



K&S ENGINEERING, INC.

Planning Engineering Surveying

Drainage Study

For

Sanyo Logistics Center

PTS#

Prepared for:

Badiee Development Inc.
1261 Prospect Street Suite 9
La Jolla, CA 92037
Contact: Scott Merry (888) 815-8886

Prepared by:

K&S ENGINEERING, INC.
7801 Mission Center Court, Suite 100
San Diego, CA 92108
619.296.5565

October 4, 2021

K&S JN 20-002



A handwritten signature in black ink that reads 'Kamal S. Sweis'. The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

10/4/2021

Kamal S. Sweis RCE 48592

Date

TABLE OF CONTENTS

SECTION 1 – VICINITY MAP

SECTION 2 – INTRODUCTION

SECTION 3 – PURPOSE OF THIS STUDY

SECTION 4 - PROJECT INFORMATION

- 4.1 Existing Condition.....
- 4.2 Proposed Condition
- 4.3 Offsite Hydrology.....
- 4.4 Detention Basin Methodology
- 4.5 Summary.....

SECTION 5 - DESIGN CRITERIA AND METHODOLOGY

SECTION 6- HYDROLOGY DESIGN MODELS

SECTION 7 – HYDROLOGY CALCULATIONS

- 7.1 Rational Method Calculations

SECTION 8 – DETENTION BASIN CALCULATIONS

TABLE OF FIGURES

APPENDIX A

Tables and Charts

APPENDIX B

Drainage Exhibit

1 VICINITY MAP

2 INTRODUCTION

THE PROJECT SITE IS LOCATED AT THE NORTHWEST CORNER OF THE INTERSECTION OF AIRWAY ROAD AND SANYO AVENUE IN OTAY MESA.

THE PROJECT CONSISTS OF GRADING AND DRAINAGE IMPROVEMENTS FOR TWO INDUSTRIAL BUILDINGS WITH LOADING DOCKS, PARKING, LANDSCAPING, STORM DRAINS AND ONE DETENTION BASIN FOR PEAK FLOW DETENTION PURPOSES.

THE SUBJECT REPORT REFLECTS THE PROPOSED CONCEPTUAL GRADING AND DRAINAGE AS SHOWN ON PRELIMINARY GRADING PLAN DRAWING PTS# 668005

3 PURPOSE OF THIS STUDY

THE PURPOSE OF THIS STUDY IS TO DETERMINE THE PROPOSED PEAK FLOWS PRODUCED BY THE PROPOSED DEVELOPMENT PROJECT FOR THE 5, 10, 25 AND 50 YEAR STORM EVENTS AS SHOWN ON THE GRADING PLAN FOR THE SANYO LOGISTICS CENTER AS WELL AS TO DETERMINE THE PROPOSED PIPE AND INLET SIZES.

MOREOVER, THE PROPOSED PROJECT IS NOT IN THE CLOSE VICINITY OF NAVIGABLE WATERS OR WETLAND. THE PROPOSED CONSTRUCTION AND ANY ASSOCIATED RUNOFF WILL NOT RESULT INTO NAVIGABLE WATERS AND THEREFORE EXEMPT FROM THE REGIONAL WATER QUALITY CONTROL BOARD UNDER FEDERAL CLEAN WATER ACT (CWA) SECTION 401 OR 404.

4 PROJECT INFORMATION

4.1 EXISTING CONDITION

THE EXISTING SITE CONSISTS OF ONE UNDEVELOPED LOT. WEIGHTED RUNOFF COEFFICIENT FOR THE EXISTING ONSITE LOT IS 0.45. THE EXISTING SITE CURRENTLY DRAINS TO ONE LOCATION. Q(50) AT NODE 14 IS 17.3 CFS.

4.2 PROPOSED CONDITION

THE PROPOSED LAND USE WILL BE INDUSTRIAL. A WEIGHTED RUNOFF COEFFICIENT OF 0.84 WAS USED TO DETERMINE THE PROPOSED ONSITE RUNOFF FLOWS. THE PROPOSED UNDETAINED Q(50) AT NODE 67 IS 39.4 CFS.

4.3 OFFSITE HYDROLOGY

OFFSITE DRAINAGE ENTERS THE SITE FROM THE NORTH FROM TWO SOURCES. ONE SOURCE FROM THE OTAY INTERNATIONAL CENTER WITH 19.0 CFS OF DETAINED FLOWS. THE SECOND SOURCE IS FROM AIRWAY AND SANYO AVENUE WITH 11.34 CFS. THE TOTAL CONFLUENCED OFFSITE FLOW IS 30.06 CFS.

4.4 DETENTION BASIN METHODOLOGY

SEE SECTION 8 FOR DETENTION BASIN CALCULATIONS. ONE DETENTION BASIN WAS DESIGNED FOR THIS PROJECT USING THE JANUARY 2017 CITY OF SAN DIEGO DRAINAGE DESIGN MANUAL AND DRAINAGE REQUIREMENTS IN OTAY MESA NOTICE DATED AUGUST 7, 1997.

THE PURPOSE OF THIS BASIN IS TO TEMPORARILY STORE THE INCREASED RUNOFF AND RELEASE IT AT A RATE EQUAL OR LESS THAN THE EXISTING. HYDROGRAPHS WERE DETERMINED USING THE RATIONAL METHOD DESIGN STORM HYDROGRAPH METHOD. THE DETENTION BASIN SIZE WAS DETERMINED USING THE SINGLE HYDROGRAPH PROCEDURE AND BY ROUTING THE 5, 10, 25 AND 50-YEAR STORM EVENTS HYDROGRAPHS. THE OUTLET STRUCTURE HAS BEEN SIZED TO DRAIN THE BASIN WITHIN 96 HOURS.

4.5 SUMMARY

IN ORDER TO MITIGATE THE INCREASED RUNOFF FROM THE EXISTING TO THE PROPOSED CONDITION, A DETENTION BASIN IS PROPOSED IN COMPLIANCE WITH THE OTAY MESA COMMUNITY PLAN. PROPOSED FLOWS AFTER ROUTING ARE SMALLER THAN THE EXISTING ONES. ALSO, ULTIMATE RATIONAL METHOD FLOWS WERE USED TO SIZE THE PERMANENT DRAINAGE STRUCTURES PROPOSED BY THIS DEVELOPMENT; THEREFORE, THE PROJECT WOULD NOT CREATE OR CONTRIBUTE RUNOFF WATER WHICH WOULD EXCEED THE CAPACITY OF ANY EXISTING OR PLANNED STORM WATER DRAINAGE SYSTEM, AND WILL NOT EXPOSE PEOPLE OR STRUCTURE TO A SIGNIFICANT RISK OF LOSS, INJURY OR DEATH INVOLVING FLOODING AS A RESULT OF THE FAILURE OF A LEVEE OR DAM.

THE PROJECT WILL MAINTAIN THE EXISTING DRAINAGE PATTERN OF THE SITE AND WILL NOT RESULT IN ANY EROSION OR SILTATION. ALSO, THE PROJECT WILL NOT RESULT IN FLOODING ONSITE OR OFFSITE DUE TO THE INSTALLATION OF PEAK FLOW DETENTION BASINS. NO ADVERSE IMPACT WILL OCCUR TO THE DOWNSTREAM PROPERTIES AS RESULT OF THE PROPOSED DEVELOPMENT SINCE THE PROPOSED ARE BEING MITIGATED ON-SITE.

THE FOLLOWING TABLES SUMMARIZE THE EXISTING AND PROPOSED PEAK FLOW RATES FOR THE 5, 10, 25 & 50 -YEAR STORM EVENTS AT THE ULTIMATE POINT OF DISCHARGE AS WELL AS THE MAXIMUM PRE VELOCITY AND MITIGATED VELOCITY WITH RIP RAQP. PEAK RATIONAL METHOD FLOWS WERE USED TO SIZE ALL DRAINAGE STRUCTURES SUCH AS BROW DITCH, CURB INLETS AND STORM DRAIN PIPES AND DETENTION BASIN STRUCTURES.

ALSO, THE PROPOSED PROJECT IS REQUIRED TO OBTAIN APPROVAL FROM THE REGIONAL WATER QUALITY CONTROL BOARD UNDER FEDERAL CLEAN WATER ACT (CWA) SECTION 401 OR 404. A COMPLETE EXPLANATION MUST BE PROVIDED. PLEASE NOTE, IF THE PROPOSED PROJECT IS SUBJECT TO REGULATIONS AS SET FORTH IN CWA 401/404, APPROVAL FROM THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD MUST BE OBTAINED PRIOR TO PERMIT ISSUANCE.

PEAK FLOW TABLE (CFS) SUMMARY TABLE

STORM EVENT	EXISTING CONDITION (cfs)	PROPOSED CONDITION BEFORE DETENTION (cfs)	PROPOSED CONDITION AFTER DETENTION (cfs)	BASIN VOLUME REQUIRED (ft ³)	DETENTION TIME (hrs)		
5-Yr	11.3	27.4	2.6	44,991	13.0		
10-Yr	13.4	31.8	8.8	53,265	10.3		
25-Yr	14.9	34.8	14.6	59,102	9.0		
50-Yr	17.3	39.4	14.7	64,177	9.2		

VELOCITY COMPARISON TABLE (CFS) SUMMARY TABLE

PRE VELOCITY (FPS)	POST VELOCITY (FPS)
10.1	3.7

5. DESIGN CRITERIA AND METHODOLOGY

THIS REPORT WAS PREPARED USING THE CITY OF SAN DIEGO TRANSPORTATION AND STORMWATER DESIGN MANUAL, JANUARY 2017 EDITION.

THE PROPOSED STORM FLOW WERE DETERMINED USING THE RATIONAL METHOD HYDROLOGY PROGRAM CIVILCADD/CIVILDESIGN WHICH IS BASED ON THE CITY OF SAN DIEGO DRAINAGE DESIGN MANUAL DATED 1984. SEE SECTION 4 FOR HYDROLOGY DESIGN MODELS. THE PIPES WERE SIZED USING THE 50 YEAR STORM EVENT. ALSO, INLETS WERE SIZED USING ATTACHED PLATE 2.6-0658.

6. HYDROLOGY DESIGN MODELS

A. DESIGN METHODS

THE RATIONAL METHOD IS USED IN THIS HYDROLOGY STUDY; THE RATIONAL FORMULA IS AS FOLLOWS:

$Q = CIA$, WHERE : Q= PEAK DISCHARGE IN CUBIC FEET/SECOND *

C = RUNOFF COEFFICIENT (DIMENSIONLESS)

I = RAINFALL INTENSITY IN INCHES/HOUR

A = TRIBUTARY DRAINAGE AREA IN ACRES

*1 ACRE INCHES/HOUR = 1.008 CUBIC FEET/SEC

THE OVERLAND METHOD IS ALSO USED IN THIS HYDROLOGY STUDY;

THE URBAN AREAS OVERLAND FORMULA IS AS FOLLOWS:

$$T = [1.8(1.1 - C)(L)^{.5})] / [S(100)]^{.333}$$

L = LENGTH OF WATERSHED

C = COEFFICIENT OF RUNOFF

T = TIME IN MINUTES

S = DIFFERENCE IN ELEVATION DIVIDED BY DE LENGTH OF WATERSHED

B. DESIGN CRITERIA

- FREQUENCY 50 YEAR STORM.

- RAIN FALL INTENSITY PER CITY OF SAN DIEGO DRAINAGE DESIGN MANUAL, JANUARY 2017.

C. REFERENCES

- CITY OF SAN DIEGO DRAINAGE DESIGN MANUAL, JANUARY 2017.

- COUNTY OF SAN DIEGO HYDROLOGY MANUAL, JUNE 2003

- HAND BOOK OF HYDRAULICS BY BRATER & KING, SIXTH EDITION.

7 HYDROLOGY CALCULATIONS

7.1 RATIONAL METHOD CALCULATIONS

San Diego County Rational Hydrology Program

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

Rational method hydrology program based on
San Diego County Flood Control Division 1985 hydrology manual
Rational Hydrology Study Date: 07/17/20

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

Program License Serial Number 6303

Rational hydrology study storm event year is 5.0
English (in-lb) input data Units used
English (in) rainfall data used

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

+++++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Initial subarea flow distance = 295.000(Ft.)
Highest elevation = 559.410(Ft.)
Lowest elevation = 557.380(Ft.)
Elevation difference = 2.030(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 5.25 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.9500) * (295.000^{.5}) / (0.688^{(1/3)})] = 5.25$
Rainfall intensity (I) = 3.069(In/Hr) for a 5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff = 1.458(CFS)
Total initial stream area = 0.500(Ac.)

+++++
Process from Point/Station 1.000 to Point/Station 2.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Time of concentration = 5.25 min.

Rainfall intensity = 3.069(In/Hr) for a 5.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.950$
Subarea runoff = 1.458(CFS) for 0.500(Ac.)
Total runoff = 2.915(CFS) Total area = 1.00(Ac.)

+++++
Process from Point/Station 2.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 548.880(Ft.)
Downstream point/station elevation = 545.510(Ft.)
Pipe length = 99.00(Ft.) Manning's $N = 0.013$
No. of pipes = 1 Required pipe flow = 2.915(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 2.915(CFS)
Normal flow depth in pipe = 4.72(In.)
Flow top width inside pipe = 15.83(In.)
Critical Depth = 7.78(In.)
Pipe flow velocity = 7.89(Ft/s)
Travel time through pipe = 0.21 min.
Time of concentration (TC) = 5.46 min.

+++++
Process from Point/Station 2.000 to Point/Station 3.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 1.000(Ac.)
Runoff from this stream = 2.915(CFS)
Time of concentration = 5.46 min.
Rainfall intensity = 3.007(In/Hr)
Summary of stream data:

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

1	2.915	5.46	3.007
---	-------	------	-------

$Q_{max}(1) =$
 $1.000 * 1.000 * 2.915) + = 2.915$

Total of 1 streams to confluence:
Flow rates before confluence point:
2.915
Maximum flow rates at confluence using above data:
2.915
Area of streams before confluence:
1.000
Results of confluence:
Total flow rate = 2.915(CFS)
Time of concentration = 5.462 min.
Effective stream area after confluence = 1.000(Ac.)

+++++
Process from Point/Station 4.000 to Point/Station 5.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Initial subarea flow distance = 1408.000(Ft.)
Highest elevation = 595.900(Ft.)
Lowest elevation = 560.000(Ft.)
Elevation difference = 35.900(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 7.42 min.
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.9500) * (1408.000^{.5})] / (2.550^{(1/3)}) = 7.42$
Rainfall intensity (I) = 2.571(In/Hr) for a 5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff = 4.640(CFS)
Total initial stream area = 1.900(Ac.)

+++++
Process from Point/Station 5.000 to Point/Station 6.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 549.300(Ft.)
Downstream point/station elevation = 549.080(Ft.)
Pipe length = 22.25(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.640(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 4.640(CFS)
Normal flow depth in pipe = 8.40(In.)
Flow top width inside pipe = 17.96(In.)
Critical Depth = 9.93(In.)
Pipe flow velocity = 5.74(Ft/s)
Travel time through pipe = 0.06 min.
Time of concentration (TC) = 7.48 min.

+++++
Process from Point/Station 6.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 547.820(Ft.)
Downstream point/station elevation = 546.510(Ft.)
Pipe length = 99.56(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.640(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 4.640(CFS)
Normal flow depth in pipe = 6.36(In.)
Flow top width inside pipe = 24.53(In.)
Critical Depth = 8.51(In.)
Pipe flow velocity = 6.10(Ft/s)
Travel time through pipe = 0.27 min.
Time of concentration (TC) = 7.75 min.

+++++
Process from Point/Station 6.000 to Point/Station 3.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 1.900(Ac.)
Runoff from this stream = 4.640(CFS)
Time of concentration = 7.75 min.
Rainfall intensity = 2.514(In/Hr)

Summary of stream data:

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

1	2.915	5.46	3.007
2	4.640	7.75	2.514

Qmax(1) =

$$\frac{1.000 * 1.000 * 2.915 + 1.000 * 0.705 * 4.640}{2} = 6.184$$

Qmax(2) =

$$\frac{0.836 * 1.000 * 2.915 + 1.000 * 1.000 * 4.640}{2} = 7.078$$

Total of 2 streams to confluence:

Flow rates before confluence point:

2.915 4.640

Maximum flow rates at confluence using above data:

6.184 7.078

Area of streams before confluence:

1.000 1.900

Results of confluence:

Total flow rate = 7.078(CFS)

Time of concentration = 7.752 min.

Effective stream area after confluence = 2.900(Ac.)

 Process from Point/Station 3.000 to Point/Station 7.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.510(Ft.)
 Downstream point/station elevation = 542.920(Ft.)
 Pipe length = 431.22(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 7.078(CFS)
 Given pipe size = 42.00(In.)
 Calculated individual pipe flow = 7.078(CFS)
 Normal flow depth in pipe = 8.55(In.)
 Flow top width inside pipe = 33.82(In.)
 Critical Depth = 9.61(In.)
 Pipe flow velocity = 5.04(Ft/s)
 Travel time through pipe = 1.43 min.
 Time of concentration (TC) = 9.18 min.

 Process from Point/Station 3.000 to Point/Station 7.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1

Stream flow area = 2.900(Ac.)
 Runoff from this stream = 7.078(CFS)
 Time of concentration = 9.18 min.
 Rainfall intensity = 2.311(In/Hr)
 Summary of stream data:

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

1	7.078	9.18	2.311
---	-------	------	-------

$$Q_{\max(1)} = 1.000 * 1.000 * 7.078) + = 7.078$$

Total of 1 streams to confluence:
Flow rates before confluence point:
7.078
Maximum flow rates at confluence using above data:
7.078
Area of streams before confluence:
2.900
Results of confluence:
Total flow rate = 7.078(CFS)
Time of concentration = 9.179 min.
Effective stream area after confluence = 2.900(Ac.)

