Hydrology Study

Multi-Family Residential Apartments
1398 Lieta Street
San Diego, CA 92110

Prepared For:

Almeria Investment LP
1398 Lieta Street
San Diego, CA 92110

Prepared By:

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CLW No. 1192-D

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D-Sheet No. XXXXX-D IO No. XXXXXXXX Project No. XXXXXX

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INTRODUCTION

Determine storm water runoff and site drainage for a 50 year storm event for a new proposed multi-family residential apartment development in the City of San Diego, California. The project site is located at 1398 Lieta Street in San Diego. The APN is 430-680-09 and is approximately 26,856 SF.

The proposed site developments consist of removing the existing residential building, paved asphalt driveway, clearing and grubbing for two (2) new multi-family residential apartment building with a private driveway. Incidental underground utilities, retaining walls, hardscape, site landscaping, and vehicular pavement are also proposed with this development. See Attachment 1 for site location and vicinity maps.

DESIGN CRITERIA AND ASSUMPTIONS

1. C factors were based on the City of San Diego Drainage Design Manual (1984) Table 2 page 82:
   - The existing condition utilized a C factor of 0.84 for the first 80 feet of travel, then a C factor of 0.48 for the rest of the site. The proposed condition utilized a C factor of 0.95, 0.83 and 0.35 for the different drainage basins. See Attachment 2 for the City of San Diego Hydrology Manual (1984) criteria.
2. Hydrologic calculations were performed using the CIVILCAD/CIVILDESIGN Engineering software version 7.6 per the Rational Hydrology Method as outlined within the City of San Diego Drainage Design Manual (1984). The hydrology calculations for proposed and existing conditions may be found within the hydrology calculations section of this report.

DISCUSSION

EXISTING CONDITIONS

The site is currently developed and comprises of two hydrologic basin. The site also takes on a small offsite drainage area from Tonopah Ave. See Attachment 5 for existing drainage patterns.

Below is a summary of pre-development criteria for the subject property:

TABLE 1: 50 YEAR PRE-DEVELOPMENT CRITERIA

Node	C	Tc (Min.)	Area (acre)	Rainfall Intensity (In/Hr)	Q50 (cfs)
103	0.84	9.66	0.633	3.235	1.177
TOTAL			0.633		1.177

PROPOSED CONDITIONS

The proposed conditions will consist of three basins and a small offsite area that drains through the proposed development. See Attachment 6 for proposed drainage patterns.

The proposed drainage for basin one will sheet flow toward a grate inlet located at the westmost of the property limit, then piped east into a biofiltration basin. The second basin will mainly include roof drainage discharging via downspouts and nearby landscaping toward the biofiltration basin. After treatment, storm water will be piped and discharge onto Morena Blvd's curb and gutter. The third basin will remain fairly untouched, with very minor grading and will drain north. Drainage from all three basins will discharge onto Morena Blvd similar to the existing drainage pattern. Since the offsite drainage area is small, there is no need to route it around the proposed development. The offsite drainage will drain into drainage basin one and ends up in the biofiltration basin as well.

See Attachment 4 for the proposed hydrology calculations. The proposed hydrologic conditions are summarized below:

TABLE 2: 50 YEAR POST-DEVELOPMENT CRITERIA WITHOUT DETENTION					
Node	**C**	**Tc (Min.)**	**Area (acre)**	**Rainfall Intensity (In/Hr)**	**Q50 (cfs)**
204	0.95	6.05	0.579	4.27	2.827
303	0.35	8.53	0.055	3.43	0.08
TOTAL			0.634		2.835

TABLE 3: 50 YEAR POST-DEVELOPMENT CRITERIA WITH DETENTION					
Node	**C**	**Tc (Min.)**	**Area (acre)**	**Rainfall Intensity (In/Hr)**	**Q50 (cfs)**
204	0.95	10.21	0.579	4.27	1.030
303	0.35	8.53	0.055	3.43	0.08
TOTAL			0.634		1.110

The project will decrease the peak flow rate by 0.061 cfs.

DISCUSSION AND CONCLUSION

A hydrologic analysis has been conducted for the subject for a 50 year storm event. The site peak runoff will be decreased by 0.061 cfs. The site will discharge treated stormwater to Morena Blvd via a curb outlet. The ungraded area will add a catch basin at the lowest point to collect storm water, preventing erosion to the existing slopes. Stormwater will be pipe and discharge onto Morena Blvd via a sidewalk underdrain. The proposed development will maintain drainage pattern similar to the existing condition. The proposed devevelopment will drain directly into the Bay, therefore, no impacts will be made to streams and wetlands as stated in section 401 or 404.

DECLARATION OF RESPONSIBLE CHARGE

I, hereby declare that I am the Engineer of Work for this project, that I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions code, and that the design is consistent with current standards.

I understand that the check of project drawings and specifications by the City of San Diego is confined to a review only and does not relieve me, as Engineer of Work of my responsibility for project design.

ENGINEER OF WORK:

Civil Landworks Corporation
110 Copperwood Way Suite P,
Oceanside CA, USA 92058

_____ 1-5-17

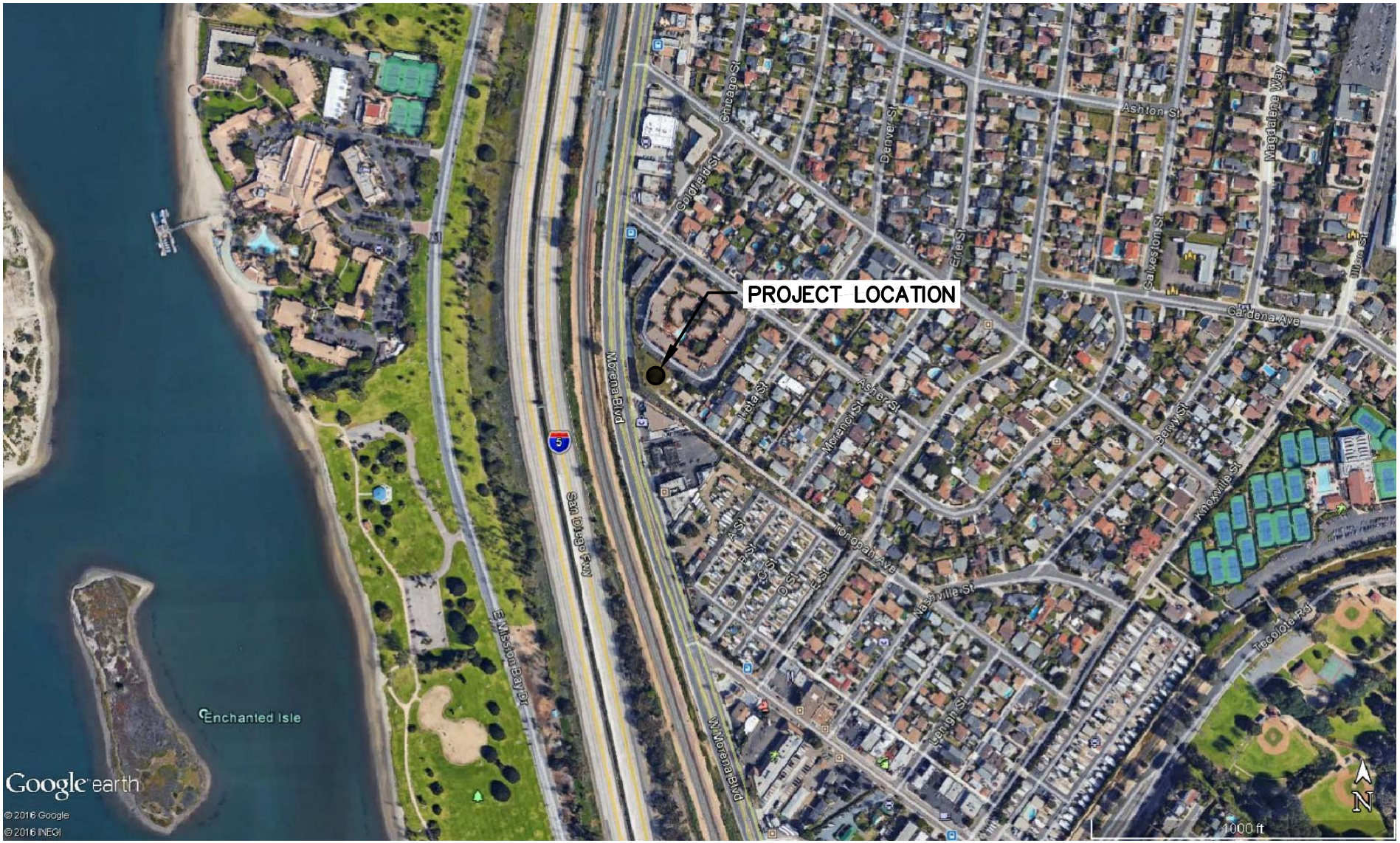
David V. Caron — Date
R.C.E. 70066
Exp. 9-30-16

REFERENCES

1. City of San Diego Drainage Design Manual (April 1984).
2. CIVILCADD/CIVILDESIGN Engineering Software, © 1991-2006 Version 7.6. City of San Diego Method.

ATTACHMENT 1

LOCATION MAP



SITE LOCATION MAP

DATE: 7-19-16	LIETA STREET	
SCALE: AS SHOWN		DRAWN BY: P. NONG

SITE VICINITY MAP

DATE: 7-19-16	LIETA STREET	
SCALE: AS SHOWN		DRAWN BY: P. NONG

ATTACHMENT 2

CITY OF SAN DIEGO MANUAL EXCERPTS

TABLE 2

RUNOFF COEFFICIENTS (RATIONAL METHOD)

DEVELOPED AREAS (URBAN)

Land Use	Coefficient, C Soil Type (1)
Residential:	D
Single Family	.55
Multi-Units	.70
Mobile Homes	.65
Rural (lots greater than 1/2 acre)	.45
Commercial (2) 80% Impervious	.85
Industrial (2) 90% Impervious	.95

NOTES:

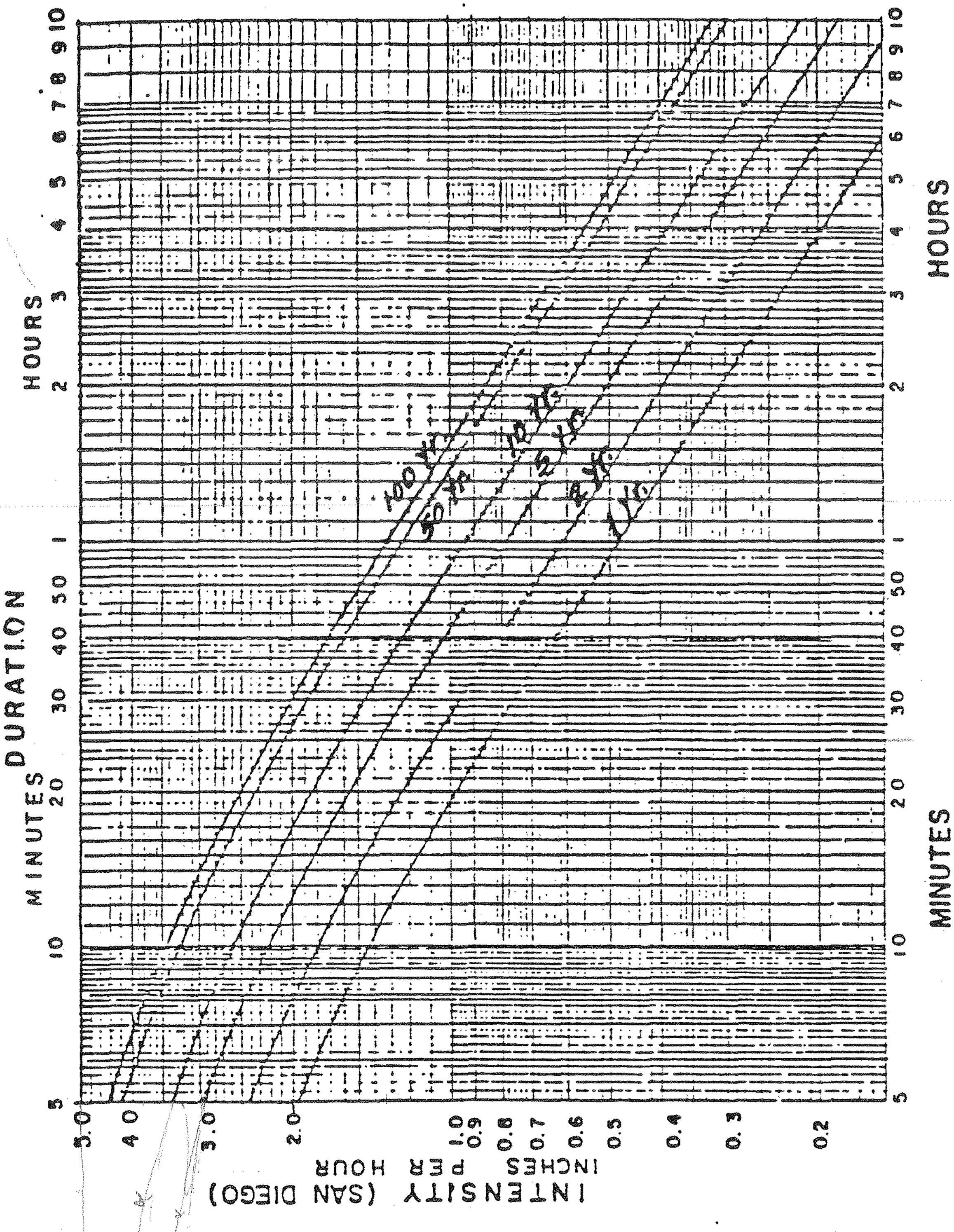
(1) Type D soil to be used for all areas.

(2) Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in no case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%

Tabulated imperviousness = 80%

Revised C = $\frac{50}{80}$ x 0.85 = 0.53



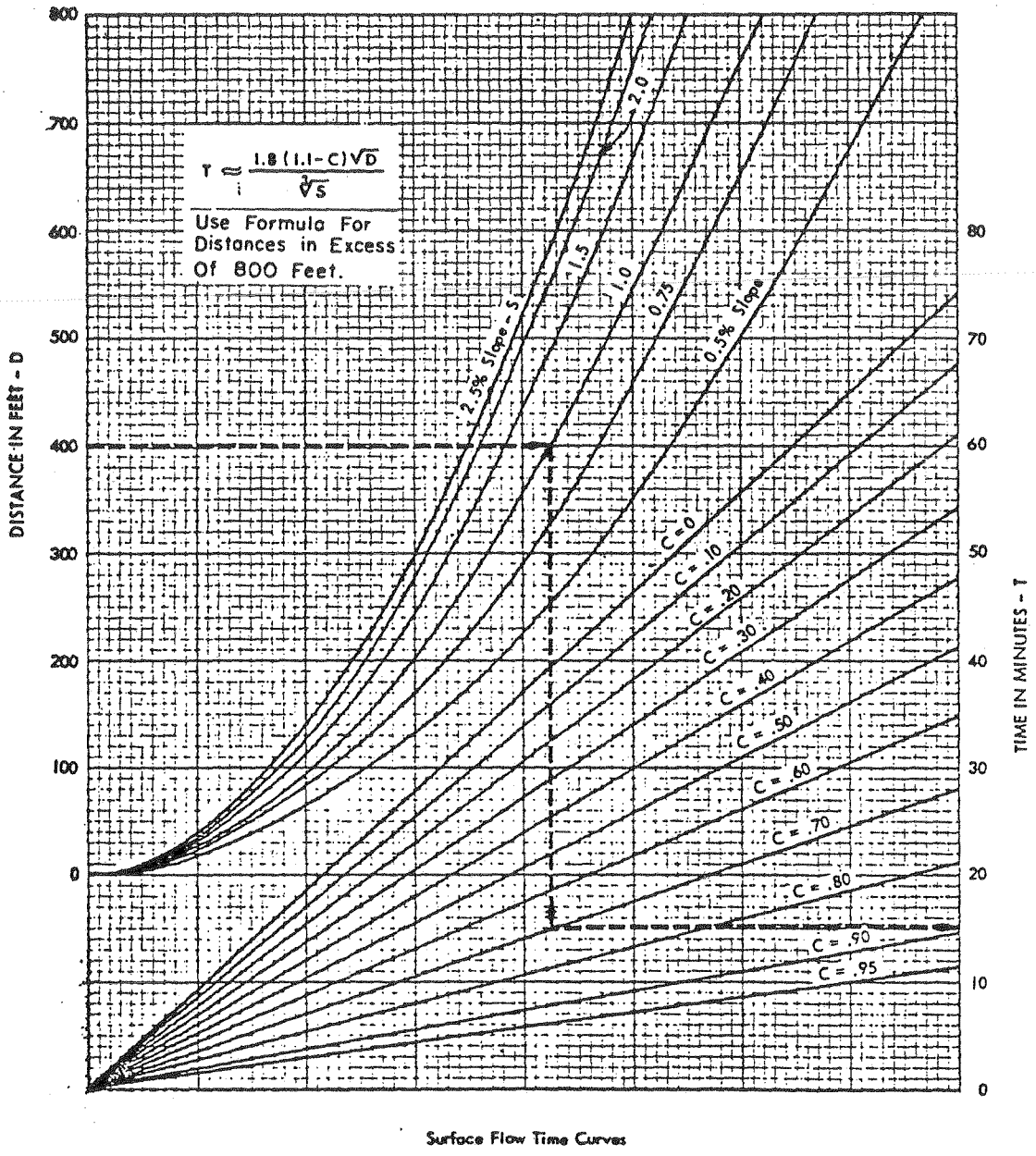
ELEV.	FACTOR
0–1500	1.00
1500–3000	1.25
3000–4000	1.42
4000–5000	1.60
5000–6000	1.70
DESERT	1.25

To obtain correct intensity, multiply intensity on chart by factor for design elevation.

