WALSH ENGINEERING
& SURVEYING, INC.

DRAINAGE STUDY
For
Sundale Road
Sundale Road (Vacant)
El Cajon CA, 92019

Prepared for:
Emad Yousif
1490 South Orange Ave, #128
El Cajon CA, 92020

(Walsh Engineering Job No 191138)

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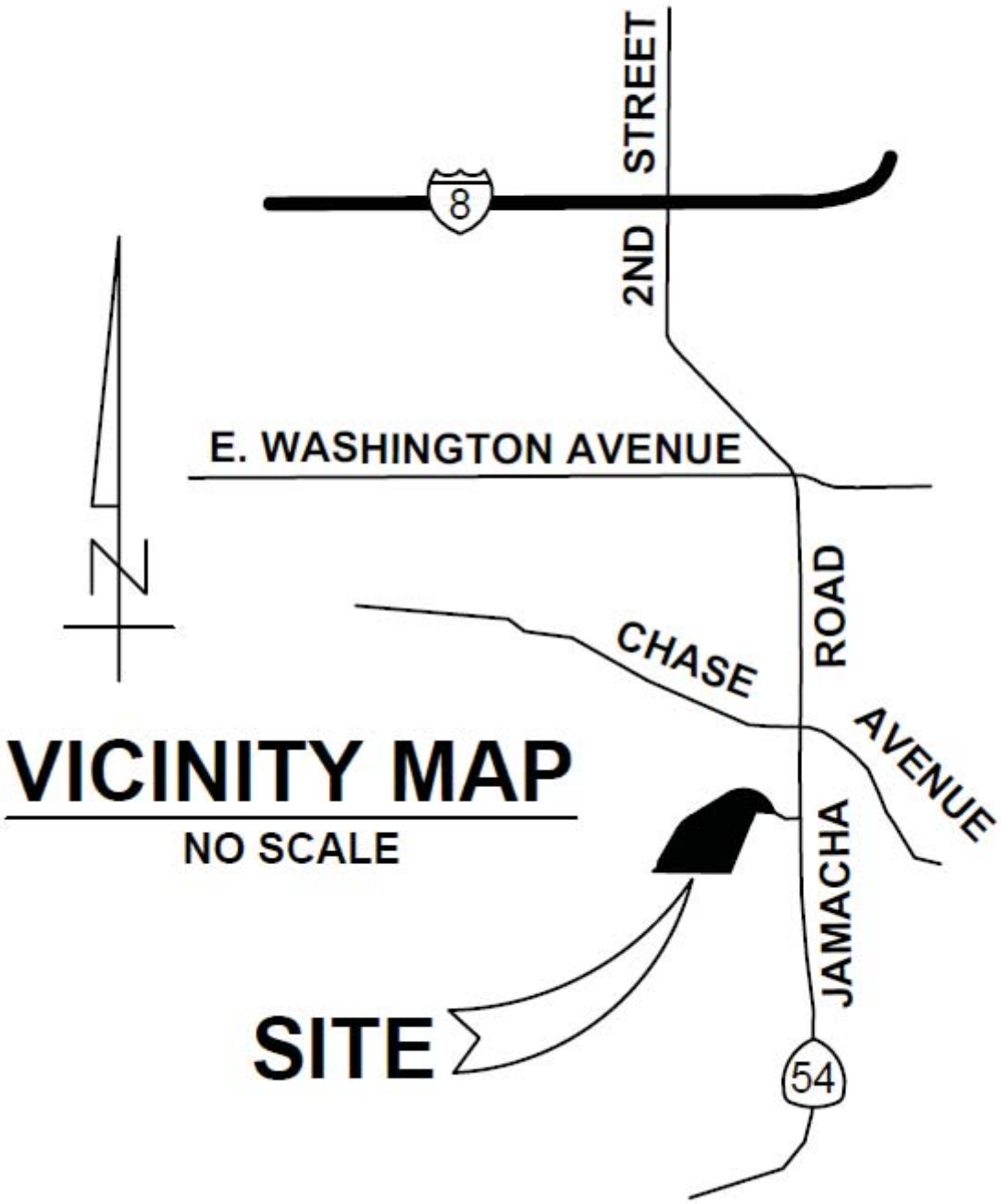
Declaration of Responsible Charge

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 standards.

I understand the check of this project drawings and specification by the County of San Diego is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

Lawrence W. Walsh 1/16/24

Lawrence W. Walsh, RCE 46316, EXP. 12-31-24 Date



VICINITY MAP

NO SCALE

Introduction
The project is a 6 lot grading plan on a vacant 3.7 acre property located on Sundale Road, El Cajon, CA 92019 (see attached Vicinity Map and reduced Sheet 2 of the Grading Plan). The project covers development of the lots, even though the purpose of the plan is for grading only. The purpose of this drainage study is to show how the areas of the pre and post development basins are kept the same, but that any increase in flow from pre to post development is mitigated.

Pre-Developed Condition
In the pre-developed condition, the site is composed of vacant natural terrain with Type B soil. The project site is surrounded by homes in a suburban setting and has an average slope of 17%, with runoff flowing south to north through the site. There are two drainage basins on the property. The C-values for Basins 1 and 2 are 0.33 and 0.25, respectively (see C-value Calculations in Appendix C). Basin 1 is approximately 3 acres and discharges at a point of comparison on Sundale Road (see Pre-Developed Drainage Map in Appendix B). Basin 2 is approximately 1.3 acres and sheet flows across the Easterly property line. Due to the sheet flow condition of Basin 2, the entire length of the Easterly boundary will be considered the point of comparison. Using CivilDesign software, the pre-developed flow rates were calculated to be 4.38 cfs for Basin 1 and 1.57 cfs for Basin 2 (see Pre-Developed Calculations in Appendix D). See the table on the next page for a summary of pre-developed values and flow rates.

Post-Developed Condition
In the post-developed condition, the C-values increase to 0.41 and 0.34 in Basins 1 and 2, respectively, to account for the increase in impervious area (see C-value Calculations in Appendix C). In Basin 1, a longer flow path starting from Lot 1 will increase the time of concentration (see Post-Developed Drainage Map in Appendix B). Using CivilDesign software, the calculated post-developed flow rate is 4.23 cfs (see Post-Developed Calculations in Appendix E). That is, the runoff has decreased by 0.15 cfs from 4.38 cfs in the Pre-Developed condition. In Basin 2, the post-developed flow rate is 1.78 cfs, having increased by 0.21 cfs from 1.57 cfs in the Pre-Developed condition. See the table on the next page for a summary of post-developed values and flow rates.

There are two mitigation measures proposed to counter Basin 2's increase in flow rate. To help mitigate concentrated runoff leaving the site, a 130' X 10' X 1' thick rock bed is proposed along the Easterly property line, which will help recreate a sheet flow condition. 3" rock was deemed suitable for energy dissipation following analysis of flows and velocities of discharge on to the rock bed. The second mitigation measure is routing the runoff through three conjunctive use tree wells before leaving the site. These tree wells are designed to meet section 6.2.7 of the Hydraulic Design Manual. The hydrographs and detention pond outputs for each tree well from the Hydraflow Hydrographs Civil 3D program can be found in Appendix F.

Orifices have been added and modeled at the tree well finished grade elevation using the start of the flood storage layer. The orifice design is in the "Culvert/Orifice Structures" section on the "Pond Report" page for each tree well in Appendix F. The Sub-Basin 2-2 tree well has one 3" orifice. The Sub-Basin 2-5 tree well has one 4" orifice. The Sub-Basin 2-7 tree well has one 3" orifice. Catch basin parameters are in the "Weir Structures" section of the "Pond Report."

Conclusion

Comparing the flow rates for the pre and post-developed conditions, there is a 0.15 cfs decrease in runoff for Basin 1 and a 0.21 cfs increase in runoff for Basin 2. Therefore, no detention will be required in Basin 1. As for Basin 2, the runoff will be detained by three proposed tree wells. The mitigated flow rate, 1.19 cfs, in the table below is calculated herein. Pond No.1, which is Sub-basin 2-2's tree well, detains 0.28 cfs. That is, the pond's Q_{100} peak is 0.213 cfs, whereas the unmitigated Q_{100} peak is 0.49 cfs (see Hydrograph Summary Report in Appendix F). The detained flow is 0.49 cfs – 0.213 cfs = 0.28 cfs. Pond No.2, which is Sub-basin 2-5's tree well, detains 0.15 cfs. Here, the pond's Q_{100} peak is 0.384 cfs, whereas the unmitigated Q_{100} peak is 0.53 cfs, resulting in detained flow of 0.53 cfs – 0.384 cfs = 0.15 cfs. Pond No.3, which is Sub-basin 2-7's tree well, detains 0.16 cfs. Here, the pond's Q_{100} peak is 0.220 cfs, whereas the unmitigated Q_{100} peak is 0.38 cfs, resulting in detained flow of 0.38 – 0.22 cfs = 0.16 cfs. Overall, the total amount detained is 0.28 cfs + 0.15 cfs + 0.16 cfs = 0.59 cfs, which exceeds the minimum 0.21 cfs to satisfy detention requirements. Therefore, Post Basin 2's mitigated flow rate is now 1.78 cfs – 0.59 cfs = 1.19 cfs.

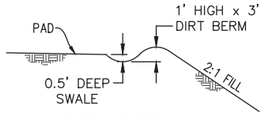
The Hydraflow program also calculates the maximum water surface level in each pond. Each maximum water surface level stays below the 1.5' available for ponding. That is, each maximum elevation in the Hydrograph Summary Report remains below its respective catch basin's Crest Elevation noted in the Weir Structures section of the Pond Report (see Appendix F). For example, Sub-Basin's 2-2 tree well has a maximum water surface level of 646.14 feet, which is below the catch basin's crest elevation of 646.70 feet. Each pond also includes the minimum 1' of freeboard.

In conclusion, there is no detention needed for Basin 1. Basin 2's increase in flow rate from proposed development has been adequately detained. The peak flow rate from proposed development will be mitigated back to the pre-developed flow rate.

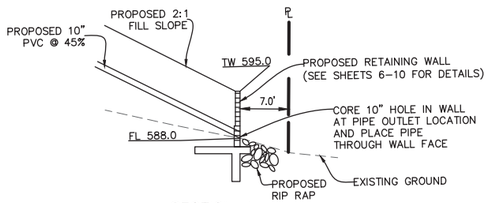
Basin	Pre-Developed Effective C	Pre-Developed Tc (min.)	Pre-Developed I (in./hr.)	Pre-Developed Area (acres)	Pre-Developed Q_{100} (cfs)
1	0.33	11.43	4.33	3.04	4.38
2	0.25	9.22	4.97	1.26	1.57

Basin	Post-Developed Effective C	Post-Developed Tc (min.)	Post-Developed I (in./hr.)	Post-Developed Area (acres)	Post-Developed Q_{100} (cfs)	Mitigated Q_{100} (cfs)
1	0.41	16.63	3.40	3.04	4.23	N/A
2	0.34	12.20	4.15	1.26	1.78	1.19

Appendix A –Grading Plan Sheet 2 (Reduced Size)



BERM DETAIL
NO SCALE



SECTION A-A
H: 1" = 10'
V: 1" = 10'

TREE WELL LEGEND:					
NO.	CANOPY DIAMETER (FT)	SOIL DEPTH (FT)	FG	TW	BW
1	15	5.5	645.4	645.9	644.9
2	20	6	644.7	646.7	643.7
3	20	6	618.0	620.0	617.0
4	20	4	619.6	620.1	618.6
5	20	6	591.7	593.7	590.7
6	20	6	593.3	593.8	592.3
7	15	6	592.9	593.4	591.9
8	20	6	592.9	593.4	591.9
9	20	6	584.8	585.3	583.8

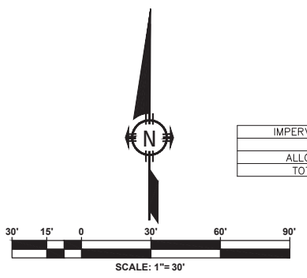
LEGEND

1. PROPOSED 6" PVC S.D. PIPE @ 1%
2. PROPOSED 12" PVC S.D. PIPE @ 10%
3. PROPOSED 6" PVC S.D. PIPE @ 22%
4. PROPOSED 6" PVC S.D. PIPE @ 28%
5. PROPOSED 10" PVC S.D. PIPE @ 45%
6. PROPOSED CURB OUTLET PER RSD D-25B
7. PROPOSED 16' DRIVEWAY PER RSD G-14A
8. PROPOSED 6" PVC S.D. PIPE @ 8%
9. PROPOSED TYPE 2 5'x5'x1.1' THICK NO. 2 BACKING CLASS RIPRAP PER RSD D-40
10. PROPOSED 5' MAX RETAINING WALL PER RSD C-02
11. PROPOSED TYPE B GRAVITY WALL PER RSD C-09
12. PROPOSED 6" PVC S.D. PIPE @ 6%
13. PROPOSED 10" PVC S.D. PIPE @ 4%
14. PROPOSED 6" PVC S.D. PIPE @ 26%
15. PROPOSED 6" PVC S.D. PIPE @ 2%
16. PROPOSED 12"X12" CATCH BASIN WITH STEEL GRATE ("BROOKS" 1212CB)
17. PROPOSED 10" PVC S.D. PIPE @ 1%
18. PROPOSED 12" PVC S.D. PIPE @ 1%

EASEMENT LEGEND

1. PROPOSED 10' STORM DRAIN EASEMENT FOR THE BENEFIT OF LOT 1 PER DOC.#_____ REC._____
2. PROPOSED 10' STORM DRAIN EASEMENT FOR THE BENEFIT OF LOT 3 PER DOC.#_____ REC._____
3. PROPOSED 10' STORM DRAIN EASEMENT FOR THE BENEFIT OF LOTS 3 & 4 PER DOC.#_____ REC._____

NOTE:
CONSTRUCTION/EXCAVATION PERMIT IS REQUIRED FOR WORK WITHIN THE COUNTY RIGHT-OF-WAY, INCLUDING DRIVEWAY ACCESS AND D-25.



IMPERVIOUS SURFACES (SF)	LOT 1	LOT 2	LOT 3	LOT 4	LOT 5	LOT 6
FUTURE HOUSE (SF)	3,792	1,942	2,104	2,380	3,832	2,540
ALLOWABLE FUTURE PCC (SF)	206	1,318	886	1,763	0	0
TOTAL IMPERVIOUS (SF)	3,998	3,260	2,990	4,143	3,832	2,540

PVC PIPE THROUGH GRAVITY WALL DETAIL (LOT 2)
NO SCALE

LOCAL BENCHMARK: CENTERLINE WELL MONUMENT WITH 3" BRASS DISC STAMPED "RCE 18136" AT CENTER OF BULB IN SUNDALE ROAD APPROXIMATELY 31' NORTHWESTERLY FROM THE SOUTHWESTERLY CORNER OF SUBJECT PROPERTY AS SHOWN HEREON. EL: 647.07 (NAVD88)

COUNTY APPROVED CHANGES			
NO.	DESCRIPTION	APPROVED BY	DATE

BENCH MARK
DESCRIPTION: CENTERLINE WELL MONUMENT WITH 1" PIPE AND DISC STAMPED "SAN DIEGO SURVEYOR".
LOCATION: CENTERLINE OF JAMACHA ROAD 15' NORTHERLY OF INTERSECTION WITH FALDA DEL CERRO.
RECORD FROM: SAN DIEGO COUNTY BENCHBOOK AND ROS 17454
ELEVATION: 562.84 DATUM: NAVD88

PRIVATE CONTRACT

SHEET 2	COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS	OF 10 SHEETS

GRADING PLANS FOR:

SUNDALE ROAD

CALIFORNIA COORDINATE INDEX: 218-1792

RECOMMENDED FOR APPROVAL: SUBDIVISION ENGINEER	APPROVED FOR WILLIAM P. MORGAN, COUNTY ENGINEER BY: DATE:
ENGINEER OF WORK: LAWRENCE W. WALSH RCE 46316 EXP 12-31-24	CHECKED BY: TM 2272
	PDS2021-LDGRMJ-30366

LAWRENCE W. WALSH R.C.E. 46316 DATE
Walsh Engineering & Surveying, Inc.
607 Aldwych Road, El Cajon, CA 92020
(619) 588-6747 (619) 792-1232 Fax

REGISTERED PROFESSIONAL ENGINEER LAWRENCE W. WALSH 46316 CIVIL STATE OF CALIFORNIA

ENGINEER'S NAME: WALSH ENGINEERING & SURVEYING, INC.
PHONE NO.: 619-588-6747

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Appendix B – Drainage Maps

DRAINAGE MAP: PRE-DEVELOPED

SUNDALE ROAD (VACANT)
EL CAJON, CA 92019

LEGEND:

- BASIN BOUNDARY
- SUB-BASIN BOUNDARY
- FLOWPATH

BASIN
SUB BASIN
NODE

1.021
EL 657.0

NODE ELEVATION

SUNDALE ROAD

BASIN 1
3.04 AC

SUB-BASIN 1-2
A=2.45 AC

L=494'

L=326'

1.031
EL 579.0

L=201'

SUB-BASIN 1-3
A=0.57 AC

1.032
ELEV 575.5
POC 1
Q_{100}=4.38 CFS

DUE TO THE SHEET FLOW CONDITION THE POC 2 IS ANALYZED ACROSS THE ENTIRE PROPERTY LINE
Q_{100}=1.57 CFS

2.022
ELEV 585.0

BASIN 2
1.26 AC

SUB-BASIN 2-2
A=1.24 AC

1.021
EL 657.0

2.021
ELEV 652.0

SUB-BASIN 1-1
A=0.02 AC

L=100'

L=100'

SUB-BASIN 2-1
A=0.02 AC

1.011
2.011
EL 671.0

600
625
650

50' 25' 0 50' 100' 150'

SCALE: 1"= 50'

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DRAINAGE MAP: POST-DEVELOPED

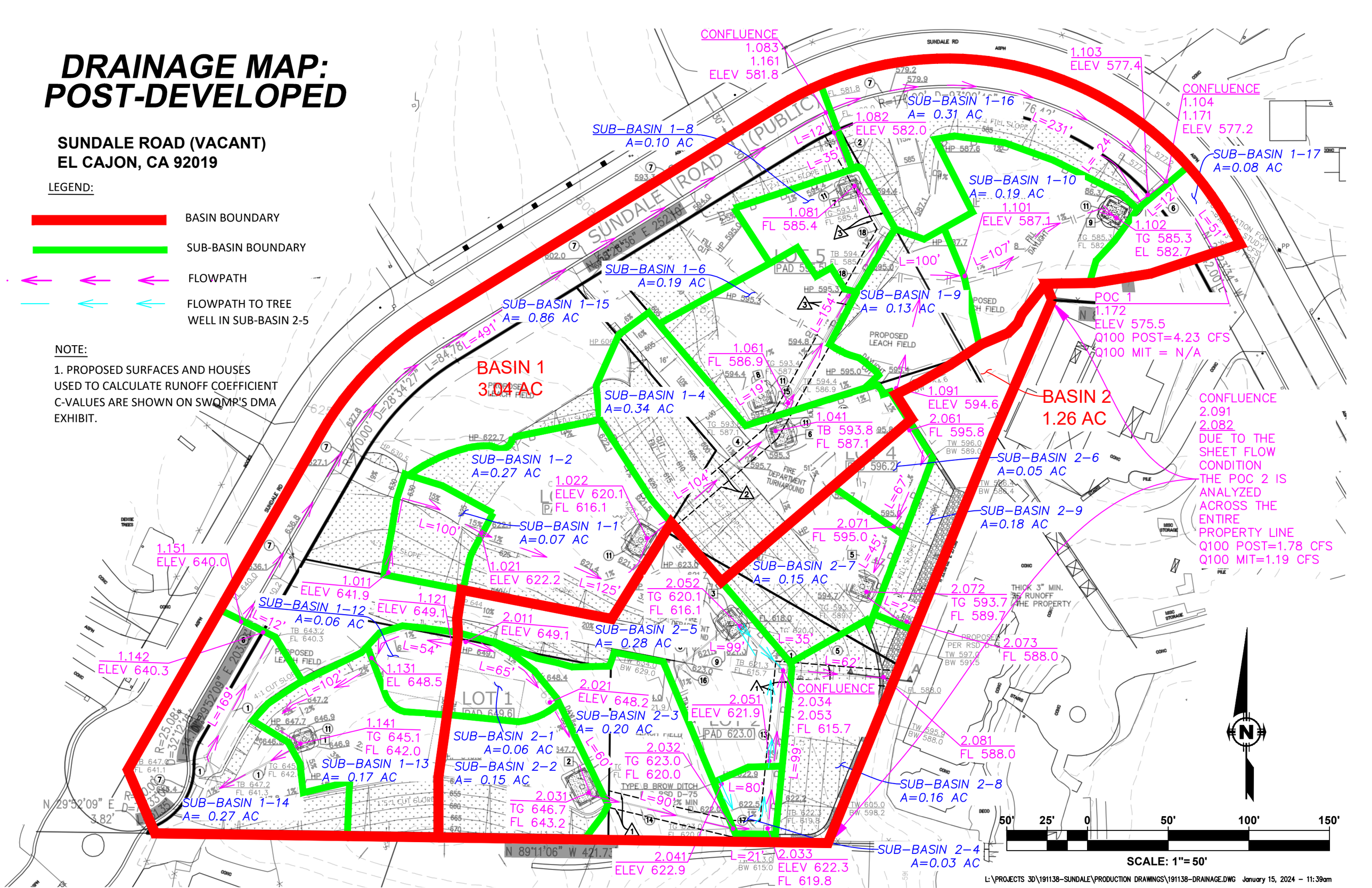
SUNDALE ROAD (VACANT)
EL CAJON, CA 92019

LEGEND:

- BASIN BOUNDARY
- SUB-BASIN BOUNDARY
- FLOWPATH
- FLOWPATH TO TREE WELL IN SUB-BASIN 2-5

NOTE:

1. PROPOSED SURFACES AND HOUSES USED TO CALCULATE RUNOFF COEFFICIENT C-VALUES ARE SHOWN ON SWQMP'S DMA EXHIBIT.



Appendix C – C-value Calculations

Weighted C-Value Calculations – Pre-Basin 1

Sub-Basin 1-1:
Total Area = 0.02 ac
Existing Percent Impervious = 0%
Soil = Type B

C = 0.25 (Permanent Open Space) (Table 3-1, Hydrology Manual)

Sub-Basin 1-2:
Weighted C value = C_W = ?
Total Area = 2.45 ac

Existing Impervious = Road = 12,830 SF x (1 ac / 43,560 SF) = 0.29 ac

Total Impervious = $\frac{0.29\ ac}{2.45\ ac}$ = 12%

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

C_W = 0.90(% Impervious) + C_P (1- % Impervious)
C_W = 0.90(0.12) + 0.25(1-0.12) = 0.33
C_W = 0.33

Sub-Basin 1-3:
Weighted C value = C_W = ?
Total Area = 0.57 ac

Existing Impervious = Road = 3,873 SF x (1 ac / 43,560 SF) = 0.09 ac

Total Impervious = $\frac{0.09\ ac}{0.57\ ac}$ = 16%

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

C_W = 0.90(% Impervious) + C_P (1- % Impervious)
C_W = 0.90(0.16) + 0.25(1-0.16) = 0.35
C_W = 0.35

Basin 1:
$C_w = \frac{(0.25)(0.02\ ac)+(0.33)(2.45\ ac)+(0.35)(0.57\ ac)}{3.04\ ac}$ = 0.33

C_w = 0.33

C-Value Calculations – Pre-Basin 2

Sub-Basin 2-1:
Total Area = 0.02 ac
Existing Percent Impervious = 0%
Soil = Type B

C = 0.25 (Permanent Open Space) (Table 3-1, Hydrology Manual)

Sub-Basin 2-2:
Total Area = 1.24 ac
Existing Percent Impervious = 0%
Soil = Type B

C = 0.25 (Permanent Open Space) (Table 3-1, Hydrology Manual)

Basin 2:
C = 0.25

Weighted C-Value Calculations – Post-Basin 1

Sub-Basin 1-1:
Note that no weighted C-value is used for initial area input because Civil Design software does not allow for user input C-value on the initial area.

