	
449	4+21	0.0860	0.27						V	
450	4+22	0.0863	0.26						V	
451	4+23	0.0867	0.25						V	
452	4+24	0.0870	0.24						V	
453	4+25	0.0873	0.23						V	
454	4+26	0.0876	0.22						V	
455	4+27	0.0879	0.22						V	
456	4+28	0.0882	0.21						V	
457	4+29	0.0885	0.21						V	
458	4+30	0.0888	0.20						V	
459	4+31	0.0890	0.20						V	
460	4+32	0.0893	0.19						V	
461	4+33	0.0895	0.19						V	
462	4+34	0.0898	0.18						V	
463	4+35	0.0900	0.18						V	
464	4+36	0.0903	0.17						V	
465	4+37	0.0905	0.17						V	
466	4+38	0.0908	0.17						V	
467	4+39	0.0910	0.16						V	
468	4+40	0.0912	0.16						V	
469	4+41	0.0914	0.16						V	
470	4+42	0.0916	0.16						V	
471	4+43	0.0918	0.15						V	
472	4+44	0.0921	0.15						V	
473	4+45	0.0923	0.15						V	
474	4+46	0.0925	0.15						V	
475	4+47	0.0927	0.14						V	
476	4+48	0.0929	0.14						V	
477	4+49	0.0930	0.14						V	
478	4+50	0.0932	0.14						V	
479	4+51	0.0934	0.14						V	
480	4+52	0.0936	0.13						V	
481	4+53	0.0938	0.13						V	
482	4+54	0.0940	0.13						V	
483	4+55	0.0942	0.13						V	

484	4+56	0.0943	0.13	IQ	V
485	4+57	0.0945	0.13	IQ	V
486	4+58	0.0947	0.12	IQ	V
487	4+59	0.0948	0.12	IQ	V
488	5+ 0	0.0950	0.12	IQ	V
489	5+ 1	0.0952	0.12	IQ	V
490	5+ 2	0.0953	0.12	IQ	V
491	5+ 3	0.0955	0.12	IQ	V
492	5+ 4	0.0957	0.12	IQ	V
493	5+ 5	0.0958	0.12	IQ	V
494	5+ 6	0.0960	0.11	IQ	V
495	5+ 7	0.0961	0.11	IQ	V
496	5+ 8	0.0963	0.11	IQ	V
497	5+ 9	0.0964	0.11	IQ	V
498	5+10	0.0966	0.11	IQ	V
499	5+11	0.0967	0.11	IQ	V
500	5+12	0.0969	0.11	IQ	V
501	5+13	0.0970	0.11	IQ	V
502	5+14	0.0972	0.11	IQ	V
503	5+15	0.0973	0.10	IQ	V
504	5+16	0.0975	0.10	IQ	V
505	5+17	0.0976	0.10	IQ	V
506	5+18	0.0977	0.10	IQ	V
507	5+19	0.0979	0.10	IQ	V
508	5+20	0.0980	0.10	IQ	V
509	5+21	0.0982	0.10	IQ	V
510	5+22	0.0983	0.10	IQ	V
511	5+23	0.0984	0.10	IQ	V
512	5+24	0.0986	0.10	IQ	V
513	5+25	0.0987	0.10	IQ	V
514	5+26	0.0988	0.10	IQ	V
515	5+27	0.0990	0.09	IQ	V
516	5+28	0.0991	0.09	IQ	V
517	5+29	0.0992	0.09	IQ	V
518	5+30	0.0993	0.09	IQ	V
519	5+31	0.0995	0.09	IQ	V
520	5+32	0.0996	0.09	IQ	V
521	5+33	0.0997	0.09	IQ	V
522	5+34	0.0998	0.09	IQ	V
523	5+35	0.1000	0.09	IQ	V
524	5+36	0.1001	0.09	IQ	V
525	5+37	0.1002	0.09	IQ	V
526	5+38	0.1003	0.09	IQ	V
527	5+39	0.1004	0.09	IQ	V
528	5+40	0.1006	0.09	IQ	V
529	5+41	0.1007	0.09	IQ	V
530	5+42	0.1008	0.08	IQ	V
531	5+43	0.1009	0.08	IQ	V
532	5+44	0.1010	0.08	IQ	V
533	5+45	0.1011	0.08	IQ	V
534	5+46	0.1012	0.08	IQ	V
535	5+47	0.1014	0.08	IQ	V
536	5+48	0.1015	0.08	IQ	V
537	5+49	0.1016	0.08	IQ	V
538	5+50	0.1017	0.08	IQ	V
539	5+51	0.1018	0.08	IQ	V
540	5+52	0.1019	0.08	IQ	V
541	5+53	0.1020	0.08	IQ	V
542	5+54	0.1021	0.08	IQ	V
543	5+55	0.1022	0.08	IQ	V
544	5+56	0.1023	0.08	IQ	V
545	5+57	0.1025	0.08	IQ	V
546	5+58	0.1026	0.08	IQ	V
547	5+59	0.1027	0.08	IQ	V
548	6+ 0	0.1028	0.08	IQ	V
549	6+ 1	0.1029	0.08	IQ	V
550	6+ 2	0.1030	0.08	IQ	V
551	6+ 3	0.1031	0.07	IQ	V
552	6+ 4	0.1032	0.07	IQ	V

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End of computations, total study area = 0.777 (Ac.)

6k. CivilD Post Development Onsite Reach 1 Calculations

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2014 Version 9.0

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 04/26/24

19025 Post Dev
100 Year Study Reach 1
PostDev100R1.rd3
offiste ud to onsite w/main confluence

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

Program License Serial Number 6332

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.500
24 hour precipitation(inches) = 6.000
P6/P24 = 58.3%
San Diego hydrology manual 'C' values used

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

Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL]
(7.3 DU/A or Less)
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Initial subarea total flow distance = 53.000 (Ft.)
Highest elevation = 316.800 (Ft.)
Lowest elevation = 316.700 (Ft.)
Elevation difference = 0.100 (Ft.) Slope = 0.189 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of 0.19 %, in a development type of
7.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 13.75 minutes
TC = [1.8*(1.1-C)*distance (Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.4800)*(50.000^0.5)/(0.189^(1/3))]= 13.75
The initial area total distance of 53.00 (Ft.) entered leaves a
remaining distance of 3.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 0.20 minutes
for a distance of 3.00 (Ft.) and a slope of 0.19 %
with an elevation difference of 0.01 (Ft.) from the end of the top area
Tt = [11.9*length (Mi)^3]/(elevation change (Ft.))^.385 *60 (min/hr)
= 0.203 Minutes
Tt=[(11.9*0.0006^3)/(0.01)]^.385= 0.20
Total initial area Ti = 13.75 minutes from Figure 3-3 formula plus
0.20 minutes from the Figure 3-4 formula = 13.95 minutes
Rainfall intensity (I) = 4.757 (In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
Subarea runoff = 0.068 (CFS)

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70 Total initial stream area = 0.030 (Ac.)
71
72
73 ++++++
74 Process from Point/Station 101.000 to Point/Station 102.000
75 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
76
77 -----
78 Estimated mean flow rate at midpoint of channel = 0.228 (CFS)
79 Depth of flow = 0.095 (Ft.), Average velocity = 0.591 (Ft/s)
80 ***** Irregular Channel Data *****
81 -----
82 Information entered for subchannel number 1 :
83 Point number 'X' coordinate 'Y' coordinate
84 1 0.00 0.33
85 2 23.00 0.00
86 3 28.50 0.33
87 Manning's 'N' friction factor = 0.015
88 -----
89 Sub-Channel flow = 0.228 (CFS)
90 ' ' flow top width = 8.130 (Ft.)
91 ' ' velocity = 0.591 (Ft/s)
92 ' ' area = 0.386 (Sq.Ft)
93 ' ' Froude number = 0.478
94
95 Upstream point elevation = 316.700 (Ft.)
96 Downstream point elevation = 316.300 (Ft.)
97 Flow length = 193.000 (Ft.)
98 Travel time = 5.44 min.
99 Time of concentration = 19.39 min.
100 Depth of flow = 0.095 (Ft.)
101 Average velocity = 0.591 (Ft/s)
102 Total irregular channel flow = 0.228 (CFS)
103 Irregular channel normal depth above invert elev. = 0.095 (Ft.)
104 Average velocity of channel(s) = 0.591 (Ft/s)
105 Adding area flow to channel
106 Rainfall intensity (I) = 3.847 (In/Hr) for a 100.0 year storm
107 Decimal fraction soil group A = 1.000
108 Decimal fraction soil group B = 0.000
109 Decimal fraction soil group C = 0.000
110 Decimal fraction soil group D = 0.000
111 [MEDIUM DENSITY RESIDENTIAL ]
112 (7.3 DU/A or Less )
113 Impervious value, Ai = 0.400
114 Sub-Area C Value = 0.480
115 Rainfall intensity = 3.847 (In/Hr) for a 100.0 year storm
116 Effective runoff coefficient used for total area
117 (Q=KCIA) is C = 0.480 CA = 0.082
118 Subarea runoff = 0.245 (CFS) for 0.140 (Ac.)
119 Total runoff = 0.314 (CFS) Total area = 0.170 (Ac.)
120 Depth of flow = 0.107 (Ft.), Average velocity = 0.640 (Ft/s)
121
122 ++++++
123 Process from Point/Station 102.000 to Point/Station 102.000
124 **** SUBAREA FLOW ADDITION ****
125
126 -----
127 Rainfall intensity (I) = 3.847 (In/Hr) for a 100.0 year storm
128 Decimal fraction soil group A = 1.000
129 Decimal fraction soil group B = 0.000
130 Decimal fraction soil group C = 0.000
131 Decimal fraction soil group D = 0.000
132 [LOW DENSITY RESIDENTIAL ]
133 (1.0 DU/A or Less )
134 Impervious value, Ai = 0.100
135 Sub-Area C Value = 0.270
136 Time of concentration = 19.39 min.
137 Rainfall intensity = 3.847 (In/Hr) for a 100.0 year storm
138 Effective runoff coefficient used for total area
139 (Q=KCIA) is C = 0.393 CA = 0.114

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139 Subarea runoff = 0.125(CFS) for 0.120(Ac.)
140 Total runoff = 0.439(CFS) Total area = 0.290(Ac.)
141
142

143 ++++++
144 Process from Point/Station 102.000 to Point/Station 103.000
145 **** PIPEFLOW TRAVEL TIME (User specified size) ****

147 Upstream point/station elevation = 310.200(Ft.)
148 Downstream point/station elevation = 309.000(Ft.)
149 Pipe length = 250.00(Ft.) Slope = 0.0048 Manning's N = 0.013
150 No. of pipes = 1 Required pipe flow = 0.439(CFS)
151 Given pipe size = 12.00(In.)
152 Calculated individual pipe flow = 0.439(CFS)
153 Normal flow depth in pipe = 3.42(In.)
154 Flow top width inside pipe = 10.84(In.)
155 Critical Depth = 3.28(In.)
156 Pipe flow velocity = 2.37(Ft/s)
157 Travel time through pipe = 1.76 min.
158 Time of concentration (TC) = 21.15 min.
159
160

161 ++++++
162 Process from Point/Station 103.000 to Point/Station 103.000
163 **** CONFLUENCE OF MINOR STREAMS ****

165 Along Main Stream number: 1 in normal stream number 1
166 Stream flow area = 0.290(Ac.)
167 Runoff from this stream = 0.439(CFS)
168 Time of concentration = 21.15 min.
169 Rainfall intensity = 3.637(In/Hr)
170
171

172 ++++++
173 Process from Point/Station 1100.000 to Point/Station 1101.000
174 **** INITIAL AREA EVALUATION ****

176 Decimal fraction soil group A = 1.000
177 Decimal fraction soil group B = 0.000
178 Decimal fraction soil group C = 0.000
179 Decimal fraction soil group D = 0.000
180 [LOW DENSITY RESIDENTIAL]
181 (1.0 DU/A or Less)
182 Impervious value, Ai = 0.100
183 Sub-Area C Value = 0.270
184 Initial subarea total flow distance = 59.000(Ft.)
185 Highest elevation = 336.700(Ft.)
186 Lowest elevation = 321.600(Ft.)
187 Elevation difference = 15.100(Ft.) Slope = 25.593 %
188 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
189 The maximum overland flow distance is 100.00 (Ft)
190 for the top area slope value of 25.59 %, in a development type of
191 1.0 DU/A or Less
192 In Accordance With Figure 3-3
193 Initial Area Time of Concentration = 5.07 minutes
194 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{0.5} / (% slope^{1/3})]$
195 $TC = [1.8 * (1.1 - 0.2700) * (100.000^{0.5}) / (25.593^{1/3})] = 5.07$
196 Rainfall intensity (I) = 9.140(In/Hr) for a 100.0 year storm
197 Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
198 Subarea runoff = 0.173(CFS)
199 Total initial stream area = 0.070(Ac.)
200
201

202 ++++++
203 Process from Point/Station 1101.000 to Point/Station 103.000
204 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