RAINFALL INTENSITY – DURATION – FREQUENC CURVES for COUNTY OF SAN DIEGO

APPENDIX I

URBAN AREAS OVERLAND TIME OF FLOW CURVES



Surface Flow Time Curves

EXAMPLE:

GIVEN: LENGTH OF FLOW = 400 FT.
SLOPE = 1.0 %
COEFFICIENT OF RUNOFF C = .70

READ: OVERLAND FLOWTIME = 15 MINUTES

APPENDIX II

MODIFIED RATIONAL METHOD

1. Divide drainage area into subareas of from 20 to 100 acres. These divisions should, if possible, be based on the topography, soil type, and the land development. The size of the initial area should be chosen such that the length of travel for the water from the most remote point to the point of concentration should not exceed 1,000 ft., and if possible be near 500 ft.

2. Determine the quantity of water for the initial area.

   (a) Estimate the initial time of concentration using Appendix X-A and X-B for rural areas, and Appendix X-C for urban areas. (See attached sheets).

   (b) Obtain the intensity from Appendix XI (also attached). Frequency of the design storm shall be in accordance with 1-102.2 Design Runoff.

   (c) Obtain coefficient C from Appendix IX-B.

   (d) Determine Area A in acres.

   (e) Calculate the discharge Q using rational formula Q = CIA.

   (f) Estimate the travel time to the next point of concentration.

   (g) Add this time to the initial Tc to obtain a new time of concentration.

   (h) Calculate a new Q for the second sub area by using this new Tc and continuing with 2. (b) above. Continue adding sub areas along the main line until a junction with a tributary is reached.

3. When a junction is reached, start at the upper end of the tributary area and calculate its Q as was done before, down to the junction.

   (a) Compute the peak Q at each junction. Let Q_A, T_A, I_A correspond to the tributary area with the longer time of concentration. Let Q_B, T_B, I_B correspond to the tributary area with the shorter time of concentration and Q_p, T_p correspond to the peak Q and time of concentration when the peak flow occurs.

   (b) If the tributary areas have the same time of concentration, the tributary q's are added to obtain the peak Q.

$$Q_p = Q_A + Q_B \qquad T_p = T_A = T_B$$

(c) If the tributary areas have different time of concentration, the smaller of the tributary Q's must be corrected as follows:

(1) The usual case is where the tributary area with the longer time of concentration has the larger Q. In this case, the smaller Q is corrected by a ratio of the intensities and added to the larger Q to obtain the peak Q. The tabling is then continued downstream using the longer time of concentration.

$$Q_p = Q_A + Q_B \frac{I_A}{I_B} \qquad T_p = T_A$$

(2) In some cases, the tributary area with the shorter time of concentration has the larger Q. In this case, the smaller Q is corrected by a ratio of the times of concentration and added to the larger Q to obtain the peak Q. The tabling is then continued downstream using the shorter time of concentration.

$$Q_p = Q_B + Q_A \frac{T_B}{T_A} \qquad T_p = T_B$$

ATTACHMENT 3

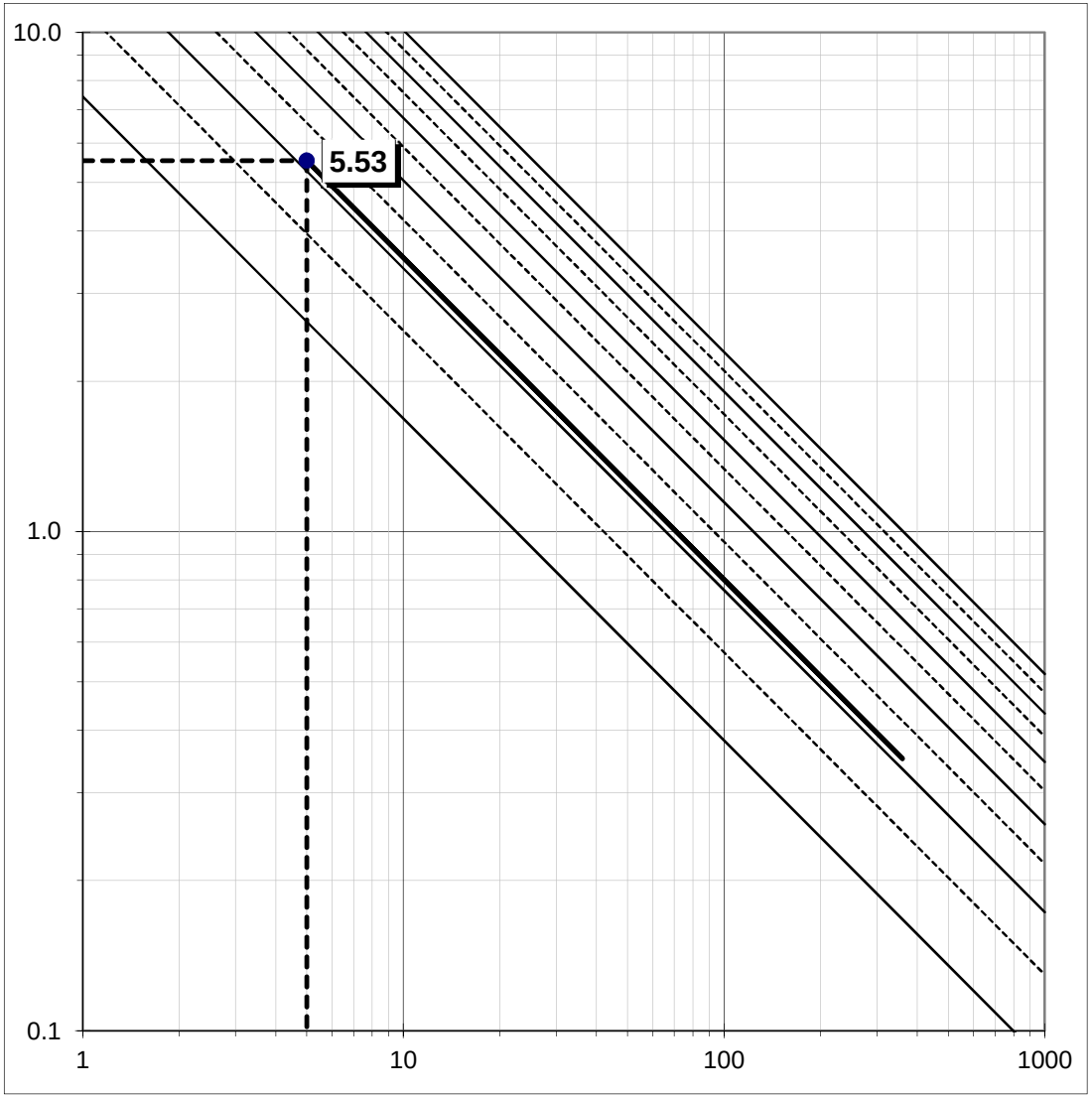
EXISTING HYDROLOGY CALCULATIONS

AREA CALCULATIONS

EXISTING HYDROLOGIC BASINS

Basin Number	Total Area SF	Total Area Acres	Impervious Area SF	Landscape Area SF	Pervious Pavers SF	Percent Impervious	C Value Weighted
EX-1	1,963	0.045	1,476	487	0	75.19%	0.84
EX-2	24,893	0.571	4,876	20,017	0	19.59%	0.48
OFFSITE	735	0.017	538	197	0	73.20%	0.83
TOTAL	27,591	0.633	6,890	20,701	0	24.97%	

Based on Soil Type D



EX

Existing Conditions

Time of Concentration Calculations

Overland Flow Method

Land Use =

C = 0.84

Dist. = 85.00 ft.

slope = 2.470 %

***T$_c$** = 5.00 min.

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

* Minimum T_c = 5 Minutes

Natural Watershed (Kirpich)

L = na ft

ΔE = na ft

****T$_c$** = #VALUE! min.

$$T_C = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

** Minimum T_c = 10 Minutes

Basin Intensity Calculations

Selected Frequency, **50** year

P_6 = 2.1 in. — P_6 must be within

P_{24} = 3.5 in. — 45% to 65% of P_{24}.

P_6 / P_{24} = 60% — Adjust P_6 as needed.

Adjusted **P_6**= 2.10 in.

T_c (**D**) = 5.00 min.

I = 5.53 in/hr

$$I = 7.44 P_6 D^{-0.645}$$

Basin Flow Calculations

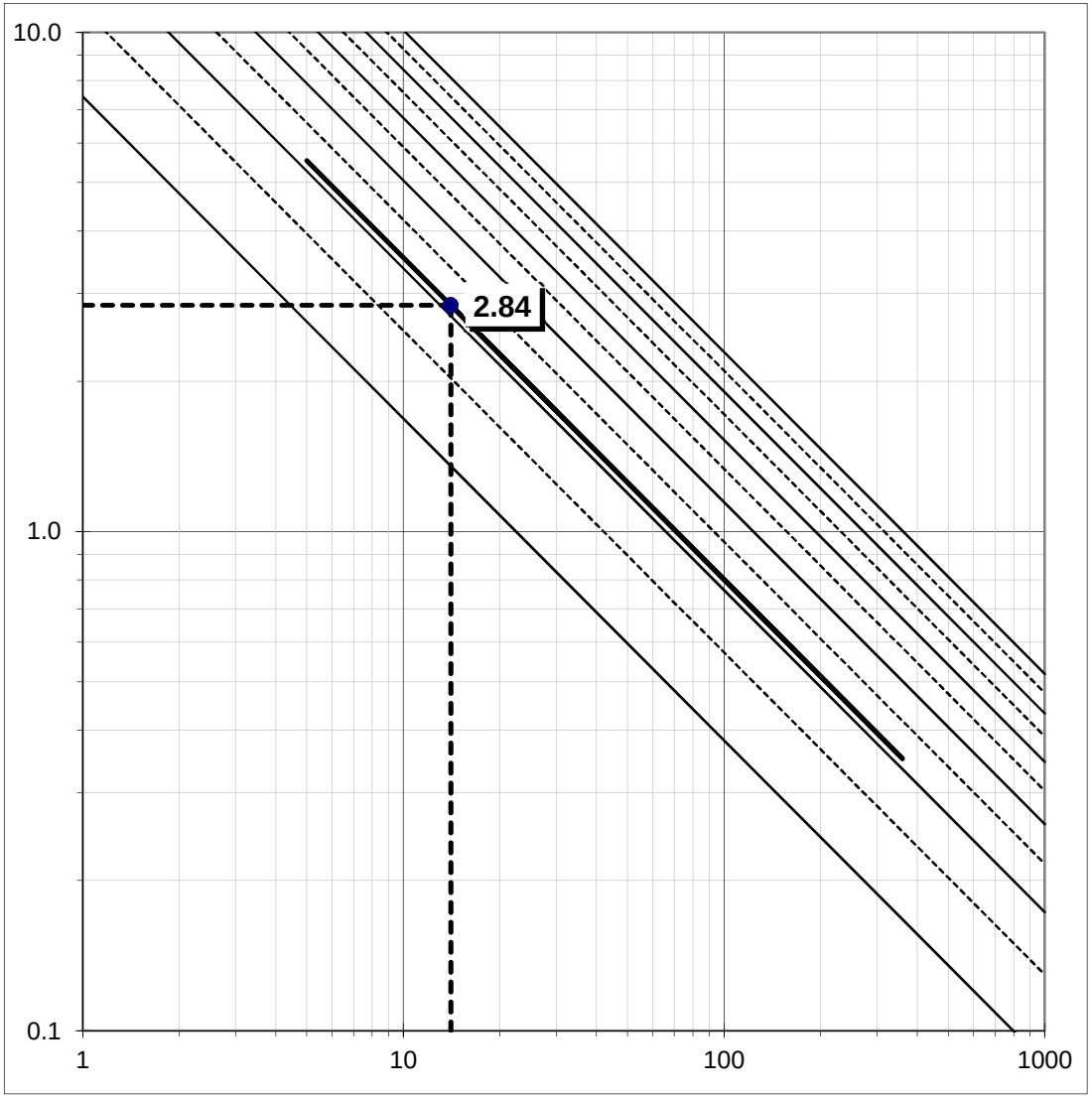
Q = 0.21 cfs

C = 0.84

I = 5.53 in/hr

A = 0.045 ac.

$$Q = C * I * A$$



EX

Existing Conditions

Time of Concentration Calculations

Overland Flow Method

Land Use =

C = 0.48

Dist. = 297.00 ft.

slope = 2.560 %

***T$_c$** = 14.06 min.

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

* Minimum T_c = 5 Minutes

Natural Watershed (Kirpich)

L = na ft

ΔE = na ft

****T$_c$** = #VALUE! min.

$$T_C = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

** Minimum T_c = 10 Minutes

Basin Intensity Calculations

Selected Frequency, **50** year

P_6 = 2.1 in. P_6 must be within

P_{24} = 3.5 in. 45% to 65% of P_{24}.

P_6 / P_{24} = 60% Adjust P_6 as needed.

Adjusted **P_6**= 2.10 in.

T_c (**D**) = 14.06 min.