Total Area = 0.07 ac
Soil = Type B

Existing Impervious = 0 ac
Proposed Impervious = Driveway = 886 SF x (1 ac / 43,560 SF) = 0.02 ac

$$\% \text{ Impervious} = \frac{0.02 \text{ ac}}{0.07 \text{ ac}} = 29\% \approx 30\%$$

C = 0.45 (4.3 DU/ac) (Table 3-1, Hydrology Manual)

Sub-Basin 1-2:
Weighted C-value = C_W = ?
Total Area = 0.27 ac

Existing Impervious = 0 ac
Proposed Impervious = House = 2,104 SF = 0.05 ac

$$\% \text{ Impervious} = \frac{0.05 \text{ ac}}{0.27 \text{ ac}} = 19\%$$

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

$C_W = 0.90(\%\text{ Impervious}) + C_P (1 - \%\text{ Impervious})$

$C_W = 0.90(0.19) + 0.25(1-0.19) = 0.37$

C_W = 0.37

Sub-Basin 1-4:
Weighted C-value = C_W = ?
Total Area = 0.34 ac

Existing Impervious = 0 ac
Proposed Impervious = House = 2,545 SF = 0.06 ac

$$\% \text{ Impervious} = \frac{0.06 \text{ ac}}{0.34 \text{ ac}} = 18\%$$

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

C_W = 0.90(% Impervious) + C_P (1- % Impervious)

C_W = 0.90(0.18) + 0.25(1-0.18) = 0.40

C_W = 0.37

Sub-Basin 1-6:
Weighted C-value = C_W = ?
Total Area = 0.19 ac

Existing Impervious = 0 ac
Proposed Impervious = House = 2,278 SF = 0.05 ac

$$\% \text{ Impervious} = \frac{0.05 \text{ ac}}{0.19 \text{ ac}} = 26\%$$

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

C_W = 0.90(% Impervious) + C_P (1- % Impervious)

C_W = 0.90(0.26) + 0.25(1-0.26) = 0.42

C_W = 0.42

Sub-Basin 1-8:
Weighted C-value = C_W = ?
Total Area = 0.10 ac

Existing Impervious = 0 ac
Proposed Impervious = House = 1,554 SF = 0.04 ac

$$\% \text{ Impervious} = \frac{0.04 \text{ ac}}{0.10 \text{ac}} = 40\%$$

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

C_W = 0.90(% Impervious) + C_P (1- % Impervious)

C_W = 0.90(0.40) + 0.25(1-0.40) = 0.51
C_W = 0.51

Sub-Basin 1-9:
Note that no weighted C-value is used for initial area input because Civil Design software does not allow for user input C-value on the initial area.

Total Area = 0.13 ac
Soil = Type B

Existing Impervious = 0 ac
Proposed Impervious = House = 285 SF x (1 ac / 43,560 SF) = 0.01 ac

$$\% \text{ Impervious} = \frac{0.01 \text{ ac}}{0.13 \text{ ac}} = 8\% \approx 10\%$$

C = 0.32 (1 DU/ac) (Table 3-1, Hydrology Manual)

Sub-Basin 1-10:
Weighted C-value = C_W = ?
Total Area = 0.19 ac

Existing Impervious = 0
Proposed Impervious = House = 2,255 SF = 0.05 ac

$$\% \text{ Impervious} = \frac{0.05 \text{ ac}}{0.19 \text{ ac}} = 26\%$$

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

$C_W = 0.90(\% \text{ Impervious}) + C_P (1 - \% \text{ Impervious})$

$C_W = 0.90(0.26) + 0.25(1-0.26) = 0.419$

C_W = 0.42

Sub-Basin 1-12:
Note that no weighted C-value is used for initial area input because Civil Design software does not allow for user input C-value on the initial area.

Total Area = 0.06 ac
Soil = Type B

Existing Impervious = 0 ac
Proposed Impervious = House = 978 SF x (1 ac / 43,560 SF) = 0.02 ac

$$\% \text{ Impervious} = \frac{0.02 \text{ ac}}{0.06 \text{ ac}} = 33\% \approx 30\%$$

C = 0.45 (4.3 DU/ac) (Table 3-1, Hydrology Manual)

Sub-Basin 1-13:
Weighted C-value = C_W = ?
Total Area = 0.17 ac

Existing Impervious = 0 ac
Proposed Impervious = House = 222 SF = 0.01 ac

$$\% \text{ Impervious} = \frac{0.01 \text{ ac}}{0.17 \text{ ac}} = 6\%$$

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

$C_W = 0.90(\% \text{ Impervious}) + C_P (1 - \% \text{ Impervious})$

$C_W = 0.90(0.06) + 0.25(1-0.06) = 0.29$
C_W = 0.29

Sub-Basin 1-14:
Weighted C value = C_W = ?
Total Area = 0.27 ac

Existing Impervious = Road = 3,313 SF = 0.07 ac
Proposed Impervious = Driveway Apron = 206 SF = 0.01 ac
Total Impervious = 0.08 ac

$$\% \text{ Impervious} = \frac{0.08 \text{ ac}}{0.27 \text{ ac}} = 30\%$$

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

$C_W = 0.90(\% \text{ Impervious}) + C_P (1 - \% \text{ Impervious})$

$C_W = 0.90(0.30) + 0.25(1-0.30) = 0.45$
C_W = 0.45

Sub-Basin 1-15:
Weighted C value = C_W = ?
Total Area = 0.86 ac

Existing Impervious = Road = 8,946 = 0.20 ac
Proposed Impervious = House = 824 SF = 0.02 ac
Total Impervious = 0.22 ac

$$\% \text{ Impervious} = \frac{0.22 \text{ ac}}{0.86 \text{ ac}} = 26\%$$

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

$C_W = 0.90(\% \text{ Impervious}) + C_P (1 - \% \text{ Impervious})$

$C_W = 0.90(0.26) + 0.25(1-0.26) = 0.42$
C_W = 0.42

Sub-Basin 1-16:
Weighted C-value = C_W = ?
Total Area = 0.31 ac

Existing Impervious = Road = 4,127 SF = 0.09 ac
Proposed Impervious = Driveway Apron = 206 SF = 0.01 ac
Total Impervious = 0.10 ac

$$\% \text{ Impervious} = \frac{0.10 \text{ ac}}{0.31 \text{ ac}} = 32\%$$

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

$C_W = 0.90(\% \text{ Impervious}) + C_P (1 - \% \text{ Impervious})$

$C_W = 0.90(0.32) + 0.25(1-0.32) = 0.46$
C_W = 0.46

Sub-Basin 1-17:
Weighted C value = C_W = ?
Total Area = 0.08 ac

Existing Impervious = Road = 882 SF = 0.02 ac
Proposed Impervious = 0 ac
Total Impervious = 0.02 ac

$$\% \text{ Impervious} = \frac{0.02 \text{ ac}}{0.08 \text{ ac}} = 25\%$$

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

$C_W = 0.90(\%\text{ Impervious}) + C_P(1 - \%\text{ Impervious})$

$C_W = 0.90(0.25) + 0.25(1-0.25) = 0.41$
$C_W = 0.41$

Basin 1:
$$C_w = \frac{\begin{array}{c}(0.45)(0.07\text{ ac})+(0.37)(0.27\text{ ac})+(0.37)(0.34\text{ ac})+(0.42)(0.19\text{ ac})+(0.51)(0.10\text{ ac})+(0.32)(0.13\text{ ac})+\\ (0.42)(0.19\text{ ac})+(0.45)(0.06\text{ ac})+(0.29)(0.17\text{ ac})+(0.45)(0.27\text{ ac})+(0.42)(0.86\text{ ac})+\\ (0.46)(0.31\text{ ac})+(0.41)(0.08\text{ ac})\end{array}}{3.04\text{ ac}}$$

= 0.409

$C_w = 0.41$

Weighted C-Value Calculations – Post-Basin 2

Sub-Basin 2-1:
Note that no weighted C-value is used for initial area input because Civil Design software does not allow for user input C-value on the initial area.

Total Area = 0.06 ac
Soil = Type B

Existing Impervious = 0 ac
Proposed Impervious = House = 1,220 SF x (1 ac / 43,560 SF) = 0.03 ac

$$\text{Total Impervious} = \frac{0.03\ \text{ac}}{0.06\ \text{ac}} = 50\%$$

C = 0.58 (14.5 DU/ac) (Table 3-1, Hydrology Manual)

Sub-Basin 2-2:
Weighted C-value = C_W = ?
Total Area = 0.15 ac

Existing Impervious = 0 ac
Proposed Impervious = House = 1,360 SF = 0.03 ac

$$\text{Total Impervious} = \frac{0.03\ \text{ac}}{0.15\ \text{ac}} = 20\%$$

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

$C_W = 0.90(\%\ \text{Impervious}) + C_P\ (1 - \%\ \text{Impervious})$

$C_W = 0.90(0.20) + 0.25(1-0.20) = 0.38$

C_W = 0.38

Sub-Basin 2-3:
Weighted C-value = C_W = ?
Total Area = 0.20 ac

Existing Impervious = 0 ac
Proposed Impervious = 0 ac
Soil = Type B

C = 0.25 (Permanent Open Space) (Table 3-1, Hydrology Manual)

Sub-Basin 2-4:
Note that no weighted C-value is used for initial area input because Civil Design software does not allow for user input C-value on the initial area. The total impervious will be rounded.

C-value = C_W = ?
Total Area = 0.03 ac

Existing Impervious = 0 ac
Proposed Impervious = House = 330 SF = 0.0076 ac

$$\text{Total Impervious} = \frac{0.0076 \text{ ac}}{0.03 \text{ ac}} = 23\% \approx 20\%$$

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

C = 0.38 (2 DU/ac) (Table 3-1, Hydrology Manual)

Sub-Basin 2-5:
Weighted C-value = C_W = ?
Total Area = 0.28 ac

Existing Impervious = 0 ac
Proposed Impervious = House = 2,930 SF = 0.07 ac

$$\text{Total Impervious} = \frac{0.07 \text{ ac}}{0.28 \text{ ac}} = 25\%$$

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

$C_W = 0.90(\%\text{ Impervious}) + C_P(1 - \%\text{ Impervious})$

$C_W = 0.90(0.25) + 0.25(1-0.25) = 0.41$

C_W = 0.41

Sub-Basin 2-6:
Note that no weighted C-value is used for initial area input because Civil Design software does not allow for user input C-value on the initial area.

Total Area = 0.05 ac
Soil = Type B

Existing Impervious = 0 ac
Proposed Impervious = House = 828 SF x (1 ac / 43,560 SF) = 0.02 ac

Total Impervious = $\frac{0.02 \text{ ac}}{0.05 \text{ ac}}$ = 40%

C = 0.51 (7.3 DU/ac) (Table 3-1, Hydrology Manual)

Sub-Basin 2-7:
Weighted C-value = C_W = ?
Total Area = 0.15 ac

Existing Impervious = 0 ac
Proposed Impervious = House = 770 SF x (1 ac / 43,560 SF) = 0.02 ac

Total Impervious = $\frac{0.02 \text{ ac}}{0.15 \text{ ac}}$ = 13%

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

C_W = 0.90(% Impervious) + C_P (1- % Impervious)

C_W = 0.90(0.13) + 0.25(1-0.13) = 0.33

C_W = 0.33

Sub-Basin 2-8:
C-value =?
Total Area = 0.16 ac

Existing Impervious = 0 ac
Proposed Impervious = 0 ac

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

C = 0.25 (Permanent Open Space) (Table 3-1, Hydrology Manual)

Sub-Basin 2-9:
C-value =?
Total Area = 0.18 ac

Existing Impervious = 0 ac
Proposed Impervious = 0 ac

Type B = C_P = 0.25 (Table 3-1, Hydrology Manual)

C = 0.25 (Permanent Open Space) (Table 3-1, Hydrology Manual)

Basin 2:
C_w =

$$\frac{(0.58)(0.06 \text{ ac})+(0.38)(0.15 \text{ ac})+(0.25)(0.20 \text{ ac})+(0.38)(0.03 \text{ ac})+(0.41)(0.28 \text{ ac})+ (0.51)(0.05 \text{ ac})+ (0.33)(0.15 \text{ ac})+(0.25)(0.16 \text{ ac})+(0.25)(0.18 \text{ ac})}{1.26 \text{ ac}}$$

C_w = 0.34

Appendix D – Pre-Developed Calculations

San Diego County Rational Hydrology Program

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

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study   Date: 12/12/23

Pre Basin 1

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

Program License Serial Number 6548

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

Map data precipitation entered:
6 hour, precipitation(inches) = 2.800
24 hour precipitation(inches) = 5.800
P6/P24 =   48.3%
San Diego hydrology manual 'C' values used

++
Process from Point/Station   1.011 to Point/Station   1.021
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN   ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance = 100.000(Ft.)
Highest elevation = 671.000(Ft.)
Lowest elevation = 657.000(Ft.)

```
Elevation difference =   14.000(Ft.) Slope = 14.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  14.00 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.90 minutes
 (for slope value of  10.00 %)
Rainfall intensity (I) =      5.993(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
Subarea runoff =      0.030(CFS)
Total initial stream area =        0.020(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.021 to Point/Station        1.031
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.895(CFS)
Depth of flow =   0.121(Ft.), Average velocity =   2.597(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2             50.00              0.00
        3            100.00              1.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =      1.895(CFS)
  '     '        flow top width =     12.080(Ft.)
  '     '    velocity=    2.597(Ft/s)
  '     '        area =      0.730(Sq.Ft)
  '     '        Froude number =     1.862

Upstream point elevation =   657.000(Ft.)
Downstream point elevation =   579.000(Ft.)
Flow length =   494.000(Ft.)
Travel time  =    3.17 min.
Time of concentration =   10.07 min.
Depth of flow =   0.121(Ft.)
Average velocity =   2.597(Ft/s)
Total irregular channel flow =     1.895(CFS)
Irregular channel normal depth above invert elev. =   0.121(Ft.)
Average velocity of channel(s) =   2.597(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.696(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.330 given for subarea
Rainfall intensity =      4.696(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
```

```
(Q=KCIA) is C = 0.329  CA =      0.814
Subarea runoff =      3.790(CFS) for      2.450(Ac.)
Total runoff =      3.820(CFS)  Total area =       2.470(Ac.)
Depth of flow =   0.157(Ft.), Average velocity =   3.094(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.031 to Point/Station        1.032
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   579.000(Ft.)
Downstream point elevation =   575.500(Ft.)
Channel length thru subarea  =   201.000(Ft.)
Channel base width      =   16.000(Ft.)
Slope or 'Z' of left channel bank =   0.333
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      4.142(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      4.142(CFS)
Depth of flow =   0.092(Ft.), Average velocity =   2.457(Ft/s)
Channel flow top width =   20.634(Ft.)
Flow Velocity =    2.46(Ft/s)
Travel time  =    1.36 min.
Time of concentration =   11.43 min.
Critical depth =      0.119(Ft.)
 Adding area flow to channel
Rainfall intensity (I) =      4.327(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.350 given for subarea
Rainfall intensity =      4.327(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.333  CA =      1.013
Subarea runoff =      0.563(CFS) for      0.570(Ac.)
Total runoff =      4.383(CFS)  Total area =       3.040(Ac.)
Depth of flow =   0.095(Ft.), Average velocity =   2.505(Ft/s)
Critical depth =      0.124(Ft.)
End of computations, total study area =           3.040 (Ac.)
```

San Diego County Rational Hydrology Program

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

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study   Date: 12/12/23

Pre Basin 2

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

Program License Serial Number 6548

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

Map data precipitation entered:
6 hour, precipitation(inches) = 2.800
24 hour precipitation(inches) = 5.800
P6/P24 =   48.3%
San Diego hydrology manual 'C' values used

++
Process from Point/Station   2.011 to Point/Station   2.021
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN   ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Initial subarea total flow distance = 100.000(Ft.)
Highest elevation = 671.000(Ft.)
Lowest elevation = 652.000(Ft.)

```
Elevation difference =   19.000(Ft.) Slope = 19.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  19.00 %, in a development type of
 Permanent Open Space
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.90 minutes
 (for slope value of  10.00 %)
Rainfall intensity (I) =      5.993(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.250
Subarea runoff =      0.030(CFS)
Total initial stream area =        0.020(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.021 to Point/Station        2.022
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.840(CFS)
Depth of flow =   0.085(Ft.), Average velocity =   2.339(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2             50.00              0.00
        3            100.00              1.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =      0.840(CFS)
  '     '        flow top width =      8.475(Ft.)
  '     '    velocity=    2.339(Ft/s)
  '     '        area =      0.359(Sq.Ft)
  '     '        Froude number =     2.003

Upstream point elevation =   652.000(Ft.)
Downstream point elevation =   585.000(Ft.)
Flow length =   326.000(Ft.)
Travel time  =    2.32 min.
Time of concentration =    9.22 min.
Depth of flow =   0.085(Ft.)
Average velocity =   2.339(Ft/s)
Total irregular channel flow =     0.840(CFS)
Irregular channel normal depth above invert elev. =   0.085(Ft.)
Average velocity of channel(s) =   2.339(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.970(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
```

```
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.250
Rainfall intensity =      4.970(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.250  CA =      0.315
Subarea runoff =      1.536(CFS) for      1.240(Ac.)
Total runoff =      1.566(CFS)  Total area =       1.260(Ac.)
Depth of flow =   0.107(Ft.), Average velocity =   2.733(Ft/s)
End of computations, total study area =           1.260 (Ac.)
```

Appendix E– Post-Developed Calculations

San Diego County Rational Hydrology Program

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

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study   Date: 01/03/24

Post Basin 1

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

Program License Serial Number 6548

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

Map data precipitation entered:
6 hour, precipitation(inches) = 2.800
24 hour precipitation(inches) = 5.800
P6/P24 =   48.3%
San Diego hydrology manual 'C' values used

++
Process from Point/Station   1.011 to Point/Station   1.021
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
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 = 0.450
Initial subarea total flow distance = 100.000(Ft.)
Highest elevation = 641.900(Ft.)
Lowest elevation = 622.200(Ft.)
Elevation difference =   19.700(Ft.) Slope = 19.700 %
Top of Initial Area Slope adjusted by User to 23.673 %

```
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  23.67 %, in a development type of
 4.3 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   5.30 minutes
 (for slope value of  10.00 %)
Rainfall intensity (I) =      7.105(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      0.224(CFS)
Total initial stream area =        0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.021 to Point/Station        1.022
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.542(CFS)
Depth of flow =   0.094(Ft.), Average velocity =   1.222(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2             50.00              0.00
        3            100.00              1.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =      0.542(CFS)
  '     '        flow top width =      9.413(Ft.)
  '     '    velocity=    1.222(Ft/s)
  '     '        area =      0.443(Sq.Ft)
  '     '        Froude number =     0.993

Upstream point elevation =   622.200(Ft.)
Downstream point elevation =   616.100(Ft.)
Flow length =   125.000(Ft.)
Travel time  =    1.70 min.
Time of concentration =    7.00 min.
Depth of flow =   0.094(Ft.)
Average velocity =   1.222(Ft/s)
Total irregular channel flow =     0.542(CFS)
Irregular channel normal depth above invert elev. =   0.094(Ft.)
Average velocity of channel(s) =   1.222(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.936(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.370 given for subarea
Rainfall intensity =      5.936(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.386  CA =      0.131
```

```
Subarea runoff =      0.556(CFS) for      0.270(Ac.)
Total runoff =      0.780(CFS)  Total area =       0.340(Ac.)
Depth of flow =   0.108(Ft.), Average velocity =   1.339(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.022 to Point/Station        1.041
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   616.100(Ft.)
Downstream point/station elevation =   587.100(Ft.)
Pipe length  =   104.00(Ft.) Slope =   0.2788  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.780(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.780(CFS)
Normal flow depth in pipe =    2.10(In.)
Flow top width inside pipe =    5.73(In.)
Critical Depth =    5.28(In.)
Pipe flow velocity =     12.73(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     7.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.041 to Point/Station        1.041
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Rainfall intensity (I) =      5.862(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.370 given for subarea
Time of concentration =     7.14 min.
Rainfall intensity =      5.862(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.378  CA =      0.257
Subarea runoff =      0.728(CFS) for      0.340(Ac.)
Total runoff =      1.508(CFS)  Total area =       0.680(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.041 to Point/Station        1.061
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   587.100(Ft.)
Downstream point/station elevation =   586.900(Ft.)
Pipe length  =    19.00(Ft.) Slope =   0.0105  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.508(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.508(CFS)
Normal flow depth in pipe =    6.60(In.)
Flow top width inside pipe =    7.96(In.)
Critical Depth =    6.79(In.)
```

```
Pipe flow velocity =      4.34(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     7.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.061 to Point/Station        1.061
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Rainfall intensity (I) =      5.824(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.420 given for subarea
Time of concentration =     7.21 min.
Rainfall intensity =      5.824(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.387  CA =      0.337
Subarea runoff =      0.455(CFS) for      0.190(Ac.)
Total runoff =      1.963(CFS)  Total area =       0.870(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.061 to Point/Station        1.081
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   586.900(Ft.)
Downstream point/station elevation =   585.400(Ft.)
Pipe length  =   154.00(Ft.) Slope =   0.0097  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.963(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.963(CFS)
Normal flow depth in pipe =    6.41(In.)
Flow top width inside pipe =   11.97(In.)
Critical Depth =    7.17(In.)
Pipe flow velocity =      4.60(Ft/s)
Travel time through pipe =    0.56 min.
Time of concentration (TC) =     7.77 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.081 to Point/Station        1.081
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Rainfall intensity (I) =      5.551(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.510 given for subarea
Time of concentration =     7.77 min.
Rainfall intensity =      5.551(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.400  CA =      0.388
Subarea runoff =      0.191(CFS) for      0.100(Ac.)
Total runoff =      2.154(CFS)  Total area =       0.970(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.081 to Point/Station        1.082
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   585.400(Ft.)
Downstream point/station elevation =   582.000(Ft.)
Pipe length  =    35.00(Ft.) Slope =   0.0971  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.154(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.154(CFS)
Normal flow depth in pipe =    4.05(In.)
Flow top width inside pipe =    8.96(In.)
Critical Depth =    7.92(In.)
Pipe flow velocity =     11.14(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     7.82 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.082 to Point/Station        1.083
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Covered channel
Upstream point elevation =   582.000(Ft.)
Downstream point elevation =   581.800(Ft.)
Channel length thru subarea  =    12.000(Ft.)
Channel base width      =    3.500(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =      2.154(CFS)
Depth of flow =   0.168(Ft.), Average velocity =   3.663(Ft/s)
Channel flow top width =    3.500(Ft.)
Flow Velocity =    3.66(Ft/s)
Travel time  =    0.05 min.
Time of concentration =    7.88 min.
Critical depth =      0.227(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.083 to Point/Station        1.161
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      0.970(Ac.)
Runoff from this stream =      2.154(CFS)
Time of concentration =    7.88 min.
```

```
Rainfall intensity =     5.502(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.121 to Point/Station        1.131
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
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 = 0.450
Initial subarea total flow distance  =   54.000(Ft.)
Highest elevation =  649.100(Ft.)
Lowest elevation =  648.500(Ft.)
Elevation difference =    0.600(Ft.) Slope =  1.111 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.11 %, in a development type of
 4.3 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   9.60 minutes
 (for slope value of   1.00 %)
Rainfall intensity (I) =      4.844(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      0.131(CFS)
Total initial stream area =        0.060(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.131 to Point/Station        1.141
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.275(CFS)
Depth of flow =   0.069(Ft.), Average velocity =   1.141(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2             50.00              0.00
        3            100.00              1.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =      0.275(CFS)
  '     '        flow top width =      6.946(Ft.)
```

```
  '     '    velocity=    1.141(Ft/s)
  '     '        area =      0.241(Sq.Ft)
  '     '        Froude number =     1.079

Upstream point elevation =   648.500(Ft.)
Downstream point elevation =   642.000(Ft.)
Flow length =   102.000(Ft.)
Travel time  =    1.49 min.
Time of concentration =   11.09 min.
Depth of flow =   0.069(Ft.)
Average velocity =   1.141(Ft/s)
Total irregular channel flow =     0.275(CFS)
Irregular channel normal depth above invert elev. =   0.069(Ft.)
Average velocity of channel(s) =   1.141(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.413(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.290 given for subarea
Rainfall intensity =      4.413(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.332  CA =      0.076
Subarea runoff =      0.206(CFS) for      0.170(Ac.)
Total runoff =      0.337(CFS)  Total area =       0.230(Ac.)
Depth of flow =   0.075(Ft.), Average velocity =   1.200(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.141 to Point/Station        1.142
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   642.000(Ft.)
Downstream point/station elevation =   640.300(Ft.)
Pipe length  =   169.00(Ft.) Slope =   0.0101  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.337(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.337(CFS)
Normal flow depth in pipe =    3.34(In.)
Flow top width inside pipe =    5.96(In.)
Critical Depth =    3.53(In.)
Pipe flow velocity =      2.99(Ft/s)
Travel time through pipe =    0.94 min.
Time of concentration (TC) =    12.03 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.142 to Point/Station        1.151
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Covered channel
Upstream point elevation =   640.300(Ft.)
Downstream point elevation =   640.000(Ft.)
```

```
Channel length thru subarea  =    12.000(Ft.)
Channel base width      =    3.500(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =      0.337(CFS)
Depth of flow =   0.048(Ft.), Average velocity =   2.021(Ft/s)
Channel flow top width =    3.500(Ft.)
Flow Velocity =    2.02(Ft/s)
Travel time  =    0.10 min.
Time of concentration =   12.13 min.
Critical depth =      0.066(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.151 to Point/Station        1.151
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Rainfall intensity (I) =      4.165(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.450 given for subarea
Time of concentration =    12.13 min.
Rainfall intensity =      4.165(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.396  CA =      0.198
Subarea runoff =      0.487(CFS) for      0.270(Ac.)
Total runoff =      0.824(CFS)  Total area =       0.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.151 to Point/Station        1.161
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   640.000(Ft.)
Downstream point elevation =   581.800(Ft.)
Channel length thru subarea  =   491.000(Ft.)
Channel base width      =   16.000(Ft.)
Slope or 'Z' of left channel bank =   0.333
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      1.486(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      1.486(CFS)
Depth of flow =   0.029(Ft.), Average velocity =   3.102(Ft/s)
Channel flow top width =   17.442(Ft.)
Flow Velocity =    3.10(Ft/s)
Travel time  =    2.64 min.
Time of concentration =   14.77 min.
Critical depth =      0.063(Ft.)
 Adding area flow to channel
```

```
Rainfall intensity (I) =      3.669(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.420 given for subarea
Rainfall intensity =      3.669(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.411  CA =      0.559
Subarea runoff =      1.227(CFS) for      0.860(Ac.)
Total runoff =      2.051(CFS)  Total area =       1.360(Ac.)
Depth of flow =   0.035(Ft.), Average velocity =   3.504(Ft/s)
Critical depth =      0.076(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.083 to Point/Station        1.161
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.360(Ac.)
Runoff from this stream =      2.051(CFS)
Time of concentration =   14.77 min.
Rainfall intensity =     3.669(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        2.154      7.88                5.502
2        2.051     14.77                3.669
Qmax(1) =
           1.000 *    1.000 *     2.154) +
           1.000 *    0.533 *     2.051) + =       3.248
Qmax(2) =
           0.667 *    1.000 *     2.154) +
           1.000 *    1.000 *     2.051) + =       3.487

Total of 2 main streams to confluence:
Flow rates before confluence point:
       2.154       2.051
Maximum flow rates at confluence using above data:
        3.248        3.487
Area of streams before confluence:
        0.970        1.360


Results of confluence:
Total flow rate =      3.487(CFS)
Time of concentration =    14.769 min.
Effective stream area after confluence  =      2.330(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.161 to Point/Station        1.171
**** IMPROVED CHANNEL TRAVEL TIME ****
_____________________________________________________________________________
Upstream point elevation =   581.800(Ft.)
Downstream point elevation =   577.200(Ft.)
Channel length thru subarea  =   231.000(Ft.)
Channel base width      =   16.000(Ft.)
Slope or 'Z' of left channel bank =   0.333
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      3.642(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      3.642(CFS)
Depth of flow =   0.082(Ft.), Average velocity =   2.453(Ft/s)
Channel flow top width =   20.136(Ft.)
Flow Velocity =    2.45(Ft/s)
Travel time  =    1.57 min.
Time of concentration =   16.34 min.
Critical depth =      0.110(Ft.)
 Adding area flow to channel
Rainfall intensity (I) =      3.437(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.460 given for subarea
Rainfall intensity =      3.437(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.413  CA =      1.090
Subarea runoff =      0.258(CFS) for      0.310(Ac.)
Total runoff =      3.745(CFS)  Total area =       2.640(Ac.)
Depth of flow =   0.084(Ft.), Average velocity =   2.477(Ft/s)
Critical depth =      0.112(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.104 to Point/Station        1.171
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.640(Ac.)
Runoff from this stream =      3.745(CFS)
Time of concentration =   16.34 min.
Rainfall intensity =     3.437(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.091 to Point/Station        1.101
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.320
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  594.600(Ft.)
Lowest elevation =  587.100(Ft.)
Elevation difference =    7.500(Ft.) Slope =  7.500 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of   7.50 %, in a development type of
 1.0 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   6.40 minutes
 (for slope value of  10.00 %)
Rainfall intensity (I) =      6.291(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.320
Subarea runoff =      0.262(CFS)
Total initial stream area =        0.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.101 to Point/Station        1.102
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.453(CFS)
Depth of flow =   0.091(Ft.), Average velocity =   1.096(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2             50.00              0.00
        3            100.00              1.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =      0.453(CFS)
  '     '        flow top width =      9.090(Ft.)
  '     '    velocity=    1.096(Ft/s)
  '     '        area =      0.413(Sq.Ft)
  '     '        Froude number =     0.906

Upstream point elevation =   587.100(Ft.)
Downstream point elevation =   582.700(Ft.)
Flow length =   107.000(Ft.)
Travel time  =    1.63 min.
```

```
Time of concentration =    8.03 min.
Depth of flow =   0.091(Ft.)
Average velocity =   1.096(Ft/s)
Total irregular channel flow =     0.453(CFS)
Irregular channel normal depth above invert elev. =   0.091(Ft.)
Average velocity of channel(s) =   1.096(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.436(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.420 given for subarea
Rainfall intensity =      5.436(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.379  CA =      0.121
Subarea runoff =      0.398(CFS) for      0.190(Ac.)
Total runoff =      0.660(CFS)  Total area =       0.320(Ac.)
Depth of flow =   0.105(Ft.), Average velocity =   1.204(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.102 to Point/Station        1.103
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   582.700(Ft.)
Downstream point/station elevation =   577.400(Ft.)
Pipe length  =    24.00(Ft.) Slope =   0.2208  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.660(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.660(CFS)
Normal flow depth in pipe =    2.05(In.)
Flow top width inside pipe =    5.69(In.)
Critical Depth =    4.94(In.)
Pipe flow velocity =     11.17(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     8.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.103 to Point/Station        1.104
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Covered channel
Upstream point elevation =   577.400(Ft.)
Downstream point elevation =   577.200(Ft.)
Channel length thru subarea  =    12.000(Ft.)
Channel base width      =    3.500(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =      0.660(CFS)
Depth of flow =   0.081(Ft.), Average velocity =   2.325(Ft/s)
```

```
Channel flow top width =    3.500(Ft.)
Flow Velocity =    2.32(Ft/s)
Travel time  =    0.09 min.
Time of concentration =    8.15 min.
Critical depth =      0.104(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.104 to Point/Station        1.171
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.320(Ac.)
Runoff from this stream =      0.660(CFS)
Time of concentration =    8.15 min.
Rainfall intensity =     5.384(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        3.745     16.34                3.437
2        0.660      8.15                5.384
Qmax(1) =
           1.000 *    1.000 *     3.745) +
           0.638 *    1.000 *     0.660) + =       4.167
Qmax(2) =
           1.000 *    0.499 *     3.745) +
           1.000 *    1.000 *     0.660) + =       2.528

Total of 2 main streams to confluence:
Flow rates before confluence point:
       3.745       0.660
Maximum flow rates at confluence using above data:
        4.167        2.528
Area of streams before confluence:
        2.640        0.320


Results of confluence:
Total flow rate =      4.167(CFS)
Time of concentration =    16.338 min.
Effective stream area after confluence  =      2.960(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.171 to Point/Station        1.172
**** IMPROVED CHANNEL TRAVEL TIME ****
```

```
Upstream point elevation =   577.200(Ft.)
Downstream point elevation =   575.500(Ft.)
Channel length thru subarea  =    51.000(Ft.)
Channel base width      =   16.000(Ft.)
Slope or 'Z' of left channel bank =   0.333
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      4.223(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      4.223(CFS)
Depth of flow =   0.077(Ft.), Average velocity =   3.054(Ft/s)
Channel flow top width =   19.880(Ft.)
Flow Velocity =    3.05(Ft/s)
Travel time  =    0.28 min.
Time of concentration =   16.62 min.
Critical depth =      0.121(Ft.)
 Adding area flow to channel
Rainfall intensity (I) =      3.400(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.410 given for subarea
Rainfall intensity =      3.400(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.409  CA =      1.244
Subarea runoff =      0.062(CFS) for      0.080(Ac.)
Total runoff =      4.229(CFS)  Total area =       3.040(Ac.)
Depth of flow =   0.077(Ft.), Average velocity =   3.055(Ft/s)
Critical depth =      0.121(Ft.)
End of computations, total study area =           3.040 (Ac.)
```