+++++
Process from Point/Station 9.000 to Point/Station 0.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.450 given for subarea
Rainfall intensity (I) = 2.115(In/Hr) for a 5.0 year storm
User specified values are as follows:
TC = 11.00 min. Rain intensity = 2.11(In/Hr)
Total area = 19.100(Ac.) Total runoff = 19.000(CFS)

+++++
Process from Point/Station 9.000 to Point/Station 10.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.410(Ft.)
Downstream point/station elevation = 542.990(Ft.)
Pipe length = 76.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.000(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 19.000(CFS)
Normal flow depth in pipe = 10.43(In.)
Flow top width inside pipe = 28.57(In.)
Critical Depth = 17.74(In.)
Pipe flow velocity = 12.53(Ft/s)
Travel time through pipe = 0.10 min.
Time of concentration (TC) = 11.10 min.

+++++
Process from Point/Station 10.000 to Point/Station 7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 542.990(Ft.)
Downstream point/station elevation = 542.770(Ft.)
Pipe length = 46.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.000(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 19.000(CFS)
Normal flow depth in pipe = 17.95(In.)
Flow top width inside pipe = 29.41(In.)
Critical Depth = 17.74(In.)
Pipe flow velocity = 6.19(Ft/s)
Travel time through pipe = 0.12 min.
Time of concentration (TC) = 11.22 min.

+++++
Process from Point/Station 10.000 to Point/Station 7.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 19.100(Ac.)
Runoff from this stream = 19.000(CFS)
Time of concentration = 11.22 min.
Rainfall intensity = 2.094(In/Hr)
Summary of stream data:

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

1	7.078	9.18	2.311
2	19.000	11.22	2.094

Qmax(1) =

$$1.000 * 1.000 * 7.078 + 1.000 * 0.818 * 19.000 = 22.615$$
 Qmax(2) =

$$0.906 * 1.000 * 7.078 + 1.000 * 1.000 * 19.000 = 25.411$$

Total of 2 streams to confluence:
Flow rates before confluence point:
7.078 19.000
Maximum flow rates at confluence using above data:
22.615 25.411
Area of streams before confluence:
2.900 19.100
Results of confluence:
Total flow rate = 25.411(CFS)
Time of concentration = 11.225 min.
Effective stream area after confluence = 22.000(Ac.)

+++++
Process from Point/Station 11.000 to Point/Station 12.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.950 given for subarea
Initial subarea flow distance = 408.000(Ft.)
Highest elevation = 559.150(Ft.)
Lowest elevation = 550.000(Ft.)
Elevation difference = 9.150(Ft.)
Time of concentration calculated by the urban areas overland flow method (App X-C) = 4.17 min.

$$TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$$

$$TC = [1.8 * (1.1 - 0.9500) * (408.000^{.5})] / (2.243^{(1/3)}) = 4.17$$
 Setting time of concentration to 5 minutes
Rainfall intensity (I) = 3.149(In/Hr) for a 5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff = 1.257(CFS)
Total initial stream area = 0.420(Ac.)

+++++
Process from Point/Station 11.000 to Point/Station 12.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.950 given for subarea
Time of concentration = 5.00 min.
Rainfall intensity = 3.149(In/Hr) for a 5.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.950$
Subarea runoff = 0.449(CFS) for 0.150(Ac.)
Total runoff = 1.705(CFS) Total area = 0.57(Ac.)

+++++
Process from Point/Station 12.000 to Point/Station 7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.140(Ft.)
Downstream point/station elevation = 542.920(Ft.)
Pipe length = 21.75(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.705(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 1.705(CFS)
Normal flow depth in pipe = 2.76(In.)
Flow top width inside pipe = 12.97(In.)
Critical Depth = 5.89(In.)
Pipe flow velocity = 9.94(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 5.04 min.

+++++
Process from Point/Station 12.000 to Point/Station 7.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area = 0.570(Ac.)
Runoff from this stream = 1.705(CFS)
Time of concentration = 5.04 min.
Rainfall intensity = 3.137(In/Hr)
Summary of stream data:

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

1	7.078	9.18	2.311
2	19.000	11.22	2.094
3	1.705	5.04	3.137

$Q_{max(1)} =$
 $1.000 * 1.000 * 7.078) +$
 $1.000 * 0.818 * 19.000) +$
 $0.737 * 1.000 * 1.705) + = 23.871$

$Q_{max(2)} =$
 $0.906 * 1.000 * 7.078) +$
 $1.000 * 1.000 * 19.000) +$
 $0.667 * 1.000 * 1.705) + = 26.550$

$Q_{max(3)} =$
 $1.000 * 0.549 * 7.078) +$
 $1.000 * 0.449 * 19.000) +$
 $1.000 * 1.000 * 1.705) + = 14.114$

Total of 3 streams to confluence:
Flow rates before confluence point:
7.078 19.000 1.705
Maximum flow rates at confluence using above data:
23.871 26.550 14.114

Area of streams before confluence:
2.900 19.100 0.570

Results of confluence:
Total flow rate = 26.550(CFS)
Time of concentration = 11.225 min.
Effective stream area after confluence = 22.570(Ac.)

Process from Point/Station 7.000 to Point/Station 13.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 542.420(Ft.)
Downstream point/station elevation = 542.140(Ft.)
Pipe length = 59.60(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 26.550(CFS)
Given pipe size = 48.00(In.)
Calculated individual pipe flow = 26.550(CFS)
Normal flow depth in pipe = 17.03(In.)
Flow top width inside pipe = 45.93(In.)
Critical Depth = 18.26(In.)
Pipe flow velocity = 6.65(Ft/s)
Travel time through pipe = 0.15 min.
Time of concentration (TC) = 11.37 min.

Process from Point/Station 13.000 to Point/Station 14.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 542.140(Ft.)
Downstream point elevation = 525.920(Ft.)
Channel length thru subarea = 990.000(Ft.)
Channel base width = 0.000(Ft.)
Slope or 'Z' of left channel bank = 80.000
Slope or 'Z' of right channel bank = 80.000
Manning's 'N' = 0.034
Maximum depth of channel = 0.500(Ft.)
Flow(q) thru subarea = 26.550(CFS)
Depth of flow = 0.412(Ft.), Average velocity = 1.952(Ft/s)
Channel flow top width = 65.970(Ft.)
Flow Velocity = 1.95(Ft/s)
Travel time = 8.45 min.
Time of concentration = 19.83 min.
Critical depth = 0.369(Ft.)

Process from Point/Station 13.000 to Point/Station 14.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 22.570(Ac.)
Runoff from this stream = 26.550(CFS)
Time of concentration = 19.83 min.
Rainfall intensity = 1.575(In/Hr)
Summary of stream data:

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

1 26.550 19.83 1.575
Qmax(1) =
1.000 * 1.000 * 26.550) + = 26.550

Total of 1 streams to confluence:
Flow rates before confluence point:
26.550
Maximum flow rates at confluence using above data:
26.550
Area of streams before confluence:
22.570
Results of confluence:
Total flow rate = 26.550(CFS)
Time of concentration = 19.826 min.
Effective stream area after confluence = 22.570(Ac.)

+++++
Process from Point/Station 15.000 to Point/Station 16.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.450 given for subarea
Initial subarea flow distance = 90.000(Ft.)
Highest elevation = 559.000(Ft.)
Lowest elevation = 551.000(Ft.)
Elevation difference = 8.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 5.36 min.
TC = $[1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})]$
TC = $[1.8 * (1.1 - 0.4500) * (90.000^{.5})] / (8.889^{(1/3)}) = 5.36$
Rainfall intensity (I) = 3.037(In/Hr) for a 5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff = 0.547(CFS)
Total initial stream area = 0.400(Ac.)

+++++
Process from Point/Station 16.000 to Point/Station 14.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 551.000(Ft.)
Downstream point elevation = 525.920(Ft.)
Channel length thru subarea = 1177.000(Ft.)
Channel base width = 0.000(Ft.)
Slope or 'Z' of left channel bank = 80.000
Slope or 'Z' of right channel bank = 80.000
Estimated mean flow rate at midpoint of channel = 10.113(CFS)
Manning's 'N' = 0.034
Maximum depth of channel = 0.500(Ft.)
Flow(q) thru subarea = 10.113(CFS)
Depth of flow = 0.273(Ft.), Average velocity = 1.692(Ft/s)
Channel flow top width = 43.727(Ft.)
Flow Velocity = 1.69(Ft/s)
Travel time = 11.59 min.
Time of concentration = 16.95 min.
Critical depth = 0.250(Ft.)
Adding area flow to channel
User specified 'C' value of 0.450 given for subarea
Rainfall intensity = 1.707(In/Hr) for a 5.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.450
Subarea runoff = 10.757(CFS) for 14.000(Ac.)
Total runoff = 11.303(CFS) Total area = 14.40(Ac.)

+++++
Process from Point/Station 16.000 to Point/Station 14.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2

Stream flow area = 14.400(Ac.)
Runoff from this stream = 11.303(CFS)
Time of concentration = 16.95 min.
Rainfall intensity = 1.707(In/Hr)
Summary of stream data:

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

1	26.550	19.83	1.575
2	11.303	16.95	1.707

Qmax(1) =

$$1.000 * 1.000 * 26.550) + 0.922 * 1.000 * 11.303) + = 36.974$$

Qmax(2) =

$$1.000 * 0.855 * 26.550) + 1.000 * 1.000 * 11.303) + = 33.999$$

Total of 2 streams to confluence:
Flow rates before confluence point:
26.550 11.303
Maximum flow rates at confluence using above data:
36.974 33.999
Area of streams before confluence:
22.570 14.400
Results of confluence:
Total flow rate = 36.974(CFS)
Time of concentration = 19.826 min.
Effective stream area after confluence = 36.970(Ac.)
End of computations, total study area = 36.970 (Ac.)

San Diego County Rational Hydrology Program

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

Rational method hydrology program based on
San Diego County Flood Control Division 1985 hydrology manual
Rational Hydrology Study Date: 07/17/20

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

Program License Serial Number 6303

Rational hydrology study storm event year is 10.0
English (in-lb) input data Units used
English (in) rainfall data used

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

+++++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Initial subarea flow distance = 295.000(Ft.)
Highest elevation = 559.410(Ft.)
Lowest elevation = 557.380(Ft.)
Elevation difference = 2.030(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 5.25 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.9500) * (295.000^{.5})] / (0.688^{(1/3)}) = 5.25$
Rainfall intensity (I) = 3.504(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff = 1.664(CFS)
Total initial stream area = 0.500(Ac.)

+++++
Process from Point/Station 1.000 to Point/Station 2.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]

Time of concentration = 5.25 min.
Rainfall intensity = 3.504(In/Hr) for a 10.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.950$
Subarea runoff = 1.664(CFS) for 0.500(Ac.)
Total runoff = 3.329(CFS) Total area = 1.00(Ac.)

Process from Point/Station 2.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 548.880(Ft.)
Downstream point/station elevation = 545.510(Ft.)
Pipe length = 99.00(Ft.) Manning's $N = 0.013$
No. of pipes = 1 Required pipe flow = 3.329(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 3.329(CFS)
Normal flow depth in pipe = 5.05(In.)
Flow top width inside pipe = 16.17(In.)
Critical Depth = 8.34(In.)
Pipe flow velocity = 8.20(Ft/s)
Travel time through pipe = 0.20 min.
Time of concentration (TC) = 5.45 min.

Process from Point/Station 2.000 to Point/Station 3.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 1.000(Ac.)
Runoff from this stream = 3.329(CFS)
Time of concentration = 5.45 min.
Rainfall intensity = 3.438(In/Hr)
Summary of stream data:

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

1	3.329	5.45	3.438
---	-------	------	-------

$Q_{\max}(1) = 1.000 * 1.000 * 3.329 + = 3.329$

Total of 1 streams to confluence:
Flow rates before confluence point:
3.329
Maximum flow rates at confluence using above data:
3.329
Area of streams before confluence:
1.000
Results of confluence:
Total flow rate = 3.329(CFS)
Time of concentration = 5.454 min.
Effective stream area after confluence = 1.000(Ac.)

Process from Point/Station 4.000 to Point/Station 5.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000

Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Initial subarea flow distance = 1408.000(Ft.)
Highest elevation = 595.900(Ft.)
Lowest elevation = 560.000(Ft.)
Elevation difference = 35.900(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 7.42 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5} / (% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.9500) * (1408.000^{.5}) / (2.550^{(1/3)})] = 7.42$
Rainfall intensity (I) = 2.956(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff = 5.336(CFS)
Total initial stream area = 1.900(Ac.)

+++++
Process from Point/Station 5.000 to Point/Station 6.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 549.300(Ft.)
Downstream point/station elevation = 549.080(Ft.)
Pipe length = 22.25(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.336(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 5.336(CFS)
Normal flow depth in pipe = 9.12(In.)
Flow top width inside pipe = 18.00(In.)
Critical Depth = 10.67(In.)
Pipe flow velocity = 5.94(Ft/s)
Travel time through pipe = 0.06 min.
Time of concentration (TC) = 7.48 min.

+++++
Process from Point/Station 6.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 547.820(Ft.)
Downstream point/station elevation = 546.510(Ft.)
Pipe length = 99.56(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.336(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 5.336(CFS)
Normal flow depth in pipe = 6.82(In.)
Flow top width inside pipe = 25.15(In.)
Critical Depth = 9.14(In.)
Pipe flow velocity = 6.36(Ft/s)
Travel time through pipe = 0.26 min.
Time of concentration (TC) = 7.74 min.

+++++
Process from Point/Station 6.000 to Point/Station 3.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 1.900(Ac.)
Runoff from this stream = 5.336(CFS)
Time of concentration = 7.74 min.

Rainfall intensity = 2.896(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	3.329	5.45	3.438
2	5.336	7.74	2.896
Qmax(1) =			
	1.000 *	1.000 *	3.329) +
	1.000 *	0.705 *	5.336) + = 7.089
Qmax(2) =			
	0.842 *	1.000 *	3.329) +
	1.000 *	1.000 *	5.336) + = 8.140

Total of 2 streams to confluence:
Flow rates before confluence point:
3.329 5.336
Maximum flow rates at confluence using above data:
7.089 8.140
Area of streams before confluence:
1.000 1.900
Results of confluence:
Total flow rate = 8.140(CFS)
Time of concentration = 7.739 min.
Effective stream area after confluence = 2.900(Ac.)

+++++
Process from Point/Station 3.000 to Point/Station 7.000
*** PIPEFLOW TRAVEL TIME (User specified size) ***

Upstream point/station elevation = 545.510(Ft.)
Downstream point/station elevation = 542.920(Ft.)
Pipe length = 431.22(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.140(CFS)
Given pipe size = 42.00(In.)
Calculated individual pipe flow = 8.140(CFS)
Normal flow depth in pipe = 9.16(In.)
Flow top width inside pipe = 34.69(In.)
Critical Depth = 10.30(In.)
Pipe flow velocity = 5.25(Ft/s)
Travel time through pipe = 1.37 min.
Time of concentration (TC) = 9.11 min.

+++++
Process from Point/Station 3.000 to Point/Station 7.000
*** CONFLUENCE OF MINOR STREAMS ***

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 2.900(Ac.)
Runoff from this stream = 8.140(CFS)
Time of concentration = 9.11 min.
Rainfall intensity = 2.680(In/Hr)
Summary of stream data:

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

1 8.140 9.11 2.680
Qmax(1) =
 1.000 * 1.000 * 8.140) + = 8.140

Total of 1 streams to confluence:
Flow rates before confluence point:
8.140
Maximum flow rates at confluence using above data:
8.140
Area of streams before confluence:
2.900
Results of confluence:
Total flow rate = 8.140(CFS)
Time of concentration = 9.109 min.
Effective stream area after confluence = 2.900(Ac.)

+++++
Process from Point/Station 9.000 to Point/Station 0.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.450 given for subarea
Rainfall intensity (I) = 2.453(In/Hr) for a 10.0 year storm
User specified values are as follows:
TC = 11.00 min. Rain intensity = 2.45(In/Hr)
Total area = 19.100(Ac.) Total runoff = 19.000(CFS)

+++++
Process from Point/Station 9.000 to Point/Station 10.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.410(Ft.)
Downstream point/station elevation = 542.990(Ft.)
Pipe length = 76.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.000(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 19.000(CFS)
Normal flow depth in pipe = 10.43(In.)
Flow top width inside pipe = 28.57(In.)
Critical Depth = 17.74(In.)
Pipe flow velocity = 12.53(Ft/s)
Travel time through pipe = 0.10 min.
Time of concentration (TC) = 11.10 min.

+++++
Process from Point/Station 10.000 to Point/Station 7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 542.990(Ft.)
Downstream point/station elevation = 542.770(Ft.)
Pipe length = 46.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.000(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 19.000(CFS)
Normal flow depth in pipe = 17.95(In.)
Flow top width inside pipe = 29.41(In.)
Critical Depth = 17.74(In.)
Pipe flow velocity = 6.19(Ft/s)
Travel time through pipe = 0.12 min.
Time of concentration (TC) = 11.22 min.

+++++
Process from Point/Station 10.000 to Point/Station 7.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 19.100(Ac.)
Runoff from this stream = 19.000(CFS)
Time of concentration = 11.22 min.
Rainfall intensity = 2.430(In/Hr)
Summary of stream data:

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

1	8.140	9.11	2.680
2	19.000	11.22	2.430

Qmax(1) =

$$\frac{1.000 * 1.000 * 8.140}{1.000 * 0.811} + = 23.558$$

Qmax(2) =

$$\frac{0.907 * 1.000 * 8.140}{1.000 * 1.000} + = 26.380$$

Total of 2 streams to confluence:
Flow rates before confluence point:
8.140 19.000
Maximum flow rates at confluence using above data:
23.558 26.380
Area of streams before confluence:
2.900 19.100
Results of confluence:
Total flow rate = 26.380(CFS)
Time of concentration = 11.225 min.
Effective stream area after confluence = 22.000(Ac.)

+++++
Process from Point/Station 11.000 to Point/Station 12.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.950 given for subarea
Initial subarea flow distance = 408.000(Ft.)
Highest elevation = 559.150(Ft.)
Lowest elevation = 550.000(Ft.)
Elevation difference = 9.150(Ft.)
Time of concentration calculated by the urban areas overland flow method (App X-C) = 4.17 min.

$$TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$$

$$TC = [1.8 * (1.1 - 0.9500) * (408.000^{.5})] / (2.243^{(1/3)}) = 4.17$$

Setting time of concentration to 5 minutes
Rainfall intensity (I) = 3.592(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff = 1.433(CFS)
Total initial stream area = 0.420(Ac.)