I = 2.84 in/hr

$$I = 7.44 P_6 D^{-0.645}$$

Basin Flow Calculations

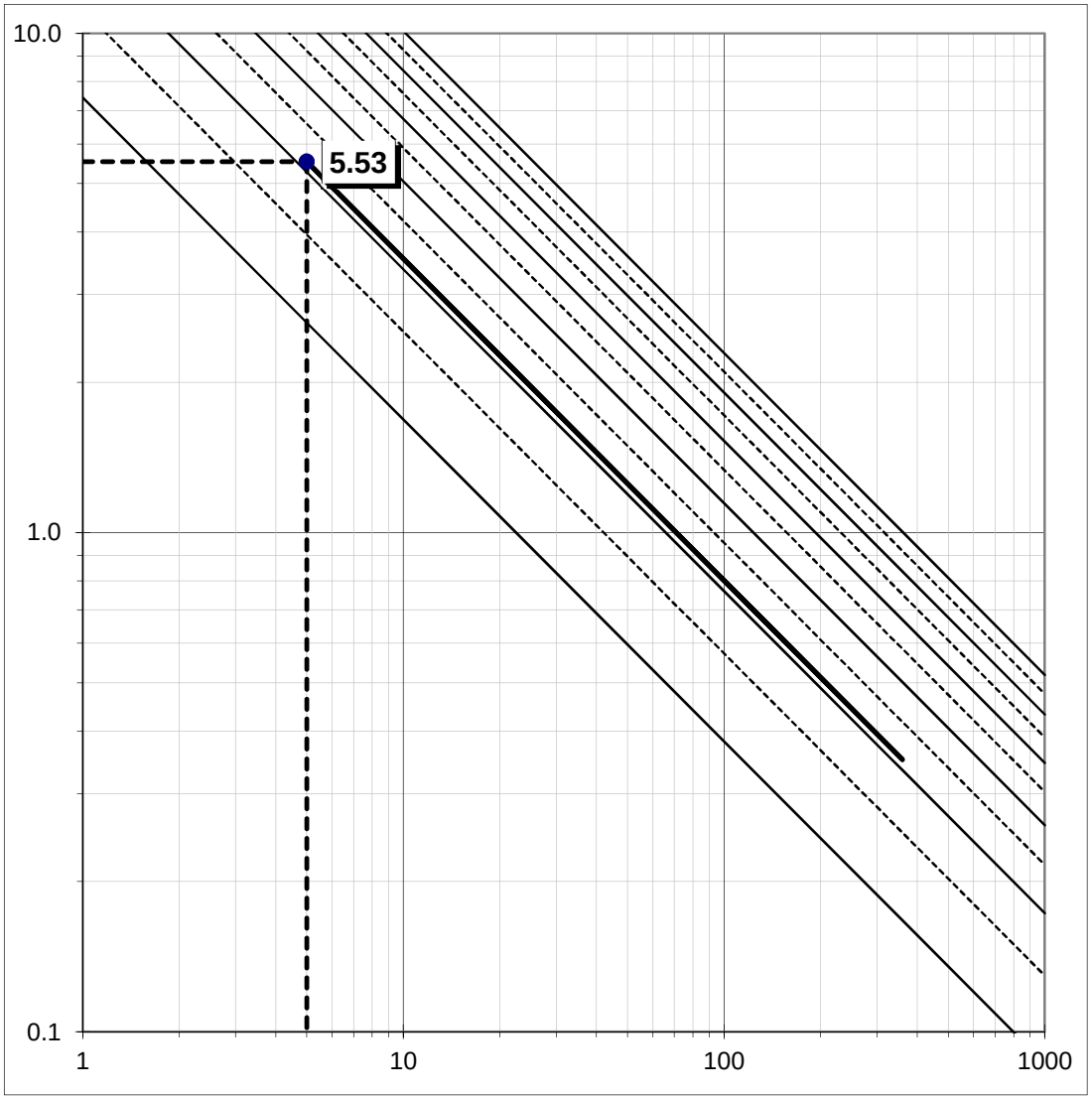
Q = **0.78** **cfs**

C = 0.48

I = 2.84 in/hr

A = 0.571 ac.

$$Q = C * I * A$$



PR-1

Proposed Conditions

Time of Concentration Calculations

Overland Flow Method

Land Use =

C = 0.83

Dist. = 39.00 ft.

slope = 2.560 %

***T$_c$** = 5.00 min.

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

* Minimum T_c = 5 Minutes

Natural Watershed (Kirpich)

L = 0 ft

ΔE = 0 ft

****T$_c$** = #DIV/0! min.

$$T_C = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

** Minimum T_c = 10 Minutes

Basin Intensity Calculations

Selected Frequency, **50** year

P_6 = 2.1 in. — P_6 must be within

P_{24} = 3.5 in. — 45% to 65% of P_{24}.

P_6 / P_{24} = 60% — Adjust P_6 as needed.

Adjusted **P_6**= 2.10 in.

T_c (**D**) = 5.00 min.

I = 5.53 in/hr

$$I = 7.44 P_6 D^{-0.645}$$

Basin Flow Calculations

Q = 0.08 cfs

C = 0.83

I = 5.53 in/hr

A = 0.017 ac.

$$Q = C * I * A$$

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology program based on
San Diego County Flood Control Division 1985 hydrology manual
Rational Hydrology Study Date: 01/09/17

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

Program License Serial Number 6313

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

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity) = 1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method

++

Process from Point/Station 201.000 to Point/Station 101.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.830 given for subarea
Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm
User specified values are as follows:
TC = 5.00 min. Rain intensity = 4.27(In/Hr)
Total area = 0.017(Ac.) Total runoff = 0.080(CFS)

++

Process from Point/Station 201.000 to Point/Station 101.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 0.017(Ac.)
Runoff from this stream = 0.080(CFS)
Time of concentration = 5.00 min.
Rainfall intensity = 4.265(In/Hr)

++

Process from Point/Station 101.000 to Point/Station 102.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.840 given for subarea
Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm
User specified values are as follows:
TC = 5.00 min. Rain intensity = 4.27(In/Hr)
Total area = 0.045(Ac.) Total runoff = 0.210(CFS)

++

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

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.045(Ac.)
Runoff from this stream = 0.210(CFS)
Time of concentration = 5.00 min.
Rainfall intensity = 4.265(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	0.080	5.00	4.265
2	0.210	5.00	4.265

Qmax(1) =
1.000 * 1.000 * 0.080) +
1.000 * 1.000 * 0.210) + = 0.290
Qmax(2) =
1.000 * 1.000 * 0.080) +
1.000 * 1.000 * 0.210) + = 0.290

Total of 2 streams to confluence:
Flow rates before confluence point:
0.080 0.210
Maximum flow rates at confluence using above data:
0.290 0.290
Area of streams before confluence:
0.017 0.045
Results of confluence:
Total flow rate = 0.290(CFS)
Time of concentration = 5.000 min.
Effective stream area after confluence = 0.062(Ac.)

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

Estimated mean flow rate at midpoint of channel = 1.625(CFS)
Depth of flow = 0.124(Ft.), Average velocity = 1.062(Ft/s)
******* Irregular Channel Data **********

Information entered for subchannel number 1 :

Point number	'X' coordinate	'Y' coordinate
1	0.00	0.31
2	31.00	0.00
3	62.00	0.31

Manning's 'N' friction factor = 0.035

Sub-Channel flow = 1.625(CFS)
' ' flow top width = 24.741(Ft.)
' ' velocity= 1.062(Ft/s)
' ' area = 1.530(Sq.Ft)
' ' Froude number = 0.753

Upstream point elevation = 46.000(Ft.)
Downstream point elevation = 38.400(Ft.)
Flow length = 297.000(Ft.)
Travel time = 4.66 min.
Time of concentration = 9.66 min.
Depth of flow = 0.124(Ft.)

EX

```
Average velocity =   1.062(Ft/s)
Total irregular channel flow =     1.625(CFS)
Irregular channel normal depth above invert elev. =   0.124(Ft.)
Average velocity of channel(s) =   1.062(Ft/s)

Sub-Channel No. 1 Critical depth =      0.110(Ft.)
  '     '       '     Critical flow top width =     22.070(Ft.)
  '     '       '     Critical flow velocity=    1.335(Ft/s)
  '     '       '     Critical flow area =      1.218(Sq.Ft)

 Adding area flow to channel
User specified 'C' value of 0.480 given for subarea
Rainfall intensity =      3.235(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.480
Subarea runoff =      0.887(CFS) for    0.571(Ac.)
Total runoff =      1.177(CFS)  Total area =        0.63(Ac.)
End of computations, total study area =           0.633 (Ac.)
```

ATTACHMENT 4

PROPOSED HYDROLOGY CALCULATIONS

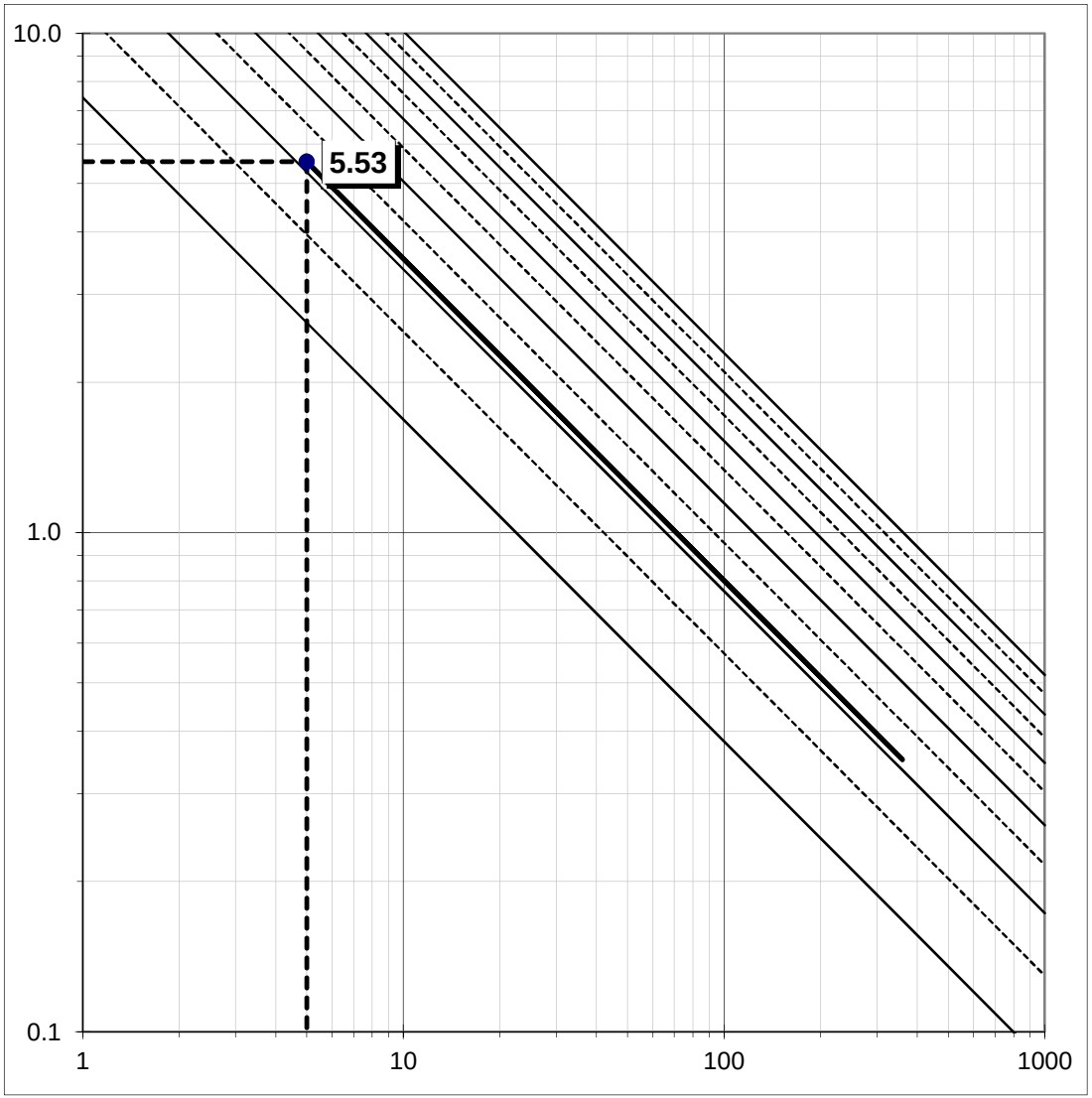
PROPOSED HYDROLOGY CALCULATIONS

WITHOUT DETENTION

AREA CALCULATIONS

PROPOSED HYDROLOGIC BASINS

Basin Number	Total Area SF	Total Area Acres	Impervious Area SF	Landscape Area SF	Pervious Pavers SF	Percent Impervious	C Value Weighted
PR-1	13,700	0.315	12,684	1,016	0	93%	0.95
PR-2	10,763	0.247	7,953	2,810	0	74%	0.83
PR-3	2,393	0.055	0	2,393	0	0%	0.35
OFFSITE	735	0.017	538	197	0	73.20%	0.83
TOTAL	27,591	0.633	21,175	6,416	0	77%	



PR-1

Proposed Conditions

Time of Concentration Calculations

Overland Flow Method

Land Use =

C = 0.83

Dist. = 39.00 ft.

slope = 2.560 %

***T$_c$** = 5.00 min.

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

* Minimum T_c = 5 Minutes

Natural Watershed (Kirpich)

L = 0 ft

ΔE = 0 ft

****T$_c$** = #DIV/0! min.

$$T_C = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

** Minimum T_c = 10 Minutes

Basin Intensity Calculations

Selected Frequency, **50** year

P_6 = 2.1 in. — P_6 must be within

P_{24} = 3.5 in. — 45% to 65% of P_{24}.

P_6 / P_{24} = 60% — Adjust P_6 as needed.

Adjusted **P_6**= 2.10 in.

T_c (**D**) = 5.00 min.

I = 5.53 in/hr

$$I = 7.44 P_6 D^{-0.645}$$

Basin Flow Calculations

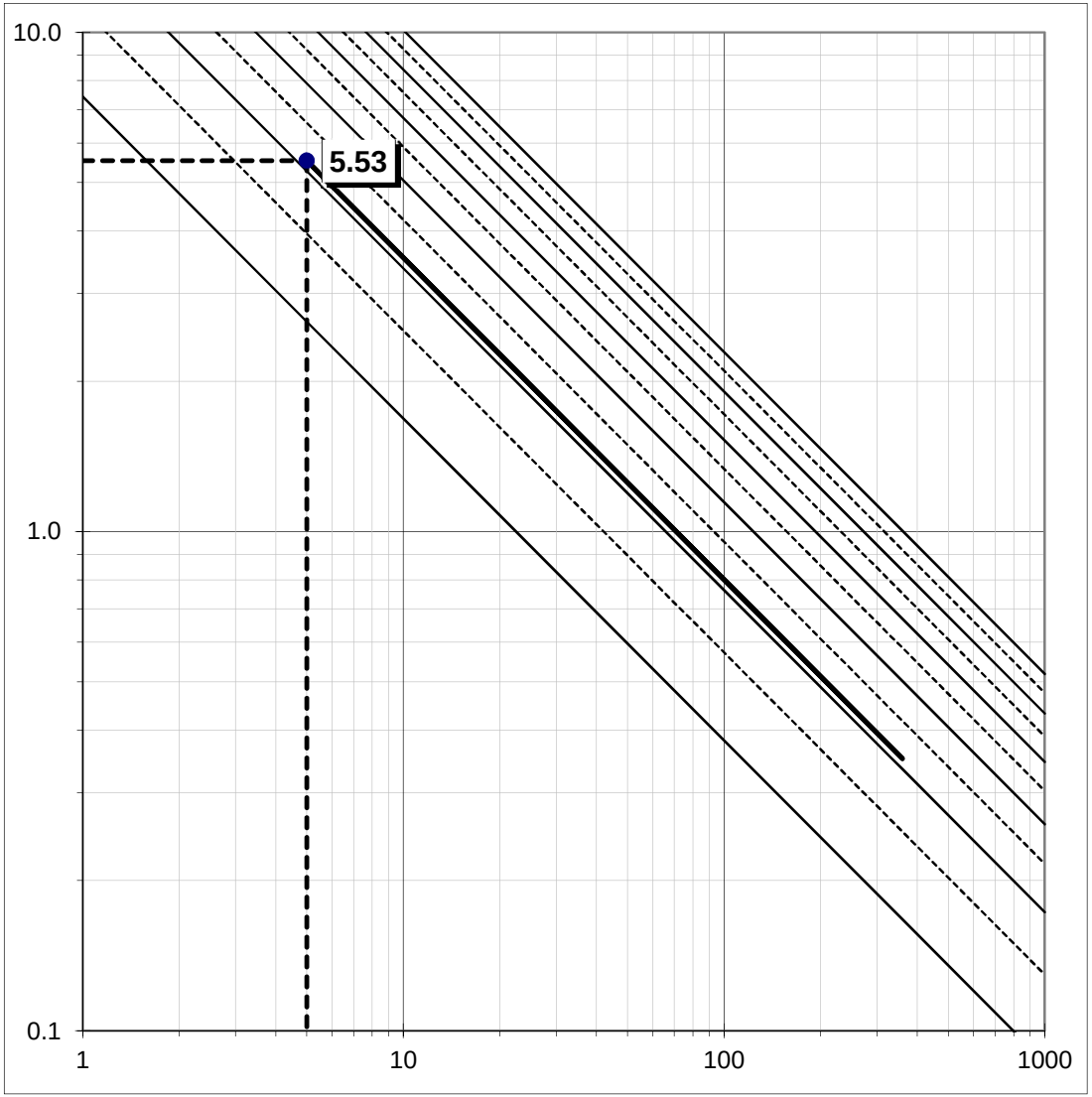
Q = 0.08 cfs

C = 0.83

I = 5.53 in/hr

A = 0.017 ac.

$$Q = C * I * A$$



PR-1

Proposed Conditions

Time of Concentration Calculations

Overland Flow Method

Land Use =

C = 0.95

Dist. = 219.00 ft.

slope = 1.930 %

***T$_c$** = 5.00 min.

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

* Minimum T_c = 5 Minutes

Natural Watershed (Kirpich)

L = 0 ft

ΔE = 0 ft

****T$_c$** = #DIV/0! min.

$$T_C = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

** Minimum T_c = 10 Minutes

Basin Intensity Calculations

Selected Frequency, **50** year

P_6 = 2.1 in. — P_6 must be within

P_{24} = 3.5 in. — 45% to 65% of P_{24}.