San Diego County Rational Hydrology Program

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

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study   Date: 01/03/24

Post Basin 2

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

Program License Serial Number 6548

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

Map data precipitation entered:
6 hour, precipitation(inches) = 2.800
24 hour precipitation(inches) = 5.800
P6/P24 =   48.3%
San Diego hydrology manual 'C' values used

++
Process from Point/Station   2.011 to Point/Station   2.021
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL   ]
(14.5 DU/A or Less   )
Impervious value, Ai = 0.500
Sub-Area C Value = 0.580
Initial subarea total flow distance =   65.000(Ft.)
Highest elevation = 649.100(Ft.)
Lowest elevation = 648.200(Ft.)
Elevation difference =   0.900(Ft.) Slope = 1.385 %
Top of Initial Area Slope adjusted by User to 1.268 %

```
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.27 %, in a development type of
 14.5 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   7.40 minutes
 (for slope value of   1.00 %)
Rainfall intensity (I) =      5.729(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.580
Subarea runoff =      0.199(CFS)
Total initial stream area =        0.060(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.021 to Point/Station        2.031
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.373(CFS)
Depth of flow =   0.074(Ft.), Average velocity =   1.361(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2             50.00              0.00
        3            100.00              1.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =      0.373(CFS)
  '     '        flow top width =      7.401(Ft.)
  '     '    velocity=    1.361(Ft/s)
  '     '        area =      0.274(Sq.Ft)
  '     '        Froude number =     1.247

Upstream point elevation =   648.200(Ft.)
Downstream point elevation =   643.200(Ft.)
Flow length =    60.000(Ft.)
Travel time  =    0.73 min.
Time of concentration =    8.13 min.
Depth of flow =   0.074(Ft.)
Average velocity =   1.361(Ft/s)
Total irregular channel flow =     0.373(CFS)
Irregular channel normal depth above invert elev. =   0.074(Ft.)
Average velocity of channel(s) =   1.361(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.390(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.380 given for subarea
Rainfall intensity =      5.390(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.437  CA =      0.092
```

Subarea runoff = 0.295(CFS) for 0.150(Ac.)
Total runoff = 0.495(CFS) Total area = 0.210(Ac.)
Depth of flow = 0.082(Ft.), Average velocity = 1.461(Ft/s)

++
Process from Point/Station 2.031 to Point/Station 2.031
**** 6 HOUR HYDROGRAPH ****
_____
++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003

Time of Concentration = 8.13
Basin Area = 0.21 Acres
6 Hour Rainfall = 2.800 Inches
Runoff Coefficient = 0.437
Peak Discharge = 0.49 CFS

Time (Min)	Discharge (CFS)
0	0.000
8	0.015
16	0.016
24	0.016
32	0.016
40	0.017
48	0.017
56	0.018
64	0.018
72	0.019
80	0.019
88	0.020
96	0.020
104	0.021
112	0.022
120	0.023
128	0.024
136	0.025
144	0.026
152	0.028
160	0.029
168	0.032
176	0.033
184	0.037
192	0.039
200	0.045
208	0.048
216	0.059
224	0.067
232	0.099
240	0.140

248	0.495
256	0.079
264	0.053
272	0.042
280	0.035
288	0.030
296	0.027
304	0.025
312	0.023
320	0.021
328	0.020
336	0.018
344	0.017
352	0.017
360	0.016
368	0.015

++

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))

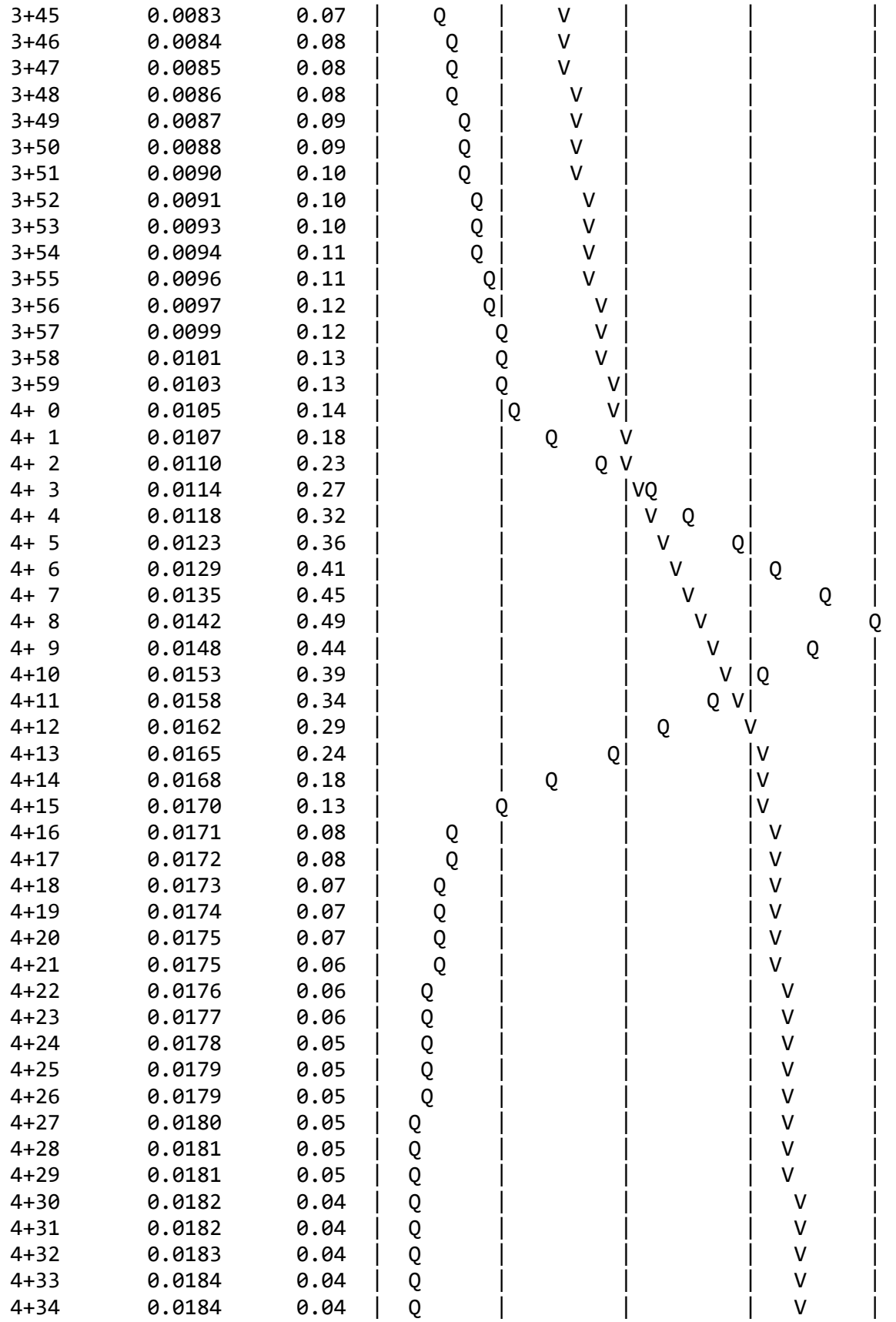
Time(h+m)	Volume Ac.Ft	Q(CFS)	0	0.1	0.2	0.4	0.5
0+ 0	0.0000	0.00	Q	|	|	|	|
0+ 1	0.0000	0.00	Q	|	|	|	|
0+ 2	0.0000	0.00	Q	|	|	|	|
0+ 3	0.0000	0.01	Q	|	|	|	|
0+ 4	0.0000	0.01	Q	|	|	|	|
0+ 5	0.0000	0.01	Q	|	|	|	|
0+ 6	0.0001	0.01	Q	|	|	|	|
0+ 7	0.0001	0.01	VQ	|	|	|	|
0+ 8	0.0001	0.02	VQ	|	|	|	|
0+ 9	0.0001	0.02	VQ	|	|	|	|
0+10	0.0001	0.02	VQ	|	|	|	|
0+11	0.0002	0.02	VQ	|	|	|	|
0+12	0.0002	0.02	VQ	|	|	|	|
0+13	0.0002	0.02	VQ	|	|	|	|
0+14	0.0002	0.02	VQ	|	|	|	|
0+15	0.0002	0.02	VQ	|	|	|	|
0+16	0.0003	0.02	VQ	|	|	|	|
0+17	0.0003	0.02	VQ	|	|	|	|
0+18	0.0003	0.02	VQ	|	|	|	|
0+19	0.0003	0.02	VQ	|	|	|	|
0+20	0.0004	0.02	VQ	|	|	|	|
0+21	0.0004	0.02	VQ	|	|	|	|
0+22	0.0004	0.02	VQ	|	|	|	|
0+23	0.0004	0.02	VQ	|	|	|	|
0+24	0.0004	0.02	VQ	|	|	|	|

```
0+25       0.0005      0.02  VQ        |          |          |          |
0+26       0.0005      0.02  VQ        |          |          |          |
0+27       0.0005      0.02  VQ        |          |          |          |
0+28       0.0005      0.02  VQ        |          |          |          |
0+29       0.0006      0.02  |Q        |          |          |          |
0+30       0.0006      0.02  |Q        |          |          |          |
0+31       0.0006      0.02  |Q        |          |          |          |
0+32       0.0006      0.02  |Q        |          |          |          |
0+33       0.0006      0.02  |Q        |          |          |          |
0+34       0.0007      0.02  |Q        |          |          |          |
0+35       0.0007      0.02  |Q        |          |          |          |
0+36       0.0007      0.02  |Q        |          |          |          |
0+37       0.0007      0.02  |Q        |          |          |          |
0+38       0.0008      0.02  |Q        |          |          |          |
0+39       0.0008      0.02  |Q        |          |          |          |
0+40       0.0008      0.02  |Q        |          |          |          |
0+41       0.0008      0.02  |Q        |          |          |          |
0+42       0.0008      0.02  |Q        |          |          |          |
0+43       0.0009      0.02  |Q        |          |          |          |
0+44       0.0009      0.02  |Q        |          |          |          |
0+45       0.0009      0.02  |Q        |          |          |          |
0+46       0.0009      0.02  |Q        |          |          |          |
0+47       0.0010      0.02  |Q        |          |          |          |
0+48       0.0010      0.02  |Q        |          |          |          |
0+49       0.0010      0.02  |Q        |          |          |          |
0+50       0.0010      0.02  |Q        |          |          |          |
0+51       0.0011      0.02  |Q        |          |          |          |
0+52       0.0011      0.02  |QV       |          |          |          |
0+53       0.0011      0.02  |QV       |          |          |          |
0+54       0.0011      0.02  |QV       |          |          |          |
0+55       0.0012      0.02  |QV       |          |          |          |
0+56       0.0012      0.02  |QV       |          |          |          |
0+57       0.0012      0.02  |QV       |          |          |          |
0+58       0.0012      0.02  |QV       |          |          |          |
0+59       0.0013      0.02  |QV       |          |          |          |
1+ 0       0.0013      0.02  |QV       |          |          |          |
1+ 1       0.0013      0.02  |QV       |          |          |          |
1+ 2       0.0013      0.02  |QV       |          |          |          |
1+ 3       0.0014      0.02  |QV       |          |          |          |
1+ 4       0.0014      0.02  |QV       |          |          |          |
1+ 5       0.0014      0.02  |QV       |          |          |          |
1+ 6       0.0014      0.02  |QV       |          |          |          |
1+ 7       0.0015      0.02  |QV       |          |          |          |
1+ 8       0.0015      0.02  |QV       |          |          |          |
1+ 9       0.0015      0.02  |QV       |          |          |          |
1+10       0.0015      0.02  |QV       |          |          |          |
1+11       0.0016      0.02  |QV       |          |          |          |
1+12       0.0016      0.02  |QV       |          |          |          |
1+13       0.0016      0.02  |Q V      |          |          |          |
1+14       0.0016      0.02  |Q V      |          |          |          |
```