+++++
Process from Point/Station 11.000 to Point/Station 12.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.950 given for subarea
Time of concentration = 5.00 min.
Rainfall intensity = 3.592(In/Hr) for a 10.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.950$
Subarea runoff = 0.512(CFS) for 0.150(Ac.)
Total runoff = 1.945(CFS) Total area = 0.57(Ac.)

+++++
Process from Point/Station 12.000 to Point/Station 7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.140(Ft.)
Downstream point/station elevation = 542.920(Ft.)
Pipe length = 21.75(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.945(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 1.945(CFS)
Normal flow depth in pipe = 2.94(In.)
Flow top width inside pipe = 13.31(In.)
Critical Depth = 6.30(In.)
Pipe flow velocity = 10.34(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 5.04 min.

+++++
Process from Point/Station 12.000 to Point/Station 7.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area = 0.570(Ac.)
Runoff from this stream = 1.945(CFS)
Time of concentration = 5.04 min.
Rainfall intensity = 3.580(In/Hr)
Summary of stream data:

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

1	8.140	9.11	2.680
2	19.000	11.22	2.430
3	1.945	5.04	3.580

Qmax(1) =
 $1.000 * 1.000 * 8.140) +$
 $1.000 * 0.811 * 19.000) +$
 $0.749 * 1.000 * 1.945) + = 25.014$

Qmax(2) =
 $0.907 * 1.000 * 8.140) +$
 $1.000 * 1.000 * 19.000) +$
 $0.679 * 1.000 * 1.945) + = 27.700$

Qmax(3) =
 $1.000 * 0.553 * 8.140) +$
 $1.000 * 0.449 * 19.000) +$
 $1.000 * 1.000 * 1.945) + = 14.967$

Total of 3 streams to confluence:
Flow rates before confluence point:
8.140 19.000 1.945
Maximum flow rates at confluence using above data:

25.014 27.700 14.967
Area of streams before confluence:
2.900 19.100 0.570
Results of confluence:
Total flow rate = 27.700(CFS)
Time of concentration = 11.225 min.
Effective stream area after confluence = 22.570(Ac.)

+++++
Process from Point/Station 7.000 to Point/Station 13.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 542.420(Ft.)
Downstream point/station elevation = 542.140(Ft.)
Pipe length = 59.60(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 27.700(CFS)
Given pipe size = 48.00(In.)
Calculated individual pipe flow = 27.700(CFS)
Normal flow depth in pipe = 17.41(In.)
Flow top width inside pipe = 46.16(In.)
Critical Depth = 18.68(In.)
Pipe flow velocity = 6.73(Ft/s)
Travel time through pipe = 0.15 min.
Time of concentration (TC) = 11.37 min.

+++++
Process from Point/Station 13.000 to Point/Station 14.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 542.140(Ft.)
Downstream point elevation = 525.920(Ft.)
Channel length thru subarea = 990.000(Ft.)
Channel base width = 0.000(Ft.)
Slope or 'Z' of left channel bank = 80.000
Slope or 'Z' of right channel bank = 80.000
Manning's 'N' = 0.034
Maximum depth of channel = 0.500(Ft.)
Flow(q) thru subarea = 27.700(CFS)
Depth of flow = 0.419(Ft.), Average velocity = 1.973(Ft/s)
Channel flow top width = 67.028(Ft.)
Flow Velocity = 1.97(Ft/s)
Travel time = 8.36 min.
Time of concentration = 19.74 min.
Critical depth = 0.375(Ft.)

+++++
Process from Point/Station 13.000 to Point/Station 14.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 22.570(Ac.)
Runoff from this stream = 27.700(CFS)
Time of concentration = 19.74 min.
Rainfall intensity = 1.853(In/Hr)
Summary of stream data:

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

1 27.700 19.74 1.853
Qmax(1) =
1.000 * 1.000 * 27.700) + = 27.700

Total of 1 streams to confluence:
Flow rates before confluence point:
27.700
Maximum flow rates at confluence using above data:
27.700
Area of streams before confluence:
22.570
Results of confluence:
Total flow rate = 27.700(CFS)
Time of concentration = 19.735 min.
Effective stream area after confluence = 22.570(Ac.)

+++++
Process from Point/Station 15.000 to Point/Station 16.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.450 given for subarea
Initial subarea flow distance = 90.000(Ft.)
Highest elevation = 559.000(Ft.)
Lowest elevation = 551.000(Ft.)
Elevation difference = 8.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 5.36 min.
TC = $[1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})$
TC = $[1.8 * (1.1 - 0.4500) * (90.000^{.5})] / (8.889^{(1/3)}) = 5.36$
Rainfall intensity (I) = 3.469(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff = 0.624(CFS)
Total initial stream area = 0.400(Ac.)

+++++
Process from Point/Station 16.000 to Point/Station 14.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 551.000(Ft.)
Downstream point elevation = 525.920(Ft.)
Channel length thru subarea = 1177.000(Ft.)
Channel base width = 0.000(Ft.)
Slope or 'Z' of left channel bank = 80.000
Slope or 'Z' of right channel bank = 80.000
Estimated mean flow rate at midpoint of channel = 11.551(CFS)
Manning's 'N' = 0.034
Maximum depth of channel = 0.500(Ft.)
Flow(q) thru subarea = 11.551(CFS)
Depth of flow = 0.287(Ft.), Average velocity = 1.750(Ft/s)
Channel flow top width = 45.963(Ft.)
Flow Velocity = 1.75(Ft/s)
Travel time = 11.21 min.
Time of concentration = 16.57 min.
Critical depth = 0.264(Ft.)
Adding area flow to channel
User specified 'C' value of 0.450 given for subarea
Rainfall intensity = 2.021(In/Hr) for a 10.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.450
Subarea runoff = 12.731(CFS) for 14.000(Ac.)

Total runoff = 13.355(CFS) Total area = 14.40(Ac.)

+++++
Process from Point/Station 16.000 to Point/Station 14.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2

Stream flow area = 14.400(Ac.)
Runoff from this stream = 13.355(CFS)
Time of concentration = 16.57 min.
Rainfall intensity = 2.021(In/Hr)
Summary of stream data:

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

1	27.700	19.74	1.853
---	--------	-------	-------

2	13.355	16.57	2.021
---	--------	-------	-------

Qmax(1) =

$$1.000 * 1.000 * 27.700) + 0.917 * 1.000 * 13.355) + = 39.944$$

Qmax(2) =

$$1.000 * 0.840 * 27.700) + 1.000 * 1.000 * 13.355) + = 36.613$$

Total of 2 streams to confluence:

Flow rates before confluence point:

27.700 13.355

Maximum flow rates at confluence using above data:

39.944 36.613

Area of streams before confluence:

22.570 14.400

Results of confluence:

Total flow rate = 39.944(CFS)

Time of concentration = 19.735 min.

Effective stream area after confluence = 36.970(Ac.)

End of computations, total study area = 36.970 (Ac.)

San Diego County Rational Hydrology Program

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

Rational method hydrology program based on
San Diego County Flood Control Division 1985 hydrology manual
Rational Hydrology Study Date: 07/17/20

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

Program License Serial Number 6303

Rational hydrology study storm event year is 25.0
English (in-lb) input data Units used
English (in) rainfall data used

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

+++++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Initial subarea flow distance = 295.000(Ft.)
Highest elevation = 559.410(Ft.)
Lowest elevation = 557.380(Ft.)
Elevation difference = 2.030(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 5.25 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.9500) * (295.000^{.5})] / (0.688^{(1/3)}) = 5.25$
Rainfall intensity (I) = 3.756(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff = 1.784(CFS)
Total initial stream area = 0.500(Ac.)

+++++
Process from Point/Station 1.000 to Point/Station 2.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Time of concentration = 5.25 min.

Rainfall intensity = 3.756(In/Hr) for a 25.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.950$
Subarea runoff = 1.784(CFS) for 0.500(Ac.)
Total runoff = 3.568(CFS) Total area = 1.00(Ac.)

+++++
Process from Point/Station 2.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 548.880(Ft.)
Downstream point/station elevation = 545.510(Ft.)
Pipe length = 99.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.568(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 3.568(CFS)
Normal flow depth in pipe = 5.23(In.)
Flow top width inside pipe = 16.35(In.)
Critical Depth = 8.65(In.)
Pipe flow velocity = 8.37(Ft/s)
Travel time through pipe = 0.20 min.
Time of concentration (TC) = 5.45 min.

+++++
Process from Point/Station 2.000 to Point/Station 3.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 1.000(Ac.)
Runoff from this stream = 3.568(CFS)
Time of concentration = 5.45 min.
Rainfall intensity = 3.691(In/Hr)
Summary of stream data:

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

1	3.568	5.45	3.691
---	-------	------	-------

$Q_{\max}(1) = 1.000 * 1.000 * 3.568 + = 3.568$

Total of 1 streams to confluence:
Flow rates before confluence point:
3.568
Maximum flow rates at confluence using above data:
3.568
Area of streams before confluence:
1.000
Results of confluence:
Total flow rate = 3.568(CFS)
Time of concentration = 5.450 min.
Effective stream area after confluence = 1.000(Ac.)

+++++
Process from Point/Station 4.000 to Point/Station 5.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Initial subarea flow distance = 1408.000(Ft.)
Highest elevation = 595.900(Ft.)
Lowest elevation = 560.000(Ft.)
Elevation difference = 35.900(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 7.42 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.9500) * (1408.000^{.5})] / (2.550^{(1/3)}) = 7.42$
Rainfall intensity (I) = 3.206(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff = 5.787(CFS)
Total initial stream area = 1.900(Ac.)

+++++
Process from Point/Station 5.000 to Point/Station 6.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 549.300(Ft.)
Downstream point/station elevation = 549.080(Ft.)
Pipe length = 22.25(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.787(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 5.787(CFS)
Normal flow depth in pipe = 9.57(In.)
Flow top width inside pipe = 17.96(In.)
Critical Depth = 11.15(In.)
Pipe flow velocity = 6.06(Ft/s)
Travel time through pipe = 0.06 min.
Time of concentration (TC) = 7.48 min.

+++++
Process from Point/Station 6.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 547.820(Ft.)
Downstream point/station elevation = 546.510(Ft.)
Pipe length = 99.56(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.787(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 5.787(CFS)
Normal flow depth in pipe = 7.10(In.)
Flow top width inside pipe = 25.50(In.)
Critical Depth = 9.54(In.)
Pipe flow velocity = 6.51(Ft/s)
Travel time through pipe = 0.25 min.
Time of concentration (TC) = 7.73 min.

+++++
Process from Point/Station 6.000 to Point/Station 3.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 1.900(Ac.)
Runoff from this stream = 5.787(CFS)
Time of concentration = 7.73 min.
Rainfall intensity = 3.147(In/Hr)

Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	3.568	5.45	3.691
2	5.787	7.73	3.147
Qmax(1) =			
	1.000 *	1.000 *	3.568) +
	1.000 *	0.705 *	5.787) + = 7.647
Qmax(2) =			
	0.853 *	1.000 *	3.568) +
	1.000 *	1.000 *	5.787) + = 8.830

Total of 2 streams to confluence:

Flow rates before confluence point:

3.568 5.787

Maximum flow rates at confluence using above data:

7.647 8.830

Area of streams before confluence:

1.000 1.900

Results of confluence:

Total flow rate = 8.830(CFS)

Time of concentration = 7.732 min.

Effective stream area after confluence = 2.900(Ac.)

+++++
Process from Point/Station 3.000 to Point/Station 7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.510(Ft.)
Downstream point/station elevation = 542.920(Ft.)
Pipe length = 431.22(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.830(CFS)
Given pipe size = 42.00(In.)
Calculated individual pipe flow = 8.830(CFS)
Normal flow depth in pipe = 9.54(In.)
Flow top width inside pipe = 35.19(In.)
Critical depth could not be calculated.
Pipe flow velocity = 5.37(Ft/s)
Travel time through pipe = 1.34 min.
Time of concentration (TC) = 9.07 min.

+++++
Process from Point/Station 3.000 to Point/Station 7.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 2.900(Ac.)
Runoff from this stream = 8.830(CFS)
Time of concentration = 9.07 min.
Rainfall intensity = 2.934(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	8.830	9.07	2.934

$$Q_{\max(1)} = 1.000 * 1.000 * 8.830) + = 8.830$$

Total of 1 streams to confluence:
Flow rates before confluence point:
8.830
Maximum flow rates at confluence using above data:
8.830
Area of streams before confluence:
2.900
Results of confluence:
Total flow rate = 8.830(CFS)
Time of concentration = 9.070 min.
Effective stream area after confluence = 2.900(Ac.)

Process from Point/Station 9.000 to Point/Station 0.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.450 given for subarea
Rainfall intensity (I) = 2.699(In/Hr) for a 25.0 year storm
User specified values are as follows:
TC = 11.00 min. Rain intensity = 2.70(In/Hr)
Total area = 19.100(Ac.) Total runoff = 19.000(CFS)

Process from Point/Station 9.000 to Point/Station 10.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.410(Ft.)
Downstream point/station elevation = 542.990(Ft.)
Pipe length = 76.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.000(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 19.000(CFS)
Normal flow depth in pipe = 10.43(In.)
Flow top width inside pipe = 28.57(In.)
Critical Depth = 17.74(In.)
Pipe flow velocity = 12.53(Ft/s)
Travel time through pipe = 0.10 min.
Time of concentration (TC) = 11.10 min.

Process from Point/Station 10.000 to Point/Station 7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 542.990(Ft.)
Downstream point/station elevation = 542.770(Ft.)
Pipe length = 46.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.000(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 19.000(CFS)
Normal flow depth in pipe = 17.95(In.)
Flow top width inside pipe = 29.41(In.)
Critical Depth = 17.74(In.)
Pipe flow velocity = 6.19(Ft/s)
Travel time through pipe = 0.12 min.
Time of concentration (TC) = 11.22 min.

Process from Point/Station 10.000 to Point/Station 7.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 19.100(Ac.)
Runoff from this stream = 19.000(CFS)
Time of concentration = 11.22 min.
Rainfall intensity = 2.675(In/Hr)
Summary of stream data:

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

1	8.830	9.07	2.934
2	19.000	11.22	2.675

Qmax(1) =

$$1.000 * 1.000 * 8.830 + 1.000 * 0.808 * 19.000 = 24.182$$

Qmax(2) =

$$0.912 * 1.000 * 8.830 + 1.000 * 1.000 * 19.000 = 27.050$$

Total of 2 streams to confluence:
Flow rates before confluence point:
8.830 19.000
Maximum flow rates at confluence using above data:
24.182 27.050
Area of streams before confluence:
2.900 19.100
Results of confluence:
Total flow rate = 27.050(CFS)
Time of concentration = 11.225 min.
Effective stream area after confluence = 22.000(Ac.)

Process from Point/Station 11.000 to Point/Station 12.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.950 given for subarea
Initial subarea flow distance = 408.000(Ft.)
Highest elevation = 559.150(Ft.)
Lowest elevation = 550.000(Ft.)
Elevation difference = 9.150(Ft.)
Time of concentration calculated by the urban areas overland flow method (App X-C) = 4.17 min.

$$TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$$

$$TC = [1.8 * (1.1 - 0.9500) * (408.000^{.5})] / (2.243^{(1/3)}) = 4.17$$

 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 3.845(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
 Subarea runoff = 1.534(CFS)
 Total initial stream area = 0.420(Ac.)

Process from Point/Station 11.000 to Point/Station 12.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.950 given for subarea
Time of concentration = 5.00 min.
Rainfall intensity = 3.845(In/Hr) for a 25.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.950$
Subarea runoff = 0.548(CFS) for 0.150(Ac.)
Total runoff = 2.082(CFS) Total area = 0.57(Ac.)

+++++
Process from Point/Station 12.000 to Point/Station 7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.140(Ft.)
Downstream point/station elevation = 542.920(Ft.)
Pipe length = 21.75(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.082(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 2.082(CFS)
Normal flow depth in pipe = 3.04(In.)
Flow top width inside pipe = 13.49(In.)
Critical Depth = 6.53(In.)
Pipe flow velocity = 10.55(Ft/s)
Travel time through pipe = 0.03 min.
Time of concentration (TC) = 5.03 min.

+++++
Process from Point/Station 12.000 to Point/Station 7.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area = 0.570(Ac.)
Runoff from this stream = 2.082(CFS)
Time of concentration = 5.03 min.
Rainfall intensity = 3.833(In/Hr)
Summary of stream data:

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

1	8.830	9.07	2.934
2	19.000	11.22	2.675
3	2.082	5.03	3.833

Qmax(1) =
 $1.000 * 1.000 * 8.830) +$
 $1.000 * 0.808 * 19.000) +$
 $0.766 * 1.000 * 2.082) + = 25.776$

Qmax(2) =
 $0.912 * 1.000 * 8.830) +$
 $1.000 * 1.000 * 19.000) +$
 $0.698 * 1.000 * 2.082) + = 28.503$

Qmax(3) =
 $1.000 * 0.555 * 8.830) +$
 $1.000 * 0.448 * 19.000) +$
 $1.000 * 1.000 * 2.082) + = 15.504$

Total of 3 streams to confluence:
Flow rates before confluence point:
8.830 19.000 2.082
Maximum flow rates at confluence using above data:
25.776 28.503 15.504

Area of streams before confluence:
2.900 19.100 0.570

Results of confluence:
Total flow rate = 28.503(CFS)
Time of concentration = 11.225 min.
Effective stream area after confluence = 22.570(Ac.)

Process from Point/Station 7.000 to Point/Station 13.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 542.420(Ft.)
Downstream point/station elevation = 542.140(Ft.)
Pipe length = 59.60(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 28.503(CFS)
Given pipe size = 48.00(In.)
Calculated individual pipe flow = 28.503(CFS)
Normal flow depth in pipe = 17.68(In.)
Flow top width inside pipe = 46.31(In.)
Critical Depth = 18.98(In.)
Pipe flow velocity = 6.78(Ft/s)
Travel time through pipe = 0.15 min.
Time of concentration (TC) = 11.37 min.