206 Estimated mean flow rate at midpoint of channel = 1.544(CFS)
207 Depth of flow = 0.128(Ft.), Average velocity = 3.658(Ft/s)

```

208          ***** Irregular Channel Data *****
209          -----
210 Information entered for subchannel number 1 :
211 Point number      'X' coordinate      'Y' coordinate
212      1              0.00              0.60
213      2              16.00             0.00
214      3              46.00             1.20
215 Manning's 'N' friction factor = 0.015
216          -----
217 Sub-Channel flow = 1.544 (CFS)
218 ' ' flow top width = 6.605 (Ft.)
219 ' ' velocity = 3.658 (Ft/s)
220 ' ' area = 0.422 (Sq.Ft)
221 ' ' Froude number = 2.549
222
223 Upstream point elevation = 321.600 (Ft.)
224 Downstream point elevation = 309.000 (Ft.)
225 Flow length = 236.000 (Ft.)
226 Travel time = 1.08 min.
227 Time of concentration = 6.15 min.
228 Depth of flow = 0.128 (Ft.)
229 Average velocity = 3.658 (Ft/s)
230 Total irregular channel flow = 1.544 (CFS)
231 Irregular channel normal depth above invert elev. = 0.128 (Ft.)
232 Average velocity of channel(s) = 3.658 (Ft/s)
233 Adding area flow to channel
234 Rainfall intensity (I) = 8.073 (In/Hr) for a 100.0 year storm
235 Decimal fraction soil group A = 0.100
236 Decimal fraction soil group B = 0.000
237 Decimal fraction soil group C = 0.900
238 Decimal fraction soil group D = 0.000
239 [MEDIUM DENSITY RESIDENTIAL ]
240 (7.3 DU/A or Less )
241 Impervious value, Ai = 0.400
242 Sub-Area C Value = 0.534
243 Rainfall intensity = 8.073 (In/Hr) for a 100.0 year storm
244 Effective runoff coefficient used for total area
245 (Q=KCIA) is C = 0.509 CA = 0.371
246 Subarea runoff = 2.825 (CFS) for 0.660 (Ac.)
247 Total runoff = 2.998 (CFS) Total area = 0.730 (Ac.)
248 Depth of flow = 0.164 (Ft.), Average velocity = 4.317 (Ft/s)
249
250
251 +-----+
252 Process from Point/Station 103.000 to Point/Station 103.000
253 **** CONFLUENCE OF MINOR STREAMS ****
254
255 -----
256 Along Main Stream number: 1 in normal stream number 2
257 Stream flow area = 0.730 (Ac.)
258 Runoff from this stream = 2.998 (CFS)
259 Time of concentration = 6.15 min.
260 Rainfall intensity = 8.073 (In/Hr)
261
262 +-----+
263 Process from Point/Station 3003.000 to Point/Station 103.000
264 **** USER DEFINED FLOW INFORMATION AT A POINT ****
265
266 -----
267 Decimal fraction soil group A = 0.270
268 Decimal fraction soil group B = 0.000
269 Decimal fraction soil group C = 0.730
270 Decimal fraction soil group D = 0.000
271 [MEDIUM DENSITY RESIDENTIAL ]
272 (4.3 DU/A or Less )
273 Impervious value, Ai = 0.300
274 Sub-Area C Value = 0.461
275 Rainfall intensity (I) = 7.186 (In/Hr) for a 100.0 year storm
276 User specified values are as follows:
277 TC = 7.36 min. Rain intensity = 7.19 (In/Hr)

```

277 Total area = 0.777 (Ac.) Total runoff = 2.575 (CFS)

278
279

280 ++++++
281 Process from Point/Station 103.000 to Point/Station 103.000
282 **** CONFLUENCE OF MINOR STREAMS ****

284 Along Main Stream number: 1 in normal stream number 3
285 Stream flow area = 0.777 (Ac.)
286 Runoff from this stream = 2.575 (CFS)
287 Time of concentration = 7.36 min.
288 Rainfall intensity = 7.186 (In/Hr)
289 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	0.439	21.15	3.637
2	2.998	6.15	8.073
3	2.575	7.36	7.186

298 Qmax (1) =
 299 1.000 * 1.000 * 0.439) +
 300 0.451 * 1.000 * 2.998) +
 301 0.506 * 1.000 * 2.575) + = 3.093
 302 Qmax (2) =
 303 1.000 * 0.291 * 0.439) +
 304 1.000 * 1.000 * 2.998) +
 305 1.000 * 0.835 * 2.575) + = 5.275
 306 Qmax (3) =
 307 1.000 * 0.348 * 0.439) +
 308 0.890 * 1.000 * 2.998) +
 309 1.000 * 1.000 * 2.575) + = 5.396

311 Total of 3 streams to confluence:
 312 Flow rates before confluence point:
 313 0.439 2.998 2.575
 314 Maximum flow rates at confluence using above data:
 315 3.093 5.275 5.396
 316 Area of streams before confluence:
 317 0.290 0.730 0.777

318 Results of confluence:
 319 Total flow rate = 5.396 (CFS)
 320 Time of concentration = 7.360 min.
 321 Effective stream area after confluence = 1.797 (Ac.)

322
323
324 ++++++
325 Process from Point/Station 103.000 to Point/Station 104.000
326 **** PIPEFLOW TRAVEL TIME (User specified size) ****

328 Upstream point/station elevation = 304.200 (Ft.)
 329 Downstream point/station elevation = 303.300 (Ft.)
 330 Pipe length = 189.00 (Ft.) Slope = 0.0048 Manning's N = 0.013
 331 No. of pipes = 1 Required pipe flow = 5.396 (CFS)
 332 Given pipe size = 18.00 (In.)
 333 Calculated individual pipe flow = 5.396 (CFS)
 334 Normal flow depth in pipe = 11.58 (In.)
 335 Flow top width inside pipe = 17.25 (In.)
 336 Critical Depth = 10.74 (In.)
 337 Pipe flow velocity = 4.50 (Ft/s)
 338 Travel time through pipe = 0.70 min.
 339 Time of concentration (TC) = 8.06 min.

340
341
342 ++++++
343 Process from Point/Station 104.000 to Point/Station 104.000
344 **** CONFLUENCE OF MINOR STREAMS ****

345

346 Along Main Stream number: 1 in normal stream number 1
347 Stream flow area = 1.797 (Ac.)
348 Runoff from this stream = 5.396 (CFS)
349 Time of concentration = 8.06 min.
350 Rainfall intensity = 6.777 (In/Hr)

351
352
353 +-----+
354 Process from Point/Station 200.000 to Point/Station 201.000
355 **** INITIAL AREA EVALUATION ****

356
357 Decimal fraction soil group A = 0.050
358 Decimal fraction soil group B = 0.000
359 Decimal fraction soil group C = 0.950
360 Decimal fraction soil group D = 0.000
361 [COMMERCIAL area type]
362 (Office Professional)
363 Impervious value, Ai = 0.900
364 Sub-Area C Value = 0.839
365 Initial subarea total flow distance = 50.000 (Ft.)
366 Highest elevation = 316.800 (Ft.)
367 Lowest elevation = 316.200 (Ft.)
368 Elevation difference = 0.600 (Ft.) Slope = 1.200 %
369 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
370 The maximum overland flow distance is 60.00 (Ft)
371 for the top area slope value of 1.20 %, in a development type of
372 Office Professional
373 In Accordance With Figure 3-3
374 Initial Area Time of Concentration = 3.42 minutes
375 $TC = [1.8 * (1.1 - C) * distance (Ft.)^{.5} / (% slope^{(1/3)})]$
376 $TC = [1.8 * (1.1 - 0.8395) * (60.000^{.5}) / (1.200^{(1/3)})] = 3.42$
377 Calculated TC of 3.418 minutes is less than 5 minutes,
378 resetting TC to 5.0 minutes for rainfall intensity calculations
379 Rainfall intensity (I) = 9.222 (In/Hr) for a 100.0 year storm
380 Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
381 Subarea runoff = 0.310 (CFS)
382 Total initial stream area = 0.040 (Ac.)

383
384
385 +-----+
386 Process from Point/Station 201.000 to Point/Station 202.000
387 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

388
389 Estimated mean flow rate at midpoint of channel = 2.245 (CFS)
390 Depth of flow = 0.209 (Ft.), Average velocity = 2.102 (Ft/s)
391 ***** Irregular Channel Data *****

392
393 Information entered for subchannel number 1 :
394 Point number 'X' coordinate 'Y' coordinate
395 1 0.00 0.30
396 2 1.50 0.00
397 3 45.50 1.00
398 4 61.50 1.50

399 Manning's 'N' friction factor = 0.015

400
401 Sub-Channel flow = 2.245 (CFS)
402 ' ' flow top width = 10.230 (Ft.)
403 ' ' velocity = 2.102 (Ft/s)
404 ' ' area = 1.068 (Sq.Ft)
405 ' ' Froude number = 1.147

406
407 Upstream point elevation = 316.200 (Ft.)
408 Downstream point elevation = 314.500 (Ft.)
409 Flow length = 185.000 (Ft.)
410 Travel time = 1.47 min.
411 Time of concentration = 4.88 min.
412 Depth of flow = 0.209 (Ft.)
413 Average velocity = 2.102 (Ft/s)
414 Total irregular channel flow = 2.245 (CFS)

```

415 Irregular channel normal depth above invert elev. = 0.209(Ft.)
416 Average velocity of channel(s) = 2.102(Ft/s)
417 Adding area flow to channel
418 Calculated TC of 4.885 minutes is less than 5 minutes,
419 resetting TC to 5.0 minutes for rainfall intensity calculations
420 Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm
421 Decimal fraction soil group A = 0.000
422 Decimal fraction soil group B = 0.000
423 Decimal fraction soil group C = 1.000
424 Decimal fraction soil group D = 0.000
425 [COMMERCIAL area type ]
426 (Office Professional )
427 Impervious value, Ai = 0.900
428 Sub-Area C Value = 0.840
429 Rainfall intensity = 9.222(In/Hr) for a 100.0 year storm
430 Effective runoff coefficient used for total area
431 (Q=KCIA) is C = 0.840 CA = 0.454
432 Subarea runoff = 3.873(CFS) for 0.500(Ac.)
433 Total runoff = 4.183(CFS) Total area = 0.540(Ac.)
434 Depth of flow = 0.264(Ft.), Average velocity = 2.456(Ft/s)
435
436
437 ++++++
438 Process from Point/Station 202.000 to Point/Station 104.000
439 **** PIPEFLOW TRAVEL TIME (User specified size) ****
440
441 -----
442 Upstream point/station elevation = 308.500(Ft.)
443 Downstream point/station elevation = 303.300(Ft.)
444 Pipe length = 48.00(Ft.) Slope = 0.1083 Manning's N = 0.013
445 No. of pipes = 1 Required pipe flow = 4.183(CFS)
446 Given pipe size = 12.00(In.)
447 Calculated individual pipe flow = 4.183(CFS)
448 Normal flow depth in pipe = 4.95(In.)
449 Flow top width inside pipe = 11.82(In.)
450 Critical Depth = 10.36(In.)
451 Pipe flow velocity = 13.68(Ft/s)
452 Travel time through pipe = 0.06 min.
453 Time of concentration (TC) = 4.94 min.
454
455 ++++++
456 Process from Point/Station 202.000 to Point/Station 104.000
457 **** CONFLUENCE OF MINOR STREAMS ****
458
459 -----
460 Along Main Stream number: 1 in normal stream number 2
461 Stream flow area = 0.540(Ac.)
462 Runoff from this stream = 4.183(CFS)
463 Time of concentration = 4.94 min.
464 Rainfall intensity = 9.222(In/Hr)
465
466 ++++++
467 Process from Point/Station 300.000 to Point/Station 301.000
468 **** INITIAL AREA EVALUATION ****
469
470 -----
471 Decimal fraction soil group A = 0.000
472 Decimal fraction soil group B = 0.000
473 Decimal fraction soil group C = 1.000
474 Decimal fraction soil group D = 0.000
475 [COMMERCIAL area type ]
476 (Neighborhood Commercial )
477 Impervious value, Ai = 0.800
478 Sub-Area C Value = 0.780
479 Initial subarea total flow distance = 42.000(Ft.)
480 Highest elevation = 316.000(Ft.)
481 Lowest elevation = 314.700(Ft.)
482 Elevation difference = 1.300(Ft.) Slope = 3.095 %
483 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
484 The maximum overland flow distance is 85.00 (Ft)

```

```

484 for the top area slope value of 3.10%, in a development type of
485 Neighborhood Commercial
486 In Accordance With Figure 3-3
487 Initial Area Time of Concentration = 3.64 minutes
488 TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3)]
489 TC = [1.8*(1.1-0.7800)*(85.000^0.5)/(3.095^(1/3))]= 3.64
490 Calculated TC of 3.644 minutes is less than 5 minutes,
491 resetting TC to 5.0 minutes for rainfall intensity calculations
492 Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm
493 Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
494 Subarea runoff = 0.288(CFS)
495 Total initial stream area = 0.040(Ac.)
496
497
498 ++++++
499 Process from Point/Station 301.000 to Point/Station 302.000
500 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
501
502 -----
503 Estimated mean flow rate at midpoint of channel = 1.259(CFS)
504 Depth of flow = 0.087(Ft.), Average velocity = 2.583(Ft/s)
505 ***** Irregular Channel Data *****
506 -----
507 Information entered for subchannel number 1 :
508 Point number 'X' coordinate 'Y' coordinate
509 1 0.00 0.50
510 2 0.00 0.00
511 3 64.00 0.50
512 Manning's 'N' friction factor = 0.015
513 -----
514 Sub-Channel flow = 1.259(CFS)
515 ' ' flow top width = 11.169(Ft.)
516 ' ' velocity= 2.583(Ft/s)
517 ' ' area = 0.487(Sq.Ft)
518 ' ' Froude number = 2.180
519
520 Upstream point elevation = 314.700(Ft.)
521 Downstream point elevation = 313.000(Ft.)
522 Flow length = 38.000(Ft.)
523 Travel time = 0.25 min.
524 Time of concentration = 3.89 min.
525 Depth of flow = 0.087(Ft.)
526 Average velocity = 2.583(Ft/s)
527 Total irregular channel flow = 1.259(CFS)
528 Irregular channel normal depth above invert elev. = 0.087(Ft.)
529 Average velocity of channel(s) = 2.583(Ft/s)
530 Adding area flow to channel
531 Calculated TC of 3.889 minutes is less than 5 minutes,
532 resetting TC to 5.0 minutes for rainfall intensity calculations
533 Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm
534 Decimal fraction soil group A = 0.000
535 Decimal fraction soil group B = 0.000
536 Decimal fraction soil group C = 1.000
537 Decimal fraction soil group D = 0.000
538 [COMMERCIAL area type ]
539 (Neighborhood Commercial )
540 Impervious value, Ai = 0.800
541 Sub-Area C Value = 0.780
542 Rainfall intensity = 9.222(In/Hr) for a 100.0 year storm
543 Effective runoff coefficient used for total area
544 (Q=KCIA) is C = 0.780 CA = 0.242
545 Subarea runoff = 1.942(CFS) for 0.270(Ac.)
546 Total runoff = 2.230(CFS) Total area = 0.310(Ac.)
547 Depth of flow = 0.108(Ft.), Average velocity = 2.980(Ft/s)
548
549 ++++++
550 Process from Point/Station 302.000 to Point/Station 104.000
551 **** PIPEFLOW TRAVEL TIME (User specified size) ****
552

```


553 Upstream point/station elevation = 306.000 (Ft.)
 554 Downstream point/station elevation = 303.300 (Ft.)
 555 Pipe length = 30.00 (Ft.) Slope = 0.0900 Manning's N = 0.013
 556 No. of pipes = 1 Required pipe flow = 2.230 (CFS)
 557 Given pipe size = 12.00 (In.)
 558 Calculated individual pipe flow = 2.230 (CFS)
 559 Normal flow depth in pipe = 3.72 (In.)
 560 Flow top width inside pipe = 11.10 (In.)
 561 Critical Depth = 7.66 (In.)
 562 Pipe flow velocity = 10.75 (Ft/s)
 563 Travel time through pipe = 0.05 min.
 564 Time of concentration (TC) = 3.94 min.