P_6 / P_{24} = 60% — Adjust P_6 as needed.

Adjusted **P_6**= 2.10 in.

T_c (**D**) = 5.00 min.

I = 5.53 in/hr

$$I = 7.44 P_6 D^{-0.645}$$

Basin Flow Calculations

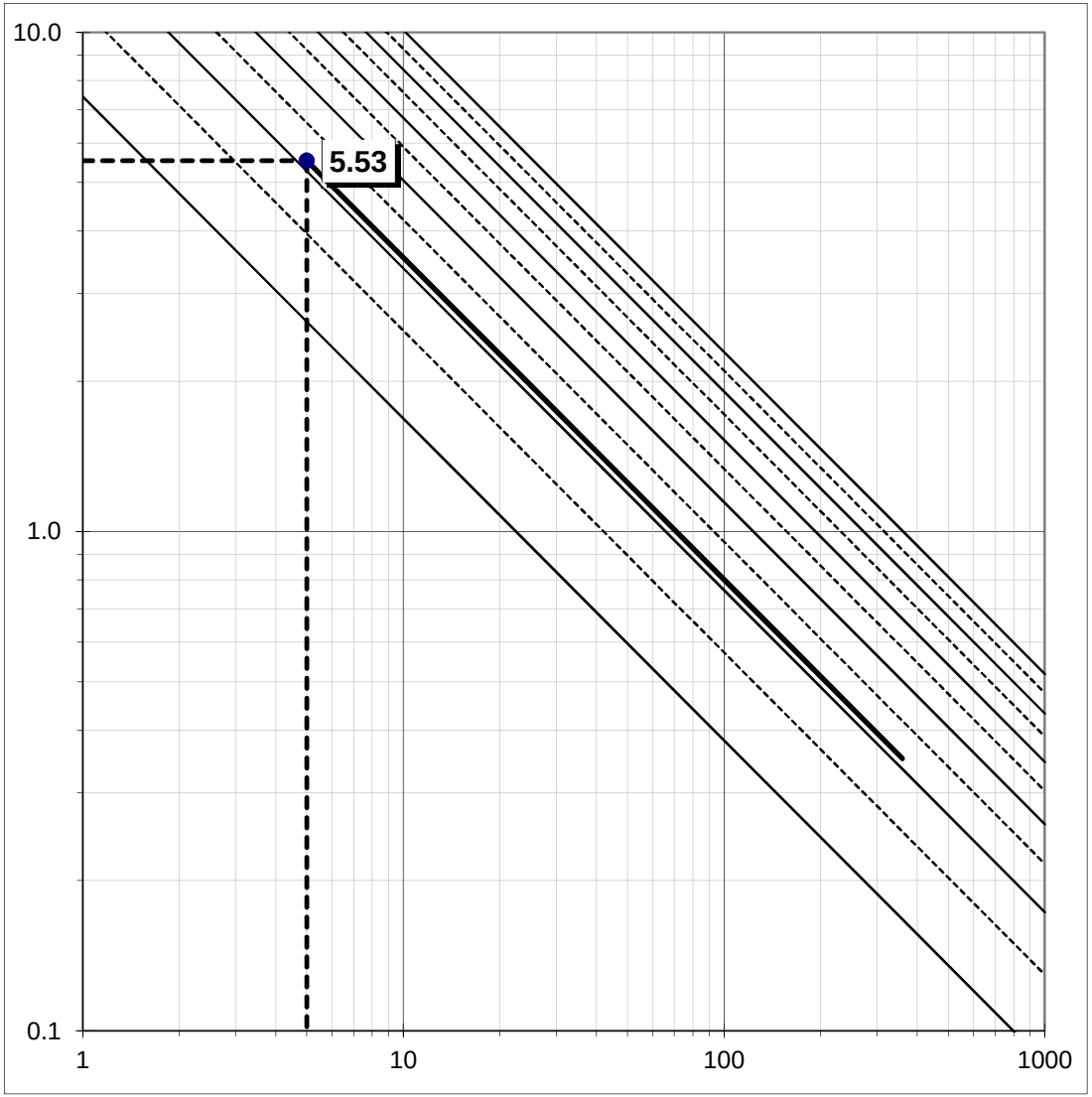
Q = **1.66** **cfs**

C = 0.95

I = 5.53 in/hr

A = 0.315 ac.

$$Q = C * I * A$$



PR-2

Proposed Conditions

Time of Concentration Calculations

Overland Flow Method

Land Use =

C = 0.83

Dist. = 74.00 ft.

slope = 6.860 %

***T$_c$** = 5.00 min.

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

* Minimum T_c = 5 Minutes

Natural Watershed (Kirpich)

L = 0 ft

ΔE = 0 ft

****T$_c$** = #DIV/0! min.

$$T_C = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

** Minimum T_c = 10 Minutes

Basin Intensity Calculations

Selected Frequency, **50** year

P_6 = 2.1 in. — P_6 must be within

P_{24} = 3.5 in. — 45% to 65% of P_{24}.

P_6 / P_{24} = 60% — Adjust P_6 as needed.

Adjusted **P_6**= 2.10 in.

T_c (**D**) = 5.00 min.

I = 5.53 in/hr

$$I = 7.44 P_6 D^{-0.645}$$

Basin Flow Calculations

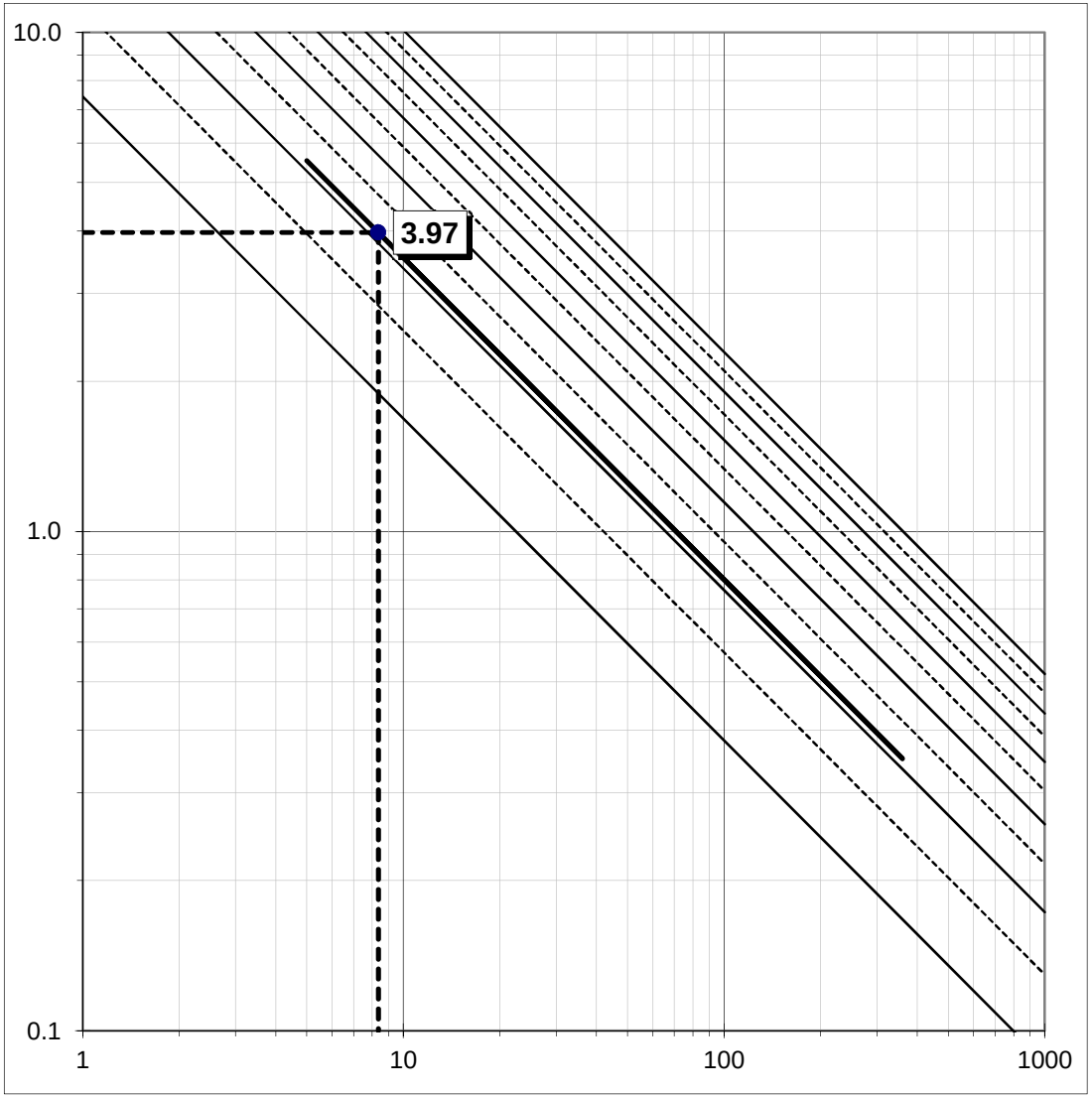
Q = **1.13** **cfs**

C = 0.83

I = 5.53 in/hr

A = 0.247 ac.

$$Q = C * I * A$$



PR-3

Proposed Conditions

Time of Concentration Calculations

Overland Flow Method

Land Use =

C = 0.35

Dist. = 117.00 ft.

slope = 5.340 %

***T$_c$** = 8.35 min.

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

* Minimum T_c = 5 Minutes

Natural Watershed (Kirpich)

L = 0 ft

ΔE = 0 ft

****T$_c$** = #DIV/0! min.

$$T_C = \left(\frac{11.9L^3}{\Delta E}\right)^{0.385}$$

** Minimum T_c = 10 Minutes

Basin Intensity Calculations

Selected Frequency, **50** year

P_6 = 2.1 in. — P_6 must be within

P_{24} = 3.5 in. — 45% to 65% of P_{24}.

P_6 / P_{24} = 60% — Adjust P_6 as needed.

Adjusted **P_6**= 2.10 in.

T_c (**D**) = 8.35 min.

I = 3.97 in/hr

$$I = 7.44 P_6 D^{-0.645}$$

Basin Flow Calculations

Q = **0.08** **cfs**

C = 0.35

I = 3.97 in/hr

A = 0.055 ac.

$$Q = C * I * A$$

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology program based on
San Diego County Flood Control Division 1985 hydrology manual
Rational Hydrology Study Date: 01/09/17

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

Program License Serial Number 6313

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

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity) = 1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method

++

Process from Point/Station 103.000 to Point/Station 101.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.830 given for subarea
Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm
User specified values are as follows:
TC = 5.00 min. Rain intensity = 4.27(In/Hr)
Total area = 0.017(Ac.) Total runoff = 0.080(CFS)

++

Process from Point/Station 103.000 to Point/Station 101.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 0.017(Ac.)
Runoff from this stream = 0.080(CFS)
Time of concentration = 5.00 min.
Rainfall intensity = 4.265(In/Hr)

++

Process from Point/Station 101.000 to Point/Station 102.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.950 given for subarea
Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm
User specified values are as follows:
TC = 5.00 min. Rain intensity = 4.27(In/Hr)
Total area = 0.315(Ac.) Total runoff = 1.660(CFS)

++

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

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.315(Ac.)
Runoff from this stream = 1.660(CFS)
Time of concentration = 5.00 min.
Rainfall intensity = 4.265(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	0.080	5.00	4.265
2	1.660	5.00	4.265

Qmax(1) =
1.000 * 1.000 * 0.080) +
1.000 * 1.000 * 1.660) + = 1.740
Qmax(2) =
1.000 * 1.000 * 0.080) +
1.000 * 1.000 * 1.660) + = 1.740

Total of 2 streams to confluence:
Flow rates before confluence point:
0.080 1.660
Maximum flow rates at confluence using above data:
1.740 1.740
Area of streams before confluence:
0.017 0.315
Results of confluence:
Total flow rate = 1.740(CFS)
Time of concentration = 5.000 min.
Effective stream area after confluence = 0.332(Ac.)

++
Process from Point/Station 102.000 to Point/Station 202.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 42.780(Ft.)
Downstream point/station elevation = 41.700(Ft.)
Pipe length = 104.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.740(CFS)
Given pipe size = 9.00(In.)
Calculated individual pipe flow = 1.740(CFS)
Normal flow depth in pipe = 9.00(In.)
Flow top width inside pipe = 0.00(In.)
Critical Depth = 7.26(In.)
Pipe flow velocity = 3.82(Ft/s)
Travel time through pipe = 0.45 min.
Time of concentration (TC) = 5.45 min.

++
Process from Point/Station 102.000 to Point/Station 202.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 0.332(Ac.)
Runoff from this stream = 1.740(CFS)
Time of concentration = 5.45 min.

Rainfall intensity = 4.104(In/Hr)
Program is now starting with Main Stream No. 2

++
Process from Point/Station 201.000 to Point/Station 202.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.830 given for subarea
Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm
User specified values are as follows:
TC = 5.00 min. Rain intensity = 4.27(In/Hr)
Total area = 0.247(Ac.) Total runoff = 1.130(CFS)

++
Process from Point/Station 201.000 to Point/Station 202.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 0.247(Ac.)
Runoff from this stream = 1.130(CFS)
Time of concentration = 5.00 min.
Rainfall intensity = 4.265(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	1.740	5.45	4.104
2	1.130	5.00	4.265

Qmax(1) =
1.000 * 1.000 * 1.740) +
0.962 * 1.000 * 1.130) + = 2.827
Qmax(2) =
1.000 * 0.917 * 1.740) +
1.000 * 1.000 * 1.130) + = 2.725

Total of 2 main streams to confluence:
Flow rates before confluence point:
1.740 1.130
Maximum flow rates at confluence using above data:
2.827 2.725
Area of streams before confluence:
0.332 0.247

Results of confluence:
Total flow rate = 2.827(CFS)
Time of concentration = 5.454 min.
Effective stream area after confluence = 0.579(Ac.)

++
Process from Point/Station 202.000 to Point/Station 203.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 38.700(Ft.)
Downstream point/station elevation = 36.940(Ft.)
Pipe length = 170.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.827(CFS)

PR
Given pipe size = 12.00(In.)
Calculated individual pipe flow = 2.827(CFS)
Normal flow depth in pipe = 7.97(In.)
Flow top width inside pipe = 11.34(In.)
Critical Depth = 8.65(In.)
Pipe flow velocity = 5.10(Ft/s)
Travel time through pipe = 0.56 min.
Time of concentration (TC) = 6.01 min.

++
Process from Point/Station 203.000 to Point/Station 204.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation = 36.940(Ft.)
Downstream point/station elevation = 19.230(Ft.)
Pipe length = 46.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.827(CFS)
Given pipe size = 6.00(In.)
Calculated individual pipe flow = 2.827(CFS)
Normal flow depth in pipe = 4.10(In.)
Flow top width inside pipe = 5.58(In.)
Critical depth could not be calculated.
Pipe flow velocity = 19.75(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 6.05 min.
End of computations, total study area = 0.579 (Ac.)

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Rational method hydrology program based on
San Diego County Flood Control Division 1985 hydrology manual
Rational Hydrology Study Date: 01/09/17

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

Program License Serial Number 6313

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

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity) = 1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method

++
Process from Point/Station 301.000 to Point/Station 302.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.350 given for subarea
Rainfall intensity (I) = 3.431(In/Hr) for a 50.0 year storm
User specified values are as follows:
TC = 8.35 min. Rain intensity = 3.43(In/Hr)
Total area = 0.055(Ac.) Total runoff = 0.080(CFS)

++
Process from Point/Station 302.000 to Point/Station 303.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 36.000(Ft.)
Downstream point/station elevation = 20.290(Ft.)
Pipe length = 37.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.080(CFS)
Given pipe size = 6.00(In.)
Calculated individual pipe flow = 0.080(CFS)
Normal flow depth in pipe = 0.61(In.)
Flow top width inside pipe = 3.64(In.)
Critical Depth = 1.67(In.)
Pipe flow velocity = 7.58(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 8.43 min.
End of computations, total study area = 0.055 (Ac.)