Process from Point/Station 13.000 to Point/Station 14.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 542.140(Ft.)
Downstream point elevation = 525.920(Ft.)
Channel length thru subarea = 990.000(Ft.)
Channel base width = 0.000(Ft.)
Slope or 'Z' of left channel bank = 80.000
Slope or 'Z' of right channel bank = 80.000
Manning's 'N' = 0.034
Maximum depth of channel = 0.500(Ft.)
Flow(q) thru subarea = 28.503(CFS)
Depth of flow = 0.423(Ft.), Average velocity = 1.987(Ft/s)
Channel flow top width = 67.750(Ft.)
Flow Velocity = 1.99(Ft/s)
Travel time = 8.30 min.
Time of concentration = 19.67 min.
Critical depth = 0.379(Ft.)

Process from Point/Station 13.000 to Point/Station 14.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 22.570(Ac.)
Runoff from this stream = 28.503(CFS)
Time of concentration = 19.67 min.
Rainfall intensity = 2.078(In/Hr)
Summary of stream data:

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

1 28.503 19.67 2.078
Qmax(1) =
1.000 * 1.000 * 28.503) + = 28.503

Total of 1 streams to confluence:
Flow rates before confluence point:
28.503
Maximum flow rates at confluence using above data:
28.503
Area of streams before confluence:
22.570
Results of confluence:
Total flow rate = 28.503(CFS)
Time of concentration = 19.675 min.
Effective stream area after confluence = 22.570(Ac.)

+++++
Process from Point/Station 15.000 to Point/Station 16.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.450 given for subarea
Initial subarea flow distance = 90.000(Ft.)
Highest elevation = 559.000(Ft.)
Lowest elevation = 551.000(Ft.)
Elevation difference = 8.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 5.36 min.
TC = $[1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})]$
TC = $[1.8 * (1.1 - 0.4500) * (90.000^{.5}) / (8.889^{(1/3)})] = 5.36$
Rainfall intensity (I) = 3.721(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff = 0.670(CFS)
Total initial stream area = 0.400(Ac.)

+++++
Process from Point/Station 16.000 to Point/Station 14.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 551.000(Ft.)
Downstream point elevation = 525.920(Ft.)
Channel length thru subarea = 1177.000(Ft.)
Channel base width = 0.000(Ft.)
Slope or 'Z' of left channel bank = 80.000
Slope or 'Z' of right channel bank = 80.000
Estimated mean flow rate at midpoint of channel = 12.391(CFS)
Manning's 'N' = 0.034
Maximum depth of channel = 0.500(Ft.)
Flow(q) thru subarea = 12.391(CFS)
Depth of flow = 0.295(Ft.), Average velocity = 1.781(Ft/s)
Channel flow top width = 47.188(Ft.)
Flow Velocity = 1.78(Ft/s)
Travel time = 11.02 min.
Time of concentration = 16.37 min.
Critical depth = 0.271(Ft.)
Adding area flow to channel
User specified 'C' value of 0.450 given for subarea
Rainfall intensity = 2.265(In/Hr) for a 25.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.450
Subarea runoff = 14.270(CFS) for 14.000(Ac.)
Total runoff = 14.940(CFS) Total area = 14.40(Ac.)

+++++

Process from Point/Station 16.000 to Point/Station 14.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2

Stream flow area = 14.400(Ac.)
Runoff from this stream = 14.940(CFS)
Time of concentration = 16.37 min.
Rainfall intensity = 2.265(In/Hr)
Summary of stream data:

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

1	28.503	19.67	2.078
2	14.940	16.37	2.265

Qmax(1) =

$$1.000 * 1.000 * 28.503) + 0.917 * 1.000 * 14.940) + = 42.210$$

Qmax(2) =

$$1.000 * 0.832 * 28.503) + 1.000 * 1.000 * 14.940) + = 38.663$$

Total of 2 streams to confluence:

Flow rates before confluence point:

28.503 14.940

Maximum flow rates at confluence using above data:

42.210 38.663

Area of streams before confluence:

22.570 14.400

Results of confluence:

Total flow rate = 42.210(CFS)

Time of concentration = 19.675 min.

Effective stream area after confluence = 36.970(Ac.)

End of computations, total study area = 36.970 (Ac.)

San Diego County Rational Hydrology Program

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

Rational method hydrology program based on
San Diego County Flood Control Division 1985 hydrology manual
Rational Hydrology Study Date: 07/10/20

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

Program License Serial Number 6303

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

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

+++++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Initial subarea flow distance = 295.000(Ft.)
Highest elevation = 559.410(Ft.)
Lowest elevation = 557.380(Ft.)
Elevation difference = 2.030(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 5.25 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.9500) * (295.000^{.5})] / (0.688^{(1/3)}) = 5.25$
Rainfall intensity (I) = 4.173(In/Hr) for a 50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff = 1.982(CFS)
Total initial stream area = 0.500(Ac.)

+++++
Process from Point/Station 1.000 to Point/Station 2.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Time of concentration = 5.25 min.

Rainfall intensity = 4.173(In/Hr) for a 50.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.950$
Subarea runoff = 1.982(CFS) for 0.500(Ac.)
Total runoff = 3.964(CFS) Total area = 1.00(Ac.)

+++++
Process from Point/Station 2.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 548.880(Ft.)
Downstream point/station elevation = 545.510(Ft.)
Pipe length = 99.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.964(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 3.964(CFS)
Normal flow depth in pipe = 5.53(In.)
Flow top width inside pipe = 16.60(In.)
Critical Depth = 9.14(In.)
Pipe flow velocity = 8.62(Ft/s)
Travel time through pipe = 0.19 min.
Time of concentration (TC) = 5.44 min.

+++++
Process from Point/Station 2.000 to Point/Station 3.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 1.000(Ac.)
Runoff from this stream = 3.964(CFS)
Time of concentration = 5.44 min.
Rainfall intensity = 4.107(In/Hr)
Summary of stream data:

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

1	3.964	5.44	4.107
---	-------	------	-------

$Q_{\max}(1) =$
 $1.000 * 1.000 * 3.964 + = 3.964$

Total of 1 streams to confluence:
Flow rates before confluence point:
3.964
Maximum flow rates at confluence using above data:
3.964
Area of streams before confluence:
1.000
Results of confluence:
Total flow rate = 3.964(CFS)
Time of concentration = 5.444 min.
Effective stream area after confluence = 1.000(Ac.)

+++++
Process from Point/Station 4.000 to Point/Station 5.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000

Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Initial subarea flow distance = 1408.000(Ft.)
Highest elevation = 595.900(Ft.)
Lowest elevation = 560.000(Ft.)
Elevation difference = 35.900(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 7.42 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.9500) * (1408.000^{.5})] / (2.550^{(1/3)}) = 7.42$
Rainfall intensity (I) = 3.602(In/Hr) for a 50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff = 6.501(CFS)
Total initial stream area = 1.900(Ac.)

+++++
Process from Point/Station 5.000 to Point/Station 6.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 549.300(Ft.)
Downstream point/station elevation = 549.080(Ft.)
Pipe length = 22.25(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.501(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 6.501(CFS)
Normal flow depth in pipe = 10.28(In.)
Flow top width inside pipe = 17.82(In.)
Critical Depth = 11.83(In.)
Pipe flow velocity = 6.23(Ft/s)
Travel time through pipe = 0.06 min.
Time of concentration (TC) = 7.48 min.

+++++
Process from Point/Station 6.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 547.820(Ft.)
Downstream point/station elevation = 546.510(Ft.)
Pipe length = 99.56(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.501(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 6.501(CFS)
Normal flow depth in pipe = 7.54(In.)
Flow top width inside pipe = 26.02(In.)
Critical Depth = 10.13(In.)
Pipe flow velocity = 6.73(Ft/s)
Travel time through pipe = 0.25 min.
Time of concentration (TC) = 7.72 min.

+++++
Process from Point/Station 6.000 to Point/Station 3.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 1.900(Ac.)
Runoff from this stream = 6.501(CFS)
Time of concentration = 7.72 min.
Rainfall intensity = 3.542(In/Hr)

Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	3.964	5.44	4.107
2	6.501	7.72	3.542
Qmax(1) =			
	1.000 *	1.000 *	3.964) +
	1.000 *	0.705 *	6.501) + = 8.547
Qmax(2) =			
	0.862 *	1.000 *	3.964) +
	1.000 *	1.000 *	6.501) + = 9.919

Total of 2 streams to confluence:

Flow rates before confluence point:

3.964 6.501

Maximum flow rates at confluence using above data:

8.547 9.919

Area of streams before confluence:

1.000 1.900

Results of confluence:

Total flow rate = 9.919(CFS)

Time of concentration = 7.722 min.

Effective stream area after confluence = 2.900(Ac.)

+++++
Process from Point/Station 3.000 to Point/Station 7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.510(Ft.)
Downstream point/station elevation = 542.920(Ft.)
Pipe length = 431.22(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.919(CFS)
Given pipe size = 42.00(In.)
Calculated individual pipe flow = 9.919(CFS)
Normal flow depth in pipe = 10.11(In.)
Flow top width inside pipe = 35.92(In.)
Critical Depth = 11.42(In.)
Pipe flow velocity = 5.56(Ft/s)
Travel time through pipe = 1.29 min.
Time of concentration (TC) = 9.02 min.

+++++
Process from Point/Station 3.000 to Point/Station 7.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 2.900(Ac.)
Runoff from this stream = 9.919(CFS)
Time of concentration = 9.02 min.
Rainfall intensity = 3.326(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	9.919	9.02	3.326

$$Q_{\max(1)} = 1.000 * 1.000 * 9.919 + = 9.919$$

Total of 1 streams to confluence:
Flow rates before confluence point:
9.919
Maximum flow rates at confluence using above data:
9.919
Area of streams before confluence:
2.900
Results of confluence:
Total flow rate = 9.919(CFS)
Time of concentration = 9.015 min.
Effective stream area after confluence = 2.900(Ac.)

Process from Point/Station 9.000 to Point/Station 0.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.450 given for subarea
Rainfall intensity (I) = 3.071(In/Hr) for a 50.0 year storm
User specified values are as follows:
TC = 11.00 min. Rain intensity = 3.07(In/Hr)
Total area = 19.100(Ac.) Total runoff = 19.000(CFS)

Process from Point/Station 9.000 to Point/Station 10.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.410(Ft.)
Downstream point/station elevation = 542.990(Ft.)
Pipe length = 76.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.000(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 19.000(CFS)
Normal flow depth in pipe = 10.43(In.)
Flow top width inside pipe = 28.57(In.)
Critical Depth = 17.74(In.)
Pipe flow velocity = 12.53(Ft/s)
Travel time through pipe = 0.10 min.
Time of concentration (TC) = 11.10 min.

Process from Point/Station 10.000 to Point/Station 7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 542.990(Ft.)
Downstream point/station elevation = 542.770(Ft.)
Pipe length = 46.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.000(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 19.000(CFS)
Normal flow depth in pipe = 17.95(In.)
Flow top width inside pipe = 29.41(In.)
Critical Depth = 17.74(In.)
Pipe flow velocity = 6.19(Ft/s)
Travel time through pipe = 0.12 min.
Time of concentration (TC) = 11.22 min.

+++++
Process from Point/Station 10.000 to Point/Station 7.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 19.100(Ac.)
Runoff from this stream = 19.000(CFS)
Time of concentration = 11.22 min.
Rainfall intensity = 3.046(In/Hr)
Summary of stream data:

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

1	9.919	9.02	3.326
2	19.000	11.22	3.046

Qmax(1) =

$$\frac{1.000 * 1.000 * 9.919 + 1.000 * 0.803 * 19.000}{2} = 25.179$$

Qmax(2) =

$$\frac{0.916 * 1.000 * 9.919 + 1.000 * 1.000 * 19.000}{2} = 28.085$$

Total of 2 streams to confluence:
Flow rates before confluence point:
9.919 19.000
Maximum flow rates at confluence using above data:
25.179 28.085
Area of streams before confluence:
2.900 19.100
Results of confluence:
Total flow rate = 28.085(CFS)
Time of concentration = 11.225 min.
Effective stream area after confluence = 22.000(Ac.)

+++++
Process from Point/Station 11.000 to Point/Station 12.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.950 given for subarea
Initial subarea flow distance = 408.000(Ft.)
Highest elevation = 559.150(Ft.)
Lowest elevation = 550.000(Ft.)
Elevation difference = 9.150(Ft.)
Time of concentration calculated by the urban areas overland flow method (App X-C) = 4.17 min.

$$TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$$

$$TC = [1.8 * (1.1 - 0.9500) * (408.000^{.5})] / (2.243^{(1/3)}) = 4.17$$

 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
 Subarea runoff = 1.702(CFS)
 Total initial stream area = 0.420(Ac.)

+++++
Process from Point/Station 11.000 to Point/Station 12.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.950 given for subarea
Time of concentration = 5.00 min.
Rainfall intensity = 4.265(In/Hr) for a 50.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.950$
Subarea runoff = 0.608(CFS) for 0.150(Ac.)
Total runoff = 2.310(CFS) Total area = 0.57(Ac.)

+++++
Process from Point/Station 12.000 to Point/Station 7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.140(Ft.)
Downstream point/station elevation = 542.920(Ft.)
Pipe length = 21.75(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.310(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 2.310(CFS)
Normal flow depth in pipe = 3.20(In.)
Flow top width inside pipe = 13.76(In.)
Critical Depth = 6.89(In.)
Pipe flow velocity = 10.88(Ft/s)
Travel time through pipe = 0.03 min.
Time of concentration (TC) = 5.03 min.

+++++
Process from Point/Station 12.000 to Point/Station 7.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area = 0.570(Ac.)
Runoff from this stream = 2.310(CFS)
Time of concentration = 5.03 min.
Rainfall intensity = 4.253(In/Hr)
Summary of stream data:

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

1	9.919	9.02	3.326
2	19.000	11.22	3.046
3	2.310	5.03	4.253

Qmax(1) =
 $1.000 * 1.000 * 9.919 +$
 $1.000 * 0.803 * 19.000 +$
 $0.782 * 1.000 * 2.310 + = 26.985$

Qmax(2) =
 $0.916 * 1.000 * 9.919 +$
 $1.000 * 1.000 * 19.000 +$
 $0.716 * 1.000 * 2.310 + = 29.739$

Qmax(3) =
 $1.000 * 0.558 * 9.919 +$
 $1.000 * 0.448 * 19.000 +$
 $1.000 * 1.000 * 2.310 + = 16.367$

Total of 3 streams to confluence:
Flow rates before confluence point:
9.919 19.000 2.310
Maximum flow rates at confluence using above data:
26.985 29.739 16.367

Area of streams before confluence:
2.900 19.100 0.570

Results of confluence:
Total flow rate = 29.739(CFS)
Time of concentration = 11.225 min.
Effective stream area after confluence = 22.570(Ac.)

Process from Point/Station 7.000 to Point/Station 13.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 542.420(Ft.)
Downstream point/station elevation = 542.140(Ft.)
Pipe length = 59.60(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 29.739(CFS)
Given pipe size = 48.00(In.)
Calculated individual pipe flow = 29.739(CFS)
Normal flow depth in pipe = 18.09(In.)
Flow top width inside pipe = 46.52(In.)
Critical Depth = 19.39(In.)
Pipe flow velocity = 6.86(Ft/s)
Travel time through pipe = 0.14 min.
Time of concentration (TC) = 11.37 min.

Process from Point/Station 13.000 to Point/Station 14.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 542.140(Ft.)
Downstream point elevation = 525.920(Ft.)
Channel length thru subarea = 990.000(Ft.)
Channel base width = 0.000(Ft.)
Slope or 'Z' of left channel bank = 80.000
Slope or 'Z' of right channel bank = 80.000
Manning's 'N' = 0.034
Maximum depth of channel = 0.500(Ft.)
Flow(q) thru subarea = 29.739(CFS)
Depth of flow = 0.430(Ft.), Average velocity = 2.008(Ft/s)
Channel flow top width = 68.837(Ft.)
Flow Velocity = 2.01(Ft/s)
Travel time = 8.22 min.
Time of concentration = 19.59 min.
Critical depth = 0.387(Ft.)

Process from Point/Station 13.000 to Point/Station 14.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 22.570(Ac.)
Runoff from this stream = 29.739(CFS)
Time of concentration = 19.59 min.
Rainfall intensity = 2.408(In/Hr)
Summary of stream data:

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

1 29.739 19.59 2.408
Qmax(1) =
1.000 * 1.000 * 29.739) + = 29.739

Total of 1 streams to confluence:
Flow rates before confluence point:
29.739
Maximum flow rates at confluence using above data:
29.739
Area of streams before confluence:
22.570
Results of confluence:
Total flow rate = 29.739(CFS)
Time of concentration = 19.586 min.
Effective stream area after confluence = 22.570(Ac.)

+++++
Process from Point/Station 15.000 to Point/Station 16.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.450 given for subarea
Initial subarea flow distance = 90.000(Ft.)
Highest elevation = 559.000(Ft.)
Lowest elevation = 551.000(Ft.)
Elevation difference = 8.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 5.36 min.
TC = $[1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})]$
TC = $[1.8 * (1.1 - 0.4500) * (90.000^{.5}) / (8.889^{(1/3)})] = 5.36$
Rainfall intensity (I) = 4.136(In/Hr) for a 50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff = 0.745(CFS)
Total initial stream area = 0.400(Ac.)

+++++
Process from Point/Station 16.000 to Point/Station 14.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 551.000(Ft.)
Downstream point elevation = 525.920(Ft.)
Channel length thru subarea = 1177.000(Ft.)
Channel base width = 0.000(Ft.)
Slope or 'Z' of left channel bank = 80.000
Slope or 'Z' of right channel bank = 80.000
Estimated mean flow rate at midpoint of channel = 13.774(CFS)
Manning's 'N' = 0.034
Maximum depth of channel = 0.500(Ft.)
Flow(q) thru subarea = 13.774(CFS)
Depth of flow = 0.307(Ft.), Average velocity = 1.828(Ft/s)
Channel flow top width = 49.098(Ft.)
Flow Velocity = 1.83(Ft/s)
Travel time = 10.73 min.
Time of concentration = 16.09 min.
Critical depth = 0.283(Ft.)
Adding area flow to channel
User specified 'C' value of 0.450 given for subarea
Rainfall intensity = 2.628(In/Hr) for a 50.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.450
Subarea runoff = 16.556(CFS) for 14.000(Ac.)
Total runoff = 17.301(CFS) Total area = 14.40(Ac.)