567 ++++++
 568 Process from Point/Station 104.000 to Point/Station 104.000
 569 **** CONFLUENCE OF MINOR STREAMS ****

571 Along Main Stream number: 1 in normal stream number 3
 572 Stream flow area = 0.310 (Ac.)
 573 Runoff from this stream = 2.230 (CFS)
 574 Time of concentration = 3.94 min.
 575 Rainfall intensity = 9.222 (In/Hr)
 576 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	5.396	8.06	6.777
2	4.183	4.94	9.222
3	2.230	3.94	9.222
Qmax (1) =			
	1.000 *	1.000 *	5.396) +
	0.735 *	1.000 *	4.183) +
	0.735 *	1.000 *	2.230) + = 10.109
Qmax (2) =			
	1.000 *	0.613 *	5.396) +
	1.000 *	1.000 *	4.183) +
	1.000 *	1.000 *	2.230) + = 9.722
Qmax (3) =			
	1.000 *	0.488 *	5.396) +
	1.000 *	0.796 *	4.183) +
	1.000 *	1.000 *	2.230) + = 8.195

598 Total of 3 streams to confluence:
 599 Flow rates before confluence point:
 600 5.396 4.183 2.230
 601 Maximum flow rates at confluence using above data:
 602 10.109 9.722 8.195
 603 Area of streams before confluence:
 604 1.797 0.540 0.310
 605 Results of confluence:
 606 Total flow rate = 10.109 (CFS)
 607 Time of concentration = 8.061 min.
 608 Effective stream area after confluence = 2.647 (Ac.)

611 ++++++
 612 Process from Point/Station 104.000 to Point/Station 105.000
 613 **** PIPEFLOW TRAVEL TIME (User specified size) ****

615 Upstream point/station elevation = 303.300 (Ft.)
 616 Downstream point/station elevation = 303.000 (Ft.)
 617 Pipe length = 71.00 (Ft.) Slope = 0.0042 Manning's N = 0.013
 618 No. of pipes = 1 Required pipe flow = 10.109 (CFS)
 619 Given pipe size = 18.00 (In.)
 620 NOTE: Normal flow is pressure flow in user selected pipe size.
 621 The approximate hydraulic grade line above the pipe invert is

```

622         1.119(Ft.) at the headworks or inlet of the pipe(s)
623     Pipe friction loss =         0.657(Ft.)
624     Minor friction loss =         0.762(Ft.) K-factor = 1.50
625     Pipe flow velocity =         5.72(Ft/s)
626     Travel time through pipe =     0.21 min.
627     Time of concentration (TC) =    8.27 min.
628
629
630     +-----+
631     Process from Point/Station      105.000 to Point/Station      105.000
632     **** CONFLUENCE OF MINOR STREAMS ****
633
634     -----
635     Along Main Stream number: 1 in normal stream number 1
636     Stream flow area =         2.647(Ac.)
637     Runoff from this stream =     10.109(CFS)
638     Time of concentration =       8.27 min.
639     Rainfall intensity =         6.667(In/Hr)
640
641     +-----+
642     Process from Point/Station      400.000 to Point/Station      401.000
643     **** INITIAL AREA EVALUATION ****
644
645     -----
646     Decimal fraction soil group A = 0.000
647     Decimal fraction soil group B = 0.000
648     Decimal fraction soil group C = 1.000
649     Decimal fraction soil group D = 0.000
650     [HIGH DENSITY RESIDENTIAL          ]
651     (43.0 DU/A or Less          )
652     Impervious value, Ai = 0.800
653     Sub-Area C Value = 0.780
654     Initial subarea total flow distance = 100.000(Ft.)
655     Highest elevation = 316.100(Ft.)
656     Lowest elevation = 312.600(Ft.)
657     Elevation difference = 3.500(Ft.) Slope = 3.500 %
658     INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
659     The maximum overland flow distance is 85.00 (Ft)
660     for the top area slope value of 3.50 %, in a development type of
661     43.0 DU/A or Less
662     In Accordance With Figure 3-3
663     Initial Area Time of Concentration = 3.50 minutes
664     TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
665     TC = [1.8*(1.1-0.7800)*( 85.000^.5)/( 3.500^(1/3)]= 3.50
666     The initial area total distance of 100.00 (Ft.) entered leaves a
667     remaining distance of 15.00 (Ft.)
668     Using Figure 3-4, the travel time for this distance is 0.23 minutes
669     for a distance of 15.00 (Ft.) and a slope of 3.50 %
670     with an elevation difference of 0.53(Ft.) from the end of the top area
671     Tt = [11.9*length(Mi)^3]/(elevation change(Ft.))]^.385 *60 (min/hr)
672     = 0.228 Minutes
673     Tt=[(11.9*0.0028^3)/( 0.53)]^.385= 0.23
674     Total initial area Ti = 3.50 minutes from Figure 3-3 formula plus
675     0.23 minutes from the Figure 3-4 formula = 3.73 minutes
676     Calculated TC of 3.726 minutes is less than 5 minutes,
677     resetting TC to 5.0 minutes for rainfall intensity calculations
678     Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm
679     Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
680     Subarea runoff = 0.791(CFS)
681     Total initial stream area = 0.110(Ac.)
682
683     +-----+
684     Process from Point/Station      401.000 to Point/Station      402.000
685     **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
686
687     -----
688     Estimated mean flow rate at midpoint of channel = 1.043(CFS)
689     Depth of flow = 0.351(Ft.), Average velocity = 4.504(Ft/s)
690     ***** Irregular Channel Data *****
691     -----

```

```

691 Information entered for subchannel number 1 :
692 Point number      'X' coordinate      'Y' coordinate
693     1              0.00              1.10
694     2              34.00              0.40
695     3              35.50              0.00
696     4              35.50              0.50
697 Manning's 'N' friction factor = 0.015
698 -----
699 Sub-Channel flow = 1.043 (CFS)
700 ' ' flow top width = 1.318 (Ft.)
701 ' ' velocity = 4.504 (Ft/s)
702 ' ' area = 0.232 (Sq.Ft)
703 ' ' Froude number = 1.894
704
705 Upstream point elevation = 312.600 (Ft.)
706 Downstream point elevation = 310.600 (Ft.)
707 Flow length = 67.000 (Ft.)
708 Travel time = 0.25 min.
709 Time of concentration = 3.97 min.
710 Depth of flow = 0.351 (Ft.)
711 Average velocity = 4.504 (Ft/s)
712 Total irregular channel flow = 1.043 (CFS)
713 Irregular channel normal depth above invert elev. = 0.351 (Ft.)
714 Average velocity of channel (s) = 4.504 (Ft/s)
715 Adding area flow to channel
716 Calculated TC of 3.974 minutes is less than 5 minutes,
717 resetting TC to 5.0 minutes for rainfall intensity calculations
718 Rainfall intensity (I) = 9.222 (In/Hr) for a 100.0 year storm
719 Decimal fraction soil group A = 0.000
720 Decimal fraction soil group B = 0.000
721 Decimal fraction soil group C = 1.000
722 Decimal fraction soil group D = 0.000
723 [HIGH DENSITY RESIDENTIAL ]
724 (43.0 DU/A or Less )
725 Impervious value, Ai = 0.800
726 Sub-Area C Value = 0.780
727 Rainfall intensity = 9.222 (In/Hr) for a 100.0 year storm
728 Effective runoff coefficient used for total area
729 (Q=KCIA) is C = 0.780 CA = 0.140
730 Subarea runoff = 0.503 (CFS) for 0.070 (Ac.)
731 Total runoff = 1.295 (CFS) Total area = 0.180 (Ac.)
732 Depth of flow = 0.381 (Ft.), Average velocity = 4.754 (Ft/s)
733
734
735 +-----+
736 Process from Point/Station 105.000 to Point/Station 105.000
737 **** CONFLUENCE OF MINOR STREAMS ****
738
739 -----
740 Along Main Stream number: 1 in normal stream number 2
741 Stream flow area = 0.180 (Ac.)
742 Runoff from this stream = 1.295 (CFS)
743 Time of concentration = 3.97 min.
744 Rainfall intensity = 9.222 (In/Hr)
745 Summary of stream data:
746
747 Stream Flow rate TC Rainfall Intensity
748 No. (CFS) (min) (In/Hr)
749
750 1 10.109 8.27 6.667
751 2 1.295 3.97 9.222
752 Qmax (1) =
753 1.000 * 1.000 * 10.109) +
754 0.723 * 1.000 * 1.295) + = 11.045
755 Qmax (2) =
756 1.000 * 0.481 * 10.109) +
757 1.000 * 1.000 * 1.295) + = 6.154
758
759 Total of 2 streams to confluence:

```

760 Flow rates before confluence point:
761 10.109 1.295
762 Maximum flow rates at confluence using above data:
763 11.045 6.154
764 Area of streams before confluence:
765 2.647 0.180
766 Results of confluence:
767 Total flow rate = 11.045 (CFS)
768 Time of concentration = 8.268 min.
769 Effective stream area after confluence = 2.827 (Ac.)
770
771

772 ++++++
773 Process from Point/Station 105.000 to Point/Station 106.000
774 **** PIPEFLOW TRAVEL TIME (User specified size) ****
775

776 Upstream point/station elevation = 303.000 (Ft.)
777 Downstream point/station elevation = 302.500 (Ft.)
778 Pipe length = 77.00 (Ft.) Slope = 0.0065 Manning's N = 0.013
779 No. of pipes = 1 Required pipe flow = 11.045 (CFS)
780 Given pipe size = 12.00 (In.)
781 NOTE: Normal flow is pressure flow in user selected pipe size.
782 The approximate hydraulic grade line above the pipe invert is
783 11.503 (Ft.) at the headworks or inlet of the pipe(s)
784 Pipe friction loss = 7.397 (Ft.)
785 Minor friction loss = 4.606 (Ft.) K-factor = 1.50
786 Pipe flow velocity = 14.06 (Ft/s)
787 Travel time through pipe = 0.09 min.
788 Time of concentration (TC) = 8.36 min.
789

791 ++++++
792 Process from Point/Station 106.000 to Point/Station 106.000
793 **** CONFLUENCE OF MAIN STREAMS ****
794

795 The following data inside Main Stream is listed:
796 In Main Stream number: 1
797 Stream flow area = 2.827 (Ac.)
798 Runoff from this stream = 11.045 (CFS)
799 Time of concentration = 8.36 min.
800 Rainfall intensity = 6.620 (In/Hr)
801 Program is now starting with Main Stream No. 2
802

804 ++++++
805 Process from Point/Station 804.000 to Point/Station 106.000
806 **** USER DEFINED FLOW INFORMATION AT A POINT ****
807

808 Decimal fraction soil group A = 0.000
809 Decimal fraction soil group B = 0.000
810 Decimal fraction soil group C = 1.000
811 Decimal fraction soil group D = 0.000
812 [HIGH DENSITY RESIDENTIAL]
813 (43.0 DU/A or Less)
814 Impervious value, Ai = 0.800
815 Sub-Area C Value = 0.780
816 Rainfall intensity (I) = 5.826 (In/Hr) for a 100.0 year storm
817 User specified values are as follows:
818 TC = 10.19 min. Rain intensity = 5.83 (In/Hr)
819 Total area = 2.170 (Ac.) Total runoff = 6.593 (CFS)
820

822 ++++++
823 Process from Point/Station 106.000 to Point/Station 106.000
824 **** CONFLUENCE OF MAIN STREAMS ****
825

826 The following data inside Main Stream is listed:
827 In Main Stream number: 2
828 Stream flow area = 2.170 (Ac.)

```

829 Runoff from this stream = 6.593(CFS)
830 Time of concentration = 10.19 min.
831 Rainfall intensity = 5.826(In/Hr)
832 Program is now starting with Main Stream No. 3
833
834
835 ++++++
836 Process from Point/Station 1004.000 to Point/Station 1005.000
837 **** INITIAL AREA EVALUATION ****
838
839 Decimal fraction soil group A = 1.000
840 Decimal fraction soil group B = 0.000
841 Decimal fraction soil group C = 0.000
842 Decimal fraction soil group D = 0.000
843 [LOW DENSITY RESIDENTIAL ]
844 (1.0 DU/A or Less )
845 Impervious value, Ai = 0.100
846 Sub-Area C Value = 0.270
847 Initial subarea total flow distance = 30.000(Ft.)
848 Highest elevation = 334.800(Ft.)
849 Lowest elevation = 327.500(Ft.)
850 Elevation difference = 7.300(Ft.) Slope = 24.333 %
851 Top of Initial Area Slope adjusted by User to 0.189 %
852 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
853 The maximum overland flow distance is 50.00 (Ft)
854 for the top area slope value of 0.19 %, in a development type of
855 1.0 DU/A or Less
856 In Accordance With Table 3-2
857 Initial Area Time of Concentration = 12.20 minutes
858 (for slope value of 0.50 %)
859 Rainfall intensity (I) = 5.187(In/Hr) for a 100.0 year storm
860 Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
861 Subarea runoff = 0.014(CFS)
862 Total initial stream area = 0.010(Ac.)
863
864
865 ++++++
866 Process from Point/Station 1005.000 to Point/Station 1003.000
867 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
868
869 Estimated mean flow rate at midpoint of channel = 0.042(CFS)
870 Depth of flow = 0.111(Ft.), Average velocity = 3.401(Ft/s)
871 ***** Irregular Channel Data *****
872 -----
873 Information entered for subchannel number 1 :
874 Point number 'X' coordinate 'Y' coordinate
875 1 0.00 1.00
876 2 1.00 0.00
877 3 2.00 1.00
878 Manning's 'N' friction factor = 0.015
879 -----
880 Sub-Channel flow = 0.042(CFS)
881 ' ' flow top width = 0.222(Ft.)
882 ' ' velocity= 3.401(Ft/s)
883 ' ' area = 0.012(Sq.Ft)
884 ' ' Froude number = 2.543
885
886 Upstream point elevation = 327.500(Ft.)
887 Downstream point elevation = 324.500(Ft.)
888 Flow length = 34.000(Ft.)
889 Travel time = 0.17 min.
890 Time of concentration = 12.37 min.
891 Depth of flow = 0.111(Ft.)
892 Average velocity = 3.401(Ft/s)
893 Total irregular channel flow = 0.042(CFS)
894 Irregular channel normal depth above invert elev. = 0.111(Ft.)
895 Average velocity of channel(s) = 3.401(Ft/s)
896 Adding area flow to channel
897 Rainfall intensity (I) = 5.142(In/Hr) for a 100.0 year storm