1+15	0.0017	0.02	|Q V	|	|	|	|
1+16	0.0017	0.02	|Q V	|	|	|	|
1+17	0.0017	0.02	|Q V	|	|	|	|
1+18	0.0017	0.02	|Q V	|	|	|	|
1+19	0.0018	0.02	|Q V	|	|	|	|
1+20	0.0018	0.02	|Q V	|	|	|	|
1+21	0.0018	0.02	|Q V	|	|	|	|
1+22	0.0018	0.02	|Q V	|	|	|	|
1+23	0.0019	0.02	|Q V	|	|	|	|
1+24	0.0019	0.02	|Q V	|	|	|	|
1+25	0.0019	0.02	|Q V	|	|	|	|
1+26	0.0020	0.02	|Q V	|	|	|	|
1+27	0.0020	0.02	|Q V	|	|	|	|
1+28	0.0020	0.02	|Q V	|	|	|	|
1+29	0.0020	0.02	|Q V	|	|	|	|
1+30	0.0021	0.02	|Q V	|	|	|	|
1+31	0.0021	0.02	|Q V	|	|	|	|
1+32	0.0021	0.02	|Q V	|	|	|	|
1+33	0.0021	0.02	|Q V	|	|	|	|
1+34	0.0022	0.02	|Q V	|	|	|	|
1+35	0.0022	0.02	|Q V	|	|	|	|
1+36	0.0022	0.02	|Q V	|	|	|	|
1+37	0.0023	0.02	|Q V	|	|	|	|
1+38	0.0023	0.02	|Q V	|	|	|	|
1+39	0.0023	0.02	|Q V	|	|	|	|
1+40	0.0023	0.02	|Q V	|	|	|	|
1+41	0.0024	0.02	|Q V	|	|	|	|
1+42	0.0024	0.02	|Q V	|	|	|	|
1+43	0.0024	0.02	|Q V	|	|	|	|
1+44	0.0025	0.02	|Q V	|	|	|	|
1+45	0.0025	0.02	|Q V	|	|	|	|
1+46	0.0025	0.02	|Q V	|	|	|	|
1+47	0.0026	0.02	|Q V	|	|	|	|
1+48	0.0026	0.02	|Q V	|	|	|	|
1+49	0.0026	0.02	|Q V	|	|	|	|
1+50	0.0026	0.02	|Q V	|	|	|	|
1+51	0.0027	0.02	|Q V	|	|	|	|
1+52	0.0027	0.02	|Q V	|	|	|	|
1+53	0.0027	0.02	|Q V	|	|	|	|
1+54	0.0028	0.02	|Q V	|	|	|	|
1+55	0.0028	0.02	|Q V	|	|	|	|
1+56	0.0028	0.02	|Q V	|	|	|	|
1+57	0.0029	0.02	|Q V	|	|	|	|
1+58	0.0029	0.02	|Q V	|	|	|	|
1+59	0.0029	0.02	|Q V	|	|	|	|
2+ 0	0.0030	0.02	|Q V	|	|	|	|
2+ 1	0.0030	0.02	|Q V	|	|	|	|
2+ 2	0.0030	0.02	|Q V	|	|	|	|
2+ 3	0.0031	0.02	|Q V	|	|	|	|
2+ 4	0.0031	0.02	|Q V	|	|	|	|

```
2+ 5       0.0031      0.02  |Q   V    |          |          |          |
2+ 6       0.0031      0.02  |Q   V    |          |          |          |
2+ 7       0.0032      0.02  |Q   V    |          |          |          |
2+ 8       0.0032      0.02  |Q    V   |          |          |          |
2+ 9       0.0032      0.02  |Q    V   |          |          |          |
2+10       0.0033      0.02  |Q    V   |          |          |          |
2+11       0.0033      0.02  |Q    V   |          |          |          |
2+12       0.0033      0.02  |Q    V   |          |          |          |
2+13       0.0034      0.02  | Q   V   |          |          |          |
2+14       0.0034      0.02  | Q   V   |          |          |          |
2+15       0.0035      0.03  | Q   V   |          |          |          |
2+16       0.0035      0.03  | Q   V   |          |          |          |
2+17       0.0035      0.03  | Q   V   |          |          |          |
2+18       0.0036      0.03  | Q   V   |          |          |          |
2+19       0.0036      0.03  | Q   V   |          |          |          |
2+20       0.0036      0.03  | Q   V   |          |          |          |
2+21       0.0037      0.03  | Q   V   |          |          |          |
2+22       0.0037      0.03  | Q   V   |          |          |          |
2+23       0.0037      0.03  | Q    V  |          |          |          |
2+24       0.0038      0.03  | Q    V  |          |          |          |
2+25       0.0038      0.03  | Q    V  |          |          |          |
2+26       0.0038      0.03  | Q    V  |          |          |          |
2+27       0.0039      0.03  | Q    V  |          |          |          |
2+28       0.0039      0.03  | Q    V  |          |          |          |
2+29       0.0040      0.03  | Q    V  |          |          |          |
2+30       0.0040      0.03  | Q    V  |          |          |          |
2+31       0.0040      0.03  | Q    V  |          |          |          |
2+32       0.0041      0.03  | Q    V  |          |          |          |
2+33       0.0041      0.03  | Q    V  |          |          |          |
2+34       0.0041      0.03  | Q    V  |          |          |          |
2+35       0.0042      0.03  | Q    V  |          |          |          |
2+36       0.0042      0.03  | Q    V  |          |          |          |
2+37       0.0043      0.03  | Q     V |          |          |          |
2+38       0.0043      0.03  | Q     V |          |          |          |
2+39       0.0043      0.03  | Q     V |          |          |          |
2+40       0.0044      0.03  | Q     V |          |          |          |
2+41       0.0044      0.03  | Q     V |          |          |          |
2+42       0.0045      0.03  | Q     V |          |          |          |
2+43       0.0045      0.03  | Q     V |          |          |          |
2+44       0.0045      0.03  | Q     V |          |          |          |
2+45       0.0046      0.03  | Q     V |          |          |          |
2+46       0.0046      0.03  | Q     V |          |          |          |
2+47       0.0047      0.03  | Q     V |          |          |          |
2+48       0.0047      0.03  | Q     V |          |          |          |
2+49       0.0048      0.03  | Q     V |          |          |          |
2+50       0.0048      0.03  | Q      V|          |          |          |
2+51       0.0049      0.03  | Q      V|          |          |          |
2+52       0.0049      0.03  | Q      V|          |          |          |
2+53       0.0049      0.03  | Q      V|          |          |          |
2+54       0.0050      0.03  | Q      V|          |          |          |
```

```
2+55       0.0050      0.03  | Q      V|          |          |          |
2+56       0.0051      0.03  | Q      V|          |          |          |
2+57       0.0051      0.03  | Q      V|          |          |          |
2+58       0.0052      0.03  | Q      V|          |          |          |
2+59       0.0052      0.03  | Q      V|          |          |          |
3+ 0       0.0053      0.03  | Q      V|          |          |          |
3+ 1       0.0053      0.04  | Q      V|          |          |          |
3+ 2       0.0054      0.04  | Q       V          |          |          |
3+ 3       0.0054      0.04  | Q       V          |          |          |
3+ 4       0.0055      0.04  | Q       V          |          |          |
3+ 5       0.0055      0.04  | Q       V          |          |          |
3+ 6       0.0056      0.04  |  Q      V          |          |          |
3+ 7       0.0056      0.04  |  Q      V          |          |          |
3+ 8       0.0057      0.04  |  Q      V          |          |          |
3+ 9       0.0057      0.04  |  Q      V          |          |          |
3+10       0.0058      0.04  |  Q      V          |          |          |
3+11       0.0058      0.04  |  Q      V          |          |          |
3+12       0.0059      0.04  |  Q      |V         |          |          |
3+13       0.0059      0.04  |  Q      |V         |          |          |
3+14       0.0060      0.04  |  Q      |V         |          |          |
3+15       0.0061      0.04  |  Q      |V         |          |          |
3+16       0.0061      0.04  |  Q      |V         |          |          |
3+17       0.0062      0.04  |  Q      |V         |          |          |
3+18       0.0062      0.04  |  Q      |V         |          |          |
3+19       0.0063      0.04  |  Q      |V         |          |          |
3+20       0.0064      0.04  |  Q      |V         |          |          |
3+21       0.0064      0.05  |  Q      | V        |          |          |
3+22       0.0065      0.05  |  Q      | V        |          |          |
3+23       0.0065      0.05  |  Q      | V        |          |          |
3+24       0.0066      0.05  |  Q      | V        |          |          |
3+25       0.0067      0.05  |  Q      | V        |          |          |
3+26       0.0067      0.05  |  Q      | V        |          |          |
3+27       0.0068      0.05  |  Q      | V        |          |          |
3+28       0.0069      0.05  |  Q      | V        |          |          |
3+29       0.0069      0.05  |   Q     |  V       |          |          |
3+30       0.0070      0.05  |   Q     |  V       |          |          |
3+31       0.0071      0.05  |   Q     |  V       |          |          |
3+32       0.0072      0.05  |   Q     |  V       |          |          |
3+33       0.0072      0.06  |   Q     |  V       |          |          |
3+34       0.0073      0.06  |   Q     |  V       |          |          |
3+35       0.0074      0.06  |   Q     |  V       |          |          |
3+36       0.0075      0.06  |   Q     |   V      |          |          |
3+37       0.0075      0.06  |   Q     |   V      |          |          |
3+38       0.0076      0.06  |   Q     |   V      |          |          |
3+39       0.0077      0.06  |    Q    |   V      |          |          |
3+40       0.0078      0.06  |    Q    |   V      |          |          |
3+41       0.0079      0.06  |    Q    |   V      |          |          |
3+42       0.0080      0.07  |    Q    |   V      |          |          |
3+43       0.0081      0.07  |    Q    |    V     |          |          |
3+44       0.0082      0.07  |    Q    |    V     |          |          |
```



```
4+35      0.0185      0.04  |  Q      |         |         |   V     |
4+36      0.0185      0.04  |  Q      |         |         |   V     |
4+37      0.0186      0.04  |  Q      |         |         |   V     |
4+38      0.0186      0.04  | Q       |         |         |   V     |
4+39      0.0187      0.04  | Q       |         |         |    V    |
4+40      0.0187      0.03  | Q       |         |         |    V    |
4+41      0.0188      0.03  | Q       |         |         |    V    |
4+42      0.0188      0.03  | Q       |         |         |    V    |
4+43      0.0188      0.03  | Q       |         |         |    V    |
4+44      0.0189      0.03  | Q       |         |         |    V    |
4+45      0.0189      0.03  | Q       |         |         |    V    |
4+46      0.0190      0.03  | Q       |         |         |    V    |
4+47      0.0190      0.03  | Q       |         |         |    V    |
4+48      0.0191      0.03  | Q       |         |         |    V    |
4+49      0.0191      0.03  | Q       |         |         |    V    |
4+50      0.0191      0.03  | Q       |         |         |    V    |
4+51      0.0192      0.03  | Q       |         |         |    V    |
4+52      0.0192      0.03  | Q       |         |         |     V   |
4+53      0.0193      0.03  | Q       |         |         |     V   |
4+54      0.0193      0.03  | Q       |         |         |     V   |
4+55      0.0193      0.03  | Q       |         |         |     V   |
4+56      0.0194      0.03  | Q       |         |         |     V   |
4+57      0.0194      0.03  | Q       |         |         |     V   |
4+58      0.0195      0.03  | Q       |         |         |     V   |
4+59      0.0195      0.03  | Q       |         |         |     V   |
5+ 0      0.0195      0.03  | Q       |         |         |     V   |
5+ 1      0.0196      0.03  | Q       |         |         |     V   |
5+ 2      0.0196      0.03  | Q       |         |         |     V   |
5+ 3      0.0196      0.02  | Q       |         |         |     V   |
5+ 4      0.0197      0.02  |Q        |         |         |     V   |
5+ 5      0.0197      0.02  |Q        |         |         |     V   |
5+ 6      0.0197      0.02  |Q        |         |         |      V  |
5+ 7      0.0198      0.02  |Q        |         |         |      V  |
5+ 8      0.0198      0.02  |Q        |         |         |      V  |
5+ 9      0.0198      0.02  |Q        |         |         |      V  |
5+10      0.0199      0.02  |Q        |         |         |      V  |
5+11      0.0199      0.02  |Q        |         |         |      V  |
5+12      0.0199      0.02  |Q        |         |         |      V  |
5+13      0.0200      0.02  |Q        |         |         |      V  |
5+14      0.0200      0.02  |Q        |         |         |      V  |
5+15      0.0200      0.02  |Q        |         |         |      V  |
5+16      0.0200      0.02  |Q        |         |         |      V  |
5+17      0.0201      0.02  |Q        |         |         |      V  |
5+18      0.0201      0.02  |Q        |         |         |      V  |
5+19      0.0201      0.02  |Q        |         |         |      V  |
5+20      0.0202      0.02  |Q        |         |         |      V  |
5+21      0.0202      0.02  |Q        |         |         |      V  |
5+22      0.0202      0.02  |Q        |         |         |      V  |
5+23      0.0202      0.02  |Q        |         |         |      V  |
5+24      0.0203      0.02  |Q        |         |         |       V |
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   5+25       0.0203      0.02  |Q        |         |         |        V |
   5+26       0.0203      0.02  |Q        |         |         |        V |
   5+27       0.0204      0.02  |Q        |         |         |        V |
   5+28       0.0204      0.02  |Q        |         |         |        V |
   5+29       0.0204      0.02  |Q        |         |         |        V |
   5+30       0.0204      0.02  |Q        |         |         |        V |
   5+31       0.0205      0.02  |Q        |         |         |        V |
   5+32       0.0205      0.02  |Q        |         |         |        V |
   5+33       0.0205      0.02  |Q        |         |         |        V |
   5+34       0.0205      0.02  |Q        |         |         |        V |
   5+35       0.0206      0.02  |Q        |         |         |        V |
   5+36       0.0206      0.02  |Q        |         |         |        V |
   5+37       0.0206      0.02  |Q        |         |         |        V |
   5+38       0.0206      0.02  |Q        |         |         |        V |
   5+39       0.0207      0.02  |Q        |         |         |        V |
   5+40       0.0207      0.02  |Q        |         |         |        V |
   5+41       0.0207      0.02  |Q        |         |         |        V |
   5+42       0.0207      0.02  |Q        |         |         |        V |
   5+43       0.0208      0.02  |Q        |         |         |        V |
   5+44       0.0208      0.02  |Q        |         |         |        V |
   5+45       0.0208      0.02  |Q        |         |         |         V|
   5+46       0.0208      0.02  |Q        |         |         |         V|
   5+47       0.0209      0.02  |Q        |         |         |         V|
   5+48       0.0209      0.02  |Q        |         |         |         V|
   5+49       0.0209      0.02  |Q        |         |         |         V|
   5+50       0.0209      0.02  |Q        |         |         |         V|
   5+51       0.0210      0.02  |Q        |         |         |         V|
   5+52       0.0210      0.02  |Q        |         |         |         V|
   5+53       0.0210      0.02  |Q        |         |         |         V|
   5+54       0.0210      0.02  |Q        |         |         |         V|
   5+55       0.0210      0.02  |Q        |         |         |         V|
   5+56       0.0211      0.02  |Q        |         |         |         V|
   5+57       0.0211      0.02  |Q        |         |         |         V|
   5+58       0.0211      0.02  |Q        |         |         |         V|
   5+59       0.0211      0.02  |Q        |         |         |         V|
   6+ 0       0.0212      0.02  |Q        |         |         |         V|
   6+ 1       0.0212      0.02  |Q        |         |         |         V|
   6+ 2       0.0212      0.02  |Q        |         |         |         V|
   6+ 3       0.0212      0.02  |Q        |         |         |         V|
   6+ 4       0.0212      0.02  |Q        |         |         |         V|
   6+ 5       0.0213      0.02  |Q        |         |         |         V|
   6+ 6       0.0213      0.02  |Q        |         |         |         V|
   6+ 7       0.0213      0.02  |Q        |         |         |         V|
   6+ 8       0.0213      0.02  |Q        |         |         |          V
-------------------------------------------------------------------------
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.031 to Point/Station        2.032
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   643.200(Ft.)
Downstream point/station elevation =   620.000(Ft.)
Pipe length  =    90.00(Ft.) Slope =   0.2578  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.495(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.495(CFS)
Normal flow depth in pipe =    1.69(In.)
Flow top width inside pipe =    5.40(In.)
Critical Depth =    4.30(In.)
Pipe flow velocity =     10.88(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     8.27 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.032 to Point/Station        2.032
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Rainfall intensity (I) =      5.331(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.250 given for subarea
Time of concentration =     8.27 min.
Rainfall intensity =      5.331(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.346  CA =      0.142
Subarea runoff =      0.261(CFS) for      0.200(Ac.)
Total runoff =      0.756(CFS)  Total area =       0.410(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.032 to Point/Station        2.033
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   620.000(Ft.)
Downstream point/station elevation =   619.800(Ft.)
Pipe length  =    21.00(Ft.) Slope =   0.0095  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.756(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.756(CFS)
Normal flow depth in pipe =    4.33(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    4.76(In.)
Pipe flow velocity =      3.59(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     8.37 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.033 to Point/Station        2.034
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   619.800(Ft.)
Downstream point/station elevation =   616.100(Ft.)
Pipe length  =    99.00(Ft.) Slope =   0.0374  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.756(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.756(CFS)
Normal flow depth in pipe =    3.69(In.)
Flow top width inside pipe =    5.84(In.)
Critical Depth =    5.22(In.)
Pipe flow velocity =      5.97(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     8.65 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.034 to Point/Station        2.053
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      0.410(Ac.)
Runoff from this stream =      0.756(CFS)
Time of concentration =    8.65 min.
Rainfall intensity =     5.182(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.041 to Point/Station        2.051
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                    ]
(2.0 DU/A or Less       )
Impervious value, Ai = 0.200
Sub-Area C Value = 0.380
Initial subarea total flow distance  =   80.000(Ft.)
Highest elevation =  622.900(Ft.)
Lowest elevation =  621.900(Ft.)
Elevation difference =    1.000(Ft.) Slope =  1.250 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
```

```
for the top area slope value of   1.25 %, in a development type of
 2.0 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =  10.50 minutes
 (for slope value of   1.00 %)
Rainfall intensity (I) =      4.572(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.380
Subarea runoff =      0.052(CFS)
Total initial stream area =        0.030(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.051 to Point/Station        2.052
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.295(CFS)
Depth of flow =   0.072(Ft.), Average velocity =   1.125(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2             50.00              0.00
        3            100.00              1.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =      0.295(CFS)
  '     '        flow top width =      7.246(Ft.)
  '     '    velocity=    1.125(Ft/s)
  '     '        area =      0.263(Sq.Ft)
  '     '        Froude number =     1.042

Upstream point elevation =   621.900(Ft.)
Downstream point elevation =   616.100(Ft.)
Flow length =    99.000(Ft.)
Travel time  =    1.47 min.
Time of concentration =   11.97 min.
Depth of flow =   0.072(Ft.)
Average velocity =   1.125(Ft/s)
Total irregular channel flow =     0.295(CFS)
Irregular channel normal depth above invert elev. =   0.072(Ft.)
Average velocity of channel(s) =   1.125(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      4.202(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.410 given for subarea
Rainfall intensity =      4.202(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.407  CA =      0.126
Subarea runoff =      0.478(CFS) for      0.280(Ac.)
Total runoff =      0.530(CFS)  Total area =       0.310(Ac.)
```

Depth of flow = 0.090(Ft.), Average velocity = 1.302(Ft/s)

++
Process from Point/Station 2.052 to Point/Station 2.052
**** 6 HOUR HYDROGRAPH ****
_____
++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003

Time of Concentration = 11.97
Basin Area = 0.72 Acres
6 Hour Rainfall = 2.800 Inches
Runoff Coefficient = 0.175
Peak Discharge = 0.53 CFS

Time (Min)	Discharge (CFS)
0	0.000
11	0.021
22	0.021
33	0.022
44	0.023
55	0.024
66	0.025
77	0.026
88	0.027
99	0.028
110	0.029
121	0.031
132	0.033
143	0.035
154	0.037
165	0.041
176	0.044
187	0.050
198	0.054
209	0.066
220	0.076
231	0.111
242	0.156
253	0.530
264	0.089
275	0.059
286	0.047
297	0.039
308	0.034
319	0.030
330	0.027
341	0.025
352	0.023

363 0.022

++

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))

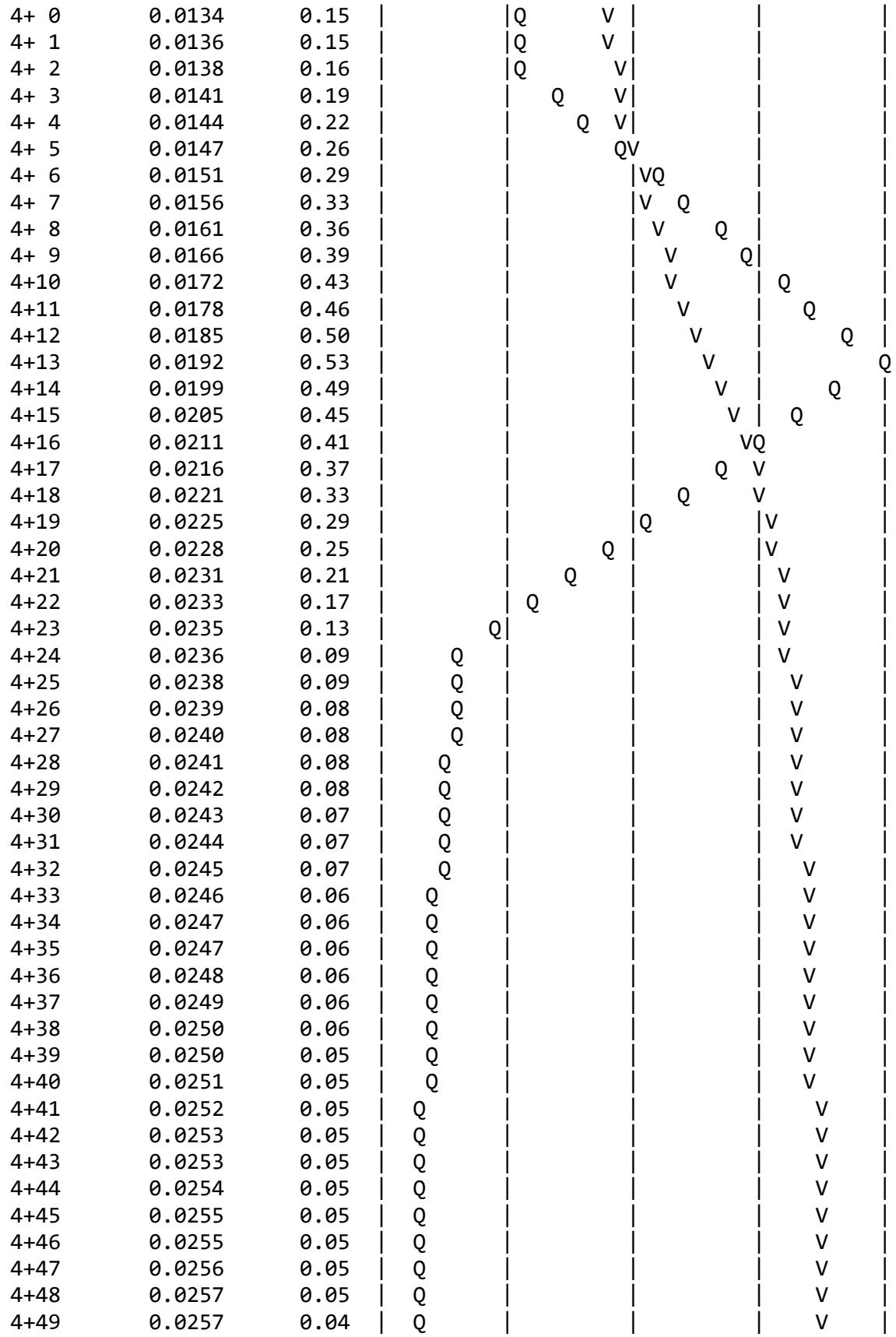
Time(h+m)	Volume Ac.Ft	Q(CFS)	0	0.1	0.3	0.4	0.5
0+ 0	0.0000	0.00	Q				
0+ 1	0.0000	0.00	Q				
0+ 2	0.0000	0.00	Q				
0+ 3	0.0000	0.01	Q				
0+ 4	0.0000	0.01	Q				
0+ 5	0.0000	0.01	Q				
0+ 6	0.0001	0.01	Q				
0+ 7	0.0001	0.01	VQ				
0+ 8	0.0001	0.02	VQ				
0+ 9	0.0001	0.02	VQ				
0+10	0.0001	0.02	VQ				
0+11	0.0002	0.02	VQ				
0+12	0.0002	0.02	VQ				
0+13	0.0002	0.02	VQ				
0+14	0.0003	0.02	VQ				
0+15	0.0003	0.02	VQ				
0+16	0.0003	0.02	VQ				
0+17	0.0003	0.02	VQ				
0+18	0.0004	0.02	VQ				
0+19	0.0004	0.02	VQ				
0+20	0.0004	0.02	VQ				
0+21	0.0005	0.02	VQ				
0+22	0.0005	0.02	VQ				
0+23	0.0005	0.02	VQ				
0+24	0.0006	0.02	VQ				
0+25	0.0006	0.02	VQ				
0+26	0.0006	0.02	VQ				
0+27	0.0006	0.02	VQ				
0+28	0.0007	0.02	VQ				
0+29	0.0007	0.02	VQ				
0+30	0.0007	0.02	|Q				
0+31	0.0008	0.02	|Q				
0+32	0.0008	0.02	|Q				
0+33	0.0008	0.02	|Q				
0+34	0.0009	0.02	|Q				
0+35	0.0009	0.02	|Q				
0+36	0.0009	0.02	|Q				
0+37	0.0010	0.02	|Q				
0+38	0.0010	0.02	|Q				
0+39	0.0010	0.02	|Q				

```
0+40       0.0010      0.02  |Q         |          |          |          |
0+41       0.0011      0.02  |Q         |          |          |          |
0+42       0.0011      0.02  |Q         |          |          |          |
0+43       0.0011      0.02  |Q         |          |          |          |
0+44       0.0012      0.02  |Q         |          |          |          |
0+45       0.0012      0.02  |Q         |          |          |          |
0+46       0.0012      0.02  |Q         |          |          |          |
0+47       0.0013      0.02  |Q         |          |          |          |
0+48       0.0013      0.02  |Q         |          |          |          |
0+49       0.0013      0.02  |Q         |          |          |          |
0+50       0.0014      0.02  |Q         |          |          |          |
0+51       0.0014      0.02  |Q         |          |          |          |
0+52       0.0014      0.02  |Q         |          |          |          |
0+53       0.0015      0.02  |QV        |          |          |          |
0+54       0.0015      0.02  |QV        |          |          |          |
0+55       0.0015      0.02  |QV        |          |          |          |
0+56       0.0016      0.02  |QV        |          |          |          |
0+57       0.0016      0.02  |QV        |          |          |          |
0+58       0.0016      0.02  |QV        |          |          |          |
0+59       0.0017      0.02  |QV        |          |          |          |
1+ 0       0.0017      0.02  |QV        |          |          |          |
1+ 1       0.0017      0.02  |QV        |          |          |          |
1+ 2       0.0018      0.02  |QV        |          |          |          |
1+ 3       0.0018      0.02  |QV        |          |          |          |
1+ 4       0.0018      0.02  |QV        |          |          |          |
1+ 5       0.0019      0.02  |QV        |          |          |          |
1+ 6       0.0019      0.02  |QV        |          |          |          |
1+ 7       0.0019      0.02  |QV        |          |          |          |
1+ 8       0.0020      0.02  |QV        |          |          |          |
1+ 9       0.0020      0.02  |QV        |          |          |          |
1+10       0.0020      0.03  |QV        |          |          |          |
1+11       0.0021      0.03  |QV        |          |          |          |
1+12       0.0021      0.03  |QV        |          |          |          |
1+13       0.0021      0.03  |QV        |          |          |          |
1+14       0.0022      0.03  |Q V       |          |          |          |
1+15       0.0022      0.03  |Q V       |          |          |          |
1+16       0.0022      0.03  |Q V       |          |          |          |
1+17       0.0023      0.03  |Q V       |          |          |          |
1+18       0.0023      0.03  |Q V       |          |          |          |
1+19       0.0024      0.03  |Q V       |          |          |          |
1+20       0.0024      0.03  |Q V       |          |          |          |
1+21       0.0024      0.03  |Q V       |          |          |          |
1+22       0.0025      0.03  |Q V       |          |          |          |
1+23       0.0025      0.03  |Q V       |          |          |          |
1+24       0.0025      0.03  |Q V       |          |          |          |
1+25       0.0026      0.03  |Q V       |          |          |          |
1+26       0.0026      0.03  | QV       |          |          |          |
1+27       0.0026      0.03  | QV       |          |          |          |
1+28       0.0027      0.03  | QV       |          |          |          |
1+29       0.0027      0.03  | QV       |          |          |          |
```