+++++
Process from Point/Station 16.000 to Point/Station 14.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2

Stream flow area = 14.400(Ac.)
Runoff from this stream = 17.301(CFS)
Time of concentration = 16.09 min.
Rainfall intensity = 2.628(In/Hr)
Summary of stream data:

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

1	29.739	19.59	2.408
2	17.301	16.09	2.628

Qmax(1) =

$$1.000 * 1.000 * 29.739) + 0.916 * 1.000 * 17.301) + = 45.593$$

Qmax(2) =

$$1.000 * 0.821 * 29.739) + 1.000 * 1.000 * 17.301) + = 41.728$$

Total of 2 streams to confluence:
Flow rates before confluence point:
29.739 17.301
Maximum flow rates at confluence using above data:
45.593 41.728
Area of streams before confluence:
22.570 14.400
Results of confluence:
Total flow rate = 45.593(CFS)
Time of concentration = 19.586 min.
Effective stream area after confluence = 36.970(Ac.)
End of computations, total study area = 36.970 (Ac.)

San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4

Rational method hydrology program based on
San Diego County Flood Control Division 1985 hydrology manual
Rational Hydrology Study Date: 06/28/21

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

Program License Serial Number 4035

Rational hydrology study storm event year is 5.0
English (in-lb) input data Units used
English (in) rainfall data used

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

+++++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Initial subarea flow distance = 1408.000(Ft.)
Highest elevation = 595.900(Ft.)
Lowest elevation = 560.000(Ft.)
Elevation difference = 35.900(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 7.42 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.9500) * (1408.000^{.5}) / (2.550^{(1/3)})] = 7.42$
Rainfall intensity (I) = 2.571(In/Hr) for a 5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff = 4.640(CFS)
Total initial stream area = 1.900(Ac.)

+++++
Process from Point/Station 2.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 549.300(Ft.)
Downstream point/station elevation = 549.080(Ft.)
Pipe length = 22.25(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.640(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 4.640(CFS)
Normal flow depth in pipe = 8.40(In.)
Flow top width inside pipe = 17.96(In.)
Critical Depth = 9.93(In.)

Pipe flow velocity = 5.74(Ft/s)
 Travel time through pipe = 0.06 min.
 Time of concentration (TC) = 7.48 min.

 Process from Point/Station 3.000 to Point/Station 4.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 547.820(Ft.)
 Downstream point/station elevation = 546.510(Ft.)
 Pipe length = 99.56(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.640(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 4.640(CFS)
 Normal flow depth in pipe = 6.36(In.)
 Flow top width inside pipe = 24.53(In.)
 Critical Depth = 8.51(In.)
 Pipe flow velocity = 6.10(Ft/s)
 Travel time through pipe = 0.27 min.
 Time of concentration (TC) = 7.75 min.

 Process from Point/Station 3.000 to Point/Station 4.000
 ***** CONFLUENCE OF MINOR STREAMS *****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 1.900(Ac.)
 Runoff from this stream = 4.640(CFS)
 Time of concentration = 7.75 min.
 Rainfall intensity = 2.514(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.640	7.75	2.514

Qmax(1) = 1.000 * 1.000 * 4.640) + = 4.640

Total of 1 streams to confluence:
 Flow rates before confluence point:
 4.640
 Maximum flow rates at confluence using above data:
 4.640
 Area of streams before confluence:
 1.900
 Results of confluence:
 Total flow rate = 4.640(CFS)
 Time of concentration = 7.752 min.
 Effective stream area after confluence = 1.900(Ac.)

 Process from Point/Station 55.000 to Point/Station 300.000
 ***** INITIAL AREA EVALUATION *****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 203.000(Ft.)
 Highest elevation = 559.500(Ft.)
 Lowest elevation = 557.580(Ft.)
 Elevation difference = 1.920(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 6.79 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$

$TC = [1.8 * (1.1 - 0.8400) * (203.000^{.5}) / (0.946^{(1/3)})] = 6.79$
 Rainfall intensity (I) = 2.687(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 0.609(CFS)
 Total initial stream area = 0.270(Ac.)

++++++
 Process from Point/Station 300.000 to Point/Station 301.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 553.420(Ft.)
 Downstream point/station elevation = 551.000(Ft.)
 Pipe length = 484.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.609(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 0.609(CFS)
 Normal flow depth in pipe = 3.49(In.)
 Flow top width inside pipe = 14.23(In.)
 Critical Depth = 3.47(In.)
 Pipe flow velocity = 2.54(Ft/s)
 Travel time through pipe = 3.18 min.
 Time of concentration (TC) = 9.97 min.

++++++
 Process from Point/Station 300.000 to Point/Station 301.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 9.97 min.
 Rainfall intensity = 2.219(In/Hr) for a 5.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.671(CFS) for 0.360(Ac.)
 Total runoff = 1.280(CFS) Total area = 0.63(Ac.)

++++++
 Process from Point/Station 300.000 to Point/Station 301.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 9.97 min.
 Rainfall intensity = 2.219(In/Hr) for a 5.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.261(CFS) for 0.140(Ac.)
 Total runoff = 1.541(CFS) Total area = 0.77(Ac.)

++++++
 Process from Point/Station 301.000 to Point/Station 302.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 551.000(Ft.)
 Downstream point/station elevation = 549.500(Ft.)
 Pipe length = 6.30(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.541(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 1.541(CFS)
 Normal flow depth in pipe = 2.14(In.)
 Flow top width inside pipe = 11.66(In.)
 Critical Depth = 5.58(In.)
 Pipe flow velocity = 12.99(Ft/s)
 Travel time through pipe = 0.01 min.
 Time of concentration (TC) = 9.98 min.

+++++
 Process from Point/Station 302.000 to Point/Station 56.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 549.500(Ft.)
 Downstream point/station elevation = 548.890(Ft.)
 Pipe length = 3.50(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.541(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 1.541(CFS)
 Normal flow depth in pipe = 2.31(In.)
 Flow top width inside pipe = 12.04(In.)
 Critical Depth = 5.58(In.)
 Pipe flow velocity = 11.64(Ft/s)
 Travel time through pipe = 0.01 min.
 Time of concentration (TC) = 9.99 min.

+++++
 Process from Point/Station 302.000 to Point/Station 56.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 Time of concentration = 9.99 min.
 Rainfall intensity = 2.217(In/Hr) for a 5.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
 Subarea runoff = 1.053(CFS) for 0.500(Ac.)
 Total runoff = 2.595(CFS) Total area = 1.27(Ac.)

+++++
 Process from Point/Station 56.000 to Point/Station 4.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 548.890(Ft.)
 Downstream point/station elevation = 546.510(Ft.)
 Pipe length = 101.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.595(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 2.595(CFS)
 Normal flow depth in pipe = 4.88(In.)
 Flow top width inside pipe = 16.00(In.)
 Critical Depth = 7.33(In.)
 Pipe flow velocity = 6.70(Ft/s)
 Travel time through pipe = 0.25 min.
 Time of concentration (TC) = 10.24 min.

+++++
 Process from Point/Station 56.000 to Point/Station 4.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 1.270(Ac.)
 Runoff from this stream = 2.595(CFS)
 Time of concentration = 10.24 min.
 Rainfall intensity = 2.191(In/Hr)
 Summary of stream data:

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

1	4.640	7.75	2.514	
2	2.595	10.24	2.191	
Qmax(1) =				
	1.000 *	1.000 *	4.640) +	
	1.000 *	0.757 *	2.595) + =	6.605
Qmax(2) =				
	0.871 *	1.000 *	4.640) +	
	1.000 *	1.000 *	2.595) + =	6.638

Total of 2 streams to confluence:
Flow rates before confluence point:
4.640 2.595
Maximum flow rates at confluence using above data:
6.605 6.638
Area of streams before confluence:
1.900 1.270
Results of confluence:
Total flow rate = 6.638(CFS)
Time of concentration = 10.238 min.
Effective stream area after confluence = 3.170(Ac.)

+++++
Process from Point/Station 4.000 to Point/Station 108.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.510(Ft.)
Downstream point/station elevation = 542.920(Ft.)
Pipe length = 431.22(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 6.638(CFS)
Given pipe size = 42.00(In.)
Calculated individual pipe flow = 6.638(CFS)
Normal flow depth in pipe = 8.29(In.)
Flow top width inside pipe = 33.43(In.)
Critical Depth = 9.29(In.)
Pipe flow velocity = 4.94(Ft/s)
Travel time through pipe = 1.45 min.
Time of concentration (TC) = 11.69 min.

+++++
Process from Point/Station 4.000 to Point/Station 108.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 3.170(Ac.)
Runoff from this stream = 6.638(CFS)
Time of concentration = 11.69 min.
Rainfall intensity = 2.052(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)	
1	6.638	11.69	2.052	
Qmax(1) =				
	1.000 *	1.000 *	6.638) + =	
				6.638

Total of 1 main streams to confluence:
Flow rates before confluence point:
6.638
Maximum flow rates at confluence using above data:
6.638
Area of streams before confluence:
3.170

Results of confluence:

Total flow rate = 6.638(CFS)
Time of concentration = 11.692 min.
Effective stream area after confluence = 3.170(Ac.)

+++++
Process from Point/Station 107.000 to Point/Station 107.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.450 given for subarea
Rainfall intensity (I) = 2.115(In/Hr) for a 5.0 year storm
User specified values are as follows:
TC = 11.00 min. Rain intensity = 2.11(In/Hr)
Total area = 19.100(Ac.) Total runoff = 19.000(CFS)

+++++
Process from Point/Station 107.000 to Point/Station 108.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.410(Ft.)
Downstream point/station elevation = 542.770(Ft.)
Pipe length = 126.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.000(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 19.000(CFS)
Normal flow depth in pipe = 11.67(In.)
Flow top width inside pipe = 29.25(In.)
Critical Depth = 17.74(In.)
Pipe flow velocity = 10.76(Ft/s)
Travel time through pipe = 0.20 min.
Time of concentration (TC) = 11.20 min.

+++++
Process from Point/Station 107.000 to Point/Station 108.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 19.100(Ac.)
Runoff from this stream = 19.000(CFS)
Time of concentration = 11.20 min.
Rainfall intensity = 2.097(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	6.638	11.69	2.052
2	19.000	11.20	2.097

Qmax(1) =
1.000 * 1.000 * 6.638) +
0.979 * 1.000 * 19.000) + = 25.238

Qmax(2) =
1.000 * 0.958 * 6.638) +
1.000 * 1.000 * 19.000) + = 25.356

Total of 2 main streams to confluence:
Flow rates before confluence point:
6.638 19.000
Maximum flow rates at confluence using above data:
25.238 25.356

Area of streams before confluence:
3.170 19.100

Results of confluence:
Total flow rate = 25.356(CFS)
Time of concentration = 11.195 min.
Effective stream area after confluence = 22.270(Ac.)

+++++
Process from Point/Station 60.000 to Point/Station 61.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
Initial subarea flow distance = 400.000(Ft.)
Highest elevation = 559.700(Ft.)
Lowest elevation = 551.370(Ft.)
Elevation difference = 8.330(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 7.33 min.
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.8400) * (400.000^{.5})] / (2.083^{(1/3)}) = 7.33$
Rainfall intensity (I) = 2.586(In/Hr) for a 5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
Subarea runoff = 1.238(CFS)
Total initial stream area = 0.570(Ac.)

+++++
Process from Point/Station 61.000 to Point/Station 303.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.500(Ft.)
Downstream point/station elevation = 545.140(Ft.)
Pipe length = 12.42(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.238(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 1.238(CFS)
Normal flow depth in pipe = 3.21(In.)
Flow top width inside pipe = 13.78(In.)
Critical Depth = 4.99(In.)
Pipe flow velocity = 5.81(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 7.37 min.

+++++
Process from Point/Station 303.000 to Point/Station 108.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.140(Ft.)
Downstream point/station elevation = 542.770(Ft.)
Pipe length = 22.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.238(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 1.238(CFS)
Normal flow depth in pipe = 2.03(In.)
Flow top width inside pipe = 15.09(In.)
Critical Depth = 4.34(In.)
Pipe flow velocity = 8.58(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 7.41 min.

+++++
Process from Point/Station 303.000 to Point/Station 108.000

**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 3

Stream flow area = 0.570(Ac.)

Runoff from this stream = 1.238(CFS)

Time of concentration = 7.41 min.

Rainfall intensity = 2.572(In/Hr)

Summary of stream data:

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

1	6.638	11.69	2.052
---	-------	-------	-------

2	19.000	11.20	2.097
---	--------	-------	-------

3	1.238	7.41	2.572
---	-------	------	-------

Qmax(1) =

1.000 *	1.000 *	6.638) +	
0.979 *	1.000 *	19.000) +	
0.798 *	1.000 *	1.238) + =	26.226

Qmax(2) =

1.000 *	0.958 *	6.638) +	
1.000 *	1.000 *	19.000) +	
0.815 *	1.000 *	1.238) + =	26.365

Qmax(3) =

1.000 *	0.634 *	6.638) +	
1.000 *	0.662 *	19.000) +	
1.000 *	1.000 *	1.238) + =	18.016

Total of 3 main streams to confluence:

Flow rates before confluence point:

6.638	19.000	1.238
-------	--------	-------

Maximum flow rates at confluence using above data:

26.226	26.365	18.016
--------	--------	--------

Area of streams before confluence:

3.170	19.100	0.570
-------	--------	-------

Results of confluence:

Total flow rate = 26.365(CFS)

Time of concentration = 11.195 min.

Effective stream area after confluence = 22.840(Ac.)

+++++

Process from Point/Station 108.000 to Point/Station 109.000

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

Upstream point/station elevation = 542.420(Ft.)

Downstream point/station elevation = 542.140(Ft.)

Pipe length = 59.60(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 26.365(CFS)

Given pipe size = 48.00(In.)

Calculated individual pipe flow = 26.365(CFS)

Normal flow depth in pipe = 16.97(In.)

Flow top width inside pipe = 45.89(In.)

Critical Depth = 18.23(In.)

Pipe flow velocity = 6.64(Ft/s)

Travel time through pipe = 0.15 min.

Time of concentration (TC) = 11.34 min.

+++++

Process from Point/Station 109.000 to Point/Station 13.000

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

Upstream point/station elevation = 541.190(Ft.)
 Downstream point/station elevation = 539.900(Ft.)
 Pipe length = 67.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 26.365(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 26.365(CFS)
 Normal flow depth in pipe = 11.79(In.)
 Flow top width inside pipe = 41.32(In.)
 Critical Depth = 18.23(In.)
 Pipe flow velocity = 11.00(Ft/s)
 Travel time through pipe = 0.10 min.
 Time of concentration (TC) = 11.45 min.

++++++
 Process from Point/Station 13.000 to Point/Station 14.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 539.480(Ft.)
 Downstream point/station elevation = 535.250(Ft.)
 Pipe length = 254.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 26.365(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 26.365(CFS)
 Normal flow depth in pipe = 12.23(In.)
 Flow top width inside pipe = 41.84(In.)
 Critical Depth = 18.23(In.)
 Pipe flow velocity = 10.45(Ft/s)
 Travel time through pipe = 0.41 min.
 Time of concentration (TC) = 11.85 min.

++++++
 Process from Point/Station 14.000 to Point/Station 15.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 534.830(Ft.)
 Downstream point/station elevation = 533.560(Ft.)
 Pipe length = 127.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 26.365(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 26.365(CFS)
 Normal flow depth in pipe = 13.92(In.)
 Flow top width inside pipe = 43.56(In.)
 Critical Depth = 18.23(In.)
 Pipe flow velocity = 8.71(Ft/s)
 Travel time through pipe = 0.24 min.
 Time of concentration (TC) = 12.09 min.

++++++
 Process from Point/Station 15.000 to Point/Station 16.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 533.140(Ft.)
 Downstream point/station elevation = 530.850(Ft.)
 Pipe length = 227.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 26.365(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 26.365(CFS)
 Normal flow depth in pipe = 13.90(In.)
 Flow top width inside pipe = 43.54(In.)
 Critical Depth = 18.23(In.)
 Pipe flow velocity = 8.74(Ft/s)
 Travel time through pipe = 0.43 min.
 Time of concentration (TC) = 12.53 min.

+++++
 Process from Point/Station 16.000 to Point/Station 68.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 530.490(Ft.)
 Downstream point/station elevation = 528.500(Ft.)
 Pipe length = 193.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 26.365(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 26.365(CFS)
 Normal flow depth in pipe = 13.82(In.)
 Flow top width inside pipe = 43.46(In.)
 Critical Depth = 18.23(In.)
 Pipe flow velocity = 8.81(Ft/s)
 Travel time through pipe = 0.37 min.
 Time of concentration (TC) = 12.89 min.

+++++
 Process from Point/Station 16.000 to Point/Station 68.000
 ***** CONFLUENCE OF MAIN STREAMS *****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 22.840(Ac.)
 Runoff from this stream = 26.365(CFS)
 Time of concentration = 12.89 min.
 Rainfall intensity = 1.956(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	26.365	12.89	1.956

Qmax(1) = 1.000 * 1.000 * 26.365) + = 26.365

Total of 1 main streams to confluence:
 Flow rates before confluence point:
 26.365
 Maximum flow rates at confluence using above data:
 26.365
 Area of streams before confluence:
 22.840

Results of confluence:
 Total flow rate = 26.365(CFS)
 Time of concentration = 12.893 min.
 Effective stream area after confluence = 22.840(Ac.)

+++++
 Process from Point/Station 52.000 to Point/Station 53.000
 ***** INITIAL AREA EVALUATION *****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 81.000(Ft.)
 Highest elevation = 544.910(Ft.)
 Lowest elevation = 544.480(Ft.)
 Elevation difference = 0.430(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 5.20 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.840) * (81.000^{.5})] / (0.531^{(1/3)}) = 5.20$

Rainfall intensity (I) = 3.085(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 1.244(CFS)
 Total initial stream area = 0.480(Ac.)

+++++
 Process from Point/Station 52.000 to Point/Station 53.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 5.20 min.
 Rainfall intensity = 3.085(In/Hr) for a 5.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.130(CFS) for 0.050(Ac.)
 Total runoff = 1.373(CFS) Total area = 0.53(Ac.)