```

```

898 Decimal fraction soil group A = 1.000
899 Decimal fraction soil group B = 0.000
900 Decimal fraction soil group C = 0.000
901 Decimal fraction soil group D = 0.000
902 [LOW DENSITY RESIDENTIAL ]
903 (1.0 DU/A or Less )
904 Impervious value, Ai = 0.100
905 Sub-Area C Value = 0.270
906 Rainfall intensity = 5.142(In/Hr) for a 100.0 year storm
907 Effective runoff coefficient used for total area
908 (Q=KCIA) is C = 0.270 CA = 0.014
909 Subarea runoff = 0.055(CFS) for 0.040(Ac.)
910 Total runoff = 0.069(CFS) Total area = 0.050(Ac.)
911 Depth of flow = 0.134(Ft.), Average velocity = 3.856(Ft/s)
912
913

```

```

914 ++++++
915 Process from Point/Station 1003.000 to Point/Station 1003.000
916 **** CONFLUENCE OF MINOR STREAMS ****
917

```

```

918 Along Main Stream number: 3 in normal stream number 1
919 Stream flow area = 0.050(Ac.)
920 Runoff from this stream = 0.069(CFS)
921 Time of concentration = 12.37 min.
922 Rainfall intensity = 5.142(In/Hr)
923
924

```

```

925 ++++++
926 Process from Point/Station 1003.000 to Point/Station 1003.000
927 **** USER DEFINED FLOW INFORMATION AT A POINT ****
928

```

```

929 Decimal fraction soil group A = 1.000
930 Decimal fraction soil group B = 0.000
931 Decimal fraction soil group C = 0.000
932 Decimal fraction soil group D = 0.000
933 [MEDIUM DENSITY RESIDENTIAL ]
934 (7.3 DU/A or Less )
935 Impervious value, Ai = 0.400
936 Sub-Area C Value = 0.480
937 Rainfall intensity (I) = 6.428(In/Hr) for a 100.0 year storm
938 User specified values are as follows:
939 TC = 8.75 min. Rain intensity = 6.43(In/Hr)
940 Total area = 5.000(Ac.) Total runoff = 13.794(CFS)
941
942

```

```

943 ++++++
944 Process from Point/Station 1003.000 to Point/Station 1003.000
945 **** CONFLUENCE OF MINOR STREAMS ****
946

```

```

947 Along Main Stream number: 3 in normal stream number 2
948 Stream flow area = 5.000(Ac.)
949 Runoff from this stream = 13.794(CFS)
950 Time of concentration = 8.75 min.
951 Rainfall intensity = 6.428(In/Hr)
952 Summary of stream data:
953

```

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	0.069	12.37	5.142
2	13.794	8.75	6.428
Qmax(1) =			
	1.000 *	1.000 *	0.069) +
	0.800 *	1.000 *	13.794) + = 11.105
Qmax(2) =			
	1.000 *	0.708 *	0.069) +
	1.000 *	1.000 *	13.794) + = 13.843

967 Total of 2 streams to confluence:
 968 Flow rates before confluence point:
 969 0.069 13.794
 970 Maximum flow rates at confluence using above data:
 971 11.105 13.843
 972 Area of streams before confluence:
 973 0.050 5.000
 974 Results of confluence:
 975 Total flow rate = 13.843 (CFS)
 976 Time of concentration = 8.750 min.
 977 Effective stream area after confluence = 5.050 (Ac.)
 978
 979

980 ++++++
 981 Process from Point/Station 1003.000 to Point/Station 106.000
 982 **** PIPEFLOW TRAVEL TIME (User specified size) ****
 983
 984 -----
 984 Upstream point/station elevation = 311.100 (Ft.)
 985 Downstream point/station elevation = 302.600 (Ft.)
 986 Pipe length = 209.00 (Ft.) Slope = 0.0407 Manning's N = 0.013
 987 No. of pipes = 1 Required pipe flow = 13.843 (CFS)
 988 Given pipe size = 18.00 (In.)
 989 Calculated individual pipe flow = 13.843 (CFS)
 990 Normal flow depth in pipe = 10.61 (In.)
 991 Flow top width inside pipe = 17.71 (In.)
 992 Critical Depth = 16.52 (In.)
 993 Pipe flow velocity = 12.78 (Ft/s)
 994 Travel time through pipe = 0.27 min.
 995 Time of concentration (TC) = 9.02 min.
 996
 997

998 ++++++
 999 Process from Point/Station 106.000 to Point/Station 106.000
 1000 **** CONFLUENCE OF MAIN STREAMS ****
 1001

1002 The following data inside Main Stream is listed:
 1003 In Main Stream number: 3
 1004 Stream flow area = 5.050 (Ac.)
 1005 Runoff from this stream = 13.843 (CFS)
 1006 Time of concentration = 9.02 min.
 1007 Rainfall intensity = 6.302 (In/Hr)
 1008 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	11.045	8.36	6.620
2	6.593	10.19	5.826
3	13.843	9.02	6.302
Qmax (1) =			
	1.000 *	1.000 *	11.045) +
	1.000 *	0.820 *	6.593) +
	1.000 *	0.926 *	13.843) + = 29.277
Qmax (2) =			
	0.880 *	1.000 *	11.045) +
	1.000 *	1.000 *	6.593) +
	0.925 *	1.000 *	13.843) + = 29.111
Qmax (3) =			
	0.952 *	1.000 *	11.045) +
	1.000 *	0.885 *	6.593) +
	1.000 *	1.000 *	13.843) + = 30.194

1029
 1030 Total of 3 main streams to confluence:
 1031 Flow rates before confluence point:
 1032 11.045 6.593 13.843
 1033 Maximum flow rates at confluence using above data:
 1034 29.277 29.111 30.194
 1035 Area of streams before confluence:

1036 2.827 2.170 5.050

1037
1038

1039 Results of confluence:

1040 Total flow rate = 30.194 (CFS)
1041 Time of concentration = 9.023 min.
1042 Effective stream area after confluence = 10.047 (Ac.)

1043
1044

1045 +-----+
1046 Process from Point/Station 106.000 to Point/Station 107.000
1047 **** PIPEFLOW TRAVEL TIME (User specified size) ****

1048
1049

1050 Upstream point/station elevation = 302.500 (Ft.)
1051 Downstream point/station elevation = 302.100 (Ft.)
1052 Pipe length = 31.00 (Ft.) Slope = 0.0129 Manning's N = 0.013
1053 No. of pipes = 1 Required pipe flow = 30.194 (CFS)
1054 Given pipe size = 18.00 (In.)
1055 NOTE: Normal flow is pressure flow in user selected pipe size.
1056 The approximate hydraulic grade line above the pipe invert is
1057 8.961 (Ft.) at the headworks or inlet of the pipe(s)
1058 Pipe friction loss = 2.561 (Ft.)
1059 Minor friction loss = 6.800 (Ft.) K-factor = 1.50
1060 Pipe flow velocity = 17.09 (Ft/s)
1061 Travel time through pipe = 0.03 min.
1062 Time of concentration (TC) = 9.05 min.

1063
1064

1065 +-----+
1066 Process from Point/Station 107.000 to Point/Station 109.000
1067 **** PIPEFLOW TRAVEL TIME (User specified size) ****

1068
1069

1070 Upstream point/station elevation = 302.100 (Ft.)
1071 Downstream point/station elevation = 285.720 (Ft.)
1072 Pipe length = 137.00 (Ft.) Slope = 0.1196 Manning's N = 0.013
1073 No. of pipes = 1 Required pipe flow = 30.194 (CFS)
1074 Given pipe size = 18.00 (In.)
1075 Calculated individual pipe flow = 30.194 (CFS)
1076 Normal flow depth in pipe = 12.54 (In.)
1077 Flow top width inside pipe = 16.55 (In.)
1078 Critical depth could not be calculated.
1079 Pipe flow velocity = 22.99 (Ft/s)
1080 Travel time through pipe = 0.10 min.
1081 Time of concentration (TC) = 9.15 min.

1082
1083

1084 +-----+
1085 Process from Point/Station 109.000 to Point/Station 109.000
1086 **** CONFLUENCE OF MINOR STREAMS ****

1087
1088

1089 Along Main Stream number: 1 in normal stream number 1
1090 Stream flow area = 10.047 (Ac.)
1091 Runoff from this stream = 30.194 (CFS)
1092 Time of concentration = 9.15 min.
1093 Rainfall intensity = 6.244 (In/Hr)

1094
1095

1096 +-----+
1097 Process from Point/Station 2002.000 to Point/Station 2003.000
1098 **** INITIAL AREA EVALUATION ****

1099
1100

1101 Decimal fraction soil group A = 0.000
1102 Decimal fraction soil group B = 0.000
1103 Decimal fraction soil group C = 1.000
1104 Decimal fraction soil group D = 0.000
1105 [COMMERCIAL area type]
1106 (General Commercial)
1107 Impervious value, Ai = 0.850
1108 Sub-Area C Value = 0.810


```

1105 Initial subarea total flow distance = 93.000 (Ft.)
1106 Highest elevation = 318.000 (Ft.)
1107 Lowest elevation = 316.300 (Ft.)
1108 Elevation difference = 1.700 (Ft.) Slope = 1.828 %
1109 Top of Initial Area Slope adjusted by User to 1.400 %
1110 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
1111 The maximum overland flow distance is 60.00 (Ft)
1112 for the top area slope value of 1.40 %, in a development type of
1113 General Commercial
1114 In Accordance With Figure 3-3
1115 Initial Area Time of Concentration = 3.61 minutes
1116 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
1117 TC = [1.8*(1.1-0.8100)*( 60.000^.5)]/( 1.400^(1/3)]= 3.61
1118 Calculated TC of 3.614 minutes is less than 5 minutes,
1119 resetting TC to 5.0 minutes for rainfall intensity calculations
1120 Rainfall intensity (I) = 9.222 (In/Hr) for a 100.0 year storm
1121 Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
1122 Subarea runoff = 0.254 (CFS)
1123 Total initial stream area = 0.034 (Ac.)
1124
1125
1126 ++++++
1127 Process from Point/Station 2003.000 to Point/Station 2004.000
1128 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
1129
1130 -----
1131 Estimated mean flow rate at midpoint of channel = 2.206 (CFS)
1132 Depth of flow = 0.250 (Ft.), Average velocity = 1.603 (Ft/s)
1133 ***** Irregular Channel Data *****
1134 -----
1135 Information entered for subchannel number 1 :
1136 Point number 'X' coordinate 'Y' coordinate
1137 1 0.00 0.31
1138 2 26.00 0.13
1139 3 27.50 0.00
1140 4 27.50 0.50
1141 Manning's 'N' friction factor = 0.015
1142 -----
1143 Sub-Channel flow = 2.206 (CFS)
1144 ' ' flow top width = 18.940 (Ft.)
1145 ' ' velocity= 1.603 (Ft/s)
1146 ' ' area = 1.376 (Sq.Ft)
1147 ' ' Froude number = 1.048
1148
1149 Upstream point elevation = 316.300 (Ft.)
1150 Downstream point elevation = 310.800 (Ft.)
1151 Flow length = 625.000 (Ft.)
1152 Travel time = 6.50 min.
1153 Time of concentration = 10.11 min.
1154 Depth of flow = 0.250 (Ft.)
1155 Average velocity = 1.603 (Ft/s)
1156 Total irregular channel flow = 2.206 (CFS)
1157 Irregular channel normal depth above invert elev. = 0.250 (Ft.)
1158 Average velocity of channel(s) = 1.603 (Ft/s)
1159 Adding area flow to channel
1160 Rainfall intensity (I) = 5.855 (In/Hr) for a 100.0 year storm
1161 User specified 'C' value of 0.804 given for subarea
1162 Rainfall intensity = 5.855 (In/Hr) for a 100.0 year storm
1163 Effective runoff coefficient used for total area
1164 (Q=KCIA) is C = 0.804 CA = 0.700
1165 Subarea runoff = 3.848 (CFS) for 0.837 (Ac.)
1166 Total runoff = 4.102 (CFS) Total area = 0.871 (Ac.)
1167 Depth of flow = 0.289 (Ft.), Average velocity = 1.862 (Ft/s)
1168
1169 ++++++
1170 Process from Point/Station 2000.000 to Point/Station 109.000
1171 **** SUBAREA FLOW ADDITION ****
1172
1173 -----
1174 Rainfall intensity (I) = 5.855 (In/Hr) for a 100.0 year storm

```

```

1174 Decimal fraction soil group A = 0.100
1175 Decimal fraction soil group B = 0.000
1176 Decimal fraction soil group C = 0.900
1177 Decimal fraction soil group D = 0.000
1178 [MEDIUM DENSITY RESIDENTIAL ]
1179 (14.5 DU/A or Less )
1180 Impervious value, Ai = 0.500
1181 Sub-Area C Value = 0.595
1182 Time of concentration = 10.11 min.
1183 Rainfall intensity = 5.855(In/Hr) for a 100.0 year storm
1184 Effective runoff coefficient used for total area
1185 (Q=KCIA) is C = 0.719 CA = 1.057
1186 Subarea runoff = 2.090(CFS) for 0.600(Ac.)
1187 Total runoff = 6.192(CFS) Total area = 1.471(Ac.)
1188
1189
1190 ++++++
1191 Process from Point/Station 2001.000 to Point/Station 109.000
1192 **** SUBAREA FLOW ADDITION ****
1193
1194 Rainfall intensity (I) = 5.855(In/Hr) for a 100.0 year storm
1195 Decimal fraction soil group A = 0.000
1196 Decimal fraction soil group B = 0.000
1197 Decimal fraction soil group C = 1.000
1198 Decimal fraction soil group D = 0.000
1199 [COMMERCIAL area type ]
1200 (Neighborhood Commercial )
1201 Impervious value, Ai = 0.800
1202 Sub-Area C Value = 0.780
1203 Time of concentration = 10.11 min.
1204 Rainfall intensity = 5.855(In/Hr) for a 100.0 year storm
1205 Effective runoff coefficient used for total area
1206 (Q=KCIA) is C = 0.733 CA = 1.409
1207 Subarea runoff = 2.060(CFS) for 0.451(Ac.)
1208 Total runoff = 8.252(CFS) Total area = 1.922(Ac.)
1209
1210
1211 ++++++
1212 Process from Point/Station 2004.000 to Point/Station 109.000
1213 **** PIPEFLOW TRAVEL TIME (User specified size) ****
1214
1215 Upstream point/station elevation = 306.830(Ft.)
1216 Downstream point/station elevation = 285.720(Ft.)
1217 Pipe length = 211.00(Ft.) Slope = 0.1000 Manning's N = 0.013
1218 No. of pipes = 1 Required pipe flow = 8.252(CFS)
1219 Given pipe size = 18.00(In.)
1220 Calculated individual pipe flow = 8.252(CFS)
1221 Normal flow depth in pipe = 6.11(In.)
1222 Flow top width inside pipe = 17.05(In.)
1223 Critical Depth = 13.35(In.)
1224 Pipe flow velocity = 15.60(Ft/s)
1225 Travel time through pipe = 0.23 min.
1226 Time of concentration (TC) = 10.34 min.
1227
1228
1229 ++++++
1230 Process from Point/Station 109.000 to Point/Station 109.000
1231 **** CONFLUENCE OF MINOR STREAMS ****
1232
1233 Along Main Stream number: 1 in normal stream number 2
1234 Stream flow area = 1.922(Ac.)
1235 Runoff from this stream = 8.252(CFS)
1236 Time of concentration = 10.34 min.
1237 Rainfall intensity = 5.773(In/Hr)
1238 Summary of stream data:
1239
1240 Stream Flow rate TC Rainfall Intensity
1241 No. (CFS) (min) (In/Hr)
1242