PROPOSED HYDROLOGY CALCULATIONS

WITH DETENTION

Stage Storage Capacity Caculations

Orifice Flow:	Q = C * A * sqrt(2gh)			
g=	32.20	sf/sec		
C=	0.60			
Orifice-1				
Elevation	0.00			
diameter	4	inches	0.33	ft
A=	0.09	sf		
Orifice-2				
No. of Orifice	2			
Elevation	3.50			
diameter	1	inches	0.08	ft
A=	0.01	sf		
Grate Inlet				
Elevation	3.90			
Cw	3			
L	1.5			
W	1.5			
Lw	6	ft	0.50	ft

Depth (ft)	Volume (cf)	Area (Ac.ft)	Effective Head Orifice-1	Q cfs Orifice-1	Effective Head Orifice-2	Q cfs Orifice-2	Effective Head Orifice-3	Q cfs Orifice-3	Q cfs Q total
0.00	0	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.000
1.50	396	0.009	1.33	0.485	0.00	0.000	0.00	0.000	0.485
3.00	435	0.010	2.83	0.707	0.00	0.000	0.00	0.000	0.707
3.75	930	0.021	3.58	0.795	0.21	0.024	0.00	0.000	0.819
4.00	1,095	0.025	3.83	0.823	0.46	0.036	0.10	0.569	1.427

Hydrology Parameters

	Before Detention	
Q=	2.827	cfs
A=	0.579	Acre
Tc=	5.45	min.
C=	0.747	
I=	6.534	in/hr
	After Detention	
Δt=	4.00	min.
Q=	1.030	cfs
A=	0.579	Acre
Tc=	9.45	min.

PRHYD

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2012 Version 7.9

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 01/09/17

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

Program License Serial Number 6313

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

Map data precipitation entered:
6 hour, precipitation(inches) = 2.100
24 hour precipitation(inches) = 3.500
P6/P24 = 60.0%
San Diego hydrology manual 'C' values used

++
Process from Point/Station 201.000 to Point/Station 202.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.950 given for subarea
Rainfall intensity (I) = 5.231(In/Hr) for a 50.0 year storm
User specified values are as follows:
TC = 5.45 min. Rain intensity = 5.23(In/Hr)
Total area = 0.579(Ac.) Total runoff = 2.827(CFS)

++
Process from Point/Station 202.000 to Point/Station 203.000
**** 6 HOUR HYDROGRAPH ****

++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003

Time of Concentration = 5.45
Basin Area = 0.58 Acres
6 Hour Rainfall = 2.100 Inches
Runoff Coefficient = 0.950
Peak Discharge = 2.83 CFS

Time (Min)	Discharge (CFS)
0	0.000
5	0.069
10	0.069
15	0.071
20	0.071
25	0.073
30	0.074
35	0.075
40	0.076
45	0.077
50	0.078

55	0.080
60	0.081
65	0.083
70	0.084
75	0.086
80	0.087
85	0.090
90	0.091
95	0.093
100	0.095
105	0.098
110	0.099
115	0.103
120	0.104
125	0.108
130	0.110
135	0.114
140	0.117
145	0.122
150	0.125
155	0.131
160	0.134
165	0.141
170	0.145
175	0.154
180	0.159
185	0.171
190	0.177
195	0.193
200	0.202
205	0.224
210	0.237
215	0.272
220	0.295
225	0.360
230	0.410
235	0.603
240	0.849
245	2.827
250	0.483
255	0.323
260	0.253
265	0.212
270	0.184
275	0.165
280	0.149
285	0.137
290	0.127
295	0.119
300	0.112
305	0.106
310	0.101
315	0.096
320	0.092
325	0.088
330	0.085
335	0.082
340	0.079
345	0.077
350	0.074
355	0.072
360	0.070
365	0.068

PRHYD

6 - H O U R S T O R M

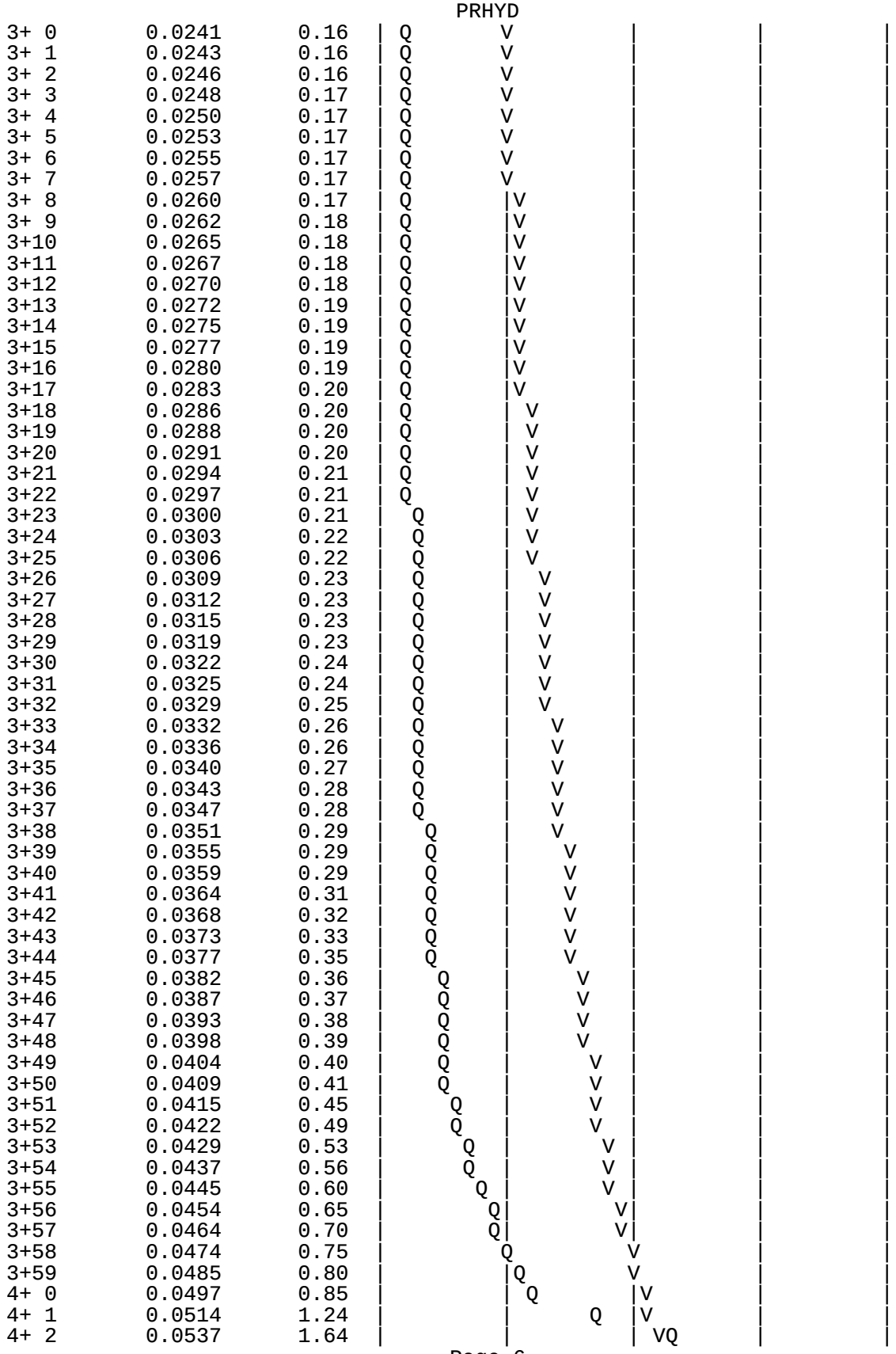
R u n o f f H y d r o g r a p h

Hydrograph in 1 Minute intervals ((CFS))

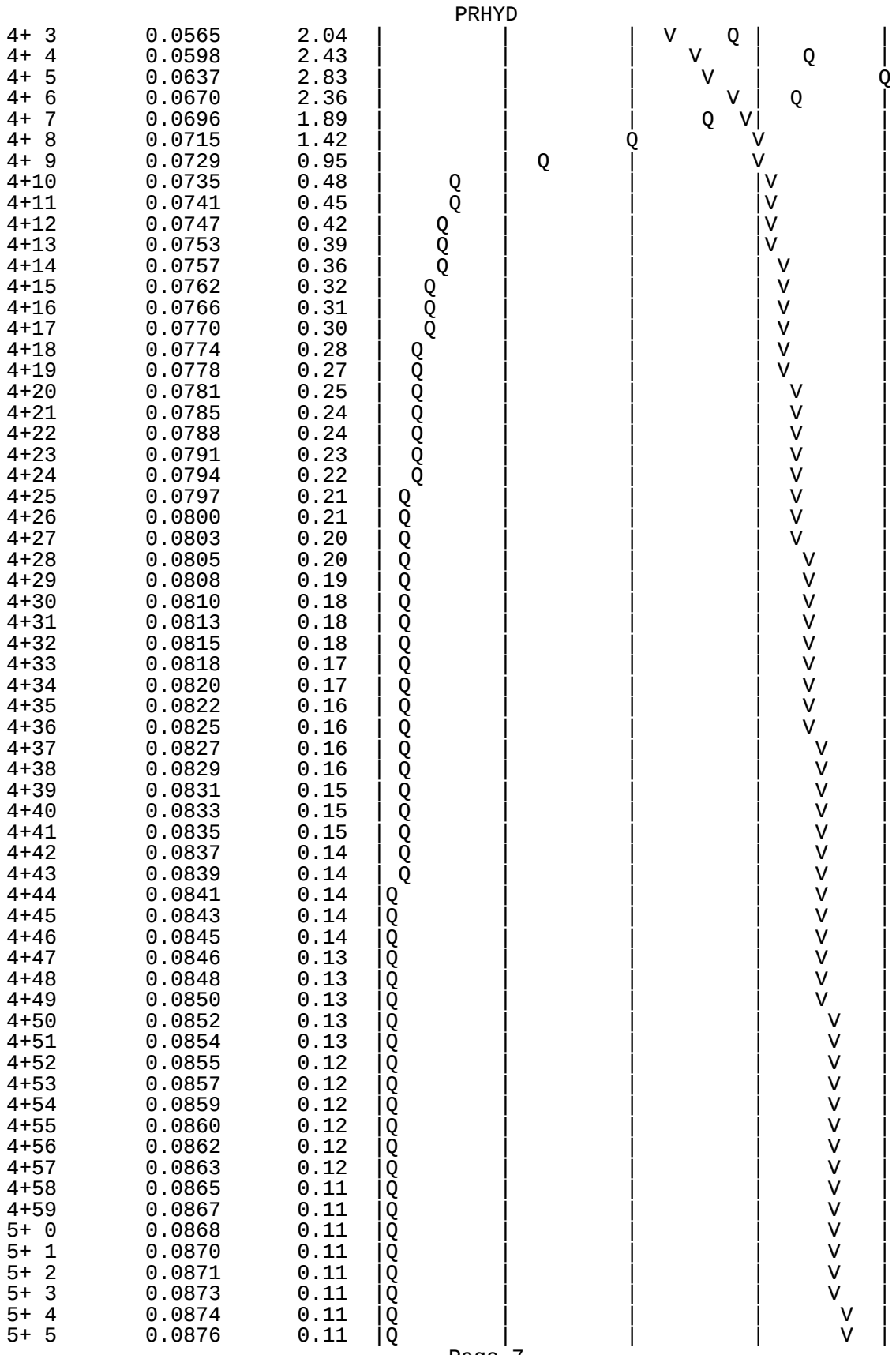
Time(h+m)	Volume Ac.Ft	Q(CFS)	0	0.7	1.4	2.1	2.8
0+ 0	0.0000	0.00	Q				
0+ 1	0.0000	0.01	Q				
0+ 2	0.0001	0.03	Q				
0+ 3	0.0001	0.04	Q				
0+ 4	0.0002	0.06	Q				
0+ 5	0.0003	0.07	Q				
0+ 6	0.0004	0.07	Q				
0+ 7	0.0005	0.07	Q				
0+ 8	0.0006	0.07	Q				
0+ 9	0.0007	0.07	Q				
0+10	0.0008	0.07	Q				
0+11	0.0009	0.07	Q				
0+12	0.0010	0.07	Q				
0+13	0.0010	0.07	Q				
0+14	0.0011	0.07	Q				
0+15	0.0012	0.07	VQ				
0+16	0.0013	0.07	VQ				
0+17	0.0014	0.07	VQ				
0+18	0.0015	0.07	VQ				
0+19	0.0016	0.07	VQ				
0+20	0.0017	0.07	VQ				
0+21	0.0018	0.07	VQ				
0+22	0.0019	0.07	VQ				
0+23	0.0020	0.07	VQ				
0+24	0.0021	0.07	VQ				
0+25	0.0022	0.07	VQ				
0+26	0.0023	0.07	VQ				
0+27	0.0024	0.07	|Q				
0+28	0.0025	0.07	|Q				
0+29	0.0026	0.07	|Q				
0+30	0.0027	0.07	|Q				
0+31	0.0028	0.07	|Q				
0+32	0.0029	0.07	|Q				
0+33	0.0030	0.07	|Q				
0+34	0.0031	0.07	|Q				
0+35	0.0032	0.08	|Q				
0+36	0.0034	0.08	|Q				
0+37	0.0035	0.08	|Q				
0+38	0.0036	0.08	|Q				
0+39	0.0037	0.08	|Q				
0+40	0.0038	0.08	|Q				
0+41	0.0039	0.08	|Q				
0+42	0.0040	0.08	|Q				
0+43	0.0041	0.08	|Q				
0+44	0.0042	0.08	|Q				
0+45	0.0043	0.08	|Q				
0+46	0.0044	0.08	|Q				
0+47	0.0045	0.08	|Q				
0+48	0.0046	0.08	|Q				
0+49	0.0047	0.08	|QV				
0+50	0.0048	0.08	|QV				
0+51	0.0049	0.08	|QV				
0+52	0.0051	0.08	|QV				
0+53	0.0052	0.08	|QV				

0+54	0.0053	0.08	QV				
0+55	0.0054	0.08	QV				
0+56	0.0055	0.08	QV				
0+57	0.0056	0.08	QV				
0+58	0.0057	0.08	QV				
0+59	0.0058	0.08	QV				
1+ 0	0.0059	0.08	QV				
1+ 1	0.0060	0.08	QV				
1+ 2	0.0062	0.08	QV				
1+ 3	0.0063	0.08	QV				
1+ 4	0.0064	0.08	QV				
1+ 5	0.0065	0.08	QV				
1+ 6	0.0066	0.08	QV				
1+ 7	0.0067	0.08	QV				
1+ 8	0.0068	0.08	QV				
1+ 9	0.0070	0.08	QV				
1+10	0.0071	0.08	QV				
1+11	0.0072	0.08	Q V				
1+12	0.0073	0.08	Q V				
1+13	0.0074	0.09	Q V				
1+14	0.0075	0.09	Q V				
1+15	0.0077	0.09	Q V				
1+16	0.0078	0.09	Q V				
1+17	0.0079	0.09	Q V				
1+18	0.0080	0.09	Q V				
1+19	0.0081	0.09	Q V				
1+20	0.0083	0.09	Q V				
1+21	0.0084	0.09	Q V				
1+22	0.0085	0.09	Q V				
1+23	0.0086	0.09	Q V				
1+24	0.0087	0.09	Q V				
1+25	0.0089	0.09	Q V				
1+26	0.0090	0.09	Q V				
1+27	0.0091	0.09	Q V				
1+28	0.0092	0.09	Q V				
1+29	0.0094	0.09	Q V				
1+30	0.0095	0.09	Q V				
1+31	0.0096	0.09	Q V				
1+32	0.0097	0.09	Q V				
1+33	0.0099	0.09	Q V				
1+34	0.0100	0.09	Q V				
1+35	0.0101	0.09	Q V				
1+36	0.0103	0.09	Q V				
1+37	0.0104	0.09	Q V				
1+38	0.0105	0.09	Q V				
1+39	0.0106	0.09	Q V				
1+40	0.0108	0.09	Q V				
1+41	0.0109	0.10	Q V				
1+42	0.0110	0.10	Q V				
1+43	0.0112	0.10	Q V				
1+44	0.0113	0.10	Q V				
1+45	0.0114	0.10	Q V				
1+46	0.0116	0.10	Q V				
1+47	0.0117	0.10	Q V				
1+48	0.0119	0.10	Q V				
1+49	0.0120	0.10	Q V				
1+50	0.0121	0.10	Q V				
1+51	0.0123	0.10	Q V				
1+52	0.0124	0.10	Q V				
1+53	0.0125	0.10	Q V				
1+54	0.0127	0.10	Q V				
1+55	0.0128	0.10	Q V				
1+56	0.0130	0.10	Q V				