+++++
 Process from Point/Station 53.000 to Point/Station 54.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 541.840(Ft.)
 Downstream point/station elevation = 541.280(Ft.)
 Pipe length = 112.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.373(CFS)
 Given pipe size = 12.00(In.)
 Calculated individual pipe flow = 1.373(CFS)
 Normal flow depth in pipe = 6.32(In.)
 Flow top width inside pipe = 11.98(In.)
 Critical Depth = 5.95(In.)
 Pipe flow velocity = 3.28(Ft/s)
 Travel time through pipe = 0.57 min.
 Time of concentration (TC) = 5.77 min.

+++++
 Process from Point/Station 53.000 to Point/Station 54.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 5.77 min.
 Rainfall intensity = 2.922(In/Hr) for a 5.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 1.104(CFS) for 0.450(Ac.)
 Total runoff = 2.478(CFS) Total area = 0.98(Ac.)

+++++
 Process from Point/Station 54.000 to Point/Station 57.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 541.280(Ft.)
 Downstream point/station elevation = 540.380(Ft.)
 Pipe length = 180.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.478(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 2.478(CFS)
 Normal flow depth in pipe = 6.39(In.)
 Flow top width inside pipe = 21.21(In.)
 Critical Depth = 6.56(In.)
 Pipe flow velocity = 3.70(Ft/s)
 Travel time through pipe = 0.81 min.
 Time of concentration (TC) = 6.58 min.

+++++

Process from Point/Station 54.000 to Point/Station 57.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 6.58 min.
Rainfall intensity = 2.731(In/Hr) for a 5.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 1.216(CFS) for 0.530(Ac.)
Total runoff = 3.693(CFS) Total area = 1.51(Ac.)

+++++
Process from Point/Station 54.000 to Point/Station 57.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 6.58 min.
Rainfall intensity = 2.731(In/Hr) for a 5.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 0.229(CFS) for 0.100(Ac.)
Total runoff = 3.923(CFS) Total area = 1.61(Ac.)

+++++
Process from Point/Station 57.000 to Point/Station 58.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 540.300(Ft.)
Downstream point/station elevation = 539.350(Ft.)
Pipe length = 206.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.923(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 3.923(CFS)
Normal flow depth in pipe = 8.27(In.)
Flow top width inside pipe = 22.81(In.)
Critical Depth = 8.32(In.)
Pipe flow velocity = 4.09(Ft/s)
Travel time through pipe = 0.84 min.
Time of concentration (TC) = 7.42 min.

+++++
Process from Point/Station 58.000 to Point/Station 62.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 539.350(Ft.)
Downstream point/station elevation = 538.770(Ft.)
Pipe length = 115.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.923(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 3.923(CFS)
Normal flow depth in pipe = 8.07(In.)
Flow top width inside pipe = 22.68(In.)
Critical Depth = 8.32(In.)
Pipe flow velocity = 4.22(Ft/s)
Travel time through pipe = 0.45 min.
Time of concentration (TC) = 7.88 min.

+++++
Process from Point/Station 62.000 to Point/Station 63.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 538.770(Ft.)
Downstream point/station elevation = 537.030(Ft.)
Pipe length = 347.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.923(CFS)

Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 3.923(CFS)
 Normal flow depth in pipe = 8.09(In.)
 Flow top width inside pipe = 22.69(In.)
 Critical Depth = 8.32(In.)
 Pipe flow velocity = 4.21(Ft/s)
 Travel time through pipe = 1.37 min.
 Time of concentration (TC) = 9.25 min.

++++++
 Process from Point/Station 62.000 to Point/Station 63.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 9.25 min.
 Rainfall intensity = 2.303(In/Hr) for a 5.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 9.149(CFS) for 4.730(Ac.)
 Total runoff = 13.072(CFS) Total area = 6.34(Ac.)

++++++
 Process from Point/Station 63.000 to Point/Station 64.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 537.030(Ft.)
 Downstream point/station elevation = 536.480(Ft.)
 Pipe length = 84.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 13.072(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 13.072(CFS)
 Normal flow depth in pipe = 15.00(In.)
 Flow top width inside pipe = 23.24(In.)
 Critical Depth = 15.62(In.)
 Pipe flow velocity = 6.33(Ft/s)
 Travel time through pipe = 0.22 min.
 Time of concentration (TC) = 9.47 min.

++++++
 Process from Point/Station 63.000 to Point/Station 64.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 6.340(Ac.)
 Runoff from this stream = 13.072(CFS)
 Time of concentration = 9.47 min.
 Rainfall intensity = 2.276(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	13.072	9.47	2.276

$Q_{\max}(1) = 1.000 * 1.000 * 13.072) + = 13.072$

Total of 1 streams to confluence:
 Flow rates before confluence point:
 13.072
 Maximum flow rates at confluence using above data:
 13.072
 Area of streams before confluence:
 6.340
 Results of confluence:

Total flow rate = 13.072(CFS)
 Time of concentration = 9.470 min.
 Effective stream area after confluence = 6.340(Ac.)

 Process from Point/Station 52.000 to Point/Station 201.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 90.000(Ft.)
 Highest elevation = 544.890(Ft.)
 Lowest elevation = 544.050(Ft.)
 Elevation difference = 0.840(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 4.54 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.840) * (90.000^{.5})] / (0.933^{(1/3)}) = 4.54$
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 3.149(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 1.164(CFS)
 Total initial stream area = 0.440(Ac.)

 Process from Point/Station 52.000 to Point/Station 201.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 5.00 min.
 Rainfall intensity = 3.149(In/Hr) for a 5.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.450(CFS) for 0.170(Ac.)
 Total runoff = 1.614(CFS) Total area = 0.61(Ac.)

 Process from Point/Station 52.000 to Point/Station 201.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 5.00 min.
 Rainfall intensity = 3.149(In/Hr) for a 5.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.212(CFS) for 0.080(Ac.)
 Total runoff = 1.825(CFS) Total area = 0.69(Ac.)

 Process from Point/Station 201.000 to Point/Station 202.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 541.640(Ft.)
 Downstream point/station elevation = 541.190(Ft.)
 Pipe length = 89.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.825(CFS)
 Given pipe size = 12.00(In.)
 Calculated individual pipe flow = 1.825(CFS)
 Normal flow depth in pipe = 7.55(In.)
 Flow top width inside pipe = 11.59(In.)
 Critical Depth = 6.91(In.)
 Pipe flow velocity = 3.51(Ft/s)
 Travel time through pipe = 0.42 min.
 Time of concentration (TC) = 5.42 min.

+++++
Process from Point/Station 201.000 to Point/Station 202.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.42 min.
Rainfall intensity = 3.018(In/Hr) for a 5.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 1.420(CFS) for 0.560(Ac.)
Total runoff = 3.245(CFS) Total area = 1.25(Ac.)

+++++
Process from Point/Station 201.000 to Point/Station 202.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.42 min.
Rainfall intensity = 3.018(In/Hr) for a 5.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 0.685(CFS) for 0.270(Ac.)
Total runoff = 3.930(CFS) Total area = 1.52(Ac.)

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

Upstream point/station elevation = 541.190(Ft.)
Downstream point/station elevation = 539.600(Ft.)
Pipe length = 242.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.930(CFS)
Given pipe size = 15.00(In.)
Calculated individual pipe flow = 3.930(CFS)
Normal flow depth in pipe = 9.70(In.)
Flow top width inside pipe = 14.34(In.)
Critical Depth = 9.62(In.)
Pipe flow velocity = 4.68(Ft/s)
Travel time through pipe = 0.86 min.
Time of concentration (TC) = 6.28 min.

+++++
Process from Point/Station 203.000 to Point/Station 64.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 539.600(Ft.)
Downstream point/station elevation = 536.480(Ft.)
Pipe length = 300.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.930(CFS)
Given pipe size = 15.00(In.)
Calculated individual pipe flow = 3.930(CFS)
Normal flow depth in pipe = 8.34(In.)
Flow top width inside pipe = 14.90(In.)
Critical Depth = 9.62(In.)
Pipe flow velocity = 5.60(Ft/s)
Travel time through pipe = 0.89 min.
Time of concentration (TC) = 7.18 min.

+++++
Process from Point/Station 203.000 to Point/Station 64.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 7.18 min.
Rainfall intensity = 2.614(In/Hr) for a 5.0 year storm

Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 1.603(CFS) for 0.730(Ac.)
 Total runoff = 5.532(CFS) Total area = 2.25(Ac.)

 Process from Point/Station 203.000 to Point/Station 64.000
 ***** CONFLUENCE OF MINOR STREAMS *****

Along Main Stream number: 1 in normal stream number 2

Stream flow area = 2.250(Ac.)
 Runoff from this stream = 5.532(CFS)
 Time of concentration = 7.18 min.
 Rainfall intensity = 2.614(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	13.072	9.47	2.276
2	5.532	7.18	2.614

Qmax(1) =
 1.000 * 1.000 * 13.072) +
 0.871 * 1.000 * 5.532) + = 17.890

Qmax(2) =
 1.000 * 0.758 * 13.072) +
 1.000 * 1.000 * 5.532) + = 15.437

Total of 2 streams to confluence:
 Flow rates before confluence point:
 13.072 5.532
 Maximum flow rates at confluence using above data:
 17.890 15.437
 Area of streams before confluence:
 6.340 2.250
 Results of confluence:
 Total flow rate = 17.890(CFS)
 Time of concentration = 9.470 min.
 Effective stream area after confluence = 8.590(Ac.)

 Process from Point/Station 64.000 to Point/Station 65.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 536.480(Ft.)
 Downstream point/station elevation = 534.950(Ft.)
 Pipe length = 306.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 17.890(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 17.890(CFS)
 Normal flow depth in pipe = 15.38(In.)
 Flow top width inside pipe = 35.62(In.)
 Critical Depth = 16.23(In.)
 Pipe flow velocity = 6.21(Ft/s)
 Travel time through pipe = 0.82 min.
 Time of concentration (TC) = 10.29 min.

 Process from Point/Station 64.000 to Point/Station 65.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 10.29 min.
 Rainfall intensity = 2.185(In/Hr) for a 5.0 year storm

Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 0.697(CFS) for 0.380(Ac.)
 Total runoff = 18.587(CFS) Total area = 8.97(Ac.)

 Process from Point/Station 65.000 to Point/Station 304.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 534.950(Ft.)
 Downstream point/station elevation = 534.360(Ft.)
 Pipe length = 117.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 18.587(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 18.587(CFS)
 Normal flow depth in pipe = 15.67(In.)
 Flow top width inside pipe = 35.70(In.)
 Critical Depth = 16.57(In.)
 Pipe flow velocity = 6.30(Ft/s)
 Travel time through pipe = 0.31 min.
 Time of concentration (TC) = 10.60 min.

 Process from Point/Station 304.000 to Point/Station 67.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 534.360(Ft.)
 Downstream point/station elevation = 532.250(Ft.)
 Pipe length = 28.16(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 18.587(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 18.587(CFS)
 Normal flow depth in pipe = 7.76(In.)
 Flow top width inside pipe = 29.60(In.)
 Critical Depth = 16.57(In.)
 Pipe flow velocity = 16.60(Ft/s)
 Travel time through pipe = 0.03 min.
 Time of concentration (TC) = 10.63 min.

 Process from Point/Station 304.000 to Point/Station 67.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 8.970(Ac.)
 Runoff from this stream = 18.587(CFS)
 Time of concentration = 10.63 min.
 Rainfall intensity = 2.151(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	18.587	10.63	2.151

$Q_{max}(1) = 1.000 * 1.000 * 18.587 + = 18.587$

Total of 1 streams to confluence:
 Flow rates before confluence point:
 18.587
 Maximum flow rates at confluence using above data:
 18.587
 Area of streams before confluence:
 8.970

Results of confluence:
 Total flow rate = 18.587(CFS)
 Time of concentration = 10.629 min.
 Effective stream area after confluence = 8.970(Ac.)

+++++

Process from Point/Station 400.000 to Point/Station 401.000
 ***** INITIAL AREA EVALUATION *****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 284.000(Ft.)
 Highest elevation = 546.430(Ft.)
 Lowest elevation = 541.360(Ft.)
 Elevation difference = 5.070(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 6.50 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.8400) * (284.000^{.5})] / (1.785^{(1/3)}) = 6.50$
 Rainfall intensity (I) = 2.748(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 0.877(CFS)
 Total initial stream area = 0.380(Ac.)

+++++

Process from Point/Station 401.000 to Point/Station 71.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 537.360(Ft.)
 Downstream point/station elevation = 533.490(Ft.)
 Pipe length = 63.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.877(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 0.877(CFS)
 Normal flow depth in pipe = 2.26(In.)
 Flow top width inside pipe = 11.94(In.)
 Critical Depth = 4.18(In.)
 Pipe flow velocity = 6.83(Ft/s)
 Travel time through pipe = 0.15 min.
 Time of concentration (TC) = 6.66 min.

+++++

Process from Point/Station 401.000 to Point/Station 71.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 6.66 min.
 Rainfall intensity = 2.715(In/Hr) for a 5.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.890(CFS) for 0.390(Ac.)
 Total runoff = 1.767(CFS) Total area = 0.77(Ac.)

+++++

Process from Point/Station 401.000 to Point/Station 71.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 6.66 min.
 Rainfall intensity = 2.715(In/Hr) for a 5.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.342(CFS) for 0.150(Ac.)
 Total runoff = 2.109(CFS) Total area = 0.92(Ac.)

+++++
 Process from Point/Station 71.000 to Point/Station 72.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 533.490(Ft.)
 Downstream point/station elevation = 532.560(Ft.)
 Pipe length = 186.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.109(CFS)
 Given pipe size = 42.00(In.)
 Calculated individual pipe flow = 2.109(CFS)
 Normal flow depth in pipe = 4.96(In.)
 Flow top width inside pipe = 27.12(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 3.30(Ft/s)
 Travel time through pipe = 0.94 min.
 Time of concentration (TC) = 7.60 min.

+++++
 Process from Point/Station 72.000 to Point/Station 67.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 532.560(Ft.)
 Downstream point/station elevation = 532.250(Ft.)
 Pipe length = 61.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.109(CFS)
 Given pipe size = 42.00(In.)
 Calculated individual pipe flow = 2.109(CFS)
 Normal flow depth in pipe = 4.95(In.)
 Flow top width inside pipe = 27.07(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 3.31(Ft/s)
 Travel time through pipe = 0.31 min.
 Time of concentration (TC) = 7.90 min.

+++++
 Process from Point/Station 72.000 to Point/Station 67.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 7.90 min.
 Rainfall intensity = 2.490(In/Hr) for a 5.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 4.476(CFS) for 2.140(Ac.)
 Total runoff = 6.585(CFS) Total area = 3.06(Ac.)

+++++
 Process from Point/Station 72.000 to Point/Station 67.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 3.060(Ac.)
 Runoff from this stream = 6.585(CFS)
 Time of concentration = 7.90 min.
 Rainfall intensity = 2.490(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	18.587	10.63	2.151
2	6.585	7.90	2.490

Qmax(1) =
 $1.000 * 1.000 * 18.587) +$

$Q_{\max(2)} = 0.864 * 1.000 * 6.585) + = 24.275$
 $1.000 * 0.743 * 18.587) +$
 $1.000 * 1.000 * 6.585) + = 20.405$

Total of 2 streams to confluence:

Flow rates before confluence point:

18.587 6.585

Maximum flow rates at confluence using above data:

24.275 20.405

Area of streams before confluence:

8.970 3.060

Results of confluence:

Total flow rate = 24.275(CFS)

Time of concentration = 10.629 min.

Effective stream area after confluence = 12.030(Ac.)

++++++
 Process from Point/Station 91.000 to Point/Station 80.000
 ***** INITIAL AREA EVALUATION *****

User specified 'C' value of 0.840 given for subarea

Initial subarea flow distance = 155.000(Ft.)

Highest elevation = 545.810(Ft.)

Lowest elevation = 544.380(Ft.)

Elevation difference = 1.430(Ft.)

Time of concentration calculated by the urban

areas overland flow method (App X-C) = 5.99 min.

$TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})]$

$TC = [1.8 * (1.1 - 0.8400) * (155.000^{.5})] / (0.923^{(1/3)}) = 5.99$

Rainfall intensity (I) = 2.867(In/Hr) for a 5.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.840

Subarea runoff = 1.228(CFS)

Total initial stream area = 0.510(Ac.)

++++++
 Process from Point/Station 91.000 to Point/Station 80.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea

Time of concentration = 5.99 min.

Rainfall intensity = 2.867(In/Hr) for a 5.0 year storm

Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840

Subarea runoff = 0.891(CFS) for 0.370(Ac.)

Total runoff = 2.119(CFS) Total area = 0.88(Ac.)

++++++
 Process from Point/Station 80.000 to Point/Station 67.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 540.190(Ft.)

Downstream point/station elevation = 532.250(Ft.)

Pipe length = 40.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 2.119(CFS)

Given pipe size = 12.00(In.)

Calculated individual pipe flow = 2.119(CFS)

Normal flow depth in pipe = 2.96(In.)

Flow top width inside pipe = 10.35(In.)

Critical Depth = 7.46(In.)

Pipe flow velocity = 14.05(Ft/s)

Travel time through pipe = 0.05 min.

Time of concentration (TC) = 6.03 min.

+++++
 Process from Point/Station 80.000 to Point/Station 67.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
 Stream flow area = 0.880(Ac.)
 Runoff from this stream = 2.119(CFS)
 Time of concentration = 6.03 min.
 Rainfall intensity = 2.856(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	18.587	10.63	2.151
2	6.585	7.90	2.490
3	2.119	6.03	2.856

Qmax(1) =
 $1.000 * 1.000 * 18.587) +$
 $0.864 * 1.000 * 6.585) +$
 $0.753 * 1.000 * 2.119) + = 25.871$

Qmax(2) =
 $1.000 * 0.743 * 18.587) +$
 $1.000 * 1.000 * 6.585) +$
 $0.872 * 1.000 * 2.119) + = 22.253$

Qmax(3) =
 $1.000 * 0.568 * 18.587) +$
 $1.000 * 0.763 * 6.585) +$
 $1.000 * 1.000 * 2.119) + = 17.695$

Total of 3 streams to confluence:
 Flow rates before confluence point:
 18.587 6.585 2.119
 Maximum flow rates at confluence using above data:
 25.871 22.253 17.695
 Area of streams before confluence:
 8.970 3.060 0.880
 Results of confluence:
 Total flow rate = 25.871(CFS)
 Time of concentration = 10.629 min.
 Effective stream area after confluence = 12.910(Ac.)