```

```

1243
1244     1      30.194      9.15      6.244
1245     2      8.252      10.34     5.773
1246 Qmax (1) =
1247     1.000 *      1.000 *      30.194) +
1248     1.000 *      0.885 *      8.252) + =      37.500
1249 Qmax (2) =
1250     0.925 *      1.000 *      30.194) +
1251     1.000 *      1.000 *      8.252) + =      36.167
1252
1253 Total of 2 streams to confluence:
1254 Flow rates before confluence point:
1255     30.194      8.252
1256 Maximum flow rates at confluence using above data:
1257     37.500      36.167
1258 Area of streams before confluence:
1259     10.047      1.922
1260 Results of confluence:
1261 Total flow rate =      37.500 (CFS)
1262 Time of concentration =      9.152 min.
1263 Effective stream area after confluence =      11.969 (Ac.)
1264 End of computations, total study area =      11.969 (Ac.)
1265
1266
1267

```

6l. CivilD Mitigated Onsite Reach 1 Calculations

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2014 Version 9.0

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 04/26/24

19025 Post Dev Mitigated
100 Year Study Reach 1
post100rlmit.rd3

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

Program License Serial Number 6332

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.500
24 hour precipitation(inches) = 6.000
P6/P24 = 58.3%
San Diego hydrology manual 'C' values used

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

Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL]
(7.3 DU/A or Less)
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Initial subarea total flow distance = 53.000 (Ft.)
Highest elevation = 316.800 (Ft.)
Lowest elevation = 316.700 (Ft.)
Elevation difference = 0.100 (Ft.) Slope = 0.189 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of 0.19 %, in a development type of
7.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 13.75 minutes
TC = [1.8*(1.1-C)*distance (Ft.)^0.5]/(% slope^(1/3))
TC = [1.8*(1.1-0.4800)*(50.000^0.5)/(0.189^(1/3))]= 13.75
The initial area total distance of 53.00 (Ft.) entered leaves a
remaining distance of 3.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 0.20 minutes
for a distance of 3.00 (Ft.) and a slope of 0.19 %
with an elevation difference of 0.01 (Ft.) from the end of the top area
Tt = [11.9*length (Mi)^3]/(elevation change (Ft.))^.385 *60 (min/hr)
= 0.203 Minutes
Tt=[(11.9*0.0006^3)/(0.01)]^.385= 0.20
Total initial area Ti = 13.75 minutes from Figure 3-3 formula plus
0.20 minutes from the Figure 3-4 formula = 13.95 minutes
Rainfall intensity (I) = 4.757 (In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
Subarea runoff = 0.068 (CFS)

```

70 Total initial stream area = 0.030 (Ac.)
71
72
73 ++++++
74 Process from Point/Station 101.000 to Point/Station 102.000
75 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
76
77 -----
78 Estimated mean flow rate at midpoint of channel = 0.228 (CFS)
79 Depth of flow = 0.095 (Ft.), Average velocity = 0.591 (Ft/s)
80 ***** Irregular Channel Data *****
81 -----
82 Information entered for subchannel number 1 :
83 Point number 'X' coordinate 'Y' coordinate
84 1 0.00 0.33
85 2 23.00 0.00
86 3 28.50 0.33
87 Manning's 'N' friction factor = 0.015
88 -----
89 Sub-Channel flow = 0.228 (CFS)
90 ' ' flow top width = 8.130 (Ft.)
91 ' ' velocity = 0.591 (Ft/s)
92 ' ' area = 0.386 (Sq.Ft)
93 ' ' Froude number = 0.478
94
95 Upstream point elevation = 316.700 (Ft.)
96 Downstream point elevation = 316.300 (Ft.)
97 Flow length = 193.000 (Ft.)
98 Travel time = 5.44 min.
99 Time of concentration = 19.39 min.
100 Depth of flow = 0.095 (Ft.)
101 Average velocity = 0.591 (Ft/s)
102 Total irregular channel flow = 0.228 (CFS)
103 Irregular channel normal depth above invert elev. = 0.095 (Ft.)
104 Average velocity of channel(s) = 0.591 (Ft/s)
105 Adding area flow to channel
106 Rainfall intensity (I) = 3.847 (In/Hr) for a 100.0 year storm
107 Decimal fraction soil group A = 1.000
108 Decimal fraction soil group B = 0.000
109 Decimal fraction soil group C = 0.000
110 Decimal fraction soil group D = 0.000
111 [MEDIUM DENSITY RESIDENTIAL ]
112 (7.3 DU/A or Less )
113 Impervious value, Ai = 0.400
114 Sub-Area C Value = 0.480
115 Rainfall intensity = 3.847 (In/Hr) for a 100.0 year storm
116 Effective runoff coefficient used for total area
117 (Q=KCIA) is C = 0.480 CA = 0.082
118 Subarea runoff = 0.245 (CFS) for 0.140 (Ac.)
119 Total runoff = 0.314 (CFS) Total area = 0.170 (Ac.)
120 Depth of flow = 0.107 (Ft.), Average velocity = 0.640 (Ft/s)
121
122 ++++++
123 Process from Point/Station 102.000 to Point/Station 102.000
124 **** SUBAREA FLOW ADDITION ****
125
126 -----
127 Rainfall intensity (I) = 3.847 (In/Hr) for a 100.0 year storm
128 Decimal fraction soil group A = 1.000
129 Decimal fraction soil group B = 0.000
130 Decimal fraction soil group C = 0.000
131 Decimal fraction soil group D = 0.000
132 [LOW DENSITY RESIDENTIAL ]
133 (1.0 DU/A or Less )
134 Impervious value, Ai = 0.100
135 Sub-Area C Value = 0.270
136 Time of concentration = 19.39 min.
137 Rainfall intensity = 3.847 (In/Hr) for a 100.0 year storm
138 Effective runoff coefficient used for total area
139 (Q=KCIA) is C = 0.393 CA = 0.114

```

139 Subarea runoff = 0.125(CFS) for 0.120(Ac.)
140 Total runoff = 0.439(CFS) Total area = 0.290(Ac.)
141
142

143 ++++++
144 Process from Point/Station 102.000 to Point/Station 103.000
145 **** PIPEFLOW TRAVEL TIME (User specified size) ****

147 Upstream point/station elevation = 310.200(Ft.)
148 Downstream point/station elevation = 309.000(Ft.)
149 Pipe length = 250.00(Ft.) Slope = 0.0048 Manning's N = 0.013
150 No. of pipes = 1 Required pipe flow = 0.439(CFS)
151 Given pipe size = 12.00(In.)
152 Calculated individual pipe flow = 0.439(CFS)
153 Normal flow depth in pipe = 3.42(In.)
154 Flow top width inside pipe = 10.84(In.)
155 Critical Depth = 3.28(In.)
156 Pipe flow velocity = 2.37(Ft/s)
157 Travel time through pipe = 1.76 min.
158 Time of concentration (TC) = 21.15 min.
159
160

161 ++++++
162 Process from Point/Station 103.000 to Point/Station 103.000
163 **** CONFLUENCE OF MINOR STREAMS ****
164

165 Along Main Stream number: 1 in normal stream number 1
166 Stream flow area = 0.290(Ac.)
167 Runoff from this stream = 0.439(CFS)
168 Time of concentration = 21.15 min.
169 Rainfall intensity = 3.637(In/Hr)
170
171

172 ++++++
173 Process from Point/Station 1100.000 to Point/Station 1101.000
174 **** INITIAL AREA EVALUATION ****
175

176 Decimal fraction soil group A = 1.000
177 Decimal fraction soil group B = 0.000
178 Decimal fraction soil group C = 0.000
179 Decimal fraction soil group D = 0.000
180 [LOW DENSITY RESIDENTIAL]
181 (1.0 DU/A or Less)
182 Impervious value, Ai = 0.100
183 Sub-Area C Value = 0.270
184 Initial subarea total flow distance = 59.000(Ft.)
185 Highest elevation = 336.700(Ft.)
186 Lowest elevation = 321.600(Ft.)
187 Elevation difference = 15.100(Ft.) Slope = 25.593 %
188 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
189 The maximum overland flow distance is 100.00 (Ft)
190 for the top area slope value of 25.59 %, in a development type of
191 1.0 DU/A or Less
192 In Accordance With Figure 3-3
193 Initial Area Time of Concentration = 5.07 minutes
194 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{0.5} / (% slope^{1/3})]$
195 $TC = [1.8 * (1.1 - 0.2700) * (100.000^{0.5}) / (25.593^{1/3})] = 5.07$
196 Rainfall intensity (I) = 9.140(In/Hr) for a 100.0 year storm
197 Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
198 Subarea runoff = 0.173(CFS)
199 Total initial stream area = 0.070(Ac.)
200
201

202 ++++++
203 Process from Point/Station 1101.000 to Point/Station 103.000
204 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
205

206 Estimated mean flow rate at midpoint of channel = 1.544(CFS)
207 Depth of flow = 0.128(Ft.), Average velocity = 3.658(Ft/s)

```

208          ***** Irregular Channel Data *****
209          -----
210 Information entered for subchannel number 1 :
211 Point number      'X' coordinate      'Y' coordinate
212      1              0.00              0.60
213      2              16.00             0.00
214      3              46.00             1.20
215 Manning's 'N' friction factor = 0.015
216          -----
217 Sub-Channel flow = 1.544 (CFS)
218 ' ' flow top width = 6.605 (Ft.)
219 ' ' velocity = 3.658 (Ft/s)
220 ' ' area = 0.422 (Sq.Ft)
221 ' ' Froude number = 2.549
222
223 Upstream point elevation = 321.600 (Ft.)
224 Downstream point elevation = 309.000 (Ft.)
225 Flow length = 236.000 (Ft.)
226 Travel time = 1.08 min.
227 Time of concentration = 6.15 min.
228 Depth of flow = 0.128 (Ft.)
229 Average velocity = 3.658 (Ft/s)
230 Total irregular channel flow = 1.544 (CFS)
231 Irregular channel normal depth above invert elev. = 0.128 (Ft.)
232 Average velocity of channel(s) = 3.658 (Ft/s)
233 Adding area flow to channel
234 Rainfall intensity (I) = 8.073 (In/Hr) for a 100.0 year storm
235 Decimal fraction soil group A = 0.100
236 Decimal fraction soil group B = 0.000
237 Decimal fraction soil group C = 0.900
238 Decimal fraction soil group D = 0.000
239 [MEDIUM DENSITY RESIDENTIAL ]
240 (7.3 DU/A or Less )
241 Impervious value, Ai = 0.400
242 Sub-Area C Value = 0.534
243 Rainfall intensity = 8.073 (In/Hr) for a 100.0 year storm
244 Effective runoff coefficient used for total area
245 (Q=KCIA) is C = 0.509 CA = 0.371
246 Subarea runoff = 2.825 (CFS) for 0.660 (Ac.)
247 Total runoff = 2.998 (CFS) Total area = 0.730 (Ac.)
248 Depth of flow = 0.164 (Ft.), Average velocity = 4.317 (Ft/s)
249
250
251 +-----+
252 Process from Point/Station 103.000 to Point/Station 103.000
253 **** CONFLUENCE OF MINOR STREAMS ****
254
255 -----
256 Along Main Stream number: 1 in normal stream number 2
257 Stream flow area = 0.730 (Ac.)
258 Runoff from this stream = 2.998 (CFS)
259 Time of concentration = 6.15 min.
260 Rainfall intensity = 8.073 (In/Hr)
261
262 +-----+
263 Process from Point/Station 3003.000 to Point/Station 103.000
264 **** USER DEFINED FLOW INFORMATION AT A POINT ****
265
266 -----
267 User specified 'C' value of 0.360 given for subarea
268 Rainfall intensity (I) = 7.186 (In/Hr) for a 100.0 year storm
269 User specified values are as follows:
270 TC = 7.36 min. Rain intensity = 7.19 (In/Hr)
271 Total area = 0.777 (Ac.) Total runoff = 2.020 (CFS)
272
273 +-----+
274 Process from Point/Station 103.000 to Point/Station 103.000
275 **** CONFLUENCE OF MINOR STREAMS ****
276

```


277 Along Main Stream number: 1 in normal stream number 3
 278 Stream flow area = 0.777 (Ac.)
 279 Runoff from this stream = 2.020 (CFS)
 280 Time of concentration = 7.36 min.
 281 Rainfall intensity = 7.186 (In/Hr)
 282 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	0.439	21.15	3.637
2	2.998	6.15	8.073
3	2.020	7.36	7.186

291 Qmax (1) =
 292 1.000 * 1.000 * 0.439) +
 293 0.451 * 1.000 * 2.998) +
 294 0.506 * 1.000 * 2.020) + = 2.812

295 Qmax (2) =
 296 1.000 * 0.291 * 0.439) +
 297 1.000 * 1.000 * 2.998) +
 298 1.000 * 0.835 * 2.020) + = 4.812

299 Qmax (3) =
 300 1.000 * 0.348 * 0.439) +
 301 0.890 * 1.000 * 2.998) +
 302 1.000 * 1.000 * 2.020) + = 4.841

304 Total of 3 streams to confluence:
 305 Flow rates before confluence point:
 306 0.439 2.998 2.020
 307 Maximum flow rates at confluence using above data:
 308 2.812 4.812 4.841
 309 Area of streams before confluence:
 310 0.290 0.730 0.777

311 Results of confluence:
 312 Total flow rate = 4.841 (CFS)
 313 Time of concentration = 7.360 min.
 314 Effective stream area after confluence = 1.797 (Ac.)