1+57	0.0131	0.10	Q	V			
1+58	0.0132	0.10	Q	V			
1+59	0.0134	0.10	Q	V			
2+ 0	0.0135	0.10	Q	V			
2+ 1	0.0137	0.11	Q	V			
2+ 2	0.0138	0.11	Q	V			
2+ 3	0.0140	0.11	Q	V			
2+ 4	0.0141	0.11	Q	V			
2+ 5	0.0143	0.11	Q	V			
2+ 6	0.0144	0.11	Q	V			
2+ 7	0.0146	0.11	Q	V			
2+ 8	0.0147	0.11	Q	V			
2+ 9	0.0149	0.11	Q	V			
2+10	0.0150	0.11	Q	V			
2+11	0.0152	0.11	Q	V			
2+12	0.0153	0.11	Q	V			
2+13	0.0155	0.11	Q	V			
2+14	0.0156	0.11	Q	V			
2+15	0.0158	0.11	Q	V			
2+16	0.0160	0.11	Q	V			
2+17	0.0161	0.12	Q	V			
2+18	0.0163	0.12	Q	V			
2+19	0.0164	0.12	Q	V			
2+20	0.0166	0.12	Q	V			
2+21	0.0168	0.12	Q	V			
2+22	0.0169	0.12	Q	V			
2+23	0.0171	0.12	Q	V			
2+24	0.0173	0.12	Q	V			
2+25	0.0174	0.12	Q	V			
2+26	0.0176	0.12	Q	V			
2+27	0.0178	0.12	Q	V			
2+28	0.0179	0.12	Q	V			
2+29	0.0181	0.12	Q	V			
2+30	0.0183	0.12	Q	V			
2+31	0.0184	0.13	Q	V			
2+32	0.0186	0.13	Q	V			
2+33	0.0188	0.13	Q	V			
2+34	0.0190	0.13	Q	V			
2+35	0.0192	0.13	Q	V			
2+36	0.0193	0.13	Q	V			
2+37	0.0195	0.13	Q	V			
2+38	0.0197	0.13	Q	V			
2+39	0.0199	0.13	Q	V			
2+40	0.0201	0.13	Q	V			
2+41	0.0203	0.14	Q	V			
2+42	0.0204	0.14	Q	V			
2+43	0.0206	0.14	Q	V			
2+44	0.0208	0.14	Q	V			
2+45	0.0210	0.14	Q	V			
2+46	0.0212	0.14	Q	V			
2+47	0.0214	0.14	Q	V			
2+48	0.0216	0.14	Q	V			
2+49	0.0218	0.14	Q	V			
2+50	0.0220	0.15	Q	V			
2+51	0.0222	0.15	Q	V			
2+52	0.0224	0.15	Q	V			
2+53	0.0226	0.15	Q	V			
2+54	0.0228	0.15	Q	V			
2+55	0.0230	0.15	Q	V			
2+56	0.0233	0.16	Q	V			
2+57	0.0235	0.16	Q	V			
2+58	0.0237	0.16	Q	V			
2+59	0.0239	0.16	Q	V			



3+ 0	0.0241	0.16	Q V
3+ 1	0.0243	0.16	Q V
3+ 2	0.0246	0.16	Q V
3+ 3	0.0248	0.17	Q V
3+ 4	0.0250	0.17	Q V
3+ 5	0.0253	0.17	Q V
3+ 6	0.0255	0.17	Q V
3+ 7	0.0257	0.17	Q V
3+ 8	0.0260	0.17	Q |V
3+ 9	0.0262	0.18	Q |V
3+10	0.0265	0.18	Q |V
3+11	0.0267	0.18	Q |V
3+12	0.0270	0.18	Q |V
3+13	0.0272	0.19	Q |V
3+14	0.0275	0.19	Q |V
3+15	0.0277	0.19	Q |V
3+16	0.0280	0.19	Q |V
3+17	0.0283	0.20	Q |V
3+18	0.0286	0.20	Q | V
3+19	0.0288	0.20	Q | V
3+20	0.0291	0.20	Q | V
3+21	0.0294	0.21	Q | V
3+22	0.0297	0.21	Q | V
3+23	0.0300	0.21	Q | V
3+24	0.0303	0.22	Q | V
3+25	0.0306	0.22	Q | V
3+26	0.0309	0.23	Q | V
3+27	0.0312	0.23	Q | V
3+28	0.0315	0.23	Q | V
3+29	0.0319	0.23	Q | V
3+30	0.0322	0.24	Q | V
3+31	0.0325	0.24	Q | V
3+32	0.0329	0.25	Q | V
3+33	0.0332	0.26	Q | V
3+34	0.0336	0.26	Q | V
3+35	0.0340	0.27	Q | V
3+36	0.0343	0.28	Q | V
3+37	0.0347	0.28	Q | V
3+38	0.0351	0.29	Q | V
3+39	0.0355	0.29	Q | V
3+40	0.0359	0.29	Q | V
3+41	0.0364	0.31	Q | V
3+42	0.0368	0.32	Q | V
3+43	0.0373	0.33	Q | V
3+44	0.0377	0.35	Q | V
3+45	0.0382	0.36	Q | V
3+46	0.0387	0.37	Q | V
3+47	0.0393	0.38	Q | V
3+48	0.0398	0.39	Q | V
3+49	0.0404	0.40	Q | V
3+50	0.0409	0.41	Q | V
3+51	0.0415	0.45	Q | V
3+52	0.0422	0.49	Q | V
3+53	0.0429	0.53	Q | V
3+54	0.0437	0.56	Q | V
3+55	0.0445	0.60	Q | V
3+56	0.0454	0.65	Q| V|
3+57	0.0464	0.70	Q| V|
3+58	0.0474	0.75	Q V
3+59	0.0485	0.80	|Q V
4+ 0	0.0497	0.85	| Q |V
4+ 1	0.0514	1.24	Q |V
4+ 2	0.0537	1.64	| VQ


PRHYD
4+ 3 0.0565 2.04
4+ 4 0.0598 2.43
4+ 5 0.0637 2.83
4+ 6 0.0670 2.36
4+ 7 0.0696 1.89
4+ 8 0.0715 1.42
4+ 9 0.0729 0.95
4+10 0.0735 0.48
4+11 0.0741 0.45
4+12 0.0747 0.42
4+13 0.0753 0.39
4+14 0.0757 0.36
4+15 0.0762 0.32
4+16 0.0766 0.31
4+17 0.0770 0.30
4+18 0.0774 0.28
4+19 0.0778 0.27
4+20 0.0781 0.25
4+21 0.0785 0.24
4+22 0.0788 0.24
4+23 0.0791 0.23
4+24 0.0794 0.22
4+25 0.0797 0.21
4+26 0.0800 0.21
4+27 0.0803 0.20
4+28 0.0805 0.20
4+29 0.0808 0.19
4+30 0.0810 0.18
4+31 0.0813 0.18
4+32 0.0815 0.18
4+33 0.0818 0.17
4+34 0.0820 0.17
4+35 0.0822 0.16
4+36 0.0825 0.16
4+37 0.0827 0.16
4+38 0.0829 0.16
4+39 0.0831 0.15
4+40 0.0833 0.15
4+41 0.0835 0.15
4+42 0.0837 0.14
4+43 0.0839 0.14
4+44 0.0841 0.14
4+45 0.0843 0.14
4+46 0.0845 0.14
4+47 0.0846 0.13
4+48 0.0848 0.13
4+49 0.0850 0.13
4+50 0.0852 0.13
4+51 0.0854 0.13
4+52 0.0855 0.12
4+53 0.0857 0.12
4+54 0.0859 0.12
4+55 0.0860 0.12
4+56 0.0862 0.12
4+57 0.0863 0.12
4+58 0.0865 0.11
4+59 0.0867 0.11
5+ 0 0.0868 0.11
5+ 1 0.0870 0.11
5+ 2 0.0871 0.11
5+ 3 0.0873 0.11
5+ 4 0.0874 0.11
5+ 5 0.0876 0.11

5+ 6	0.0877	0.11	|Q	|	|	|	V |
5+ 7	0.0879	0.10	|Q	|	|	|	V |
5+ 8	0.0880	0.10	|Q	|	|	|	V |
5+ 9	0.0881	0.10	|Q	|	|	|	V |
5+10	0.0883	0.10	|Q	|	|	|	V |
5+11	0.0884	0.10	|Q	|	|	|	V |
5+12	0.0886	0.10	|Q	|	|	|	V |
5+13	0.0887	0.10	|Q	|	|	|	V |
5+14	0.0888	0.10	|Q	|	|	|	V |
5+15	0.0890	0.10	|Q	|	|	|	V |
5+16	0.0891	0.10	|Q	|	|	|	V |
5+17	0.0892	0.09	|Q	|	|	|	V |
5+18	0.0893	0.09	|Q	|	|	|	V |
5+19	0.0895	0.09	|Q	|	|	|	V |
5+20	0.0896	0.09	|Q	|	|	|	V |
5+21	0.0897	0.09	|Q	|	|	|	V |
5+22	0.0898	0.09	|Q	|	|	|	V |
5+23	0.0900	0.09	|Q	|	|	|	V |
5+24	0.0901	0.09	|Q	|	|	|	V |
5+25	0.0902	0.09	|Q	|	|	|	V |
5+26	0.0903	0.09	|Q	|	|	|	V |
5+27	0.0905	0.09	|Q	|	|	|	V |
5+28	0.0906	0.09	|Q	|	|	|	V |
5+29	0.0907	0.09	|Q	|	|	|	V |
5+30	0.0908	0.09	|Q	|	|	|	V |
5+31	0.0909	0.08	|Q	|	|	|	V |
5+32	0.0910	0.08	|Q	|	|	|	V |
5+33	0.0912	0.08	|Q	|	|	|	V |
5+34	0.0913	0.08	|Q	|	|	|	V |
5+35	0.0914	0.08	|Q	|	|	|	V |
5+36	0.0915	0.08	|Q	|	|	|	V |
5+37	0.0916	0.08	|Q	|	|	|	V |
5+38	0.0917	0.08	|Q	|	|	|	V |
5+39	0.0918	0.08	|Q	|	|	|	V |
5+40	0.0919	0.08	|Q	|	|	|	V |
5+41	0.0920	0.08	|Q	|	|	|	V |
5+42	0.0922	0.08	|Q	|	|	|	V|
5+43	0.0923	0.08	|Q	|	|	|	V|
5+44	0.0924	0.08	|Q	|	|	|	V|
5+45	0.0925	0.08	|Q	|	|	|	V|
5+46	0.0926	0.08	|Q	|	|	|	V|
5+47	0.0927	0.08	|Q	|	|	|	V|
5+48	0.0928	0.08	|Q	|	|	|	V|
5+49	0.0929	0.07	|Q	|	|	|	V|
5+50	0.0930	0.07	|Q	|	|	|	V|
5+51	0.0931	0.07	|Q	|	|	|	V|
5+52	0.0932	0.07	|Q	|	|	|	V|
5+53	0.0933	0.07	|Q	|	|	|	V|
5+54	0.0934	0.07	|Q	|	|	|	V|
5+55	0.0935	0.07	|Q	|	|	|	V|
5+56	0.0936	0.07	|Q	|	|	|	V|
5+57	0.0937	0.07	|Q	|	|	|	V|
5+58	0.0938	0.07	|Q	|	|	|	V|
5+59	0.0939	0.07	Q	|	|	|	V|
6+ 0	0.0940	0.07	Q	|	|	|	V|
6+ 1	0.0941	0.07	Q	|	|	|	V|
6+ 2	0.0942	0.07	Q	|	|	|	V|
6+ 3	0.0943	0.07	Q	|	|	|	V|
6+ 4	0.0944	0.07	Q	|	|	|	V|
6+ 5	0.0945	0.07	Q	|	|	|	V

End of computations, total study area = 0.579 (Ac.)

PRDET

FLOOD HYDROGRAPH ROUTING PROGRAM
Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2012
Study date: 01/09/17

Program License Serial Number 6313

********** HYDROGRAPH INFORMATION **********

From study/file name: PRHYD.rte
**********HYDROGRAPH DATA**********
Number of intervals = 365
Time interval = 1.0 (Min.)
Maximum/Peak flow rate = 2.827 (CFS)
Total volume = 0.094 (Ac.Ft)

Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

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Process from Point/Station 201.000 to Point/Station 202.000
**** RETARDING BASIN ROUTING ****

User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 365
Hydrograph time unit = 1.000 (Min.)
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
1.500	0.009	0.485	0.009	0.009
3.000	0.010	0.707	0.010	0.010
3.750	0.021	0.819	0.020	0.022
4.000	0.025	1.427	0.024	0.026

Hydrograph Detention Basin Routing

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

PRDET

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0	0.7	1.41	2.12	2.83	Depth (Ft.)
0.017	0.01	0.00	0.000	O					0.00
0.033	0.03	0.00	0.000	O					0.01
0.050	0.04	0.00	0.000	O					0.01
0.067	0.06	0.01	0.000	O					0.02
0.083	0.07	0.01	0.000	O					0.03
0.100	0.07	0.02	0.000	O					0.05
0.117	0.07	0.02	0.000	O					0.06
0.133	0.07	0.02	0.000	O					0.07
0.150	0.07	0.03	0.000	O					0.08
0.167	0.07	0.03	0.001	O					0.09
0.183	0.07	0.03	0.001	O					0.10
0.200	0.07	0.03	0.001	O					0.11
0.217	0.07	0.04	0.001	O					0.12
0.233	0.07	0.04	0.001	O					0.12
0.250	0.07	0.04	0.001	O					0.13
0.267	0.07	0.04	0.001	O					0.14
0.283	0.07	0.05	0.001	O					0.14
0.300	0.07	0.05	0.001	O					0.15
0.317	0.07	0.05	0.001	O					0.15
0.333	0.07	0.05	0.001	O					0.16
0.350	0.07	0.05	0.001	O					0.16
0.367	0.07	0.05	0.001	O					0.17
0.383	0.07	0.06	0.001	O					0.17
0.400	0.07	0.06	0.001	O					0.17
0.417	0.07	0.06	0.001	O					0.18
0.433	0.07	0.06	0.001	O					0.18
0.450	0.07	0.06	0.001	O					0.18
0.467	0.07	0.06	0.001	O					0.19
0.483	0.07	0.06	0.001	O					0.19
0.500	0.07	0.06	0.001	O					0.19
0.517	0.07	0.06	0.001	O					0.20
0.533	0.07	0.06	0.001	O					0.20
0.550	0.07	0.06	0.001	O					0.20
0.567	0.07	0.07	0.001	O					0.20
0.583	0.08	0.07	0.001	O					0.20
0.600	0.08	0.07	0.001	O					0.21
0.617	0.08	0.07	0.001	O					0.21
0.633	0.08	0.07	0.001	O					0.21
0.650	0.08	0.07	0.001	O					0.21
0.667	0.08	0.07	0.001	O					0.21
0.683	0.08	0.07	0.001	O					0.21
0.700	0.08	0.07	0.001	O					0.22
0.717	0.08	0.07	0.001	O					0.22
0.733	0.08	0.07	0.001	O					0.22
0.750	0.08	0.07	0.001	O					0.22
0.767	0.08	0.07	0.001	O					0.22
0.783	0.08	0.07	0.001	O					0.22
0.800	0.08	0.07	0.001	O					0.22
0.817	0.08	0.07	0.001	O					0.23
0.833	0.08	0.07	0.001	O					0.23
0.850	0.08	0.07	0.001	O					0.23
0.867	0.08	0.07	0.001	O					0.23
0.883	0.08	0.07	0.001	O					0.23
0.900	0.08	0.07	0.001	O					0.23
0.917	0.08	0.08	0.001	O					0.23
0.933	0.08	0.08	0.001	O					0.23
0.950	0.08	0.08	0.001	O					0.23
0.967	0.08	0.08	0.001	O					0.24
0.983	0.08	0.08	0.001	O					0.24
1.000	0.08	0.08	0.001	O					0.24
1.017	0.08	0.08	0.001	O					0.24