+++++
 Process from Point/Station 402.000 to Point/Station 403.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 102.000(Ft.)
 Highest elevation = 544.650(Ft.)
 Lowest elevation = 542.670(Ft.)
 Elevation difference = 1.980(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 3.79 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.840) * (102.000^{.5})] / (1.941^{(1/3)}) = 3.79$
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 3.149(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 1.508(CFS)
 Total initial stream area = 0.570(Ac.)

+++++
 Process from Point/Station 402.000 to Point/Station 403.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 5.00 min.
 Rainfall intensity = 3.149(In/Hr) for a 5.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.714(CFS) for 0.270(Ac.)
 Total runoff = 2.222(CFS) Total area = 0.84(Ac.)

+++++
 Process from Point/Station 403.000 to Point/Station 67.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 539.670(Ft.)
 Downstream point/station elevation = 532.250(Ft.)
 Pipe length = 34.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.222(CFS)
 Given pipe size = 12.00(In.)
 Calculated individual pipe flow = 2.222(CFS)
 Normal flow depth in pipe = 2.96(In.)
 Flow top width inside pipe = 10.35(In.)
 Critical Depth = 7.65(In.)
 Pipe flow velocity = 14.74(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 5.04 min.

+++++
 Process from Point/Station 403.000 to Point/Station 67.000
 ***** CONFLUENCE OF MINOR STREAMS *****

Along Main Stream number: 1 in normal stream number 4
 Stream flow area = 0.840(Ac.)
 Runoff from this stream = 2.222(CFS)
 Time of concentration = 5.04 min.
 Rainfall intensity = 3.137(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	18.587	10.63	2.151
2	6.585	7.90	2.490
3	2.119	6.03	2.856
4	2.222	5.04	3.137

Qmax(1) =

1.000 *	1.000 *	18.587) +	
0.864 *	1.000 *	6.585) +	
0.753 *	1.000 *	2.119) +	
0.686 *	1.000 *	2.222) + =	27.395

Qmax(2) =

1.000 *	0.743 *	18.587) +	
1.000 *	1.000 *	6.585) +	
0.872 *	1.000 *	2.119) +	
0.794 *	1.000 *	2.222) + =	24.017

Qmax(3) =

1.000 *	0.568 *	18.587) +	
1.000 *	0.763 *	6.585) +	
1.000 *	1.000 *	2.119) +	
0.910 *	1.000 *	2.222) + =	19.719

Qmax(4) =

1.000 *	0.474 *	18.587) +	
1.000 *	0.638 *	6.585) +	
1.000 *	0.835 *	2.119) +	
1.000 *	1.000 *	2.222) + =	17.002

Total of 4 streams to confluence:
Flow rates before confluence point:
18.587 6.585 2.119 2.222
Maximum flow rates at confluence using above data:
27.395 24.017 19.719 17.002
Area of streams before confluence:
8.970 3.060 0.880 0.840
Results of confluence:
Total flow rate = 27.395(CFS)
Time of concentration = 10.629 min.
Effective stream area after confluence = 13.750(Ac.)

+++++
Process from Point/Station 67.000 to Point/Station 68.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 528.710(Ft.)
Downstream point/station elevation = 528.500(Ft.)
Pipe length = 27.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 27.395(CFS)
Given pipe size = 36.00(In.)
Calculated individual pipe flow = 27.395(CFS)
Normal flow depth in pipe = 17.27(In.)
Flow top width inside pipe = 35.97(In.)
Critical Depth = 20.31(In.)
Pipe flow velocity = 8.17(Ft/s)
Travel time through pipe = 0.06 min.
Time of concentration (TC) = 10.68 min.

+++++
Process from Point/Station 67.000 to Point/Station 68.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 10.68 min.
Rainfall intensity = 2.145(In/Hr) for a 5.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 0.090(CFS) for 0.050(Ac.)
Total runoff = 27.485(CFS) Total area = 13.80(Ac.)

+++++
Process from Point/Station 67.000 to Point/Station 68.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 13.800(Ac.)
Runoff from this stream = 27.485(CFS)
Time of concentration = 10.68 min.
Rainfall intensity = 2.145(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	26.365	12.89	1.956
2	27.485	10.68	2.145

Qmax(1) =
1.000 * 1.000 * 26.365) +
0.912 * 1.000 * 27.485) + = 51.431

Qmax(2) =
1.000 * 0.829 * 26.365) +
1.000 * 1.000 * 27.485) + = 49.333

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 26.365 27.485
 Maximum flow rates at confluence using above data:
 51.431 49.333
 Area of streams before confluence:
 22.840 13.800

Results of confluence:
 Total flow rate = 51.431(CFS)
 Time of concentration = 12.893 min.
 Effective stream area after confluence = 36.640(Ac.)

+++++
 Process from Point/Station 92.000 to Point/Station 93.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 170.000(Ft.)
 Highest elevation = 545.270(Ft.)
 Lowest elevation = 533.000(Ft.)
 Elevation difference = 12.270(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 3.16 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.8400) * (170.000^{.5})] / (7.218^{(1/3)}) = 3.16$
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 3.149(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 0.476(CFS)
 Total initial stream area = 0.180(Ac.)

+++++
 Process from Point/Station 303.000 to Point/Station 70.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 319.000(Ft.)
 Highest elevation = 550.000(Ft.)
 Lowest elevation = 537.600(Ft.)
 Elevation difference = 12.400(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 5.32 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.8400) * (319.000^{.5})] / (3.887^{(1/3)}) = 5.32$
 Rainfall intensity (I) = 3.050(In/Hr) for a 5.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 1.101(CFS)
 Total initial stream area = 0.430(Ac.)
 End of computations, total study area = 37.250 (Ac.)

San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4
Rational method hydrology program based on
San Diego County Flood Control Division 1985 hydrology manual
Rational Hydrology Study Date: 06/28/21

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

Program License Serial Number 4035

Rational hydrology study storm event year is 10.0
English (in-lb) input data Units used
English (in) rainfall data used

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

+++++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Initial subarea flow distance = 1408.000(Ft.)
Highest elevation = 595.900(Ft.)
Lowest elevation = 560.000(Ft.)
Elevation difference = 35.900(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 7.42 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.9500) * (1408.000^{.5})] / (2.550^{(1/3)}) = 7.42$
Rainfall intensity (I) = 2.956(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff = 5.336(CFS)
Total initial stream area = 1.900(Ac.)

+++++
Process from Point/Station 2.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 549.300(Ft.)
Downstream point/station elevation = 549.080(Ft.)
Pipe length = 22.25(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.336(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 5.336(CFS)
Normal flow depth in pipe = 9.12(In.)
Flow top width inside pipe = 18.00(In.)
Critical Depth = 10.67(In.)
Pipe flow velocity = 5.94(Ft/s)

Travel time through pipe = 0.06 min.
 Time of concentration (TC) = 7.48 min.

+++++
 Process from Point/Station 3.000 to Point/Station 4.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 547.820(Ft.)
 Downstream point/station elevation = 546.510(Ft.)
 Pipe length = 99.56(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.336(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 5.336(CFS)
 Normal flow depth in pipe = 6.82(In.)
 Flow top width inside pipe = 25.15(In.)
 Critical Depth = 9.14(In.)
 Pipe flow velocity = 6.36(Ft/s)
 Travel time through pipe = 0.26 min.
 Time of concentration (TC) = 7.74 min.

+++++
 Process from Point/Station 3.000 to Point/Station 4.000
 ***** CONFLUENCE OF MINOR STREAMS *****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 1.900(Ac.)
 Runoff from this stream = 5.336(CFS)
 Time of concentration = 7.74 min.
 Rainfall intensity = 2.896(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	5.336	7.74	2.896

Qmax(1) =
 1.000 * 1.000 * 5.336) + = 5.336

Total of 1 streams to confluence:
 Flow rates before confluence point:
 5.336
 Maximum flow rates at confluence using above data:
 5.336
 Area of streams before confluence:
 1.900
 Results of confluence:
 Total flow rate = 5.336(CFS)
 Time of concentration = 7.739 min.
 Effective stream area after confluence = 1.900(Ac.)

+++++
 Process from Point/Station 55.000 to Point/Station 300.000
 ***** INITIAL AREA EVALUATION *****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 203.000(Ft.)
 Highest elevation = 559.500(Ft.)
 Lowest elevation = 557.580(Ft.)
 Elevation difference = 1.920(Ft.)
 Time of concentration calculated by the urban areas overland flow method (App X-C) = 6.79 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.840) * (203.000^{.5})] / (0.946^{(1/3)}) = 6.79$

Rainfall intensity (I) = 3.084(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 0.700(CFS)
 Total initial stream area = 0.270(Ac.)

+++++
 Process from Point/Station 300.000 to Point/Station 301.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 553.420(Ft.)
 Downstream point/station elevation = 551.000(Ft.)
 Pipe length = 484.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.700(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 0.700(CFS)
 Normal flow depth in pipe = 3.73(In.)
 Flow top width inside pipe = 14.59(In.)
 Critical Depth = 3.73(In.)
 Pipe flow velocity = 2.64(Ft/s)
 Travel time through pipe = 3.05 min.
 Time of concentration (TC) = 9.85 min.

+++++
 Process from Point/Station 300.000 to Point/Station 301.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 9.85 min.
 Rainfall intensity = 2.584(In/Hr) for a 10.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.781(CFS) for 0.360(Ac.)
 Total runoff = 1.481(CFS) Total area = 0.63(Ac.)

+++++
 Process from Point/Station 300.000 to Point/Station 301.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 9.85 min.
 Rainfall intensity = 2.584(In/Hr) for a 10.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.304(CFS) for 0.140(Ac.)
 Total runoff = 1.785(CFS) Total area = 0.77(Ac.)

+++++
 Process from Point/Station 301.000 to Point/Station 302.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 551.000(Ft.)
 Downstream point/station elevation = 549.500(Ft.)
 Pipe length = 6.30(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.785(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 1.785(CFS)
 Normal flow depth in pipe = 2.30(In.)
 Flow top width inside pipe = 12.02(In.)
 Critical Depth = 6.03(In.)
 Pipe flow velocity = 13.57(Ft/s)
 Travel time through pipe = 0.01 min.
 Time of concentration (TC) = 9.85 min.

+++++

Process from Point/Station 302.000 to Point/Station 56.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 549.500(Ft.)
 Downstream point/station elevation = 548.890(Ft.)
 Pipe length = 3.50(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.785(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 1.785(CFS)
 Normal flow depth in pipe = 2.48(In.)
 Flow top width inside pipe = 12.40(In.)
 Critical Depth = 6.03(In.)
 Pipe flow velocity = 12.16(Ft/s)
 Travel time through pipe = 0.00 min.
 Time of concentration (TC) = 9.86 min.

+++++
 Process from Point/Station 302.000 to Point/Station 56.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 Time of concentration = 9.86 min.
 Rainfall intensity = 2.582(In/Hr) for a 10.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
 Subarea runoff = 1.227(CFS) for 0.500(Ac.)
 Total runoff = 3.011(CFS) Total area = 1.27(Ac.)

+++++
 Process from Point/Station 56.000 to Point/Station 4.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 548.890(Ft.)
 Downstream point/station elevation = 546.510(Ft.)
 Pipe length = 101.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.011(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 3.011(CFS)
 Normal flow depth in pipe = 5.27(In.)
 Flow top width inside pipe = 16.38(In.)
 Critical Depth = 7.92(In.)
 Pipe flow velocity = 6.99(Ft/s)
 Travel time through pipe = 0.24 min.
 Time of concentration (TC) = 10.10 min.

+++++
 Process from Point/Station 56.000 to Point/Station 4.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 1.270(Ac.)
 Runoff from this stream = 3.011(CFS)
 Time of concentration = 10.10 min.
 Rainfall intensity = 2.553(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	5.336	7.74	2.896

2 3.011 10.10 2.553
 Qmax(1) =
 1.000 * 1.000 * 5.336) +
 1.000 * 0.766 * 3.011) + = 7.643
 Qmax(2) =
 0.882 * 1.000 * 5.336) +
 1.000 * 1.000 * 3.011) + = 7.715

Total of 2 streams to confluence:
 Flow rates before confluence point:
 5.336 3.011
 Maximum flow rates at confluence using above data:
 7.643 7.715
 Area of streams before confluence:
 1.900 1.270
 Results of confluence:
 Total flow rate = 7.715(CFS)
 Time of concentration = 10.101 min.
 Effective stream area after confluence = 3.170(Ac.)

+++++
 Process from Point/Station 4.000 to Point/Station 108.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.510(Ft.)
 Downstream point/station elevation = 542.920(Ft.)
 Pipe length = 431.22(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 7.715(CFS)
 Given pipe size = 42.00(In.)
 Calculated individual pipe flow = 7.715(CFS)
 Normal flow depth in pipe = 8.92(In.)
 Flow top width inside pipe = 34.36(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 5.17(Ft/s)
 Travel time through pipe = 1.39 min.
 Time of concentration (TC) = 11.49 min.

+++++
 Process from Point/Station 4.000 to Point/Station 108.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 3.170(Ac.)
 Runoff from this stream = 7.715(CFS)
 Time of concentration = 11.49 min.
 Rainfall intensity = 2.404(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	7.715	11.49	2.404

Qmax(1) =
 1.000 * 1.000 * 7.715) + = 7.715

Total of 1 main streams to confluence:
 Flow rates before confluence point:
 7.715
 Maximum flow rates at confluence using above data:
 7.715
 Area of streams before confluence:
 3.170

Results of confluence:

Total flow rate = 7.715(CFS)

Time of concentration = 11.492 min.

Effective stream area after confluence = 3.170(Ac.)

+++++
Process from Point/Station 107.000 to Point/Station 107.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.450 given for subarea
Rainfall intensity (I) = 2.453(In/Hr) for a 10.0 year storm
User specified values are as follows:
TC = 11.00 min. Rain intensity = 2.45(In/Hr)
Total area = 19.100(Ac.) Total runoff = 19.000(CFS)

+++++
Process from Point/Station 107.000 to Point/Station 108.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.410(Ft.)
Downstream point/station elevation = 542.770(Ft.)
Pipe length = 126.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.000(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 19.000(CFS)
Normal flow depth in pipe = 11.67(In.)
Flow top width inside pipe = 29.25(In.)
Critical Depth = 17.74(In.)
Pipe flow velocity = 10.76(Ft/s)
Travel time through pipe = 0.20 min.
Time of concentration (TC) = 11.20 min.

+++++
Process from Point/Station 107.000 to Point/Station 108.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2

Stream flow area = 19.100(Ac.)

Runoff from this stream = 19.000(CFS)

Time of concentration = 11.20 min.

Rainfall intensity = 2.433(In/Hr)

Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	7.715	11.49	2.404
2	19.000	11.20	2.433

Qmax(1) =

1.000 *	1.000 *	7.715) +	
0.988 *	1.000 *	19.000) + =	26.484

Qmax(2) =

1.000 *	0.974 *	7.715) +	
1.000 *	1.000 *	19.000) + =	26.516

Total of 2 main streams to confluence:

Flow rates before confluence point:

7.715 19.000

Maximum flow rates at confluence using above data:

26.484 26.516

Area of streams before confluence:

3.170 19.100

Results of confluence:

Total flow rate = 26.516(CFS)

Time of concentration = 11.195 min.

Effective stream area after confluence = 22.270(Ac.)

+++++
Process from Point/Station 60.000 to Point/Station 61.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
Initial subarea flow distance = 400.000(Ft.)
Highest elevation = 559.700(Ft.)
Lowest elevation = 551.370(Ft.)
Elevation difference = 8.330(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 7.33 min.
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.840) * (400.000^{.5})] / (2.083^{(1/3)}) = 7.33$
Rainfall intensity (I) = 2.973(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
Subarea runoff = 1.423(CFS)
Total initial stream area = 0.570(Ac.)

+++++
Process from Point/Station 61.000 to Point/Station 303.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.500(Ft.)
Downstream point/station elevation = 545.140(Ft.)
Pipe length = 12.42(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.423(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 1.423(CFS)
Normal flow depth in pipe = 3.43(In.)
Flow top width inside pipe = 14.14(In.)
Critical Depth = 5.36(In.)
Pipe flow velocity = 6.05(Ft/s)
Travel time through pipe = 0.03 min.
Time of concentration (TC) = 7.36 min.

+++++
Process from Point/Station 303.000 to Point/Station 108.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.140(Ft.)
Downstream point/station elevation = 542.770(Ft.)
Pipe length = 22.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.423(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 1.423(CFS)
Normal flow depth in pipe = 2.17(In.)
Flow top width inside pipe = 15.55(In.)
Critical Depth = 4.64(In.)
Pipe flow velocity = 8.95(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 7.40 min.

+++++
Process from Point/Station 303.000 to Point/Station 108.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 3

Stream flow area = 0.570(Ac.)

Runoff from this stream = 1.423(CFS)

Time of concentration = 7.40 min.

Rainfall intensity = 2.958(In/Hr)

Summary of stream data:

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

1	7.715	11.49	2.404
---	-------	-------	-------

2	19.000	11.20	2.433
---	--------	-------	-------

3	1.423	7.40	2.958
---	-------	------	-------

Qmax(1) =

1.000 * 1.000 * 7.715) +
0.988 * 1.000 * 19.000) +
0.813 * 1.000 * 1.423) + = 27.641

Qmax(2) =

1.000 * 0.974 * 7.715) +
1.000 * 1.000 * 19.000) +
0.823 * 1.000 * 1.423) + = 27.687

Qmax(3) =

1.000 * 0.644 * 7.715) +
1.000 * 0.661 * 19.000) +
1.000 * 1.000 * 1.423) + = 18.962

Total of 3 main streams to confluence:

Flow rates before confluence point:

7.715 19.000 1.423

Maximum flow rates at confluence using above data:

27.641 27.687 18.962

Area of streams before confluence:

3.170 19.100 0.570

Results of confluence:

Total flow rate = 27.687(CFS)

Time of concentration = 11.195 min.