317 +-----+
 318 Process from Point/Station 103.000 to Point/Station 104.000
 319 **** PIPEFLOW TRAVEL TIME (User specified size) ****

321 Upstream point/station elevation = 304.200 (Ft.)
 322 Downstream point/station elevation = 303.300 (Ft.)
 323 Pipe length = 189.00 (Ft.) Slope = 0.0048 Manning's N = 0.013
 324 No. of pipes = 1 Required pipe flow = 4.841 (CFS)
 325 Given pipe size = 18.00 (In.)
 326 Calculated individual pipe flow = 4.841 (CFS)
 327 Normal flow depth in pipe = 10.76 (In.)
 328 Flow top width inside pipe = 17.65 (In.)
 329 Critical Depth = 10.14 (In.)
 330 Pipe flow velocity = 4.39 (Ft/s)
 331 Travel time through pipe = 0.72 min.
 332 Time of concentration (TC) = 8.08 min.

335 +-----+
 336 Process from Point/Station 104.000 to Point/Station 104.000
 337 **** CONFLUENCE OF MINOR STREAMS ****

339 Along Main Stream number: 1 in normal stream number 1
 340 Stream flow area = 1.797 (Ac.)
 341 Runoff from this stream = 4.841 (CFS)
 342 Time of concentration = 8.08 min.
 343 Rainfall intensity = 6.768 (In/Hr)

```

346 ++++++
347 Process from Point/Station      200.000 to Point/Station      201.000
348 **** INITIAL AREA EVALUATION ****
349
350 Decimal fraction soil group A = 0.050
351 Decimal fraction soil group B = 0.000
352 Decimal fraction soil group C = 0.950
353 Decimal fraction soil group D = 0.000
354 [COMMERCIAL area type                ]
355 (Office Professional      )
356 Impervious value, Ai = 0.900
357 Sub-Area C Value = 0.839
358 Initial subarea total flow distance = 50.000 (Ft.)
359 Highest elevation = 316.800 (Ft.)
360 Lowest elevation = 316.200 (Ft.)
361 Elevation difference = 0.600 (Ft.) Slope = 1.200 %
362 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
363 The maximum overland flow distance is 60.00 (Ft)
364 for the top area slope value of 1.20 %, in a development type of
365 Office Professional
366 In Accordance With Figure 3-3
367 Initial Area Time of Concentration = 3.42 minutes
368 TC = [1.8*(1.1-C)*distance (Ft.)^.5]/(% slope^(1/3)]
369 TC = [1.8*(1.1-0.8395)*( 60.000^.5)/( 1.200^(1/3)]= 3.42
370 Calculated TC of 3.418 minutes is less than 5 minutes,
371 resetting TC to 5.0 minutes for rainfall intensity calculations
372 Rainfall intensity (I) = 9.222 (In/Hr) for a 100.0 year storm
373 Effective runoff coefficient used for area (Q=KCIA) is C = 0.839
374 Subarea runoff = 0.310 (CFS)
375 Total initial stream area = 0.040 (Ac.)
376
377
378 ++++++
379 Process from Point/Station      201.000 to Point/Station      202.000
380 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
381
382 Estimated mean flow rate at midpoint of channel = 2.245 (CFS)
383 Depth of flow = 0.209 (Ft.), Average velocity = 2.102 (Ft/s)
384 ***** Irregular Channel Data *****
385 -----
386 Information entered for subchannel number 1 :
387 Point number      'X' coordinate      'Y' coordinate
388 1                 0.00                 0.30
389 2                 1.50                 0.00
390 3                 45.50                1.00
391 4                 61.50                1.50
392 Manning's 'N' friction factor = 0.015
393 -----
394 Sub-Channel flow = 2.245 (CFS)
395 ' ' flow top width = 10.230 (Ft.)
396 ' ' velocity= 2.102 (Ft/s)
397 ' ' area = 1.068 (Sq.Ft)
398 ' ' Froude number = 1.147
399
400 Upstream point elevation = 316.200 (Ft.)
401 Downstream point elevation = 314.500 (Ft.)
402 Flow length = 185.000 (Ft.)
403 Travel time = 1.47 min.
404 Time of concentration = 4.88 min.
405 Depth of flow = 0.209 (Ft.)
406 Average velocity = 2.102 (Ft/s)
407 Total irregular channel flow = 2.245 (CFS)
408 Irregular channel normal depth above invert elev. = 0.209 (Ft.)
409 Average velocity of channel(s) = 2.102 (Ft/s)
410 Adding area flow to channel
411 Calculated TC of 4.885 minutes is less than 5 minutes,
412 resetting TC to 5.0 minutes for rainfall intensity calculations
413 Rainfall intensity (I) = 9.222 (In/Hr) for a 100.0 year storm
414 Decimal fraction soil group A = 0.000

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```

415 Decimal fraction soil group B = 0.000
416 Decimal fraction soil group C = 1.000
417 Decimal fraction soil group D = 0.000
418 [COMMERCIAL area type ]
419 (Office Professional )
420 Impervious value, Ai = 0.900
421 Sub-Area C Value = 0.840
422 Rainfall intensity = 9.222(In/Hr) for a 100.0 year storm
423 Effective runoff coefficient used for total area
424 (Q=KCIA) is C = 0.840 CA = 0.454
425 Subarea runoff = 3.873(CFS) for 0.500(Ac.)
426 Total runoff = 4.183(CFS) Total area = 0.540(Ac.)
427 Depth of flow = 0.264(Ft.), Average velocity = 2.456(Ft/s)
428
429
430 ++++++
431 Process from Point/Station 202.000 to Point/Station 104.000
432 **** PIPEFLOW TRAVEL TIME (User specified size) ****
433
434 -----
435 Upstream point/station elevation = 308.500(Ft.)
436 Downstream point/station elevation = 303.300(Ft.)
437 Pipe length = 48.00(Ft.) Slope = 0.1083 Manning's N = 0.013
438 No. of pipes = 1 Required pipe flow = 4.183(CFS)
439 Given pipe size = 12.00(In.)
440 Calculated individual pipe flow = 4.183(CFS)
441 Normal flow depth in pipe = 4.95(In.)
442 Flow top width inside pipe = 11.82(In.)
443 Critical Depth = 10.36(In.)
444 Pipe flow velocity = 13.68(Ft/s)
445 Travel time through pipe = 0.06 min.
446 Time of concentration (TC) = 4.94 min.
447
448 ++++++
449 Process from Point/Station 202.000 to Point/Station 104.000
450 **** CONFLUENCE OF MINOR STREAMS ****
451
452 -----
453 Along Main Stream number: 1 in normal stream number 2
454 Stream flow area = 0.540(Ac.)
455 Runoff from this stream = 4.183(CFS)
456 Time of concentration = 4.94 min.
457 Rainfall intensity = 9.222(In/Hr)
458
459 ++++++
460 Process from Point/Station 300.000 to Point/Station 301.000
461 **** INITIAL AREA EVALUATION ****
462
463 -----
464 Decimal fraction soil group A = 0.000
465 Decimal fraction soil group B = 0.000
466 Decimal fraction soil group C = 1.000
467 Decimal fraction soil group D = 0.000
468 [COMMERCIAL area type ]
469 (Neighborhood Commercial )
470 Impervious value, Ai = 0.800
471 Sub-Area C Value = 0.780
472 Initial subarea total flow distance = 42.000(Ft.)
473 Highest elevation = 316.000(Ft.)
474 Lowest elevation = 314.700(Ft.)
475 Elevation difference = 1.300(Ft.) Slope = 3.095 %
476 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
477 The maximum overland flow distance is 85.00 (Ft)
478 for the top area slope value of 3.10 %, in a development type of
479 Neighborhood Commercial
480 In Accordance With Figure 3-3
481 Initial Area Time of Concentration = 3.64 minutes
482 TC = [1.8*(1.1-C)*distance(Ft.)^0.5]/(% slope^(1/3))
483 TC = [1.8*(1.1-0.7800)*( 85.000^0.5)/( 3.095^(1/3))]= 3.64
484 Calculated TC of 3.644 minutes is less than 5 minutes,

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```

484     resetting TC to 5.0 minutes for rainfall intensity calculations
485 Rainfall intensity (I) =      9.222(In/Hr) for a  100.0 year storm
486 Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
487 Subarea runoff =      0.288(CFS)
488 Total initial stream area =      0.040(Ac.)
489
490
491 +-----+
492 Process from Point/Station      301.000 to Point/Station      302.000
493 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
494
495 -----
496 Estimated mean flow rate at midpoint of channel =      1.259(CFS)
497 Depth of flow =      0.087(Ft.), Average velocity =      2.583(Ft/s)
498 ***** Irregular Channel Data *****
499 -----
500 Information entered for subchannel number 1 :
501 Point number      'X' coordinate      'Y' coordinate
502     1              0.00              0.50
503     2              0.00              0.00
504     3             64.00              0.50
505 Manning's 'N' friction factor =      0.015
506 -----
507 Sub-Channel flow =      1.259(CFS)
508 '      '      flow top width =      11.169(Ft.)
509 '      '      velocity=      2.583(Ft/s)
510 '      '      area =      0.487(Sq.Ft)
511 '      '      Froude number =      2.180
512
513 Upstream point elevation =      314.700(Ft.)
514 Downstream point elevation =      313.000(Ft.)
515 Flow length =      38.000(Ft.)
516 Travel time =      0.25 min.
517 Time of concentration =      3.89 min.
518 Depth of flow =      0.087(Ft.)
519 Average velocity =      2.583(Ft/s)
520 Total irregular channel flow =      1.259(CFS)
521 Irregular channel normal depth above invert elev. =      0.087(Ft.)
522 Average velocity of channel(s) =      2.583(Ft/s)
523 Adding area flow to channel
524 Calculated TC of      3.889 minutes is less than 5 minutes,
525     resetting TC to 5.0 minutes for rainfall intensity calculations
526 Rainfall intensity (I) =      9.222(In/Hr) for a  100.0 year storm
527 Decimal fraction soil group A = 0.000
528 Decimal fraction soil group B = 0.000
529 Decimal fraction soil group C = 1.000
530 Decimal fraction soil group D = 0.000
531 [COMMERCIAL area type                ]
532 (Neighborhood Commercial )
533 Impervious value, Ai = 0.800
534 Sub-Area C Value = 0.780
535 Rainfall intensity =      9.222(In/Hr) for a  100.0 year storm
536 Effective runoff coefficient used for total area
537 (Q=KCIA) is C = 0.780 CA =      0.242
538 Subarea runoff =      1.942(CFS) for      0.270(Ac.)
539 Total runoff =      2.230(CFS) Total area =      0.310(Ac.)
540 Depth of flow =      0.108(Ft.), Average velocity =      2.980(Ft/s)
541
542 +-----+
543 Process from Point/Station      302.000 to Point/Station      104.000
544 **** PIPEFLOW TRAVEL TIME (User specified size) ****
545
546 -----
547 Upstream point/station elevation =      306.000(Ft.)
548 Downstream point/station elevation =      303.300(Ft.)
549 Pipe length =      30.00(Ft.) Slope =      0.0900 Manning's N = 0.013
550 No. of pipes = 1 Required pipe flow =      2.230(CFS)
551 Given pipe size =      12.00(In.)
552 Calculated individual pipe flow =      2.230(CFS)
553 Normal flow depth in pipe =      3.72(In.)

```

553 Flow top width inside pipe = 11.10(In.)
554 Critical Depth = 7.66(In.)
555 Pipe flow velocity = 10.75(Ft/s)
556 Travel time through pipe = 0.05 min.
557 Time of concentration (TC) = 3.94 min.

558
559
560 ++++++
561 Process from Point/Station 104.000 to Point/Station 104.000
562 **** CONFLUENCE OF MINOR STREAMS ****

563
564 Along Main Stream number: 1 in normal stream number 3
565 Stream flow area = 0.310(Ac.)
566 Runoff from this stream = 2.230(CFS)
567 Time of concentration = 3.94 min.
568 Rainfall intensity = 9.222(In/Hr)
569 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.841	8.08	6.768
2	4.183	4.94	9.222
3	2.230	3.94	9.222

570
571
572
573
574
575
576
577
578 Qmax(1) =
579 1.000 * 1.000 * 4.841) +
580 0.734 * 1.000 * 4.183) +
581 0.734 * 1.000 * 2.230) + = 9.548

582 Qmax(2) =
583 1.000 * 0.612 * 4.841) +
584 1.000 * 1.000 * 4.183) +
585 1.000 * 1.000 * 2.230) + = 9.375

586 Qmax(3) =
587 1.000 * 0.487 * 4.841) +
588 1.000 * 0.796 * 4.183) +
589 1.000 * 1.000 * 2.230) + = 7.919

590
591 Total of 3 streams to confluence:
592 Flow rates before confluence point:
593 4.841 4.183 2.230
594 Maximum flow rates at confluence using above data:
595 9.548 9.375 7.919
596 Area of streams before confluence:
597 1.797 0.540 0.310

598 Results of confluence:
599 Total flow rate = 9.548(CFS)
600 Time of concentration = 8.077 min.
601 Effective stream area after confluence = 2.647(Ac.)