1+30	0.0028	0.03	QV				
1+31	0.0028	0.03	QV				
1+32	0.0028	0.03	QV				
1+33	0.0029	0.03	QV				
1+34	0.0029	0.03	Q V				
1+35	0.0029	0.03	Q V				
1+36	0.0030	0.03	Q V				
1+37	0.0030	0.03	Q V				
1+38	0.0031	0.03	Q V				
1+39	0.0031	0.03	Q V				
1+40	0.0031	0.03	Q V				
1+41	0.0032	0.03	Q V				
1+42	0.0032	0.03	Q V				
1+43	0.0033	0.03	Q V				
1+44	0.0033	0.03	Q V				
1+45	0.0033	0.03	Q V				
1+46	0.0034	0.03	Q V				
1+47	0.0034	0.03	Q V				
1+48	0.0035	0.03	Q V				
1+49	0.0035	0.03	Q V				
1+50	0.0035	0.03	Q V				
1+51	0.0036	0.03	Q V				
1+52	0.0036	0.03	Q V				
1+53	0.0037	0.03	Q V				
1+54	0.0037	0.03	Q V				
1+55	0.0037	0.03	Q V				
1+56	0.0038	0.03	Q V				
1+57	0.0038	0.03	Q V				
1+58	0.0039	0.03	Q V				
1+59	0.0039	0.03	Q V				
2+ 0	0.0040	0.03	Q V				
2+ 1	0.0040	0.03	Q V				
2+ 2	0.0040	0.03	Q V				
2+ 3	0.0041	0.03	Q V				
2+ 4	0.0041	0.03	Q V				
2+ 5	0.0042	0.03	Q V				
2+ 6	0.0042	0.03	Q V				
2+ 7	0.0043	0.03	Q V				
2+ 8	0.0043	0.03	Q V				
2+ 9	0.0043	0.03	Q V				
2+10	0.0044	0.03	Q V				
2+11	0.0044	0.03	Q V				
2+12	0.0045	0.03	Q V				
2+13	0.0045	0.03	Q V				
2+14	0.0046	0.03	Q V				
2+15	0.0046	0.03	Q V				
2+16	0.0047	0.03	Q V				
2+17	0.0047	0.03	Q V				
2+18	0.0048	0.03	Q V				
2+19	0.0048	0.03	Q V				

```
2+20       0.0049      0.03  | Q   V   |          |          |          |
2+21       0.0049      0.03  | Q   V   |          |          |          |
2+22       0.0050      0.04  | Q   V   |          |          |          |
2+23       0.0050      0.04  | Q   V   |          |          |          |
2+24       0.0050      0.04  | Q    V  |          |          |          |
2+25       0.0051      0.04  | Q    V  |          |          |          |
2+26       0.0051      0.04  | Q    V  |          |          |          |
2+27       0.0052      0.04  | Q    V  |          |          |          |
2+28       0.0052      0.04  | Q    V  |          |          |          |
2+29       0.0053      0.04  | Q    V  |          |          |          |
2+30       0.0053      0.04  | Q    V  |          |          |          |
2+31       0.0054      0.04  | Q    V  |          |          |          |
2+32       0.0054      0.04  | Q    V  |          |          |          |
2+33       0.0055      0.04  | Q    V  |          |          |          |
2+34       0.0056      0.04  | Q    V  |          |          |          |
2+35       0.0056      0.04  | Q    V  |          |          |          |
2+36       0.0057      0.04  | Q    V  |          |          |          |
2+37       0.0057      0.04  | Q    V  |          |          |          |
2+38       0.0058      0.04  | Q     V |          |          |          |
2+39       0.0058      0.04  | Q     V |          |          |          |
2+40       0.0059      0.04  | Q     V |          |          |          |
2+41       0.0059      0.04  | Q     V |          |          |          |
2+42       0.0060      0.04  |  Q    V |          |          |          |
2+43       0.0060      0.04  |  Q    V |          |          |          |
2+44       0.0061      0.04  |  Q    V |          |          |          |
2+45       0.0061      0.04  |  Q    V |          |          |          |
2+46       0.0062      0.04  |  Q    V |          |          |          |
2+47       0.0063      0.04  |  Q    V |          |          |          |
2+48       0.0063      0.04  |  Q    V |          |          |          |
2+49       0.0064      0.04  |  Q    V |          |          |          |
2+50       0.0064      0.04  |  Q    V |          |          |          |
2+51       0.0065      0.04  |  Q     V|          |          |          |
2+52       0.0066      0.04  |  Q     V|          |          |          |
2+53       0.0066      0.04  |  Q     V|          |          |          |
2+54       0.0067      0.04  |  Q     V|          |          |          |
2+55       0.0067      0.04  |  Q     V|          |          |          |
2+56       0.0068      0.04  |  Q     V|          |          |          |
2+57       0.0069      0.04  |  Q     V|          |          |          |
2+58       0.0069      0.04  |  Q     V|          |          |          |
2+59       0.0070      0.05  |  Q     V|          |          |          |
3+ 0       0.0070      0.05  |  Q     V|          |          |          |
3+ 1       0.0071      0.05  |  Q     V|          |          |          |
3+ 2       0.0072      0.05  |  Q     V|          |          |          |
3+ 3       0.0072      0.05  |  Q      V          |          |          |
3+ 4       0.0073      0.05  |  Q      V          |          |          |
3+ 5       0.0074      0.05  |  Q      V          |          |          |
3+ 6       0.0074      0.05  |  Q      V          |          |          |
3+ 7       0.0075      0.05  |  Q      V          |          |          |
3+ 8       0.0076      0.05  |  Q      V          |          |          |
3+ 9       0.0076      0.05  |  Q      V          |          |          |
```

```
3+10       0.0077      0.05  |  Q      V          |          |          |
3+11       0.0078      0.05  |  Q      V          |          |          |
3+12       0.0079      0.05  |  Q      V          |          |          |
3+13       0.0079      0.05  |  Q      |V         |          |          |
3+14       0.0080      0.05  |  Q      |V         |          |          |
3+15       0.0081      0.05  |   Q     |V         |          |          |
3+16       0.0081      0.05  |   Q     |V         |          |          |
3+17       0.0082      0.05  |   Q     |V         |          |          |
3+18       0.0083      0.05  |   Q     |V         |          |          |
3+19       0.0084      0.06  |   Q     |V         |          |          |
3+20       0.0084      0.06  |   Q     |V         |          |          |
3+21       0.0085      0.06  |   Q     |V         |          |          |
3+22       0.0086      0.06  |   Q     |V         |          |          |
3+23       0.0087      0.06  |   Q     | V        |          |          |
3+24       0.0088      0.06  |   Q     | V        |          |          |
3+25       0.0089      0.06  |   Q     | V        |          |          |
3+26       0.0089      0.06  |   Q     | V        |          |          |
3+27       0.0090      0.06  |   Q     | V        |          |          |
3+28       0.0091      0.07  |   Q     | V        |          |          |
3+29       0.0092      0.07  |    Q    | V        |          |          |
3+30       0.0093      0.07  |    Q    | V        |          |          |
3+31       0.0094      0.07  |    Q    |  V       |          |          |
3+32       0.0095      0.07  |    Q    |  V       |          |          |
3+33       0.0096      0.07  |    Q    |  V       |          |          |
3+34       0.0097      0.07  |    Q    |  V       |          |          |
3+35       0.0098      0.07  |    Q    |  V       |          |          |
3+36       0.0099      0.07  |    Q    |  V       |          |          |
3+37       0.0100      0.07  |    Q    |  V       |          |          |
3+38       0.0101      0.07  |    Q    |   V      |          |          |
3+39       0.0102      0.07  |    Q    |   V      |          |          |
3+40       0.0103      0.08  |    Q    |   V      |          |          |
3+41       0.0104      0.08  |    Q    |   V      |          |          |
3+42       0.0105      0.08  |     Q   |   V      |          |          |
3+43       0.0106      0.09  |     Q   |   V      |          |          |
3+44       0.0108      0.09  |     Q   |   V      |          |          |
3+45       0.0109      0.09  |     Q   |    V     |          |          |
3+46       0.0110      0.09  |      Q  |    V     |          |          |
3+47       0.0111      0.10  |      Q  |    V     |          |          |
3+48       0.0113      0.10  |      Q  |    V     |          |          |
3+49       0.0114      0.10  |      Q  |    V     |          |          |
3+50       0.0116      0.11  |       Q |     V    |          |          |
3+51       0.0117      0.11  |       Q |     V    |          |          |
3+52       0.0119      0.11  |       Q |     V    |          |          |
3+53       0.0121      0.12  |       Q |     V    |          |          |
3+54       0.0122      0.12  |        Q|      V   |          |          |
3+55       0.0124      0.13  |        Q|      V   |          |          |
3+56       0.0126      0.13  |        Q|      V   |          |          |
3+57       0.0128      0.14  |         Q      V   |          |          |
3+58       0.0130      0.14  |         Q       V  |          |          |
3+59       0.0132      0.14  |         Q       V  |          |          |
```



```
4+50       0.0258      0.04  |  Q      |         |         |    V    |
4+51       0.0258      0.04  |  Q      |         |         |    V    |
4+52       0.0259      0.04  |  Q      |         |         |     V   |
4+53       0.0260      0.04  |  Q      |         |         |     V   |
4+54       0.0260      0.04  |  Q      |         |         |     V   |
4+55       0.0261      0.04  |  Q      |         |         |     V   |
4+56       0.0261      0.04  | Q       |         |         |     V   |
4+57       0.0262      0.04  | Q       |         |         |     V   |
4+58       0.0262      0.04  | Q       |         |         |     V   |
4+59       0.0263      0.04  | Q       |         |         |     V   |
5+ 0       0.0263      0.04  | Q       |         |         |     V   |
5+ 1       0.0264      0.04  | Q       |         |         |     V   |
5+ 2       0.0264      0.04  | Q       |         |         |     V   |
5+ 3       0.0265      0.04  | Q       |         |         |     V   |
5+ 4       0.0265      0.04  | Q       |         |         |     V   |
5+ 5       0.0266      0.04  | Q       |         |         |     V   |
5+ 6       0.0266      0.03  | Q       |         |         |      V  |
5+ 7       0.0267      0.03  | Q       |         |         |      V  |
5+ 8       0.0267      0.03  | Q       |         |         |      V  |
5+ 9       0.0268      0.03  | Q       |         |         |      V  |
5+10       0.0268      0.03  | Q       |         |         |      V  |
5+11       0.0269      0.03  | Q       |         |         |      V  |
5+12       0.0269      0.03  | Q       |         |         |      V  |
5+13       0.0270      0.03  | Q       |         |         |      V  |
5+14       0.0270      0.03  | Q       |         |         |      V  |
5+15       0.0270      0.03  | Q       |         |         |      V  |
5+16       0.0271      0.03  | Q       |         |         |      V  |
5+17       0.0271      0.03  | Q       |         |         |      V  |
5+18       0.0272      0.03  | Q       |         |         |      V  |
5+19       0.0272      0.03  | Q       |         |         |      V  |
5+20       0.0272      0.03  | Q       |         |         |      V  |
5+21       0.0273      0.03  | Q       |         |         |      V  |
5+22       0.0273      0.03  | Q       |         |         |       V |
5+23       0.0274      0.03  | Q       |         |         |       V |
5+24       0.0274      0.03  | Q       |         |         |       V |
5+25       0.0275      0.03  | Q       |         |         |       V |
5+26       0.0275      0.03  | Q       |         |         |       V |
5+27       0.0275      0.03  | Q       |         |         |       V |
5+28       0.0276      0.03  | Q       |         |         |       V |
5+29       0.0276      0.03  | Q       |         |         |       V |
5+30       0.0276      0.03  | Q       |         |         |       V |
5+31       0.0277      0.03  | Q       |         |         |       V |
5+32       0.0277      0.03  | Q       |         |         |       V |
5+33       0.0278      0.03  | Q       |         |         |       V |
5+34       0.0278      0.03  | Q       |         |         |       V |
5+35       0.0278      0.03  |Q        |         |         |       V |
5+36       0.0279      0.03  |Q        |         |         |       V |
5+37       0.0279      0.03  |Q        |         |         |       V |
5+38       0.0279      0.03  |Q        |         |         |       V |
5+39       0.0280      0.03  |Q        |         |         |       V |
```

```
   5+40       0.0280      0.03  |Q        |         |         |        V |
   5+41       0.0280      0.03  |Q        |         |         |         V|
   5+42       0.0281      0.03  |Q        |         |         |         V|
   5+43       0.0281      0.02  |Q        |         |         |         V|
   5+44       0.0281      0.02  |Q        |         |         |         V|
   5+45       0.0282      0.02  |Q        |         |         |         V|
   5+46       0.0282      0.02  |Q        |         |         |         V|
   5+47       0.0282      0.02  |Q        |         |         |         V|
   5+48       0.0283      0.02  |Q        |         |         |         V|
   5+49       0.0283      0.02  |Q        |         |         |         V|
   5+50       0.0283      0.02  |Q        |         |         |         V|
   5+51       0.0284      0.02  |Q        |         |         |         V|
   5+52       0.0284      0.02  |Q        |         |         |         V|
   5+53       0.0284      0.02  |Q        |         |         |         V|
   5+54       0.0285      0.02  |Q        |         |         |         V|
   5+55       0.0285      0.02  |Q        |         |         |         V|
   5+56       0.0285      0.02  |Q        |         |         |         V|
   5+57       0.0286      0.02  |Q        |         |         |         V|
   5+58       0.0286      0.02  |Q        |         |         |         V|
   5+59       0.0286      0.02  |Q        |         |         |         V|
   6+ 0       0.0287      0.02  |Q        |         |         |         V|
   6+ 1       0.0287      0.02  |Q        |         |         |         V|
   6+ 2       0.0287      0.02  |Q        |         |         |         V|
   6+ 3       0.0288      0.02  |Q        |         |         |          V
-------------------------------------------------------------------------
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.052 to Point/Station        2.053
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   616.100(Ft.)
Downstream point/station elevation =   615.700(Ft.)
Pipe length  =    35.00(Ft.) Slope =   0.0114  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.530(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.530(CFS)
Normal flow depth in pipe =    4.38(In.)
Flow top width inside pipe =    5.32(In.)
Critical Depth =    4.46(In.)
Pipe flow velocity =      3.45(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    12.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
Process from Point/Station        2.034 to Point/Station        2.053
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.310(Ac.)
Runoff from this stream =      0.530(CFS)
Time of concentration =   12.14 min.
Rainfall intensity =     4.164(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        0.756      8.65                 5.182
2        0.530     12.14                 4.164
Qmax(1) =
           1.000 *    1.000 *     0.756) +
           1.000 *    0.712 *     0.530) + =       1.134
Qmax(2) =
           0.804 *    1.000 *     0.756) +
           1.000 *    1.000 *     0.530) + =       1.138

Total of 2 main streams to confluence:
Flow rates before confluence point:
       0.756       0.530
Maximum flow rates at confluence using above data:
        1.134        1.138
Area of streams before confluence:
        0.410        0.310


Results of confluence:
Total flow rate =      1.138(CFS)
Time of concentration =    12.136 min.
Effective stream area after confluence  =      0.720(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.034 to Point/Station        2.081
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =   616.100(Ft.)
Downstream point/station elevation =   588.000(Ft.)
Pipe length  =    62.00(Ft.) Slope =   0.4532  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.138(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.138(CFS)
Normal flow depth in pipe =    2.26(In.)
```

```
Flow top width inside pipe =    5.81(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.83(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    12.20 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.081 to Point/Station        2.081
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Rainfall intensity (I) =      4.150(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.250 given for subarea
Time of concentration =    12.20 min.
Rainfall intensity =      4.150(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.350  CA =      0.308
Subarea runoff =      0.141(CFS) for      0.160(Ac.)
Total runoff =      1.278(CFS)  Total area =       0.880(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.091 to Point/Station        2.082
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      0.880(Ac.)
Runoff from this stream =      1.278(CFS)
Time of concentration =   12.20 min.
Rainfall intensity =     4.150(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.061 to Point/Station        2.071
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
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 = 0.510
Initial subarea total flow distance  =   67.000(Ft.)
Highest elevation =  595.800(Ft.)
Lowest elevation =  595.000(Ft.)
Elevation difference =    0.800(Ft.) Slope =  1.194 %
```

```
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 65.00 (Ft)
for the top area slope value of   1.19 %, in a development type of
 7.3 DU/A or Less
In Accordance With Table 3-2
Initial Area Time of Concentration =   8.40 minutes
 (for slope value of   1.00 %)
Rainfall intensity (I) =      5.279(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.510
Subarea runoff =      0.135(CFS)
Total initial stream area =        0.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.071 to Point/Station        2.072
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.297(CFS)
Depth of flow =   0.064(Ft.), Average velocity =   1.464(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2             50.00              0.00
        3            100.00              1.00
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------
Sub-Channel flow  =      0.297(CFS)
  '     '        flow top width =      6.373(Ft.)
  '     '    velocity=    1.464(Ft/s)
  '     '        area =      0.203(Sq.Ft)
  '     '        Froude number =     1.446

Upstream point elevation =   595.000(Ft.)
Downstream point elevation =   589.700(Ft.)
Flow length =    45.000(Ft.)
Travel time  =    0.51 min.
Time of concentration =    8.91 min.
Depth of flow =   0.064(Ft.)
Average velocity =   1.464(Ft/s)
Total irregular channel flow =     0.297(CFS)
Irregular channel normal depth above invert elev. =   0.064(Ft.)
Average velocity of channel(s) =   1.464(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      5.081(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.330 given for subarea
Rainfall intensity =      5.081(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.375  CA =      0.075
```

Subarea runoff = 0.246(CFS) for 0.150(Ac.)
Total runoff = 0.381(CFS) Total area = 0.200(Ac.)
Depth of flow = 0.070(Ft.), Average velocity = 1.558(Ft/s)

++
Process from Point/Station 2.072 to Point/Station 2.072
**** 6 HOUR HYDROGRAPH ****
_____
++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003

Time of Concentration = 8.91
Basin Area = 1.08 Acres
6 Hour Rainfall = 2.800 Inches
Runoff Coefficient = 0.069
Peak Discharge = 0.38 CFS

Time (Min)	Discharge (CFS)
0	0.000
8	0.013
16	0.013
24	0.013
32	0.013
40	0.014
48	0.014
56	0.015
64	0.015
72	0.015
80	0.016
88	0.016
96	0.017
104	0.018
112	0.018
120	0.019
128	0.019
136	0.021
144	0.021
152	0.023
160	0.024
168	0.026
176	0.027
184	0.030
192	0.032
200	0.037
208	0.040
216	0.048
224	0.055
232	0.081
240	0.114

248	0.381
256	0.065
264	0.043
272	0.034
280	0.028
288	0.025
296	0.022
304	0.020
312	0.018
320	0.017
328	0.016
336	0.015
344	0.014
352	0.014
360	0.013
368	0.012

++

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))

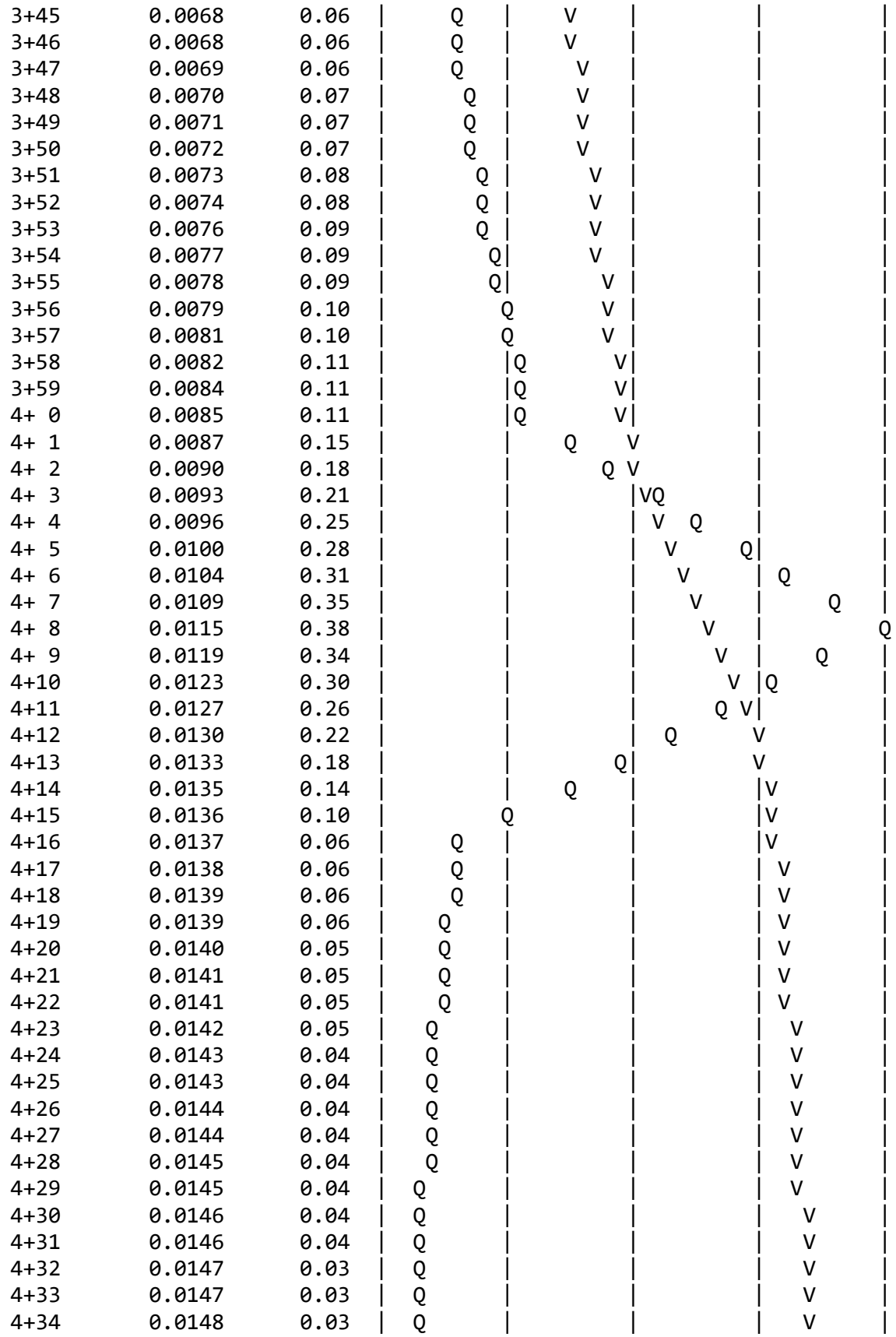
Time(h+m)	Volume Ac.Ft	Q(CFS)	0	0.1	0.2	0.3	0.4
0+ 0	0.0000	0.00	Q	|	|	|	|
0+ 1	0.0000	0.00	Q	|	|	|	|
0+ 2	0.0000	0.00	Q	|	|	|	|
0+ 3	0.0000	0.00	Q	|	|	|	|
0+ 4	0.0000	0.01	Q	|	|	|	|
0+ 5	0.0000	0.01	Q	|	|	|	|
0+ 6	0.0000	0.01	Q	|	|	|	|
0+ 7	0.0001	0.01	VQ	|	|	|	|
0+ 8	0.0001	0.01	VQ	|	|	|	|
0+ 9	0.0001	0.01	VQ	|	|	|	|
0+10	0.0001	0.01	VQ	|	|	|	|
0+11	0.0001	0.01	VQ	|	|	|	|
0+12	0.0001	0.01	VQ	|	|	|	|
0+13	0.0002	0.01	VQ	|	|	|	|
0+14	0.0002	0.01	VQ	|	|	|	|
0+15	0.0002	0.01	VQ	|	|	|	|
0+16	0.0002	0.01	VQ	|	|	|	|
0+17	0.0002	0.01	VQ	|	|	|	|
0+18	0.0003	0.01	VQ	|	|	|	|
0+19	0.0003	0.01	VQ	|	|	|	|
0+20	0.0003	0.01	VQ	|	|	|	|
0+21	0.0003	0.01	VQ	|	|	|	|
0+22	0.0003	0.01	VQ	|	|	|	|
0+23	0.0003	0.01	VQ	|	|	|	|
0+24	0.0004	0.01	VQ	|	|	|	|

```
0+25       0.0004      0.01  VQ        |          |          |          |
0+26       0.0004      0.01  VQ        |          |          |          |
0+27       0.0004      0.01  VQ        |          |          |          |
0+28       0.0004      0.01  |Q        |          |          |          |
0+29       0.0005      0.01  |Q        |          |          |          |
0+30       0.0005      0.01  |Q        |          |          |          |
0+31       0.0005      0.01  |Q        |          |          |          |
0+32       0.0005      0.01  |Q        |          |          |          |
0+33       0.0005      0.01  |Q        |          |          |          |
0+34       0.0005      0.01  |Q        |          |          |          |
0+35       0.0006      0.01  |Q        |          |          |          |
0+36       0.0006      0.01  |Q        |          |          |          |
0+37       0.0006      0.01  |Q        |          |          |          |
0+38       0.0006      0.01  |Q        |          |          |          |
0+39       0.0006      0.01  |Q        |          |          |          |
0+40       0.0007      0.01  |Q        |          |          |          |
0+41       0.0007      0.01  |Q        |          |          |          |
0+42       0.0007      0.01  |Q        |          |          |          |
0+43       0.0007      0.01  |Q        |          |          |          |
0+44       0.0007      0.01  |Q        |          |          |          |
0+45       0.0008      0.01  |Q        |          |          |          |
0+46       0.0008      0.01  |Q        |          |          |          |
0+47       0.0008      0.01  |Q        |          |          |          |
0+48       0.0008      0.01  |Q        |          |          |          |
0+49       0.0008      0.01  |Q        |          |          |          |
0+50       0.0008      0.01  |Q        |          |          |          |
0+51       0.0009      0.01  |QV       |          |          |          |
0+52       0.0009      0.01  |QV       |          |          |          |
0+53       0.0009      0.01  |QV       |          |          |          |
0+54       0.0009      0.01  |QV       |          |          |          |
0+55       0.0009      0.01  |QV       |          |          |          |
0+56       0.0010      0.01  |QV       |          |          |          |
0+57       0.0010      0.01  |QV       |          |          |          |
0+58       0.0010      0.01  |QV       |          |          |          |
0+59       0.0010      0.01  |QV       |          |          |          |
1+ 0       0.0010      0.01  |QV       |          |          |          |
1+ 1       0.0011      0.01  |QV       |          |          |          |
1+ 2       0.0011      0.01  |QV       |          |          |          |
1+ 3       0.0011      0.01  |QV       |          |          |          |
1+ 4       0.0011      0.01  |QV       |          |          |          |
1+ 5       0.0011      0.01  |QV       |          |          |          |
1+ 6       0.0012      0.01  |QV       |          |          |          |
1+ 7       0.0012      0.01  |QV       |          |          |          |
1+ 8       0.0012      0.02  |QV       |          |          |          |
1+ 9       0.0012      0.02  |QV       |          |          |          |
1+10       0.0013      0.02  |QV       |          |          |          |
1+11       0.0013      0.02  |QV       |          |          |          |
1+12       0.0013      0.02  |Q V      |          |          |          |
1+13       0.0013      0.02  |Q V      |          |          |          |
1+14       0.0013      0.02  |Q V      |          |          |          |
```