1.033	0.08	0.08	0.001	O				0.24
1.050	0.08	0.08	0.001	O				0.24
1.067	0.08	0.08	0.001	O				0.24
1.083	0.08	0.08	0.001	O				0.24
1.100	0.08	0.08	0.001	O				0.24
1.117	0.08	0.08	0.001	O				0.24
1.133	0.08	0.08	0.001	O				0.25
1.150	0.08	0.08	0.001	O				0.25
1.167	0.08	0.08	0.001	O				0.25
1.183	0.08	0.08	0.001	O				0.25
1.200	0.08	0.08	0.001	O				0.25
1.217	0.09	0.08	0.002	O				0.25
1.233	0.09	0.08	0.002	O				0.25
1.250	0.09	0.08	0.002	O				0.25
1.267	0.09	0.08	0.002	O				0.25
1.283	0.09	0.08	0.002	O				0.25
1.300	0.09	0.08	0.002	O				0.26
1.317	0.09	0.08	0.002	O				0.26
1.333	0.09	0.08	0.002	O				0.26
1.350	0.09	0.08	0.002	O				0.26
1.367	0.09	0.08	0.002	O				0.26
1.383	0.09	0.08	0.002	OI				0.26
1.400	0.09	0.08	0.002	OI				0.26
1.417	0.09	0.08	0.002	OI				0.26
1.433	0.09	0.09	0.002	OI				0.26
1.450	0.09	0.09	0.002	OI				0.26
1.467	0.09	0.09	0.002	OI				0.27
1.483	0.09	0.09	0.002	OI				0.27
1.500	0.09	0.09	0.002	OI				0.27
1.517	0.09	0.09	0.002	OI				0.27
1.533	0.09	0.09	0.002	OI				0.27
1.550	0.09	0.09	0.002	OI				0.27
1.567	0.09	0.09	0.002	OI				0.27
1.583	0.09	0.09	0.002	OI				0.27
1.600	0.09	0.09	0.002	|O				0.27
1.617	0.09	0.09	0.002	|O				0.28
1.633	0.09	0.09	0.002	|O				0.28
1.650	0.09	0.09	0.002	|O				0.28
1.667	0.09	0.09	0.002	|O				0.28
1.683	0.10	0.09	0.002	|O				0.28
1.700	0.10	0.09	0.002	|O				0.28
1.717	0.10	0.09	0.002	|O				0.28
1.733	0.10	0.09	0.002	|O				0.28
1.750	0.10	0.09	0.002	|O				0.28
1.767	0.10	0.09	0.002	|O				0.29
1.783	0.10	0.09	0.002	|O				0.29
1.800	0.10	0.09	0.002	|O				0.29
1.817	0.10	0.09	0.002	|O				0.29
1.833	0.10	0.09	0.002	|O				0.29
1.850	0.10	0.09	0.002	|O				0.29
1.867	0.10	0.09	0.002	|O				0.29
1.883	0.10	0.10	0.002	|O				0.29
1.900	0.10	0.10	0.002	|O				0.30
1.917	0.10	0.10	0.002	|O				0.30
1.933	0.10	0.10	0.002	|O				0.30
1.950	0.10	0.10	0.002	|O				0.30
1.967	0.10	0.10	0.002	|O				0.30
1.983	0.10	0.10	0.002	|O				0.30
2.000	0.10	0.10	0.002	|O				0.30
2.017	0.11	0.10	0.002	|O				0.31
2.033	0.11	0.10	0.002	|O				0.31
2.050	0.11	0.10	0.002	|O				0.31
2.067	0.11	0.10	0.002	|O				0.31

2.083	0.11	0.10	0.002	O				0.31
2.100	0.11	0.10	0.002	O				0.31
2.117	0.11	0.10	0.002	O				0.32
2.133	0.11	0.10	0.002	O				0.32
2.150	0.11	0.10	0.002	O				0.32
2.167	0.11	0.10	0.002	O				0.32
2.183	0.11	0.10	0.002	O				0.32
2.200	0.11	0.10	0.002	O				0.32
2.217	0.11	0.11	0.002	O				0.32
2.233	0.11	0.11	0.002	O				0.33
2.250	0.11	0.11	0.002	O				0.33
2.267	0.11	0.11	0.002	O				0.33
2.283	0.12	0.11	0.002	O				0.33
2.300	0.12	0.11	0.002	O				0.33
2.317	0.12	0.11	0.002	O				0.34
2.333	0.12	0.11	0.002	O				0.34
2.350	0.12	0.11	0.002	O				0.34
2.367	0.12	0.11	0.002	O				0.34
2.383	0.12	0.11	0.002	O				0.34
2.400	0.12	0.11	0.002	O				0.35
2.417	0.12	0.11	0.002	O				0.35
2.433	0.12	0.11	0.002	O				0.35
2.450	0.12	0.11	0.002	O				0.35
2.467	0.12	0.11	0.002	O				0.35
2.483	0.12	0.12	0.002	O				0.36
2.500	0.12	0.12	0.002	O				0.36
2.517	0.13	0.12	0.002	O				0.36
2.533	0.13	0.12	0.002	O				0.36
2.550	0.13	0.12	0.002	O				0.36
2.567	0.13	0.12	0.002	O				0.37
2.583	0.13	0.12	0.002	O				0.37
2.600	0.13	0.12	0.002	O				0.37
2.617	0.13	0.12	0.002	O				0.37
2.633	0.13	0.12	0.002	O				0.38
2.650	0.13	0.12	0.002	O				0.38
2.667	0.13	0.12	0.002	O				0.38
2.683	0.14	0.12	0.002	O				0.38
2.700	0.14	0.13	0.002	O				0.39
2.717	0.14	0.13	0.002	O				0.39
2.733	0.14	0.13	0.002	O				0.39
2.750	0.14	0.13	0.002	O				0.40
2.767	0.14	0.13	0.002	O				0.40
2.783	0.14	0.13	0.002	O				0.40
2.800	0.14	0.13	0.002	O				0.40
2.817	0.14	0.13	0.002	O				0.41
2.833	0.15	0.13	0.002	O				0.41
2.850	0.15	0.13	0.002	O				0.41
2.867	0.15	0.13	0.002	O				0.42
2.883	0.15	0.14	0.003	O				0.42
2.900	0.15	0.14	0.003	O				0.42
2.917	0.15	0.14	0.003	O				0.43
2.933	0.16	0.14	0.003	O				0.43
2.950	0.16	0.14	0.003	O				0.43
2.967	0.16	0.14	0.003	O				0.44
2.983	0.16	0.14	0.003	O				0.44
3.000	0.16	0.14	0.003	O				0.44
3.017	0.16	0.14	0.003	O				0.45
3.033	0.16	0.15	0.003	O				0.45
3.050	0.17	0.15	0.003	O				0.46
3.067	0.17	0.15	0.003	O				0.46
3.083	0.17	0.15	0.003	O				0.47
3.100	0.17	0.15	0.003	O				0.47
3.117	0.17	0.15	0.003	O				0.47

3.133	0.17	0.15	0.003	O				0.48
3.150	0.18	0.16	0.003	O				0.48
3.167	0.18	0.16	0.003	OI				0.49
3.183	0.18	0.16	0.003	OI				0.49
3.200	0.18	0.16	0.003	OI				0.50
3.217	0.19	0.16	0.003	OI				0.50
3.233	0.19	0.16	0.003	OI				0.51
3.250	0.19	0.17	0.003	OI				0.51
3.267	0.19	0.17	0.003	OI				0.52
3.283	0.20	0.17	0.003	OI				0.53
3.300	0.20	0.17	0.003	OI				0.53
3.317	0.20	0.17	0.003	OI				0.54
3.333	0.20	0.18	0.003	OI				0.54
3.350	0.21	0.18	0.003	O				0.55
3.367	0.21	0.18	0.003	O				0.56
3.383	0.21	0.18	0.003	O				0.56
3.400	0.22	0.18	0.003	O				0.57
3.417	0.22	0.19	0.003	O				0.58
3.433	0.23	0.19	0.004	O				0.59
3.450	0.23	0.19	0.004	O				0.60
3.467	0.23	0.20	0.004	O				0.60
3.483	0.23	0.20	0.004	O				0.61
3.500	0.24	0.20	0.004	O				0.62
3.517	0.24	0.20	0.004	O				0.63
3.533	0.25	0.21	0.004	O				0.64
3.550	0.26	0.21	0.004	O				0.65
3.567	0.26	0.21	0.004	O				0.66
3.583	0.27	0.22	0.004	OI				0.67
3.600	0.28	0.22	0.004	OI				0.69
3.617	0.28	0.23	0.004	OI				0.70
3.633	0.29	0.23	0.004	OI				0.71
3.650	0.29	0.23	0.004	OI				0.72
3.667	0.29	0.24	0.004	OI				0.74
3.683	0.31	0.24	0.005	OI				0.75
3.700	0.32	0.25	0.005	OI				0.77
3.717	0.33	0.25	0.005	OI				0.78
3.733	0.35	0.26	0.005	OI				0.80
3.750	0.36	0.27	0.005	OI				0.82
3.767	0.37	0.27	0.005	OI				0.85
3.783	0.38	0.28	0.005	OI				0.87
3.800	0.39	0.29	0.005	OI				0.89
3.817	0.40	0.30	0.005	OI				0.92
3.833	0.41	0.30	0.006	OI				0.94
3.850	0.45	0.31	0.006	O I				0.97
3.867	0.49	0.32	0.006	O I				1.00
3.883	0.53	0.34	0.006	O I				1.04
3.900	0.56	0.35	0.007	O I				1.09
3.917	0.60	0.37	0.007	O I				1.14
3.933	0.65	0.39	0.007	O I				1.20
3.950	0.70	0.41	0.008	O I				1.26
3.967	0.75	0.43	0.008	O I				1.33
3.983	0.80	0.46	0.008	O I				1.41
4.000	0.85	0.48	0.009	O I				1.49
4.017	1.24	0.62	0.010	O I				2.43
4.033	1.64	0.71	0.011	O	I			3.05
4.050	2.04	0.73	0.012	O	I			3.15
4.067	2.43	0.75	0.014	O	I			3.29
4.083	2.83	0.78	0.017	O	I			3.47
4.100	2.36	0.80	0.019	O	I			3.64
4.117	1.89	0.84	0.021	O	I			3.76
4.133	1.42	0.99	0.022	O	I			3.82
4.150	0.95	1.03	0.022	IO				3.84
4.167	0.48	0.97	0.022	I O				3.81

				PRDET				
4.183	0.45	0.88	0.021	| I |O	|	|	|	3.77
4.200	0.42	0.82	0.021	| I |O	|	|	|	3.74
4.217	0.39	0.81	0.020	| I |O	|	|	|	3.70
4.233	0.36	0.81	0.020	| I |O	|	|	|	3.66
4.250	0.32	0.80	0.019	| I |O	|	|	|	3.61
4.267	0.31	0.79	0.018	| I O	|	|	|	3.57
4.283	0.30	0.79	0.018	| I O	|	|	|	3.52
4.300	0.28	0.78	0.017	| I O	|	|	|	3.48
4.317	0.27	0.77	0.016	| I O	|	|	|	3.43
4.333	0.25	0.76	0.016	| I O	|	|	|	3.38
4.350	0.24	0.76	0.015	| I O	|	|	|	3.33
4.367	0.24	0.75	0.014	| I O	|	|	|	3.29
4.383	0.23	0.74	0.013	| I O	|	|	|	3.24
4.400	0.22	0.74	0.013	| I O	|	|	|	3.19
4.417	0.21	0.73	0.012	| I O	|	|	|	3.14
4.433	0.21	0.72	0.011	| I O	|	|	|	3.09
4.450	0.20	0.71	0.011	| I O	|	|	|	3.04
4.467	0.20	0.70	0.010	| I O|	|	|	|	2.93
4.483	0.19	0.56	0.009	| I O |	|	|	|	2.02
4.500	0.18	0.48	0.009	| I O |	|	|	|	1.48
4.517	0.18	0.46	0.008	| I O |	|	|	|	1.42
4.533	0.18	0.44	0.008	|I O |	|	|	|	1.35
4.550	0.17	0.42	0.008	|I O |	|	|	|	1.30
4.567	0.17	0.40	0.007	|I O |	|	|	|	1.24
4.583	0.16	0.38	0.007	|I O |	|	|	|	1.19
4.600	0.16	0.37	0.007	|I O |	|	|	|	1.14
4.617	0.16	0.35	0.007	|I O |	|	|	|	1.09
4.633	0.16	0.34	0.006	|I O |	|	|	|	1.05
4.650	0.15	0.33	0.006	|I O |	|	|	|	1.01
4.667	0.15	0.31	0.006	|I O |	|	|	|	0.97
4.683	0.15	0.30	0.006	|I O |	|	|	|	0.93
4.700	0.14	0.29	0.005	|I O |	|	|	|	0.90
4.717	0.14	0.28	0.005	|I O |	|	|	|	0.87
4.733	0.14	0.27	0.005	|I O |	|	|	|	0.84
4.750	0.14	0.26	0.005	|IO |	|	|	|	0.81
4.767	0.14	0.25	0.005	|IO |	|	|	|	0.78
4.783	0.13	0.24	0.005	|IO |	|	|	|	0.75
4.800	0.13	0.24	0.004	|IO |	|	|	|	0.73
4.817	0.13	0.23	0.004	|IO |	|	|	|	0.71
4.833	0.13	0.22	0.004	|IO |	|	|	|	0.68
4.850	0.13	0.21	0.004	|IO |	|	|	|	0.66
4.867	0.12	0.21	0.004	|IO |	|	|	|	0.64
4.883	0.12	0.20	0.004	|IO |	|	|	|	0.62
4.900	0.12	0.20	0.004	|IO |	|	|	|	0.61
4.917	0.12	0.19	0.004	|IO |	|	|	|	0.59
4.933	0.12	0.19	0.003	|IO |	|	|	|	0.57
4.950	0.12	0.18	0.003	|IO |	|	|	|	0.56
4.967	0.11	0.18	0.003	|O |	|	|	|	0.54
4.983	0.11	0.17	0.003	|O |	|	|	|	0.53
5.000	0.11	0.17	0.003	|O |	|	|	|	0.52
5.017	0.11	0.16	0.003	|O |	|	|	|	0.50
5.033	0.11	0.16	0.003	|O |	|	|	|	0.49
5.050	0.11	0.16	0.003	|O |	|	|	|	0.48
5.067	0.11	0.15	0.003	|O |	|	|	|	0.47
5.083	0.11	0.15	0.003	|O |	|	|	|	0.46
5.100	0.11	0.15	0.003	|O |	|	|	|	0.45
5.117	0.10	0.14	0.003	|O |	|	|	|	0.44
5.133	0.10	0.14	0.003	|O |	|	|	|	0.43
5.150	0.10	0.14	0.003	|O |	|	|	|	0.43
5.167	0.10	0.13	0.003	|O |	|	|	|	0.42
5.183	0.10	0.13	0.002	|O |	|	|	|	0.41
5.200	0.10	0.13	0.002	|O |	|	|	|	0.40
5.217	0.10	0.13	0.002	|O |	|	|	|	0.40