602
603
604 ++++++
605 Process from Point/Station 104.000 to Point/Station 105.000
606 **** PIPEFLOW TRAVEL TIME (User specified size) ****

607
608 Upstream point/station elevation = 303.300(Ft.)
609 Downstream point/station elevation = 303.000(Ft.)
610 Pipe length = 71.00(Ft.) Slope = 0.0042 Manning's N = 0.013
611 No. of pipes = 1 Required pipe flow = 9.548(CFS)
612 Given pipe size = 18.00(In.)
613 NOTE: Normal flow is pressure flow in user selected pipe size.
614 The approximate hydraulic grade line above the pipe invert is
615 0.966(Ft.) at the headworks or inlet of the pipe(s)
616 Pipe friction loss = 0.586(Ft.)
617 Minor friction loss = 0.680(Ft.) K-factor = 1.50
618 Pipe flow velocity = 5.40(Ft/s)
619 Travel time through pipe = 0.22 min.
620 Time of concentration (TC) = 8.30 min.
621

```

622
623 ++++++
624 Process from Point/Station      105.000 to Point/Station      105.000
625 **** CONFLUENCE OF MINOR STREAMS ****
626
627 -----
628 Along Main Stream number: 1 in normal stream number 1
629 Stream flow area =      2.647 (Ac.)
630 Runoff from this stream =      9.548 (CFS)
631 Time of concentration =      8.30 min.
632 Rainfall intensity =      6.652 (In/Hr)
633
634 ++++++
635 Process from Point/Station      400.000 to Point/Station      401.000
636 **** INITIAL AREA EVALUATION ****
637
638 -----
639 Decimal fraction soil group A = 0.000
640 Decimal fraction soil group B = 0.000
641 Decimal fraction soil group C = 1.000
642 Decimal fraction soil group D = 0.000
643 [HIGH DENSITY RESIDENTIAL          ]
644 (43.0 DU/A or Less          )
645 Impervious value, Ai = 0.800
646 Sub-Area C Value = 0.780
647 Initial subarea total flow distance = 100.000 (Ft.)
648 Highest elevation = 316.100 (Ft.)
649 Lowest elevation = 312.600 (Ft.)
650 Elevation difference = 3.500 (Ft.) Slope = 3.500 %
651 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
652 The maximum overland flow distance is 85.00 (Ft)
653 for the top area slope value of 3.50 %, in a development type of
654 43.0 DU/A or Less
655 In Accordance With Figure 3-3
656 Initial Area Time of Concentration = 3.50 minutes
657 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
658 TC = [1.8*(1.1-0.7800)*( 85.000^.5)/( 3.500^(1/3)]= 3.50
659 The initial area total distance of 100.00 (Ft.) entered leaves a
660 remaining distance of 15.00 (Ft.)
661 Using Figure 3-4, the travel time for this distance is 0.23 minutes
662 for a distance of 15.00 (Ft.) and a slope of 3.50 %
663 with an elevation difference of 0.53 (Ft.) from the end of the top area
664 Tt = [11.9*length(Mi)^3]/(elevation change (Ft.))]^.385 *60 (min/hr)
665 = 0.228 Minutes
666 Tt=[(11.9*0.0028^3)/( 0.53)]^.385= 0.23
667 Total initial area Ti = 3.50 minutes from Figure 3-3 formula plus
668 0.23 minutes from the Figure 3-4 formula = 3.73 minutes
669 Calculated TC of 3.726 minutes is less than 5 minutes,
670 resetting TC to 5.0 minutes for rainfall intensity calculations
671 Rainfall intensity (I) = 9.222 (In/Hr) for a 100.0 year storm
672 Effective runoff coefficient used for area (Q=KCIA) is C = 0.780
673 Subarea runoff = 0.791 (CFS)
674 Total initial stream area = 0.110 (Ac.)
675
676 ++++++
677 Process from Point/Station      401.000 to Point/Station      402.000
678 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
679
680 -----
681 Estimated mean flow rate at midpoint of channel = 1.043 (CFS)
682 Depth of flow = 0.351 (Ft.), Average velocity = 4.504 (Ft/s)
683 ***** Irregular Channel Data *****
684 -----
685 Information entered for subchannel number 1 :
686 Point number      'X' coordinate      'Y' coordinate
687 1                  0.00                  1.10
688 2                  34.00                 0.40
689 3                  35.50                 0.00
690 4                  35.50                 0.50
691 Manning's 'N' friction factor = 0.015

```

```

691 -----
692 Sub-Channel flow = 1.043 (CFS)
693 ' ' flow top width = 1.318 (Ft.)
694 ' ' velocity = 4.504 (Ft/s)
695 ' ' area = 0.232 (Sq.Ft)
696 ' ' Froude number = 1.894
697
698 Upstream point elevation = 312.600 (Ft.)
699 Downstream point elevation = 310.600 (Ft.)
700 Flow length = 67.000 (Ft.)
701 Travel time = 0.25 min.
702 Time of concentration = 3.97 min.
703 Depth of flow = 0.351 (Ft.)
704 Average velocity = 4.504 (Ft/s)
705 Total irregular channel flow = 1.043 (CFS)
706 Irregular channel normal depth above invert elev. = 0.351 (Ft.)
707 Average velocity of channel (s) = 4.504 (Ft/s)
708 Adding area flow to channel
709 Calculated TC of 3.974 minutes is less than 5 minutes,
710 resetting TC to 5.0 minutes for rainfall intensity calculations
711 Rainfall intensity (I) = 9.222 (In/Hr) for a 100.0 year storm
712 Decimal fraction soil group A = 0.000
713 Decimal fraction soil group B = 0.000
714 Decimal fraction soil group C = 1.000
715 Decimal fraction soil group D = 0.000
716 [HIGH DENSITY RESIDENTIAL ]
717 (43.0 DU/A or Less )
718 Impervious value, Ai = 0.800
719 Sub-Area C Value = 0.780
720 Rainfall intensity = 9.222 (In/Hr) for a 100.0 year storm
721 Effective runoff coefficient used for total area
722 (Q=KCIA) is C = 0.780 CA = 0.140
723 Subarea runoff = 0.503 (CFS) for 0.070 (Ac.)
724 Total runoff = 1.295 (CFS) Total area = 0.180 (Ac.)
725 Depth of flow = 0.381 (Ft.), Average velocity = 4.754 (Ft/s)
726
727
728 ++++++
729 Process from Point/Station 105.000 to Point/Station 105.000
730 **** CONFLUENCE OF MINOR STREAMS ****
731
732 -----
732 Along Main Stream number: 1 in normal stream number 2
733 Stream flow area = 0.180 (Ac.)
734 Runoff from this stream = 1.295 (CFS)
735 Time of concentration = 3.97 min.
736 Rainfall intensity = 9.222 (In/Hr)
737 Summary of stream data:
738
739 Stream Flow rate TC Rainfall Intensity
740 No. (CFS) (min) (In/Hr)
741
742
743 1 9.548 8.30 6.652
744 2 1.295 3.97 9.222
745 Qmax (1) =
746 1.000 * 1.000 * 9.548) +
747 0.721 * 1.000 * 1.295) + = 10.482
748 Qmax (2) =
749 1.000 * 0.479 * 9.548) +
750 1.000 * 1.000 * 1.295) + = 5.868
751
752 Total of 2 streams to confluence:
753 Flow rates before confluence point:
754 9.548 1.295
755 Maximum flow rates at confluence using above data:
756 10.482 5.868
757 Area of streams before confluence:
758 2.647 0.180
759 Results of confluence:

```

760 Total flow rate = 10.482 (CFS)
761 Time of concentration = 8.296 min.
762 Effective stream area after confluence = 2.827 (Ac.)
763
764

765 ++++++
766 Process from Point/Station 105.000 to Point/Station 106.000
767 **** PIPEFLOW TRAVEL TIME (User specified size) ****
768

769 Upstream point/station elevation = 303.000 (Ft.)
770 Downstream point/station elevation = 302.500 (Ft.)
771 Pipe length = 77.00 (Ft.) Slope = 0.0065 Manning's N = 0.013
772 No. of pipes = 1 Required pipe flow = 10.482 (CFS)
773 Given pipe size = 12.00 (In.)
774 NOTE: Normal flow is pressure flow in user selected pipe size.
775 The approximate hydraulic grade line above the pipe invert is
776 10.310 (Ft.) at the headworks or inlet of the pipe(s)
777 Pipe friction loss = 6.662 (Ft.)
778 Minor friction loss = 4.148 (Ft.) K-factor = 1.50
779 Pipe flow velocity = 13.35 (Ft/s)
780 Travel time through pipe = 0.10 min.
781 Time of concentration (TC) = 8.39 min.
782
783

784 ++++++
785 Process from Point/Station 106.000 to Point/Station 106.000
786 **** CONFLUENCE OF MAIN STREAMS ****
787

788 The following data inside Main Stream is listed:
789 In Main Stream number: 1
790 Stream flow area = 2.827 (Ac.)
791 Runoff from this stream = 10.482 (CFS)
792 Time of concentration = 8.39 min.
793 Rainfall intensity = 6.603 (In/Hr)
794 Program is now starting with Main Stream No. 2
795
796

797 ++++++
798 Process from Point/Station 804.000 to Point/Station 106.000
799 **** USER DEFINED FLOW INFORMATION AT A POINT ****
800

801 Decimal fraction soil group A = 0.000
802 Decimal fraction soil group B = 0.000
803 Decimal fraction soil group C = 1.000
804 Decimal fraction soil group D = 0.000
805 [HIGH DENSITY RESIDENTIAL]
806 (43.0 DU/A or Less)
807 Impervious value, Ai = 0.800
808 Sub-Area C Value = 0.780
809 Rainfall intensity (I) = 5.819 (In/Hr) for a 100.0 year storm
810 User specified values are as follows:
811 TC = 10.21 min. Rain intensity = 5.82 (In/Hr)
812 Total area = 2.170 (Ac.) Total runoff = 5.047 (CFS)
813
814

815 ++++++
816 Process from Point/Station 106.000 to Point/Station 106.000
817 **** CONFLUENCE OF MAIN STREAMS ****
818

819 The following data inside Main Stream is listed:
820 In Main Stream number: 2
821 Stream flow area = 2.170 (Ac.)
822 Runoff from this stream = 5.047 (CFS)
823 Time of concentration = 10.21 min.
824 Rainfall intensity = 5.819 (In/Hr)
825 Program is now starting with Main Stream No. 3
826
827
828

+++++

829 Process from Point/Station 1004.000 to Point/Station 1005.000

830 **** INITIAL AREA EVALUATION ****

831

832 Decimal fraction soil group A = 1.000
833 Decimal fraction soil group B = 0.000
834 Decimal fraction soil group C = 0.000
835 Decimal fraction soil group D = 0.000
836 [LOW DENSITY RESIDENTIAL]
837 (1.0 DU/A or Less)
838 Impervious value, Ai = 0.100
839 Sub-Area C Value = 0.270
840 Initial subarea total flow distance = 30.000 (Ft.)
841 Highest elevation = 334.800 (Ft.)
842 Lowest elevation = 327.500 (Ft.)
843 Elevation difference = 7.300 (Ft.) Slope = 24.333 %
844 Top of Initial Area Slope adjusted by User to 0.189 %
845 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
846 The maximum overland flow distance is 50.00 (Ft)
847 for the top area slope value of 0.19 %, in a development type of
848 1.0 DU/A or Less
849 In Accordance With Table 3-2
850 Initial Area Time of Concentration = 12.20 minutes
851 (for slope value of 0.50 %)
852 Rainfall intensity (I) = 5.187 (In/Hr) for a 100.0 year storm
853 Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
854 Subarea runoff = 0.014 (CFS)
855 Total initial stream area = 0.010 (Ac.)

856

857

858 ++++++

859 Process from Point/Station 1005.000 to Point/Station 1003.000

860 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

861

862 Estimated **mean** flow rate at midpoint of channel = 0.042 (CFS)
863 Depth of flow = 0.111 (Ft.), **Average** velocity = 3.401 (Ft/s)
864 ***** Irregular Channel Data *****

865 -----

866 Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	1.00
2	1.00	0.00
3	2.00	1.00

871 Manning's 'N' friction factor = 0.015

872 -----

873 Sub-Channel flow = 0.042 (CFS)
874 ' ' flow top width = 0.222 (Ft.)
875 ' ' velocity = 3.401 (Ft/s)
876 ' ' area = 0.012 (Sq.Ft)
877 ' ' Froude number = 2.543

878

879 Upstream point elevation = 327.500 (Ft.)
880 Downstream point elevation = 324.500 (Ft.)
881 Flow **length** = 34.000 (Ft.)
882 Travel time = 0.17 **min.**
883 Time of concentration = 12.37 **min.**
884 Depth of flow = 0.111 (Ft.)
885 **Average** velocity = 3.401 (Ft/s)
886 Total irregular channel flow = 0.042 (CFS)
887 Irregular channel normal depth above invert elev. = 0.111 (Ft.)
888 **Average** velocity of channel(s) = 3.401 (Ft/s)

889 Adding area flow to channel

890 Rainfall intensity (I) = 5.142 (In/Hr) for a 100.0 year storm

891 Decimal fraction soil group A = 1.000
892 Decimal fraction soil group B = 0.000
893 Decimal fraction soil group C = 0.000
894 Decimal fraction soil group D = 0.000
895 [LOW DENSITY RESIDENTIAL]
896 (1.0 DU/A or Less)
897 Impervious value, Ai = 0.100

898 Sub-Area C Value = 0.270
 899 Rainfall intensity = 5.142(In/Hr) for a 100.0 year storm
 900 Effective runoff coefficient used for total area
 901 (Q=KCIA) is C = 0.270 CA = 0.014
 902 Subarea runoff = 0.055(CFS) for 0.040(Ac.)
 903 Total runoff = 0.069(CFS) Total area = 0.050(Ac.)
 904 Depth of flow = 0.134(Ft.), Average velocity = 3.856(Ft/s)

907 +++++
 908 Process from Point/Station 1003.000 to Point/Station 1003.000
 909 **** CONFLUENCE OF MINOR STREAMS ****

911 Along Main Stream number: 3 in normal stream number 1
 912 Stream flow area = 0.050(Ac.)
 913 Runoff from this stream = 0.069(CFS)
 914 Time of concentration = 12.37 min.
 915 Rainfall intensity = 5.142(In/Hr)

918 +++++
 919 Process from Point/Station 1003.000 to Point/Station 1003.000
 920 **** USER DEFINED FLOW INFORMATION AT A POINT ****

921
 922 Decimal fraction soil group A = 1.000
 923 Decimal fraction soil group B = 0.000
 924 Decimal fraction soil group C = 0.000
 925 Decimal fraction soil group D = 0.000
 926 [MEDIUM DENSITY RESIDENTIAL]
 927 (7.3 DU/A or Less)
 928 Impervious value, Ai = 0.400
 929 Sub-Area C Value = 0.480
 930 Rainfall intensity (I) = 6.428(In/Hr) for a 100.0 year storm
 931 User specified values are as follows:
 932 TC = 8.75 min. Rain intensity = 6.43(In/Hr)
 933 Total area = 5.000(Ac.) Total runoff = 13.794(CFS)