1+15	0.0014	0.02	|Q V	|	|	|	|
1+16	0.0014	0.02	|Q V	|	|	|	|
1+17	0.0014	0.02	|Q V	|	|	|	|
1+18	0.0014	0.02	|Q V	|	|	|	|
1+19	0.0014	0.02	|Q V	|	|	|	|
1+20	0.0015	0.02	|Q V	|	|	|	|
1+21	0.0015	0.02	|Q V	|	|	|	|
1+22	0.0015	0.02	|Q V	|	|	|	|
1+23	0.0015	0.02	|Q V	|	|	|	|
1+24	0.0016	0.02	|Q V	|	|	|	|
1+25	0.0016	0.02	|Q V	|	|	|	|
1+26	0.0016	0.02	|Q V	|	|	|	|
1+27	0.0016	0.02	|Q V	|	|	|	|
1+28	0.0016	0.02	|Q V	|	|	|	|
1+29	0.0017	0.02	|Q V	|	|	|	|
1+30	0.0017	0.02	|Q V	|	|	|	|
1+31	0.0017	0.02	|Q V	|	|	|	|
1+32	0.0017	0.02	|Q V	|	|	|	|
1+33	0.0018	0.02	|Q V	|	|	|	|
1+34	0.0018	0.02	|Q V	|	|	|	|
1+35	0.0018	0.02	|Q V	|	|	|	|
1+36	0.0018	0.02	|Q V	|	|	|	|
1+37	0.0018	0.02	|Q V	|	|	|	|
1+38	0.0019	0.02	|Q V	|	|	|	|
1+39	0.0019	0.02	|Q V	|	|	|	|
1+40	0.0019	0.02	|Q V	|	|	|	|
1+41	0.0019	0.02	|Q V	|	|	|	|
1+42	0.0020	0.02	|Q V	|	|	|	|
1+43	0.0020	0.02	|Q V	|	|	|	|
1+44	0.0020	0.02	|Q V	|	|	|	|
1+45	0.0020	0.02	|Q V	|	|	|	|
1+46	0.0021	0.02	|Q V	|	|	|	|
1+47	0.0021	0.02	|Q V	|	|	|	|
1+48	0.0021	0.02	|Q V	|	|	|	|
1+49	0.0021	0.02	|Q V	|	|	|	|
1+50	0.0022	0.02	|Q V	|	|	|	|
1+51	0.0022	0.02	|Q V	|	|	|	|
1+52	0.0022	0.02	|Q V	|	|	|	|
1+53	0.0022	0.02	|Q V	|	|	|	|
1+54	0.0023	0.02	|Q V	|	|	|	|
1+55	0.0023	0.02	|Q V	|	|	|	|
1+56	0.0023	0.02	|Q V	|	|	|	|
1+57	0.0023	0.02	|Q V	|	|	|	|
1+58	0.0024	0.02	|Q V	|	|	|	|
1+59	0.0024	0.02	|Q V	|	|	|	|
2+ 0	0.0024	0.02	|Q V	|	|	|	|
2+ 1	0.0024	0.02	|Q V	|	|	|	|
2+ 2	0.0025	0.02	| Q V	|	|	|	|
2+ 3	0.0025	0.02	| Q V	|	|	|	|
2+ 4	0.0025	0.02	| Q V	|	|	|	|

```
2+ 5       0.0025      0.02  | Q  V    |          |          |          |
2+ 6       0.0026      0.02  | Q  V    |          |          |          |
2+ 7       0.0026      0.02  | Q   V   |          |          |          |
2+ 8       0.0026      0.02  | Q   V   |          |          |          |
2+ 9       0.0027      0.02  | Q   V   |          |          |          |
2+10       0.0027      0.02  | Q   V   |          |          |          |
2+11       0.0027      0.02  | Q   V   |          |          |          |
2+12       0.0027      0.02  | Q   V   |          |          |          |
2+13       0.0028      0.02  | Q   V   |          |          |          |
2+14       0.0028      0.02  | Q   V   |          |          |          |
2+15       0.0028      0.02  | Q   V   |          |          |          |
2+16       0.0028      0.02  | Q   V   |          |          |          |
2+17       0.0029      0.02  | Q   V   |          |          |          |
2+18       0.0029      0.02  | Q   V   |          |          |          |
2+19       0.0029      0.02  | Q   V   |          |          |          |
2+20       0.0030      0.02  | Q   V   |          |          |          |
2+21       0.0030      0.02  | Q   V   |          |          |          |
2+22       0.0030      0.02  | Q    V  |          |          |          |
2+23       0.0030      0.02  | Q    V  |          |          |          |
2+24       0.0031      0.02  | Q    V  |          |          |          |
2+25       0.0031      0.02  | Q    V  |          |          |          |
2+26       0.0031      0.02  | Q    V  |          |          |          |
2+27       0.0032      0.02  | Q    V  |          |          |          |
2+28       0.0032      0.02  | Q    V  |          |          |          |
2+29       0.0032      0.02  | Q    V  |          |          |          |
2+30       0.0033      0.02  | Q    V  |          |          |          |
2+31       0.0033      0.02  | Q    V  |          |          |          |
2+32       0.0033      0.02  | Q    V  |          |          |          |
2+33       0.0034      0.02  | Q    V  |          |          |          |
2+34       0.0034      0.02  | Q    V  |          |          |          |
2+35       0.0034      0.02  | Q    V  |          |          |          |
2+36       0.0035      0.02  | Q     V |          |          |          |
2+37       0.0035      0.02  | Q     V |          |          |          |
2+38       0.0035      0.02  | Q     V |          |          |          |
2+39       0.0035      0.02  | Q     V |          |          |          |
2+40       0.0036      0.02  | Q     V |          |          |          |
2+41       0.0036      0.02  | Q     V |          |          |          |
2+42       0.0036      0.02  | Q     V |          |          |          |
2+43       0.0037      0.02  | Q     V |          |          |          |
2+44       0.0037      0.02  | Q     V |          |          |          |
2+45       0.0038      0.03  | Q     V |          |          |          |
2+46       0.0038      0.03  | Q     V |          |          |          |
2+47       0.0038      0.03  | Q     V |          |          |          |
2+48       0.0039      0.03  | Q     V |          |          |          |
2+49       0.0039      0.03  | Q      V|          |          |          |
2+50       0.0039      0.03  | Q      V|          |          |          |
2+51       0.0040      0.03  | Q      V|          |          |          |
2+52       0.0040      0.03  | Q      V|          |          |          |
2+53       0.0040      0.03  | Q      V|          |          |          |
2+54       0.0041      0.03  | Q      V|          |          |          |
```

```
2+55       0.0041      0.03  | Q      V|          |          |          |
2+56       0.0041      0.03  | Q      V|          |          |          |
2+57       0.0042      0.03  | Q      V|          |          |          |
2+58       0.0042      0.03  | Q      V|          |          |          |
2+59       0.0043      0.03  | Q      V|          |          |          |
3+ 0       0.0043      0.03  | Q       V          |          |          |
3+ 1       0.0043      0.03  |  Q      V          |          |          |
3+ 2       0.0044      0.03  |  Q      V          |          |          |
3+ 3       0.0044      0.03  |  Q      V          |          |          |
3+ 4       0.0045      0.03  |  Q      V          |          |          |
3+ 5       0.0045      0.03  |  Q      V          |          |          |
3+ 6       0.0045      0.03  |  Q      V          |          |          |
3+ 7       0.0046      0.03  |  Q      V          |          |          |
3+ 8       0.0046      0.03  |  Q      V          |          |          |
3+ 9       0.0047      0.03  |  Q      V          |          |          |
3+10       0.0047      0.03  |  Q      |V         |          |          |
3+11       0.0048      0.03  |  Q      |V         |          |          |
3+12       0.0048      0.03  |  Q      |V         |          |          |
3+13       0.0049      0.03  |  Q      |V         |          |          |
3+14       0.0049      0.03  |  Q      |V         |          |          |
3+15       0.0049      0.03  |  Q      |V         |          |          |
3+16       0.0050      0.03  |  Q      |V         |          |          |
3+17       0.0050      0.03  |  Q      |V         |          |          |
3+18       0.0051      0.04  |  Q      |V         |          |          |
3+19       0.0051      0.04  |  Q      |V         |          |          |
3+20       0.0052      0.04  |  Q      | V        |          |          |
3+21       0.0052      0.04  |  Q      | V        |          |          |
3+22       0.0053      0.04  |  Q      | V        |          |          |
3+23       0.0053      0.04  |  Q      | V        |          |          |
3+24       0.0054      0.04  |  Q      | V        |          |          |
3+25       0.0054      0.04  |   Q     | V        |          |          |
3+26       0.0055      0.04  |   Q     | V        |          |          |
3+27       0.0056      0.04  |   Q     | V        |          |          |
3+28       0.0056      0.04  |   Q     |  V       |          |          |
3+29       0.0057      0.04  |   Q     |  V       |          |          |
3+30       0.0057      0.04  |   Q     |  V       |          |          |
3+31       0.0058      0.04  |   Q     |  V       |          |          |
3+32       0.0058      0.04  |   Q     |  V       |          |          |
3+33       0.0059      0.05  |   Q     |  V       |          |          |
3+34       0.0060      0.05  |   Q     |  V       |          |          |
3+35       0.0060      0.05  |   Q     |   V      |          |          |
3+36       0.0061      0.05  |    Q    |   V      |          |          |
3+37       0.0062      0.05  |    Q    |   V      |          |          |
3+38       0.0062      0.05  |    Q    |   V      |          |          |
3+39       0.0063      0.05  |    Q    |   V      |          |          |
3+40       0.0064      0.05  |    Q    |   V      |          |          |
3+41       0.0065      0.05  |    Q    |    V     |          |          |
3+42       0.0065      0.05  |    Q    |    V     |          |          |
3+43       0.0066      0.05  |    Q    |    V     |          |          |
3+44       0.0067      0.06  |    Q    |    V     |          |          |
```



```
4+35       0.0148      0.03  |  Q      |         |         |   V     |
4+36       0.0149      0.03  |  Q      |         |         |   V     |
4+37       0.0149      0.03  |  Q      |         |         |   V     |
4+38       0.0150      0.03  |  Q      |         |         |   V     |
4+39       0.0150      0.03  |  Q      |         |         |   V     |
4+40       0.0150      0.03  | Q       |         |         |    V    |
4+41       0.0151      0.03  | Q       |         |         |    V    |
4+42       0.0151      0.03  | Q       |         |         |    V    |
4+43       0.0151      0.03  | Q       |         |         |    V    |
4+44       0.0152      0.03  | Q       |         |         |    V    |
4+45       0.0152      0.03  | Q       |         |         |    V    |
4+46       0.0153      0.03  | Q       |         |         |    V    |
4+47       0.0153      0.03  | Q       |         |         |    V    |
4+48       0.0153      0.02  | Q       |         |         |    V    |
4+49       0.0154      0.02  | Q       |         |         |    V    |
4+50       0.0154      0.02  | Q       |         |         |    V    |
4+51       0.0154      0.02  | Q       |         |         |    V    |
4+52       0.0155      0.02  | Q       |         |         |     V   |
4+53       0.0155      0.02  | Q       |         |         |     V   |
4+54       0.0155      0.02  | Q       |         |         |     V   |
4+55       0.0155      0.02  | Q       |         |         |     V   |
4+56       0.0156      0.02  | Q       |         |         |     V   |
4+57       0.0156      0.02  | Q       |         |         |     V   |
4+58       0.0156      0.02  | Q       |         |         |     V   |
4+59       0.0157      0.02  | Q       |         |         |     V   |
5+ 0       0.0157      0.02  | Q       |         |         |     V   |
5+ 1       0.0157      0.02  | Q       |         |         |     V   |
5+ 2       0.0158      0.02  | Q       |         |         |     V   |
5+ 3       0.0158      0.02  | Q       |         |         |     V   |
5+ 4       0.0158      0.02  | Q       |         |         |     V   |
5+ 5       0.0158      0.02  | Q       |         |         |     V   |
5+ 6       0.0159      0.02  | Q       |         |         |     V   |
5+ 7       0.0159      0.02  | Q       |         |         |      V  |
5+ 8       0.0159      0.02  | Q       |         |         |      V  |
5+ 9       0.0159      0.02  |Q        |         |         |      V  |
5+10       0.0160      0.02  |Q        |         |         |      V  |
5+11       0.0160      0.02  |Q        |         |         |      V  |
5+12       0.0160      0.02  |Q        |         |         |      V  |
5+13       0.0160      0.02  |Q        |         |         |      V  |
5+14       0.0161      0.02  |Q        |         |         |      V  |
5+15       0.0161      0.02  |Q        |         |         |      V  |
5+16       0.0161      0.02  |Q        |         |         |      V  |
5+17       0.0161      0.02  |Q        |         |         |      V  |
5+18       0.0162      0.02  |Q        |         |         |      V  |
5+19       0.0162      0.02  |Q        |         |         |      V  |
5+20       0.0162      0.02  |Q        |         |         |      V  |
5+21       0.0162      0.02  |Q        |         |         |      V  |
5+22       0.0163      0.02  |Q        |         |         |      V  |
5+23       0.0163      0.02  |Q        |         |         |      V  |
5+24       0.0163      0.02  |Q        |         |         |       V |
```

```
   5+25       0.0163      0.02  |Q        |         |         |        V |
   5+26       0.0164      0.02  |Q        |         |         |        V |
   5+27       0.0164      0.02  |Q        |         |         |        V |
   5+28       0.0164      0.02  |Q        |         |         |        V |
   5+29       0.0164      0.02  |Q        |         |         |        V |
   5+30       0.0164      0.02  |Q        |         |         |        V |
   5+31       0.0165      0.02  |Q        |         |         |        V |
   5+32       0.0165      0.02  |Q        |         |         |        V |
   5+33       0.0165      0.02  |Q        |         |         |        V |
   5+34       0.0165      0.02  |Q        |         |         |        V |
   5+35       0.0165      0.02  |Q        |         |         |        V |
   5+36       0.0166      0.02  |Q        |         |         |        V |
   5+37       0.0166      0.01  |Q        |         |         |        V |
   5+38       0.0166      0.01  |Q        |         |         |        V |
   5+39       0.0166      0.01  |Q        |         |         |        V |
   5+40       0.0166      0.01  |Q        |         |         |        V |
   5+41       0.0167      0.01  |Q        |         |         |        V |
   5+42       0.0167      0.01  |Q        |         |         |        V |
   5+43       0.0167      0.01  |Q        |         |         |        V |
   5+44       0.0167      0.01  |Q        |         |         |        V |
   5+45       0.0167      0.01  |Q        |         |         |         V|
   5+46       0.0168      0.01  |Q        |         |         |         V|
   5+47       0.0168      0.01  |Q        |         |         |         V|
   5+48       0.0168      0.01  |Q        |         |         |         V|
   5+49       0.0168      0.01  |Q        |         |         |         V|
   5+50       0.0168      0.01  |Q        |         |         |         V|
   5+51       0.0169      0.01  |Q        |         |         |         V|
   5+52       0.0169      0.01  |Q        |         |         |         V|
   5+53       0.0169      0.01  |Q        |         |         |         V|
   5+54       0.0169      0.01  |Q        |         |         |         V|
   5+55       0.0169      0.01  |Q        |         |         |         V|
   5+56       0.0170      0.01  |Q        |         |         |         V|
   5+57       0.0170      0.01  |Q        |         |         |         V|
   5+58       0.0170      0.01  |Q        |         |         |         V|
   5+59       0.0170      0.01  |Q        |         |         |         V|
   6+ 0       0.0170      0.01  |Q        |         |         |         V|
   6+ 1       0.0170      0.01  |Q        |         |         |         V|
   6+ 2       0.0171      0.01  |Q        |         |         |         V|
   6+ 3       0.0171      0.01  |Q        |         |         |         V|
   6+ 4       0.0171      0.01  |Q        |         |         |         V|
   6+ 5       0.0171      0.01  |Q        |         |         |         V|
   6+ 6       0.0171      0.01  |Q        |         |         |         V|
   6+ 7       0.0171      0.01  |Q        |         |         |         V|
   6+ 8       0.0172      0.01  |Q        |         |         |          V
-------------------------------------------------------------------------
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.072 to Point/Station        2.073
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   589.700(Ft.)
Downstream point/station elevation =   588.000(Ft.)
Pipe length  =    27.00(Ft.) Slope =   0.0630  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.381(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.381(CFS)
Normal flow depth in pipe =    2.13(In.)
Flow top width inside pipe =    5.74(In.)
Critical Depth =    3.76(In.)
Pipe flow velocity =      6.09(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     8.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.073 to Point/Station        2.073
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Rainfall intensity (I) =      5.054(In/Hr) for a   100.0 year storm
User specified 'C' value of 0.250 given for subarea
Time of concentration =     8.99 min.
Rainfall intensity =      5.054(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.316  CA =      0.120
Subarea runoff =      0.225(CFS) for      0.180(Ac.)
Total runoff =      0.607(CFS)  Total area =       0.380(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.091 to Point/Station        2.082
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.380(Ac.)
Runoff from this stream =      0.607(CFS)
Time of concentration =    8.99 min.
Rainfall intensity =     5.054(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        1.278     12.20                4.150
```

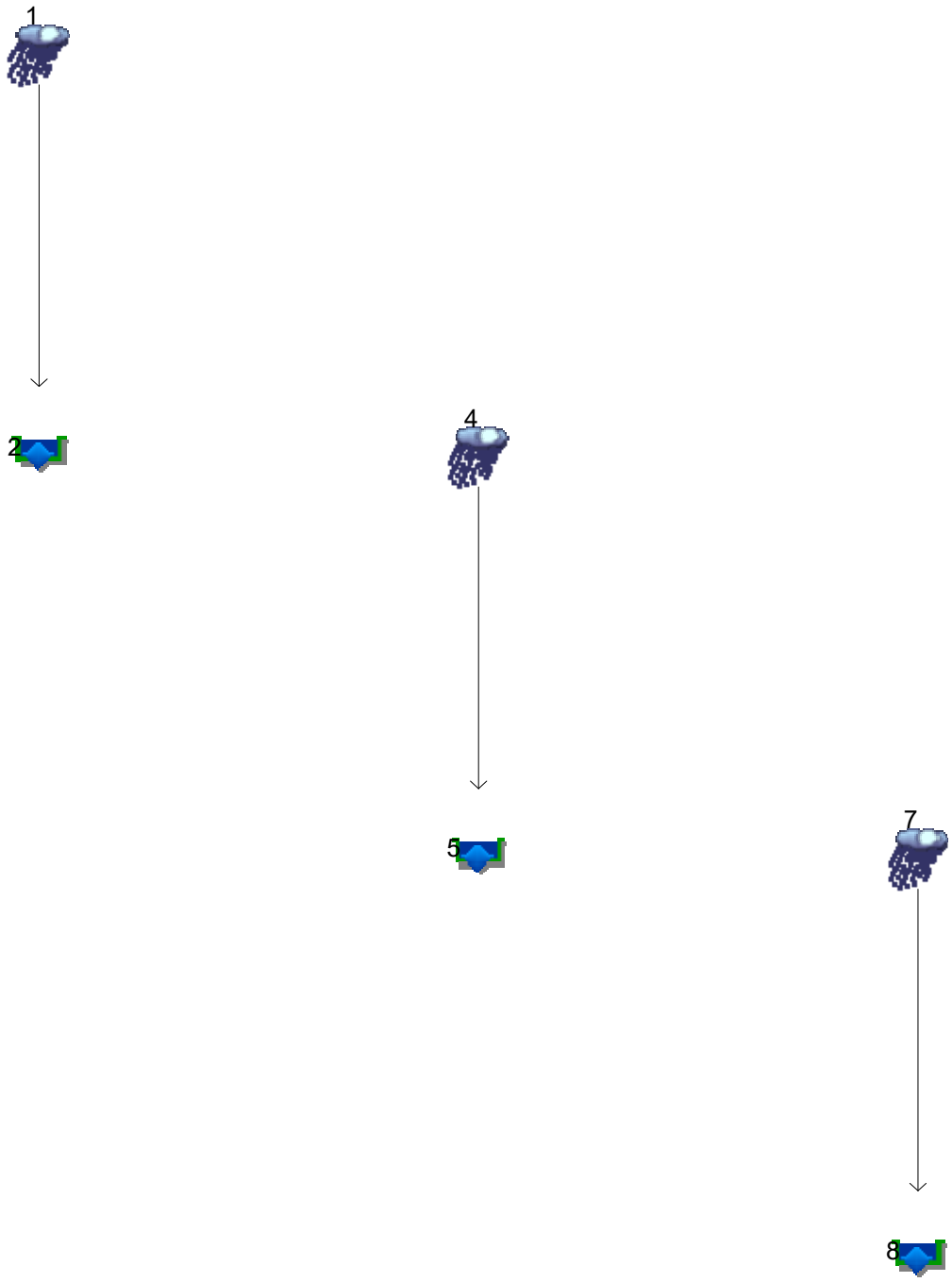
```
2        0.607      8.99                 5.054
Qmax(1) =
           1.000 *    1.000 *     1.278) +
           0.821 *    1.000 *     0.607) + =       1.776
Qmax(2) =
           1.000 *    0.737 *     1.278) +
           1.000 *    1.000 *     0.607) + =       1.548

Total of 2 main streams to confluence:
Flow rates before confluence point:
       1.278       0.607
Maximum flow rates at confluence using above data:
        1.776        1.548
Area of streams before confluence:
        0.880        0.380


Results of confluence:
Total flow rate =      1.776(CFS)
Time of concentration =    12.197 min.
Effective stream area after confluence  =      1.260(Ac.)
End of computations, total study area =           1.260 (Ac.)
```

Appendix F–Hydrographs and Detention Routing Ponds Reports

Hydraflow Table of Contents

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

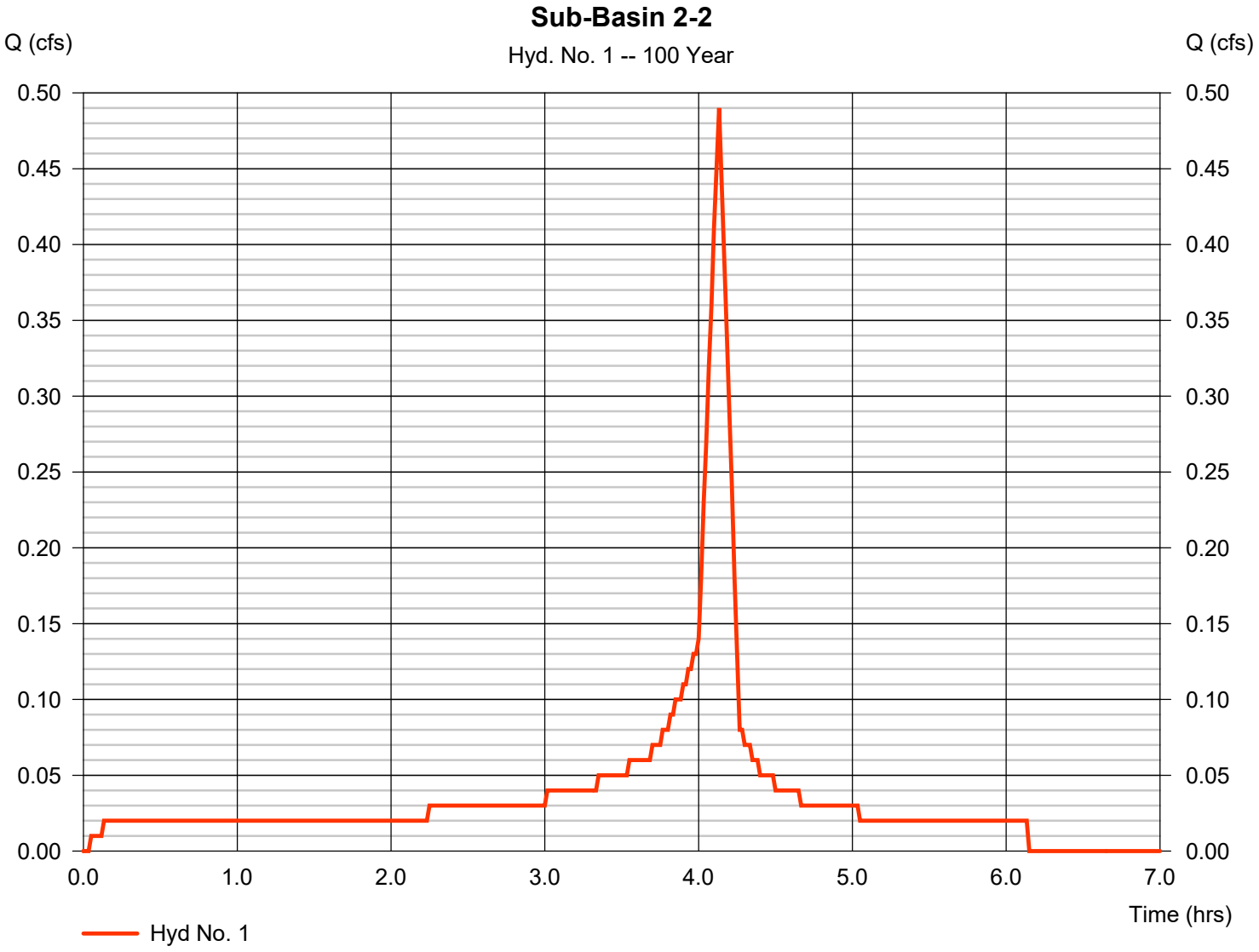
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	0.490	1	248	945	------	------	------	Sub-Basin 2-2
2	Reservoir	0.213	1	253	944	1	646.14	203	Pond No. 1
4	Manual	0.530	1	253	1,246	------	------	------	Sub-Basin 2-5
5	Reservoir	0.384	1	257	1,245	4	619.51	126	Pond No. 2
7	Manual	0.380	1	248	739	------	------	------	Sub-Basin 2-7
8	Reservoir	0.220	1	252	739	7	593.20	105	Pond No. 3