5.233	0.10	0.13	0.002	|O	|	|	|	0.39
5.250	0.10	0.12	0.002	|O	|	|	|	0.38
5.267	0.10	0.12	0.002	|O	|	|	|	0.38
5.283	0.09	0.12	0.002	|O	|	|	|	0.37
5.300	0.09	0.12	0.002	|O	|	|	|	0.36
5.317	0.09	0.12	0.002	|O	|	|	|	0.36
5.333	0.09	0.11	0.002	|O	|	|	|	0.35
5.350	0.09	0.11	0.002	|O	|	|	|	0.35
5.367	0.09	0.11	0.002	|O	|	|	|	0.34
5.383	0.09	0.11	0.002	|O	|	|	|	0.34
5.400	0.09	0.11	0.002	|O	|	|	|	0.33
5.417	0.09	0.11	0.002	|O	|	|	|	0.33
5.433	0.09	0.11	0.002	IO	|	|	|	0.33
5.450	0.09	0.10	0.002	IO	|	|	|	0.32
5.467	0.09	0.10	0.002	IO	|	|	|	0.32
5.483	0.09	0.10	0.002	IO	|	|	|	0.31
5.500	0.09	0.10	0.002	IO	|	|	|	0.31
5.517	0.08	0.10	0.002	IO	|	|	|	0.31
5.533	0.08	0.10	0.002	IO	|	|	|	0.30
5.550	0.08	0.10	0.002	IO	|	|	|	0.30
5.567	0.08	0.10	0.002	IO	|	|	|	0.30
5.583	0.08	0.10	0.002	IO	|	|	|	0.29
5.600	0.08	0.09	0.002	IO	|	|	|	0.29
5.617	0.08	0.09	0.002	IO	|	|	|	0.29
5.633	0.08	0.09	0.002	IO	|	|	|	0.29
5.650	0.08	0.09	0.002	IO	|	|	|	0.28
5.667	0.08	0.09	0.002	IO	|	|	|	0.28
5.683	0.08	0.09	0.002	IO	|	|	|	0.28
5.700	0.08	0.09	0.002	IO	|	|	|	0.28
5.717	0.08	0.09	0.002	O	|	|	|	0.27
5.733	0.08	0.09	0.002	O	|	|	|	0.27
5.750	0.08	0.09	0.002	O	|	|	|	0.27
5.767	0.08	0.09	0.002	O	|	|	|	0.27
5.783	0.08	0.09	0.002	O	|	|	|	0.26
5.800	0.08	0.08	0.002	O	|	|	|	0.26
5.817	0.07	0.08	0.002	O	|	|	|	0.26
5.833	0.07	0.08	0.002	O	|	|	|	0.26
5.850	0.07	0.08	0.002	O	|	|	|	0.26
5.867	0.07	0.08	0.002	O	|	|	|	0.25
5.883	0.07	0.08	0.002	O	|	|	|	0.25
5.900	0.07	0.08	0.001	O	|	|	|	0.25
5.917	0.07	0.08	0.001	O	|	|	|	0.25
5.933	0.07	0.08	0.001	O	|	|	|	0.25
5.950	0.07	0.08	0.001	O	|	|	|	0.24
5.967	0.07	0.08	0.001	O	|	|	|	0.24
5.983	0.07	0.08	0.001	O	|	|	|	0.24
6.000	0.07	0.08	0.001	O	|	|	|	0.24
6.017	0.07	0.08	0.001	O	|	|	|	0.24
6.033	0.07	0.08	0.001	O	|	|	|	0.24
6.050	0.07	0.08	0.001	O	|	|	|	0.23
6.067	0.07	0.08	0.001	O	|	|	|	0.23
6.083	0.07	0.07	0.001	O	|	|	|	0.23
6.100	0.00	0.07	0.001	O	|	|	|	0.22
6.117	0.00	0.07	0.001	O	|	|	|	0.21
6.133	0.00	0.06	0.001	O	|	|	|	0.19
6.150	0.00	0.06	0.001	O	|	|	|	0.18
6.167	0.00	0.05	0.001	O	|	|	|	0.17
6.183	0.00	0.05	0.001	O	|	|	|	0.15
6.200	0.00	0.05	0.001	O	|	|	|	0.14
6.217	0.00	0.04	0.001	O	|	|	|	0.13
6.233	0.00	0.04	0.001	O	|	|	|	0.12
6.250	0.00	0.04	0.001	O	|	|	|	0.11
6.267	0.00	0.03	0.001	O	|	|	|	0.11

PRDET

6.283	0.00	0.03	0.001	O	|	|	|	|	0.10
6.300	0.00	0.03	0.001	O	|	|	|	|	0.09
6.317	0.00	0.03	0.001	O	|	|	|	|	0.08
6.333	0.00	0.03	0.000	O	|	|	|	|	0.08
6.350	0.00	0.02	0.000	O	|	|	|	|	0.07
6.367	0.00	0.02	0.000	O	|	|	|	|	0.07
6.383	0.00	0.02	0.000	O	|	|	|	|	0.06
6.400	0.00	0.02	0.000	O	|	|	|	|	0.06
6.417	0.00	0.02	0.000	O	|	|	|	|	0.05
6.433	0.00	0.02	0.000	O	|	|	|	|	0.05
6.450	0.00	0.02	0.000	O	|	|	|	|	0.05
6.467	0.00	0.01	0.000	O	|	|	|	|	0.04
6.483	0.00	0.01	0.000	O	|	|	|	|	0.04
6.500	0.00	0.01	0.000	O	|	|	|	|	0.04
6.517	0.00	0.01	0.000	O	|	|	|	|	0.03
6.533	0.00	0.01	0.000	O	|	|	|	|	0.03
6.550	0.00	0.01	0.000	O	|	|	|	|	0.03
6.567	0.00	0.01	0.000	O	|	|	|	|	0.03
6.583	0.00	0.01	0.000	O	|	|	|	|	0.03
6.600	0.00	0.01	0.000	O	|	|	|	|	0.02
6.617	0.00	0.01	0.000	O	|	|	|	|	0.02
6.633	0.00	0.01	0.000	O	|	|	|	|	0.02
6.650	0.00	0.01	0.000	O	|	|	|	|	0.02
6.667	0.00	0.01	0.000	O	|	|	|	|	0.02
6.683	0.00	0.01	0.000	O	|	|	|	|	0.02
6.700	0.00	0.00	0.000	O	|	|	|	|	0.02
6.717	0.00	0.00	0.000	O	|	|	|	|	0.01
6.733	0.00	0.00	0.000	O	|	|	|	|	0.01
6.750	0.00	0.00	0.000	O	|	|	|	|	0.01
6.767	0.00	0.00	0.000	O	|	|	|	|	0.01
6.783	0.00	0.00	0.000	O	|	|	|	|	0.01
6.800	0.00	0.00	0.000	O	|	|	|	|	0.01
6.817	0.00	0.00	0.000	O	|	|	|	|	0.01
6.833	0.00	0.00	0.000	O	|	|	|	|	0.01
6.850	0.00	0.00	0.000	O	|	|	|	|	0.01
6.867	0.00	0.00	0.000	O	|	|	|	|	0.01
6.883	0.00	0.00	0.000	O	|	|	|	|	0.01
6.900	0.00	0.00	0.000	O	|	|	|	|	0.01
6.917	0.00	0.00	0.000	O	|	|	|	|	0.01
6.933	0.00	0.00	0.000	O	|	|	|	|	0.01
6.950	0.00	0.00	0.000	O	|	|	|	|	0.01
6.967	0.00	0.00	0.000	O	|	|	|	|	0.00
6.983	0.00	0.00	0.000	O	|	|	|	|	0.00
7.000	0.00	0.00	0.000	O	|	|	|	|	0.00
7.017	0.00	0.00	0.000	O	|	|	|	|	0.00
7.033	0.00	0.00	0.000	O	|	|	|	|	0.00
7.050	0.00	0.00	0.000	O	|	|	|	|	0.00
7.067	0.00	0.00	0.000	O	|	|	|	|	0.00

**********HYDROGRAPH DATA**********

Number of intervals = 424
Time interval = 1.0 (Min.)
Maximum/Peak flow rate = 1.030 (CFS)
Total volume = 0.094 (Ac.Ft)

Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

****

PRROUTE

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.5

Rational method hydrology program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study   Date: 01/09/17

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

Program License Serial Number 6313

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

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity) = 1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method

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Process from Point/Station   201.000 to Point/Station   202.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
_____
User specified 'C' value of 0.950 given for subarea
Rainfall intensity (I) =   3.264(In/Hr) for a   50.0 year storm
User specified values are as follows:
TC =   9.45 min. Rain intensity =   3.26(In/Hr)
Total area =   0.579(Ac.) Total runoff =   1.030(CFS)

++
Process from Point/Station   202.000 to Point/Station   203.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation =   38.700(Ft.)
Downstream point/station elevation =   36.940(Ft.)
Pipe length =   170.00(Ft.)   Manning's N = 0.013
No. of pipes = 1 Required pipe flow =   1.030(CFS)
Given pipe size =   12.00(In.)
Calculated individual pipe flow =   1.030(CFS)
Normal flow depth in pipe =   4.38(In.)
Flow top width inside pipe =   11.55(In.)
Critical Depth =   5.11(In.)
Pipe flow velocity =   3.97(Ft/s)
Travel time through pipe =   0.71 min.
Time of concentration (TC) =   10.16 min.

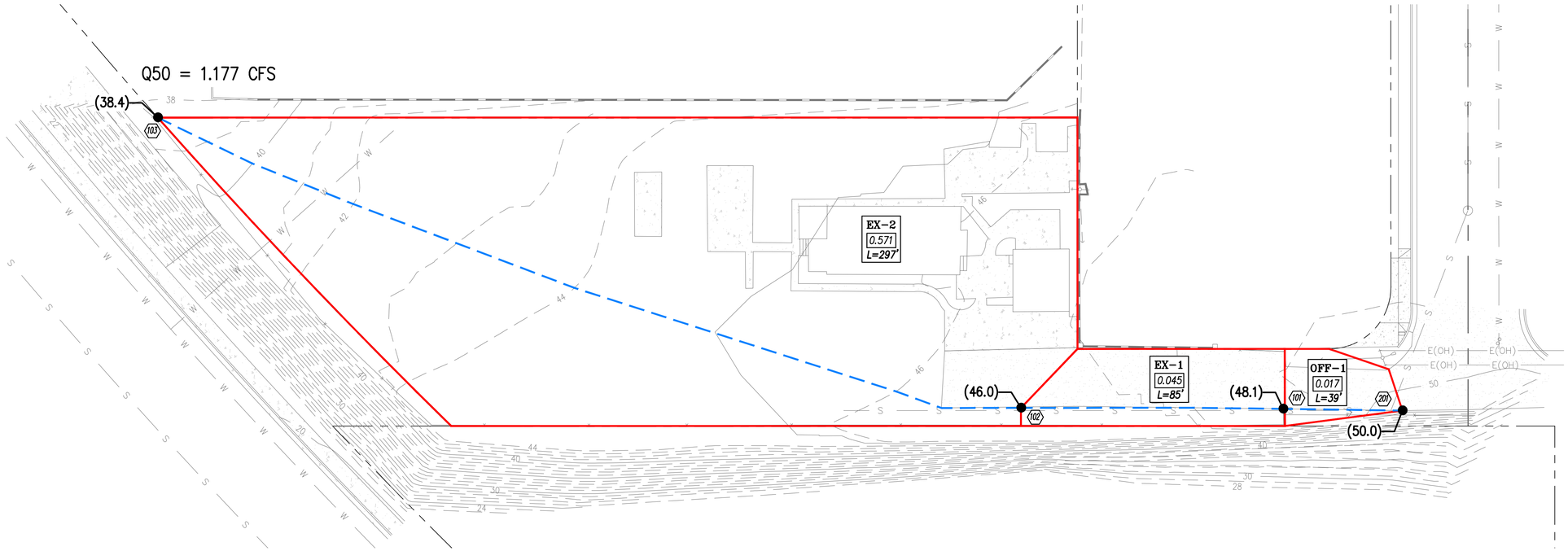
++
Process from Point/Station   203.000 to Point/Station   204.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation =   36.940(Ft.)

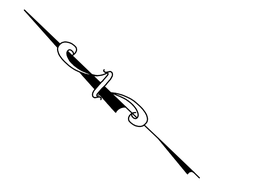
PRROUTE

```
Downstream point/station elevation =    19.230(Ft.)
Pipe length  =    46.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.030(CFS)
Given pipe size =      6.00(In.)
Calculated individual pipe flow  =     1.030(CFS)
Normal flow depth in pipe =    2.24(In.)
Flow top width inside pipe =    5.80(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.44(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    10.21 min.
End of computations, total study area =           0.579 (Ac.)
```

ATTACHMENT 5

HYDROLOGY MAP - EXISTING CONDITIONS





LEGEND

- SUBDIVISION BOUNDARY
- 200 EXISTING CONTOUR (MAJOR)
- EXISTING CONTOUR (MINOR)
- HYDROLOGIC BASIN BOUNDARY
- HYDROLOGIC FLOW PATH
- EX-1 BASIN NUMBER
- 0.20 AREA (ACRES)
- 101 NODE NUMBER
- (200.00) ELEVATION (FEET)

ATTACHMENT 5
EXISTING HYDROLOGIC CONDITIONS

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110 COPPERWOOD WAY, SUITE P, OCEANSIDE, CA 92058
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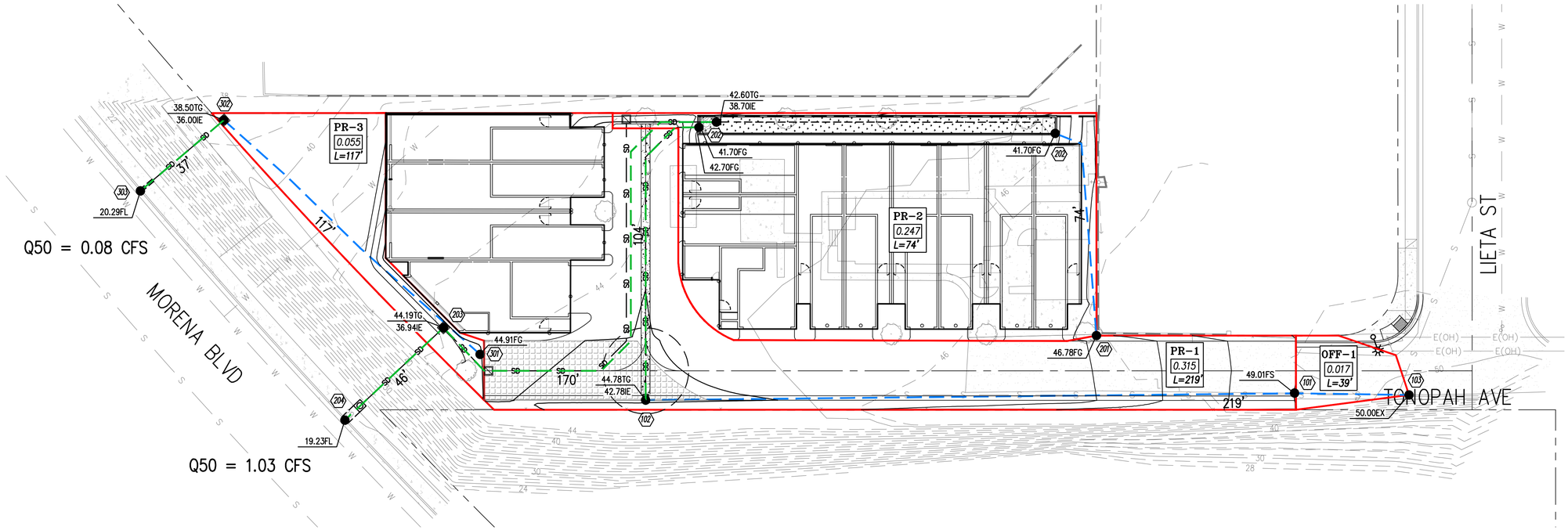
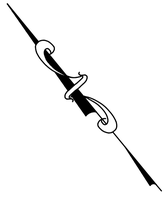
ATTACHMENT 6

HYDROLOGY MAP - PROPOSED CONDITIONS





20 0 20 40

GRAPHIC SCALE
SCALE: 1"= 20'

LEGEND

- SUBDIVISION BOUNDARY
- EXISTING CONTOUR (MAJOR)
- EXISTING CONTOUR (MINOR)
- HYDROLOGIC BASIN BOUNDARY
- HYDROLOGIC FLOW PATH
- EX-1 BASIN NUMBER
- 0.20 AREA (ACRES)
- 101 NODE NUMBER
- (200.00) ELEVATION (FEET)

ATTACHMENT 6
PROPOSED HYDROLOGIC CONDITIONS

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