936 +++++
 937 Process from Point/Station 1003.000 to Point/Station 1003.000
 938 **** CONFLUENCE OF MINOR STREAMS ****

940 Along Main Stream number: 3 in normal stream number 2
 941 Stream flow area = 5.000(Ac.)
 942 Runoff from this stream = 13.794(CFS)
 943 Time of concentration = 8.75 min.
 944 Rainfall intensity = 6.428(In/Hr)
 945 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	0.069	12.37	5.142
2	13.794	8.75	6.428
Qmax(1) =			
	1.000 *	1.000 *	0.069) +
	0.800 *	1.000 *	13.794) + = 11.105
Qmax(2) =			
	1.000 *	0.708 *	0.069) +
	1.000 *	1.000 *	13.794) + = 13.843

960 Total of 2 streams to confluence:
 961 Flow rates before confluence point:
 962 0.069 13.794
 963 Maximum flow rates at confluence using above data:
 964 11.105 13.843
 965 Area of streams before confluence:
 966 0.050 5.000

967 Results of confluence:
 968 Total flow rate = 13.843 (CFS)
 969 Time of concentration = 8.750 min.
 970 Effective stream area after confluence = 5.050 (Ac.)
 971
 972
 973 +-----+
 974 Process from Point/Station 1003.000 to Point/Station 106.000
 975 **** PIPEFLOW TRAVEL TIME (User specified size) ****
 976
 977 Upstream point/station elevation = 311.100 (Ft.)
 978 Downstream point/station elevation = 302.600 (Ft.)
 979 Pipe length = 209.00 (Ft.) Slope = 0.0407 Manning's N = 0.013
 980 No. of pipes = 1 Required pipe flow = 13.843 (CFS)
 981 Given pipe size = 18.00 (In.)
 982 Calculated individual pipe flow = 13.843 (CFS)
 983 Normal flow depth in pipe = 10.61 (In.)
 984 Flow top width inside pipe = 17.71 (In.)
 985 Critical Depth = 16.52 (In.)
 986 Pipe flow velocity = 12.78 (Ft/s)
 987 Travel time through pipe = 0.27 min.
 988 Time of concentration (TC) = 9.02 min.
 989
 990

991 +-----+
 992 Process from Point/Station 106.000 to Point/Station 106.000
 993 **** CONFLUENCE OF MAIN STREAMS ****
 994

995 The following data inside Main Stream is listed:
 996 In Main Stream number: 3
 997 Stream flow area = 5.050 (Ac.)
 998 Runoff from this stream = 13.843 (CFS)
 999 Time of concentration = 9.02 min.
 1000 Rainfall intensity = 6.302 (In/Hr)
 1001 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	10.482	8.39	6.603
2	5.047	10.21	5.819
3	13.843	9.02	6.302
Qmax (1) =			
	1.000 *	1.000 *	10.482) +
	1.000 *	0.822 *	5.047) +
	1.000 *	0.930 *	13.843) + = 27.506
Qmax (2) =			
	0.881 *	1.000 *	10.482) +
	1.000 *	1.000 *	5.047) +
	0.923 *	1.000 *	13.843) + = 27.065
Qmax (3) =			
	0.954 *	1.000 *	10.482) +
	1.000 *	0.884 *	5.047) +
	1.000 *	1.000 *	13.843) + = 28.306

1022
 1023 Total of 3 main streams to confluence:
 1024 Flow rates before confluence point:
 1025 10.482 5.047 13.843
 1026 Maximum flow rates at confluence using above data:
 1027 27.506 27.065 28.306
 1028 Area of streams before confluence:
 1029 2.827 2.170 5.050
 1030
 1031

1032 Results of confluence:
 1033 Total flow rate = 28.306 (CFS)
 1034 Time of concentration = 9.023 min.
 1035 Effective stream area after confluence = 10.047 (Ac.)

```

1036
1037
1038 *****
1039 Process from Point/Station      106.000 to Point/Station      107.000
1040 **** PIPEFLOW TRAVEL TIME (User specified size) ****
1041
1042 -----
1043 Upstream point/station elevation =  302.500 (Ft.)
1044 Downstream point/station elevation =  302.100 (Ft.)
1045 Pipe length =  31.00 (Ft.) Slope =  0.0129 Manning's N = 0.013
1046 No. of pipes = 1 Required pipe flow =  28.306 (CFS)
1047 Given pipe size =  18.00 (In.)
1048 NOTE: Normal flow is pressure flow in user selected pipe size.
1049 The approximate hydraulic grade line above the pipe invert is
1050       7.827 (Ft.) at the headworks or inlet of the pipe(s)
1051 Pipe friction loss =  2.250 (Ft.)
1052 Minor friction loss =  5.976 (Ft.) K-factor =  1.50
1053 Pipe flow velocity =  16.02 (Ft/s)
1054 Travel time through pipe =  0.03 min.
1055 Time of concentration (TC) =  9.05 min.
1056
1057 *****
1058 Process from Point/Station      107.000 to Point/Station      109.000
1059 **** PIPEFLOW TRAVEL TIME (User specified size) ****
1060
1061 -----
1062 Upstream point/station elevation =  302.100 (Ft.)
1063 Downstream point/station elevation =  285.720 (Ft.)
1064 Pipe length =  137.00 (Ft.) Slope =  0.1196 Manning's N = 0.013
1065 No. of pipes = 1 Required pipe flow =  28.306 (CFS)
1066 Given pipe size =  18.00 (In.)
1067 Calculated individual pipe flow =  28.306 (CFS)
1068 Normal flow depth in pipe =  11.95 (In.)
1069 Flow top width inside pipe =  17.00 (In.)
1070 Critical depth could not be calculated.
1071 Pipe flow velocity =  22.73 (Ft/s)
1072 Travel time through pipe =  0.10 min.
1073 Time of concentration (TC) =  9.16 min.
1074
1075 *****
1076 Process from Point/Station      109.000 to Point/Station      109.000
1077 **** CONFLUENCE OF MINOR STREAMS ****
1078
1079 -----
1080 Along Main Stream number: 1 in normal stream number 1
1081 Stream flow area =  10.047 (Ac.)
1082 Runoff from this stream =  28.306 (CFS)
1083 Time of concentration =  9.16 min.
1084 Rainfall intensity =  6.243 (In/Hr)
1085
1086 *****
1087 Process from Point/Station      2002.000 to Point/Station      2003.000
1088 **** INITIAL AREA EVALUATION ****
1089
1090 -----
1091 Decimal fraction soil group A = 0.000
1092 Decimal fraction soil group B = 0.000
1093 Decimal fraction soil group C = 1.000
1094 Decimal fraction soil group D = 0.000
1095 [COMMERCIAL area type                ]
1096 (General Commercial )
1097 Impervious value, Ai = 0.850
1098 Sub-Area C Value = 0.810
1099 Initial subarea total flow distance =  93.000 (Ft.)
1100 Highest elevation =  318.000 (Ft.)
1101 Lowest elevation =  316.300 (Ft.)
1102 Elevation difference =  1.700 (Ft.) Slope =  1.828 %
1103 Top of Initial Area Slope adjusted by User to  1.400 %
1104 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
1105 The maximum overland flow distance is  60.00 (Ft)

```

```

1105 for the top area slope value of 1.40%, in a development type of
1106 General Commercial
1107 In Accordance With Figure 3-3
1108 Initial Area Time of Concentration = 3.61 minutes
1109 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
1110 TC = [1.8*(1.1-0.8100)*( 60.000^.5)/( 1.400^(1/3)]= 3.61
1111 Calculated TC of 3.614 minutes is less than 5 minutes,
1112 resetting TC to 5.0 minutes for rainfall intensity calculations
1113 Rainfall intensity (I) = 9.222(In/Hr) for a 100.0 year storm
1114 Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
1115 Subarea runoff = 0.254(CFS)
1116 Total initial stream area = 0.034(Ac.)
1117
1118
1119 ++++++
1120 Process from Point/Station 2003.000 to Point/Station 2004.000
1121 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
1122
-----
1123 Estimated mean flow rate at midpoint of channel = 2.206(CFS)
1124 Depth of flow = 0.250(Ft.), Average velocity = 1.603(Ft/s)
1125 ***** Irregular Channel Data *****
1126 -----
1127 Information entered for subchannel number 1 :
1128 Point number 'X' coordinate 'Y' coordinate
1129 1 0.00 0.31
1130 2 26.00 0.13
1131 3 27.50 0.00
1132 4 27.50 0.50
1133 Manning's 'N' friction factor = 0.015
1134 -----
1135 Sub-Channel flow = 2.206(CFS)
1136 ' ' flow top width = 18.940(Ft.)
1137 ' ' velocity= 1.603(Ft/s)
1138 ' ' area = 1.376(Sq.Ft)
1139 ' ' Froude number = 1.048
1140
1141 Upstream point elevation = 316.300(Ft.)
1142 Downstream point elevation = 310.800(Ft.)
1143 Flow length = 625.000(Ft.)
1144 Travel time = 6.50 min.
1145 Time of concentration = 10.11 min.
1146 Depth of flow = 0.250(Ft.)
1147 Average velocity = 1.603(Ft/s)
1148 Total irregular channel flow = 2.206(CFS)
1149 Irregular channel normal depth above invert elev. = 0.250(Ft.)
1150 Average velocity of channel(s) = 1.603(Ft/s)
1151 Adding area flow to channel
1152 Rainfall intensity (I) = 5.855(In/Hr) for a 100.0 year storm
1153 User specified 'C' value of 0.804 given for subarea
1154 Rainfall intensity = 5.855(In/Hr) for a 100.0 year storm
1155 Effective runoff coefficient used for total area
1156 (Q=KCIA) is C = 0.804 CA = 0.700
1157 Subarea runoff = 3.848(CFS) for 0.837(Ac.)
1158 Total runoff = 4.102(CFS) Total area = 0.871(Ac.)
1159 Depth of flow = 0.289(Ft.), Average velocity = 1.862(Ft/s)
1160
1161
1162 ++++++
1163 Process from Point/Station 2000.000 to Point/Station 109.000
1164 **** SUBAREA FLOW ADDITION ****
1165
-----
1166 Rainfall intensity (I) = 5.855(In/Hr) for a 100.0 year storm
1167 Decimal fraction soil group A = 0.100
1168 Decimal fraction soil group B = 0.000
1169 Decimal fraction soil group C = 0.900
1170 Decimal fraction soil group D = 0.000
1171 [MEDIUM DENSITY RESIDENTIAL ]
1172 (14.5 DU/A or Less )
1173 Impervious value, Ai = 0.500

```

1174 Sub-Area C Value = 0.595
 1175 Time of concentration = 10.11 min.
 1176 Rainfall intensity = 5.855(In/Hr) for a 100.0 year storm
 1177 Effective runoff coefficient used for total area
 1178 (Q=KCIA) is C = 0.719 CA = 1.057
 1179 Subarea runoff = 2.090(CFS) for 0.600(Ac.)
 1180 Total runoff = 6.192(CFS) Total area = 1.471(Ac.)
 1181
 1182

1183 +++++
 1184 Process from Point/Station 2001.000 to Point/Station 109.000
 1185 **** SUBAREA FLOW ADDITION ****
 1186

1187 Rainfall intensity (I) = 5.855(In/Hr) for a 100.0 year storm
 1188 Decimal fraction soil group A = 0.000
 1189 Decimal fraction soil group B = 0.000
 1190 Decimal fraction soil group C = 1.000
 1191 Decimal fraction soil group D = 0.000
 1192 [COMMERCIAL area type]
 1193 (Neighborhood Commercial)
 1194 Impervious value, Ai = 0.800
 1195 Sub-Area C Value = 0.780
 1196 Time of concentration = 10.11 min.
 1197 Rainfall intensity = 5.855(In/Hr) for a 100.0 year storm
 1198 Effective runoff coefficient used for total area
 1199 (Q=KCIA) is C = 0.733 CA = 1.409
 1200 Subarea runoff = 2.060(CFS) for 0.451(Ac.)
 1201 Total runoff = 8.252(CFS) Total area = 1.922(Ac.)
 1202
 1203

1204 +++++
 1205 Process from Point/Station 2004.000 to Point/Station 109.000
 1206 **** PIPEFLOW TRAVEL TIME (User specified size) ****
 1207

1208 Upstream point/station elevation = 306.830(Ft.)
 1209 Downstream point/station elevation = 285.720(Ft.)
 1210 Pipe length = 211.00(Ft.) Slope = 0.1000 Manning's N = 0.013
 1211 No. of pipes = 1 Required pipe flow = 8.252(CFS)
 1212 Given pipe size = 18.00(In.)
 1213 Calculated individual pipe flow = 8.252(CFS)
 1214 Normal flow depth in pipe = 6.11(In.)
 1215 Flow top width inside pipe = 17.05(In.)
 1216 Critical Depth = 13.35(In.)
 1217 Pipe flow velocity = 15.60(Ft/s)
 1218 Travel time through pipe = 0.23 min.
 1219 Time of concentration (TC) = 10.34 min.
 1220
 1221

1222 +++++
 1223 Process from Point/Station 109.000 to Point/Station 109.000
 1224 **** CONFLUENCE OF MINOR STREAMS ****
 1225

1226 Along Main Stream number: 1 in normal stream number 2
 1227 Stream flow area = 1.922(Ac.)
 1228 Runoff from this stream = 8.252(CFS)
 1229 Time of concentration = 10.34 min.
 1230 Rainfall intensity = 5.773(In/Hr)
 1231 Summary of stream data:
 1232

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	28.306	9.16	6.243
2	8.252	10.34	5.773
Qmax(1) =			
	1.000 *	1.000 *	28.306) +
	1.000 *	0.886 *	8.252) + = 35.615
Qmax(2) =			

1243 0.925 * 1.000 * 28.306) +
1244 1.000 * 1.000 * 8.252) + = 34.427
1245
1246 Total of 2 streams to confluence:
1247 Flow rates before confluence point:
1248 28.306 8.252
1249 Maximum flow rates at confluence using above data:
1250 35.615 34.427
1251 Area of streams before confluence:
1252 10.047 1.922
1253 Results of confluence:
1254 Total flow rate = 35.615 (CFS)
1255 Time of concentration = 9.155 min.
1256 Effective stream area after confluence = 11.969 (Ac.)
1257 End of computations, total study area = 11.969 (Ac.)
1258
1259
1260