Hydrograph Report

Hyd. No. 1

Sub-Basin 2-2

Hydrograph type	= Manual	Peak discharge	= 0.490 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.13 hrs
Time interval	= 1 min	Hyd. volume	= 945 cuft



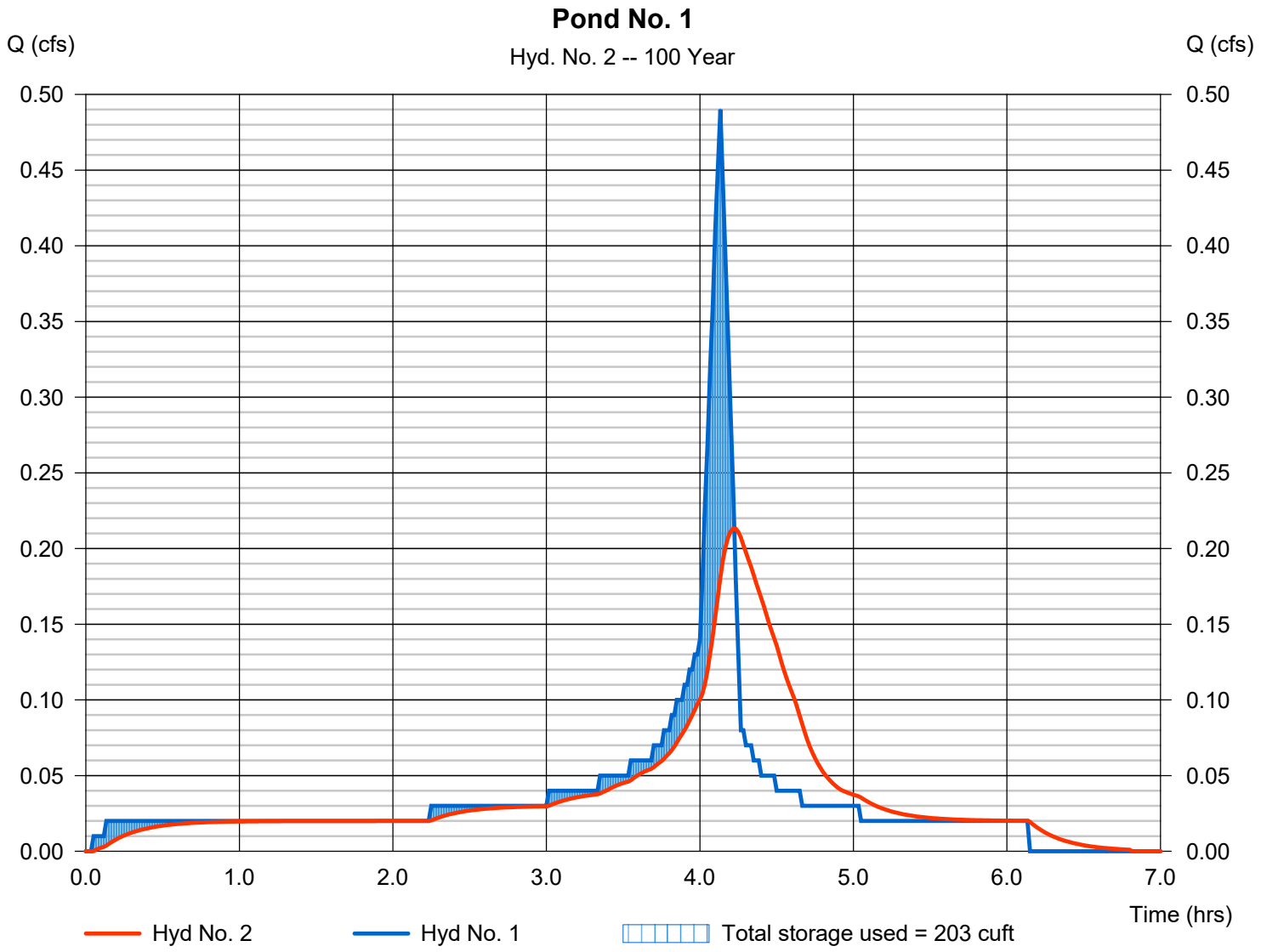
Hydrograph Report

Hyd. No. 2

Pond No. 1

Hydrograph type	=	Reservoir	Peak discharge	=	0.213 cfs
Storm frequency	=	100 yrs	Time to peak	=	4.22 hrs
Time interval	=	1 min	Hyd. volume	=	944 cuft
Inflow hyd. No.	=	1 - Sub-Basin 2-2	Max. Elevation	=	646.14 ft
Reservoir name	=	Sub-Basin 2-2 Tree Well	Max. Storage	=	203 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Sub-Basin 2-2 Tree Well

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 645.20 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	645.20	216	0	0
1.50	646.70	216	324	324
2.50	647.70	352	284	608

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 6.00	3.00	0.00	0.00
Span (in)	= 6.00	3.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 643.20	645.20	0.00	0.00
Length (ft)	= 90.00	0.00	0.00	0.00
Slope (%)	= 26.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 646.70	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

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

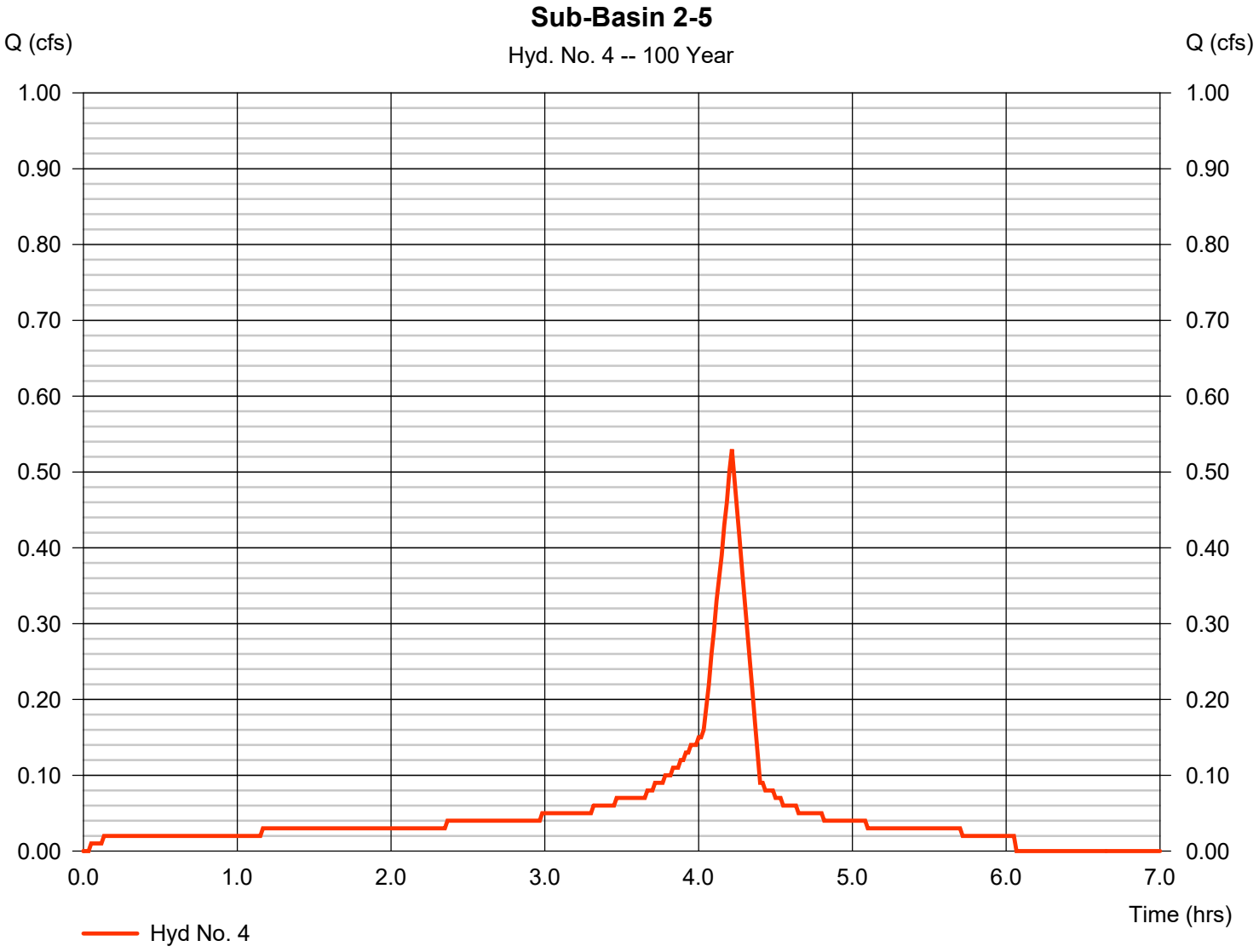
Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	645.20	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.15	32	645.35	1.25 ic	0.04 ic	---	---	0.00	---	---	---	---	---	0.041
0.30	65	645.50	1.25 ic	0.10 ic	---	---	0.00	---	---	---	---	---	0.099
0.45	97	645.65	1.25 ic	0.13 ic	---	---	0.00	---	---	---	---	---	0.135
0.60	130	645.80	1.25 ic	0.16 ic	---	---	0.00	---	---	---	---	---	0.163
0.75	162	645.95	1.25 ic	0.19 ic	---	---	0.00	---	---	---	---	---	0.187
0.90	194	646.10	1.25 ic	0.21 ic	---	---	0.00	---	---	---	---	---	0.208
1.05	227	646.25	1.25 ic	0.23 ic	---	---	0.00	---	---	---	---	---	0.227
1.20	259	646.40	1.25 ic	0.25 ic	---	---	0.00	---	---	---	---	---	0.245
1.35	292	646.55	1.25 ic	0.26 ic	---	---	0.00	---	---	---	---	---	0.262
1.50	324	646.70	1.25 ic	0.28 ic	---	---	0.00	---	---	---	---	---	0.277
1.60	352	646.80	1.25 ic	0.29 ic	---	---	0.63	---	---	---	---	---	0.919
1.70	381	646.90	1.72 ic	0.09 ic	---	---	1.64 s	---	---	---	---	---	1.722
1.80	409	647.00	1.77 ic	0.05 ic	---	---	1.72 s	---	---	---	---	---	1.770
1.90	438	647.10	1.80 ic	0.03 ic	---	---	1.77 s	---	---	---	---	---	1.800
2.00	466	647.20	1.83 ic	0.02 ic	---	---	1.80 s	---	---	---	---	---	1.826
2.10	494	647.30	1.85 ic	0.02 ic	---	---	1.82 s	---	---	---	---	---	1.842
2.20	523	647.40	1.88 ic	0.01 ic	---	---	1.85 s	---	---	---	---	---	1.862
2.30	551	647.50	1.90 ic	0.01 ic	---	---	1.86 s	---	---	---	---	---	1.877
2.40	580	647.60	1.93 ic	0.01 ic	---	---	1.89 s	---	---	---	---	---	1.904
2.50	608	647.70	1.95 ic	0.01 ic	---	---	1.94 s	---	---	---	---	---	1.948

Hydrograph Report

Hyd. No. 4

Sub-Basin 2-5

Hydrograph type	= Manual	Peak discharge	= 0.530 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.22 hrs
Time interval	= 1 min	Hyd. volume	= 1,246 cuft



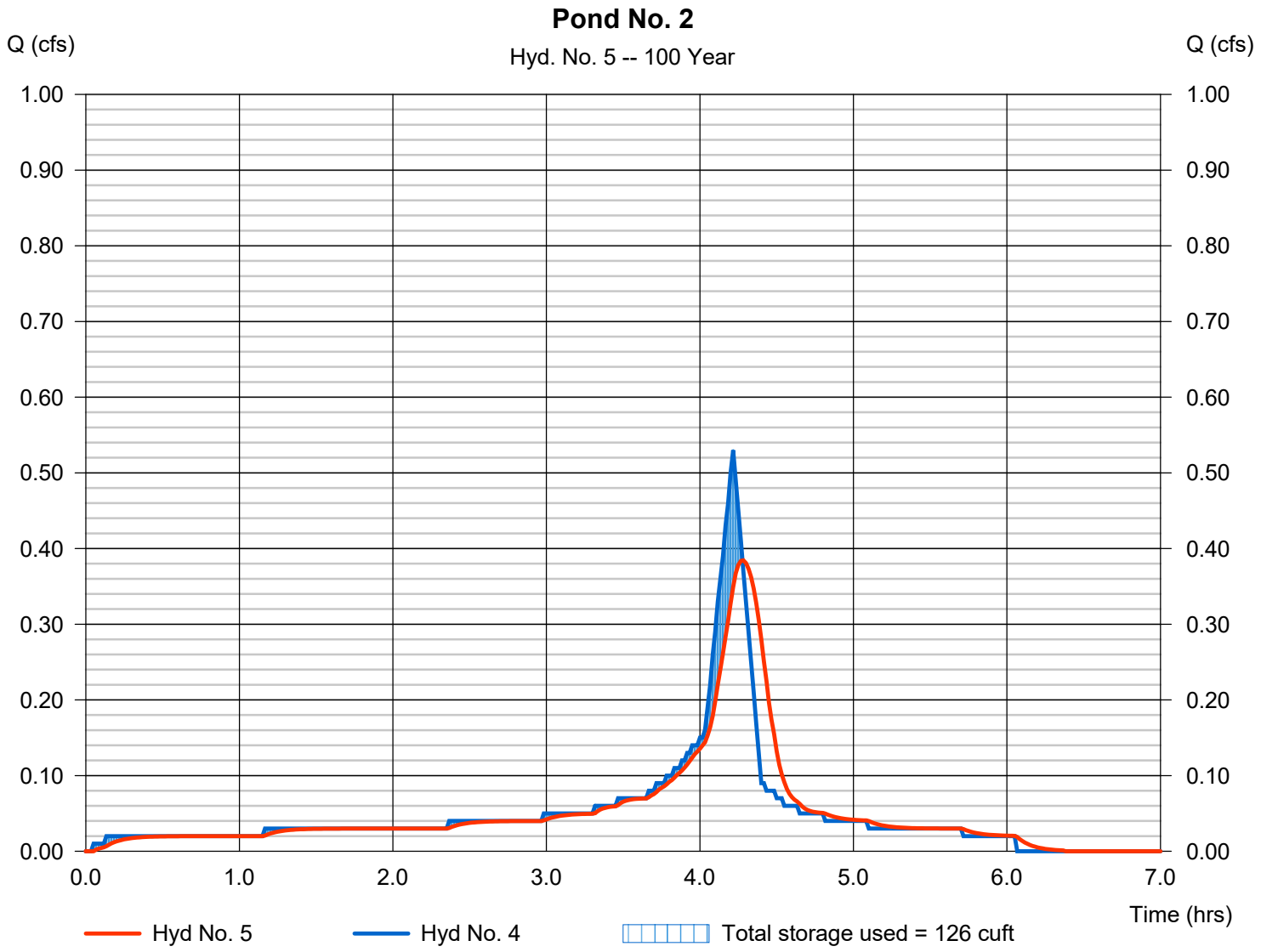
Hydrograph Report

Hyd. No. 5

Pond No. 2

Hydrograph type	=	Reservoir	Peak discharge	=	0.384 cfs
Storm frequency	=	100 yrs	Time to peak	=	4.28 hrs
Time interval	=	1 min	Hyd. volume	=	1,245 cuft
Inflow hyd. No.	=	4 - Sub-Basin 2-5	Max. Elevation	=	619.51 ft
Reservoir name	=	Sub-Basin 2-5 Tree Well	Max. Storage	=	126 cuft

Storage Indication method used.



Pond Report

Pond No. 2 - Sub-Basin 2-5 Tree Well

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 618.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	618.50	125	0	0
1.50	620.00	125	188	188
2.50	621.00	231	178	366

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 6.00	4.00	0.00	0.00
Span (in)	= 6.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 616.10	618.50	0.00	0.00
Length (ft)	= 35.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 620.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
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

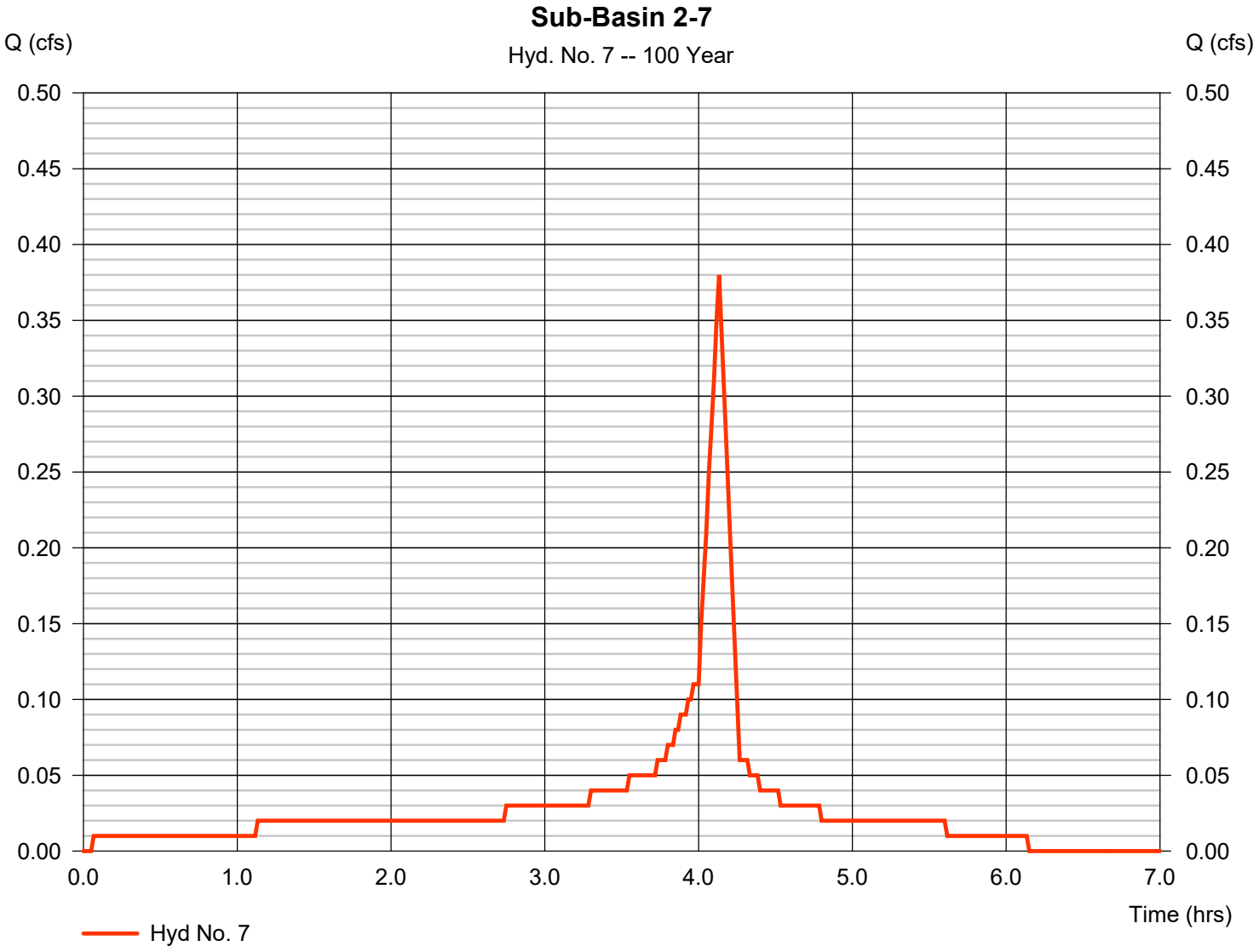
Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	618.50	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.15	19	618.65	1.15 oc	0.05 ic	---	---	0.00	---	---	---	---	---	0.051
0.30	38	618.80	1.15 oc	0.15 ic	---	---	0.00	---	---	---	---	---	0.155
0.45	56	618.95	1.15 oc	0.22 ic	---	---	0.00	---	---	---	---	---	0.224
0.60	75	619.10	1.15 oc	0.28 ic	---	---	0.00	---	---	---	---	---	0.277
0.75	94	619.25	1.15 oc	0.32 ic	---	---	0.00	---	---	---	---	---	0.321
0.90	113	619.40	1.15 oc	0.36 ic	---	---	0.00	---	---	---	---	---	0.360
1.05	131	619.55	1.15 oc	0.39 ic	---	---	0.00	---	---	---	---	---	0.395
1.20	150	619.70	1.15 oc	0.43 ic	---	---	0.00	---	---	---	---	---	0.427
1.35	169	619.85	1.15 oc	0.46 ic	---	---	0.00	---	---	---	---	---	0.457
1.50	188	620.00	1.15 oc	0.49 ic	---	---	0.00	---	---	---	---	---	0.485
1.60	205	620.10	1.15 oc	0.50 ic	---	---	0.63	---	---	---	---	---	1.135
1.70	223	620.20	1.51 oc	0.12 ic	---	---	1.39 s	---	---	---	---	---	1.508
1.80	241	620.30	1.54 oc	0.07 ic	---	---	1.47 s	---	---	---	---	---	1.537
1.90	259	620.40	1.56 oc	0.05 ic	---	---	1.51 s	---	---	---	---	---	1.555
2.00	277	620.50	1.58 oc	0.03 ic	---	---	1.54 s	---	---	---	---	---	1.577
2.10	294	620.60	1.60 oc	0.03 ic	---	---	1.56 s	---	---	---	---	---	1.590
2.20	312	620.70	1.62 oc	0.02 ic	---	---	1.59 s	---	---	---	---	---	1.609
2.30	330	620.80	1.63 oc	0.02 ic	---	---	1.60 s	---	---	---	---	---	1.618
2.40	348	620.90	1.65 oc	0.02 ic	---	---	1.62 s	---	---	---	---	---	1.637
2.50	366	621.00	1.67 oc	0.01 ic	---	---	1.63 s	---	---	---	---	---	1.647

Hydrograph Report

Hyd. No. 7

Sub-Basin 2-7

Hydrograph type	= Manual	Peak discharge	= 0.380 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.13 hrs
Time interval	= 1 min	Hyd. volume	= 739 cuft



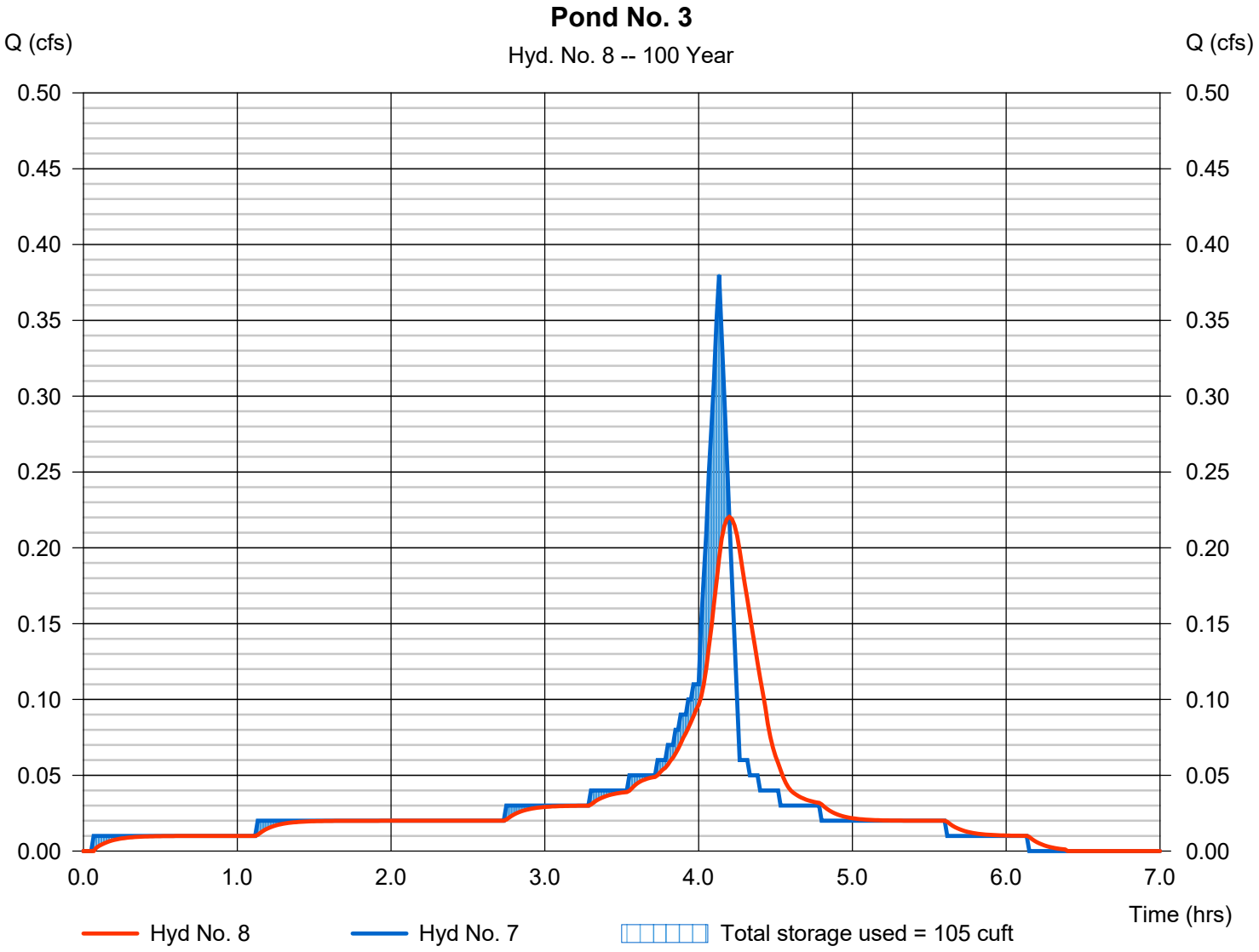
Hydrograph Report

Hyd. No. 8

Pond No. 3

Hydrograph type	=	Reservoir	Peak discharge	=	0.220 cfs
Storm frequency	=	100 yrs	Time to peak	=	4.20 hrs
Time interval	=	1 min	Hyd. volume	=	739 cuft
Inflow hyd. No.	=	7 - Sub-Basin 2-7	Max. Elevation	=	593.20 ft
Reservoir name	=	Sub-Basin 2-7 Tree Well	Max. Storage	=	105 cuft

Storage Indication method used.



Pond Report

Pond No. 3 - Sub-Basin 2-7 Tree Well

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 592.20 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	592.20	105	0	0
1.50	593.70	105	158	158
2.50	594.70	203	154	312

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 6.00	3.00	0.00	0.00
Span (in)	= 6.00	3.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 589.70	592.20	0.00	0.00
Length (ft)	= 27.00	0.00	0.00	0.00
Slope (%)	= 10.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

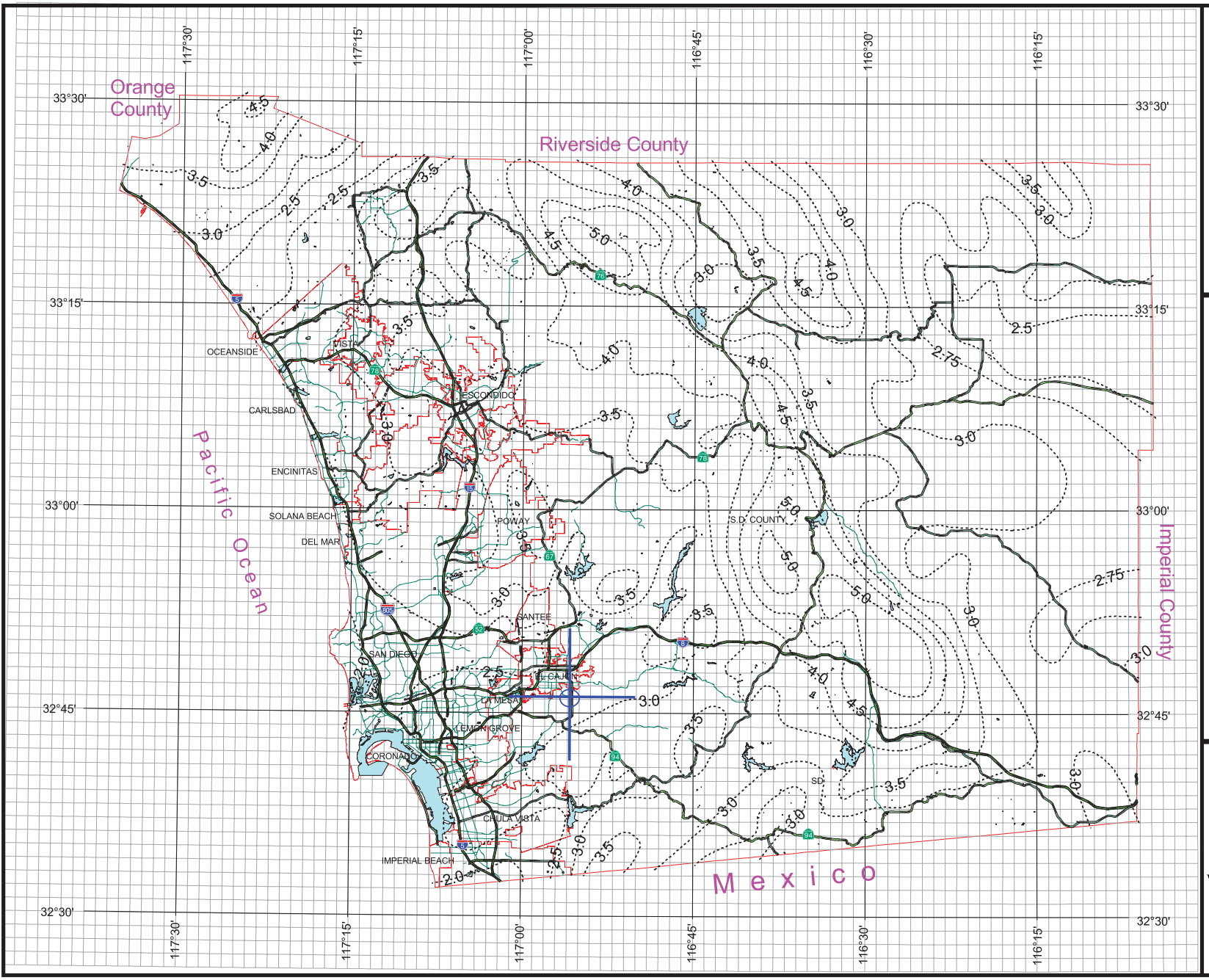
	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 593.70	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

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	592.20	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.15	16	592.35	1.42 ic	0.04 ic	---	---	0.00	---	---	---	---	---	0.041
0.30	32	592.50	1.42 ic	0.10 ic	---	---	0.00	---	---	---	---	---	0.099
0.45	47	592.65	1.42 ic	0.13 ic	---	---	0.00	---	---	---	---	---	0.135
0.60	63	592.80	1.42 ic	0.16 ic	---	---	0.00	---	---	---	---	---	0.163
0.75	79	592.95	1.42 ic	0.19 ic	---	---	0.00	---	---	---	---	---	0.187
0.90	95	593.10	1.42 ic	0.21 ic	---	---	0.00	---	---	---	---	---	0.208
1.05	110	593.25	1.42 ic	0.23 ic	---	---	0.00	---	---	---	---	---	0.227
1.20	126	593.40	1.42 ic	0.25 ic	---	---	0.00	---	---	---	---	---	0.245
1.35	142	593.55	1.42 ic	0.26 ic	---	---	0.00	---	---	---	---	---	0.262
1.50	158	593.70	1.42 ic	0.28 ic	---	---	0.00	---	---	---	---	---	0.277
1.60	173	593.80	1.42 ic	0.29 ic	---	---	0.63	---	---	---	---	---	0.919
1.70	188	593.90	1.84 ic	0.10 ic	---	---	1.74 s	---	---	---	---	---	1.838
1.80	204	594.00	1.89 ic	0.05 ic	---	---	1.84 s	---	---	---	---	---	1.891
1.90	219	594.10	1.92 ic	0.03 ic	---	---	1.88 s	---	---	---	---	---	1.918
2.00	234	594.20	1.95 ic	0.03 ic	---	---	1.92 s	---	---	---	---	---	1.944
2.10	250	594.30	1.97 ic	0.02 ic	---	---	1.95 s	---	---	---	---	---	1.966
2.20	265	594.40	1.99 ic	0.02 ic	---	---	1.97 s	---	---	---	---	---	1.981
2.30	281	594.50	2.02 ic	0.01 ic	---	---	1.99 s	---	---	---	---	---	1.999
2.40	296	594.60	2.04 ic	0.01 ic	---	---	2.00 s	---	---	---	---	---	2.010
2.50	312	594.70	2.06 ic	0.01 ic	---	---	2.03 s	---	---	---	---	---	2.041

Appendix G– Referenced Tables & Figures



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

P6 = 2.8

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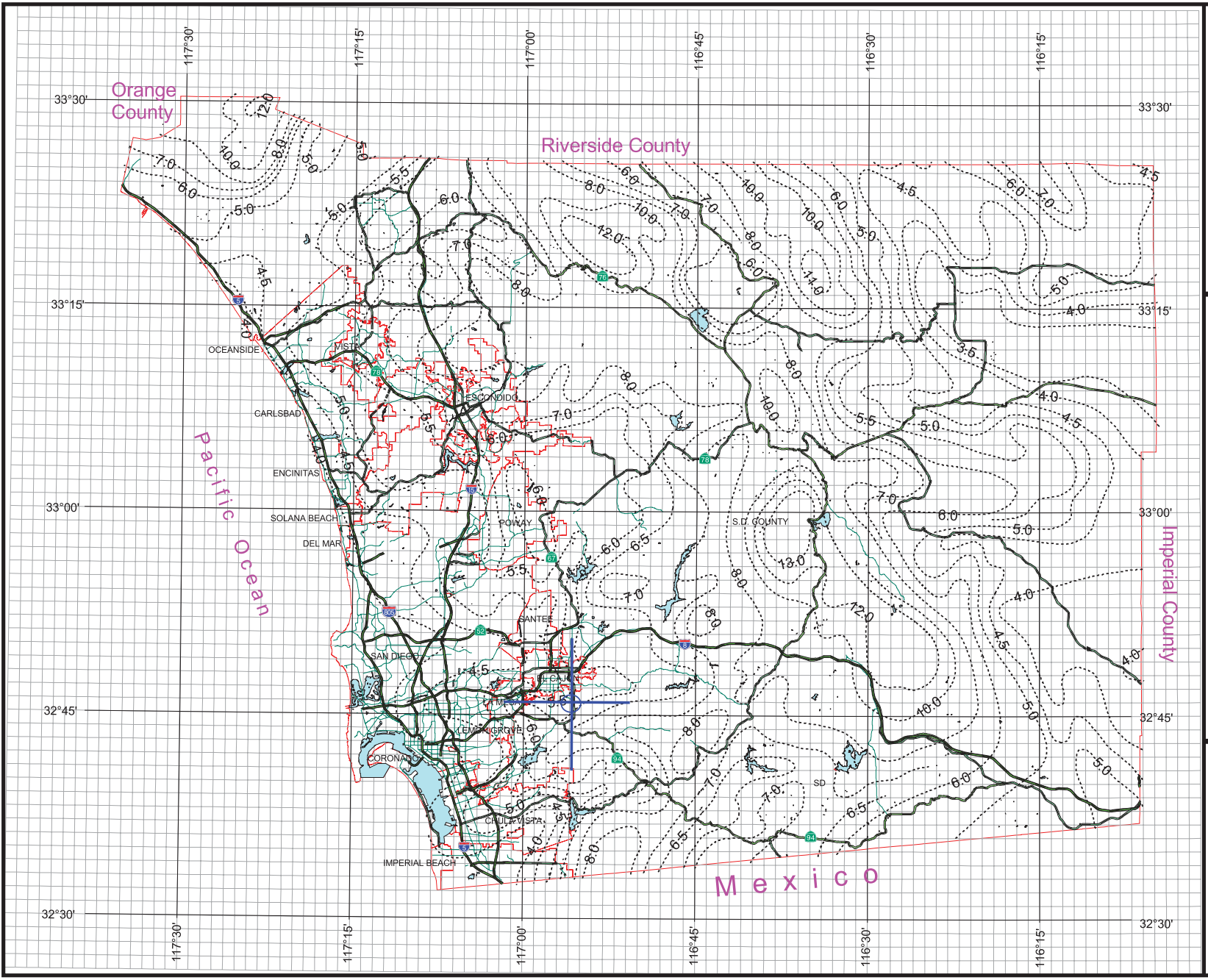
County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

P24 = 5.8



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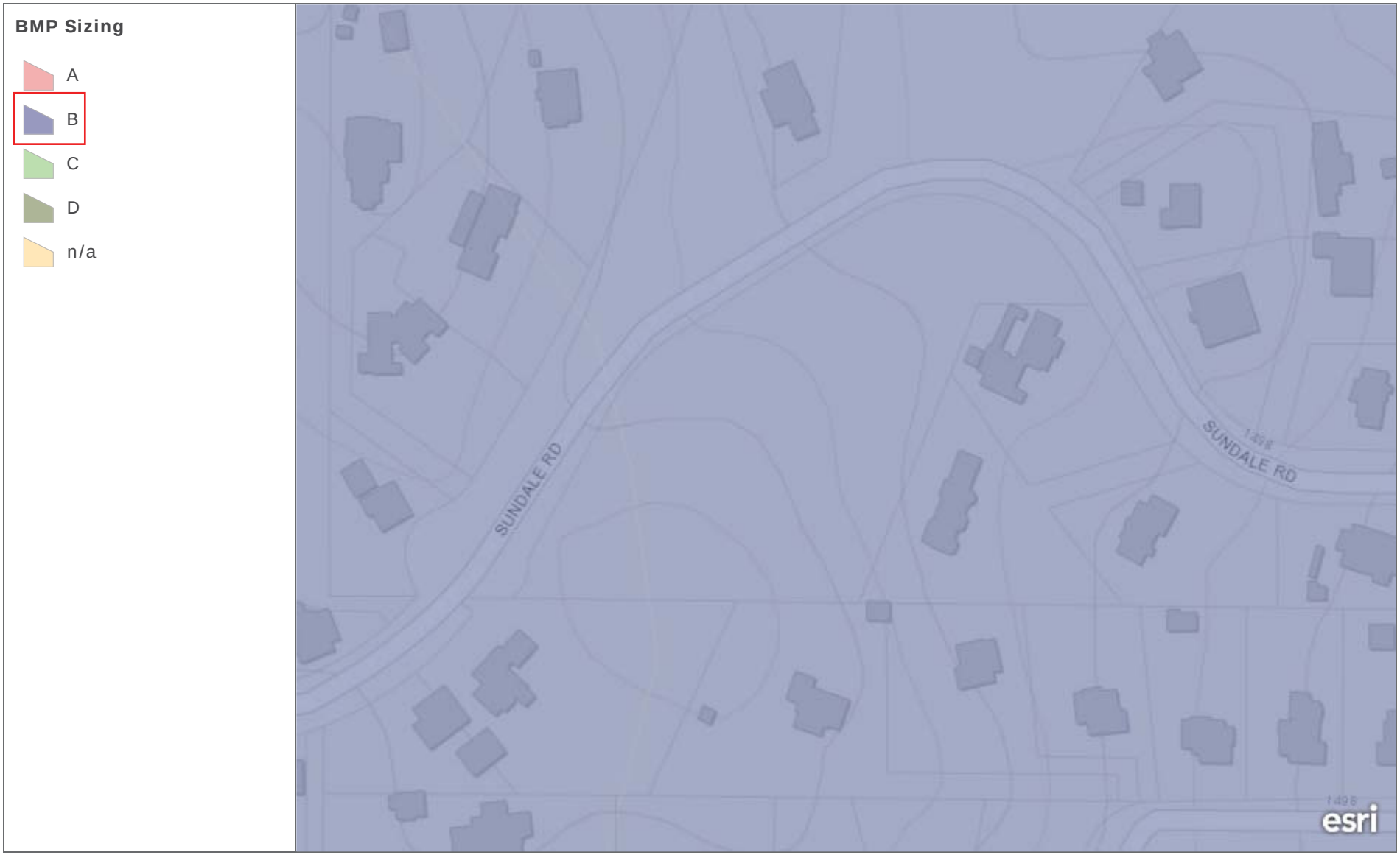
3 0 3 Miles

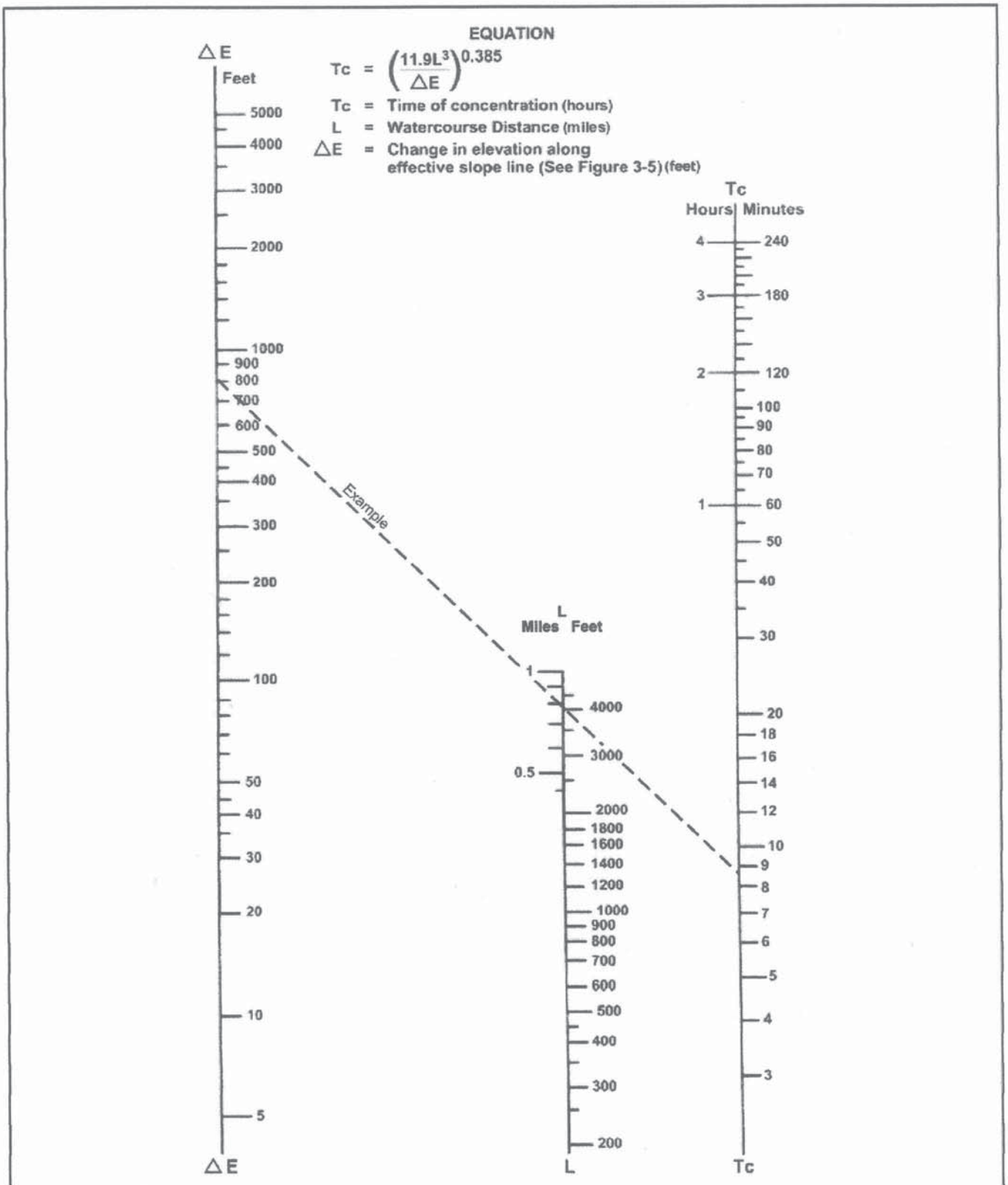
SOILS MAP

BMP Sizing Calculator



This map is intended to assist in BMP sizing for the unincorporated portion of the County of San Diego.

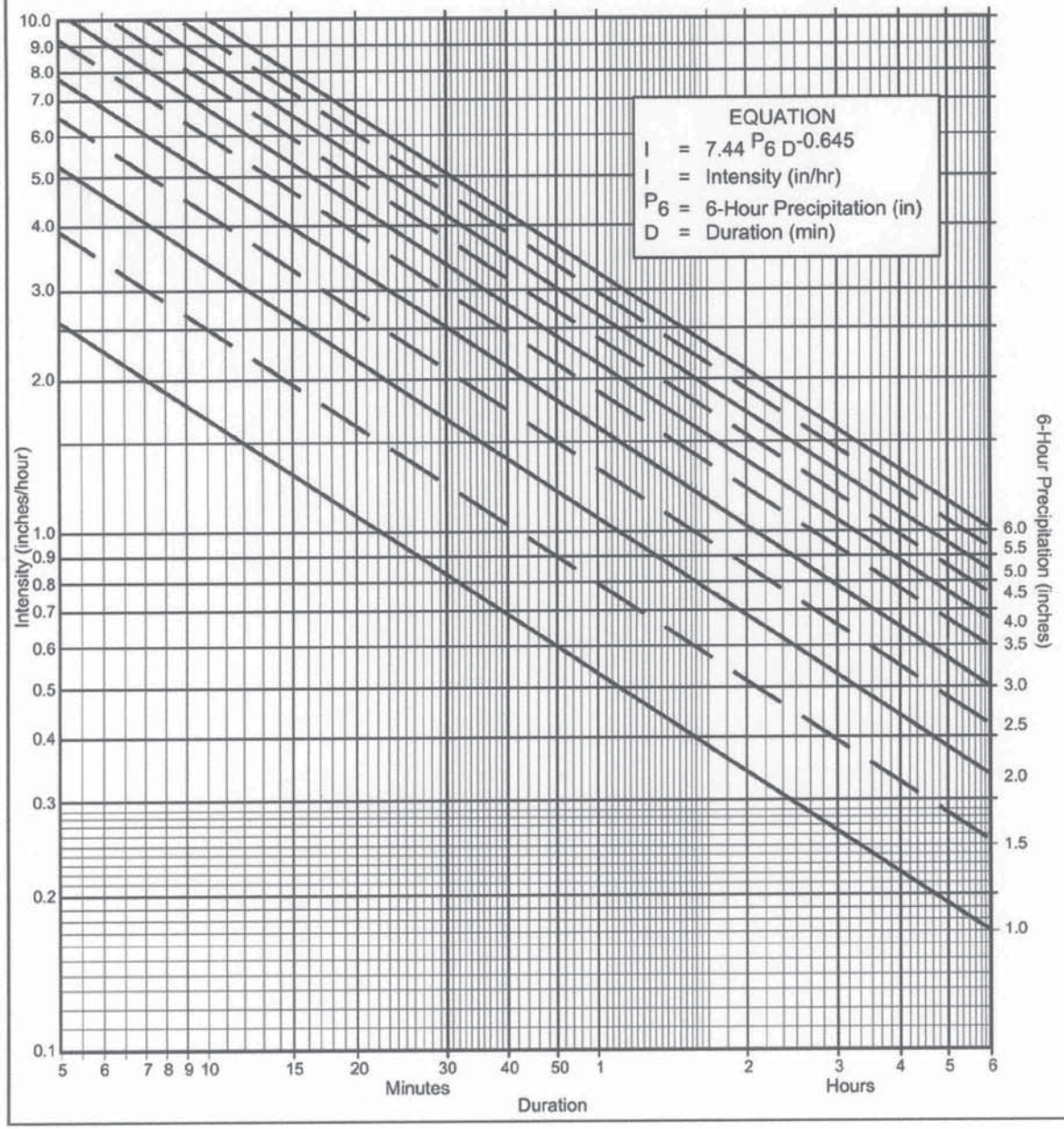
SanGIS, Bureau of Land Management, Esri, HERE, Garmin, INCREMENT P, USGS, EPA, USDA



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

FIGURE 3-4

Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency _____ year

(b) P_6 = _____ in., P_{24} = _____, $\frac{P_6}{P_{24}}$ = _____ %(2)

(c) Adjusted P_6(2) = _____ in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

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

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

Intensity-Duration Design Chart - Template

FIGURE 3-1

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

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

Table 3-2

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

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

*See Table 3-1 for more detailed description

Post Sub-Basin 1-1

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

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

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service