Effective stream area after confluence = 22.840(Ac.)

+++++

Process from Point/Station 108.000 to Point/Station 109.000

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

Upstream point/station elevation = 542.420(Ft.)

Downstream point/station elevation = 542.140(Ft.)

Pipe length = 59.60(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 27.687(CFS)

Given pipe size = 48.00(In.)

Calculated individual pipe flow = 27.687(CFS)

Normal flow depth in pipe = 17.41(In.)

Flow top width inside pipe = 46.16(In.)

Critical Depth = 18.68(In.)

Pipe flow velocity = 6.73(Ft/s)

Travel time through pipe = 0.15 min.

Time of concentration (TC) = 11.34 min.

+++++

Process from Point/Station 109.000 to Point/Station 13.000

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

Upstream point/station elevation = 541.190(Ft.)

Downstream point/station elevation = 539.900(Ft.)
 Pipe length = 67.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 27.687(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 27.687(CFS)
 Normal flow depth in pipe = 12.08(In.)
 Flow top width inside pipe = 41.66(In.)
 Critical Depth = 18.68(In.)
 Pipe flow velocity = 11.16(Ft/s)
 Travel time through pipe = 0.10 min.
 Time of concentration (TC) = 11.44 min.

++++++
 Process from Point/Station 13.000 to Point/Station 14.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 539.480(Ft.)
 Downstream point/station elevation = 535.250(Ft.)
 Pipe length = 254.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 27.687(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 27.687(CFS)
 Normal flow depth in pipe = 12.54(In.)
 Flow top width inside pipe = 42.17(In.)
 Critical Depth = 18.68(In.)
 Pipe flow velocity = 10.60(Ft/s)
 Travel time through pipe = 0.40 min.
 Time of concentration (TC) = 11.84 min.

++++++
 Process from Point/Station 14.000 to Point/Station 15.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 534.830(Ft.)
 Downstream point/station elevation = 533.560(Ft.)
 Pipe length = 127.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 27.687(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 27.687(CFS)
 Normal flow depth in pipe = 14.29(In.)
 Flow top width inside pipe = 43.89(In.)
 Critical Depth = 18.68(In.)
 Pipe flow velocity = 8.83(Ft/s)
 Travel time through pipe = 0.24 min.
 Time of concentration (TC) = 12.08 min.

++++++
 Process from Point/Station 15.000 to Point/Station 16.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 533.140(Ft.)
 Downstream point/station elevation = 530.850(Ft.)
 Pipe length = 227.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 27.687(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 27.687(CFS)
 Normal flow depth in pipe = 14.25(In.)
 Flow top width inside pipe = 43.86(In.)
 Critical Depth = 18.68(In.)
 Pipe flow velocity = 8.86(Ft/s)
 Travel time through pipe = 0.43 min.
 Time of concentration (TC) = 12.51 min.

+++++
 Process from Point/Station 16.000 to Point/Station 68.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 530.490(Ft.)
 Downstream point/station elevation = 528.500(Ft.)
 Pipe length = 193.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 27.687(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 27.687(CFS)
 Normal flow depth in pipe = 14.17(In.)
 Flow top width inside pipe = 43.79(In.)
 Critical Depth = 18.68(In.)
 Pipe flow velocity = 8.93(Ft/s)
 Travel time through pipe = 0.36 min.
 Time of concentration (TC) = 12.87 min.

+++++
 Process from Point/Station 16.000 to Point/Station 68.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 22.840(Ac.)
 Runoff from this stream = 27.687(CFS)
 Time of concentration = 12.87 min.
 Rainfall intensity = 2.279(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	27.687	12.87	2.279

Q_{max}(1) =
 $1.000 * 1.000 * 27.687 + = 27.687$

Total of 1 main streams to confluence:
 Flow rates before confluence point:
 27.687
 Maximum flow rates at confluence using above data:
 27.687
 Area of streams before confluence:
 22.840

Results of confluence:
 Total flow rate = 27.687(CFS)
 Time of concentration = 12.869 min.
 Effective stream area after confluence = 22.840(Ac.)

+++++
 Process from Point/Station 52.000 to Point/Station 53.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 81.000(Ft.)
 Highest elevation = 544.910(Ft.)
 Lowest elevation = 544.480(Ft.)
 Elevation difference = 0.430(Ft.)
 Time of concentration calculated by the urban areas overland flow method (App X-C) = 5.20 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.840) * (81.000^{.5})] / (0.531^{(1/3)}) = 5.20$
 Rainfall intensity (I) = 3.521(In/Hr) for a 10.0 year storm

Effective runoff coefficient used for area ($Q=KCIA$) is $C = 0.840$
Subarea runoff = 1.420(CFS)
Total initial stream area = 0.480(Ac.)

+++++
Process from Point/Station 52.000 to Point/Station 53.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.20 min.
Rainfall intensity = 3.521(In/Hr) for a 10.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 0.148(CFS) for 0.050(Ac.)
Total runoff = 1.568(CFS) Total area = 0.53(Ac.)

+++++
Process from Point/Station 53.000 to Point/Station 54.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 541.840(Ft.)
Downstream point/station elevation = 541.280(Ft.)
Pipe length = 112.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.568(CFS)
Given pipe size = 12.00(In.)
Calculated individual pipe flow = 1.568(CFS)
Normal flow depth in pipe = 6.86(In.)
Flow top width inside pipe = 11.88(In.)
Critical Depth = 6.38(In.)
Pipe flow velocity = 3.38(Ft/s)
Travel time through pipe = 0.55 min.
Time of concentration (TC) = 5.75 min.

+++++
Process from Point/Station 53.000 to Point/Station 54.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.75 min.
Rainfall intensity = 3.347(In/Hr) for a 10.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 1.265(CFS) for 0.450(Ac.)
Total runoff = 2.833(CFS) Total area = 0.98(Ac.)

+++++
Process from Point/Station 54.000 to Point/Station 57.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 541.280(Ft.)
Downstream point/station elevation = 540.380(Ft.)
Pipe length = 180.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.833(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 2.833(CFS)
Normal flow depth in pipe = 6.84(In.)
Flow top width inside pipe = 21.67(In.)
Critical Depth = 7.03(In.)
Pipe flow velocity = 3.84(Ft/s)
Travel time through pipe = 0.78 min.
Time of concentration (TC) = 6.53 min.

+++++
Process from Point/Station 54.000 to Point/Station 57.000

**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 6.53 min.
 Rainfall intensity = 3.143(In/Hr) for a 10.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 1.399(CFS) for 0.530(Ac.)
 Total runoff = 4.232(CFS) Total area = 1.51(Ac.)

+++++
 Process from Point/Station 54.000 to Point/Station 57.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 6.53 min.
 Rainfall intensity = 3.143(In/Hr) for a 10.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 0.264(CFS) for 0.100(Ac.)
 Total runoff = 4.496(CFS) Total area = 1.61(Ac.)

+++++
 Process from Point/Station 57.000 to Point/Station 58.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 540.300(Ft.)
 Downstream point/station elevation = 539.350(Ft.)
 Pipe length = 206.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.496(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 4.496(CFS)
 Normal flow depth in pipe = 8.89(In.)
 Flow top width inside pipe = 23.18(In.)
 Critical Depth = 8.94(In.)
 Pipe flow velocity = 4.25(Ft/s)
 Travel time through pipe = 0.81 min.
 Time of concentration (TC) = 7.34 min.

+++++
 Process from Point/Station 58.000 to Point/Station 62.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 539.350(Ft.)
 Downstream point/station elevation = 538.770(Ft.)
 Pipe length = 115.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.496(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 4.496(CFS)
 Normal flow depth in pipe = 8.68(In.)
 Flow top width inside pipe = 23.07(In.)
 Critical Depth = 8.94(In.)
 Pipe flow velocity = 4.39(Ft/s)
 Travel time through pipe = 0.44 min.
 Time of concentration (TC) = 7.78 min.

+++++
 Process from Point/Station 62.000 to Point/Station 63.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 538.770(Ft.)
 Downstream point/station elevation = 537.030(Ft.)
 Pipe length = 347.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.496(CFS)
 Given pipe size = 24.00(In.)

Calculated individual pipe flow = 4.496(CFS)
 Normal flow depth in pipe = 8.70(In.)
 Flow top width inside pipe = 23.07(In.)
 Critical Depth = 8.94(In.)
 Pipe flow velocity = 4.38(Ft/s)
 Travel time through pipe = 1.32 min.
 Time of concentration (TC) = 9.10 min.

++++++
 Process from Point/Station 62.000 to Point/Station 63.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 9.10 min.
 Rainfall intensity = 2.681(In/Hr) for a 10.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 10.653(CFS) for 4.730(Ac.)
 Total runoff = 15.149(CFS) Total area = 6.34(Ac.)

++++++
 Process from Point/Station 63.000 to Point/Station 64.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 537.030(Ft.)
 Downstream point/station elevation = 536.480(Ft.)
 Pipe length = 84.00(Ft.) Manning's $N = 0.013$
 No. of pipes = 1 Required pipe flow = 15.149(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 15.149(CFS)
 Normal flow depth in pipe = 16.64(In.)
 Flow top width inside pipe = 22.13(In.)
 Critical Depth = 16.84(In.)
 Pipe flow velocity = 6.51(Ft/s)
 Travel time through pipe = 0.22 min.
 Time of concentration (TC) = 9.32 min.

++++++
 Process from Point/Station 63.000 to Point/Station 64.000
 ***** CONFLUENCE OF MINOR STREAMS *****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 6.340(Ac.)
 Runoff from this stream = 15.149(CFS)
 Time of concentration = 9.32 min.
 Rainfall intensity = 2.652(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	15.149	9.32	2.652

$Q_{\max}(1) = 1.000 * 1.000 * 15.149) + = 15.149$

Total of 1 streams to confluence:
 Flow rates before confluence point:
 15.149
 Maximum flow rates at confluence using above data:
 15.149
 Area of streams before confluence:
 6.340
 Results of confluence:
 Total flow rate = 15.149(CFS)

Time of concentration = 9.317 min.
Effective stream area after confluence = 6.340(Ac.)

+++++
Process from Point/Station 52.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
Initial subarea flow distance = 90.000(Ft.)
Highest elevation = 544.890(Ft.)
Lowest elevation = 544.050(Ft.)
Elevation difference = 0.840(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 4.54 min.
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.840) * (90.000^{.5})] / (0.933^{(1/3)}) = 4.54$
Setting time of concentration to 5 minutes
Rainfall intensity (I) = 3.592(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
Subarea runoff = 1.328(CFS)
Total initial stream area = 0.440(Ac.)

+++++
Process from Point/Station 52.000 to Point/Station 201.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.00 min.
Rainfall intensity = 3.592(In/Hr) for a 10.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
Subarea runoff = 0.513(CFS) for 0.170(Ac.)
Total runoff = 1.841(CFS) Total area = 0.61(Ac.)

+++++
Process from Point/Station 52.000 to Point/Station 201.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.00 min.
Rainfall intensity = 3.592(In/Hr) for a 10.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
Subarea runoff = 0.241(CFS) for 0.080(Ac.)
Total runoff = 2.082(CFS) Total area = 0.69(Ac.)

+++++
Process from Point/Station 201.000 to Point/Station 202.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 541.640(Ft.)
Downstream point/station elevation = 541.190(Ft.)
Pipe length = 89.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.082(CFS)
Given pipe size = 12.00(In.)
Calculated individual pipe flow = 2.082(CFS)
Normal flow depth in pipe = 8.29(In.)
Flow top width inside pipe = 11.10(In.)
Critical Depth = 7.40(In.)
Pipe flow velocity = 3.60(Ft/s)
Travel time through pipe = 0.41 min.
Time of concentration (TC) = 5.41 min.

+++++

Process from Point/Station 201.000 to Point/Station 202.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.41 min.
Rainfall intensity = 3.451(In/Hr) for a 10.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 1.624(CFS) for 0.560(Ac.)
Total runoff = 3.706(CFS) Total area = 1.25(Ac.)

+++++
Process from Point/Station 201.000 to Point/Station 202.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.41 min.
Rainfall intensity = 3.451(In/Hr) for a 10.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 0.783(CFS) for 0.270(Ac.)
Total runoff = 4.489(CFS) Total area = 1.52(Ac.)

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

Upstream point/station elevation = 541.190(Ft.)
Downstream point/station elevation = 539.600(Ft.)
Pipe length = 242.00(Ft.) Manning's $N = 0.013$
No. of pipes = 1 Required pipe flow = 4.489(CFS)
Given pipe size = 15.00(In.)
Calculated individual pipe flow = 4.489(CFS)
Normal flow depth in pipe = 10.69(In.)
Flow top width inside pipe = 13.58(In.)
Critical Depth = 10.30(In.)
Pipe flow velocity = 4.80(Ft/s)
Travel time through pipe = 0.84 min.
Time of concentration (TC) = 6.25 min.

+++++
Process from Point/Station 203.000 to Point/Station 64.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 539.600(Ft.)
Downstream point/station elevation = 536.480(Ft.)
Pipe length = 300.00(Ft.) Manning's $N = 0.013$
No. of pipes = 1 Required pipe flow = 4.489(CFS)
Given pipe size = 15.00(In.)
Calculated individual pipe flow = 4.489(CFS)
Normal flow depth in pipe = 9.08(In.)
Flow top width inside pipe = 14.66(In.)
Critical Depth = 10.30(In.)
Pipe flow velocity = 5.77(Ft/s)
Travel time through pipe = 0.87 min.
Time of concentration (TC) = 7.12 min.

+++++
Process from Point/Station 203.000 to Point/Station 64.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 7.12 min.
Rainfall intensity = 3.015(In/Hr) for a 10.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$

Subarea runoff = 1.849(CFS) for 0.730(Ac.)
 Total runoff = 6.337(CFS) Total area = 2.25(Ac.)

+++++
 Process from Point/Station 203.000 to Point/Station 64.000
 ***** CONFLUENCE OF MINOR STREAMS *****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 2.250(Ac.)
 Runoff from this stream = 6.337(CFS)
 Time of concentration = 7.12 min.
 Rainfall intensity = 3.015(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	15.149	9.32	2.652
2	6.337	7.12	3.015

Qmax(1) =
 1.000 * 1.000 * 15.149) +
 0.880 * 1.000 * 6.337) + = 20.724

Qmax(2) =
 1.000 * 0.764 * 15.149) +
 1.000 * 1.000 * 6.337) + = 17.912

Total of 2 streams to confluence:
 Flow rates before confluence point:
 15.149 6.337
 Maximum flow rates at confluence using above data:
 20.724 17.912
 Area of streams before confluence:
 6.340 2.250
 Results of confluence:
 Total flow rate = 20.724(CFS)
 Time of concentration = 9.317 min.
 Effective stream area after confluence = 8.590(Ac.)

+++++
 Process from Point/Station 64.000 to Point/Station 65.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 536.480(Ft.)
 Downstream point/station elevation = 534.950(Ft.)
 Pipe length = 306.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 20.724(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 20.724(CFS)
 Normal flow depth in pipe = 16.70(In.)
 Flow top width inside pipe = 35.91(In.)
 Critical Depth = 17.52(In.)
 Pipe flow velocity = 6.46(Ft/s)
 Travel time through pipe = 0.79 min.
 Time of concentration (TC) = 10.11 min.

+++++
 Process from Point/Station 64.000 to Point/Station 65.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 10.11 min.
 Rainfall intensity = 2.552(In/Hr) for a 10.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840

Subarea runoff = 0.815(CFS) for 0.380(Ac.)
 Total runoff = 21.538(CFS) Total area = 8.97(Ac.)

+++++
 Process from Point/Station 65.000 to Point/Station 304.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 534.950(Ft.)
 Downstream point/station elevation = 534.360(Ft.)
 Pipe length = 117.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 21.538(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 21.538(CFS)
 Normal flow depth in pipe = 17.04(In.)
 Flow top width inside pipe = 35.95(In.)
 Critical Depth = 17.92(In.)
 Pipe flow velocity = 6.54(Ft/s)
 Travel time through pipe = 0.30 min.
 Time of concentration (TC) = 10.41 min.

+++++
 Process from Point/Station 304.000 to Point/Station 67.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 534.360(Ft.)
 Downstream point/station elevation = 532.250(Ft.)
 Pipe length = 28.16(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 21.538(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 21.538(CFS)
 Normal flow depth in pipe = 8.35(In.)
 Flow top width inside pipe = 30.39(In.)
 Critical Depth = 17.92(In.)
 Pipe flow velocity = 17.33(Ft/s)
 Travel time through pipe = 0.03 min.
 Time of concentration (TC) = 10.43 min.

+++++
 Process from Point/Station 304.000 to Point/Station 67.000
 ***** CONFLUENCE OF MINOR STREAMS *****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 8.970(Ac.)
 Runoff from this stream = 21.538(CFS)
 Time of concentration = 10.43 min.
 Rainfall intensity = 2.515(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	21.538	10.43	2.515

Q_{max}(1) =
 1.000 * 1.000 * 21.538) + = 21.538

Total of 1 streams to confluence:
 Flow rates before confluence point:
 21.538
 Maximum flow rates at confluence using above data:
 21.538
 Area of streams before confluence:
 8.970
 Results of confluence:

Total flow rate = 21.538(CFS)
 Time of concentration = 10.432 min.
 Effective stream area after confluence = 8.970(Ac.)

 Process from Point/Station 400.000 to Point/Station 401.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 284.000(Ft.)
 Highest elevation = 546.430(Ft.)
 Lowest elevation = 541.360(Ft.)
 Elevation difference = 5.070(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 6.50 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.840) * (284.000^{.5})] / (1.785^{(1/3)}) = 6.50$
 Rainfall intensity (I) = 3.151(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 1.006(CFS)
 Total initial stream area = 0.380(Ac.)

 Process from Point/Station 401.000 to Point/Station 71.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 537.360(Ft.)
 Downstream point/station elevation = 533.490(Ft.)
 Pipe length = 63.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.006(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 1.006(CFS)
 Normal flow depth in pipe = 2.42(In.)
 Flow top width inside pipe = 12.27(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 7.11(Ft/s)
 Travel time through pipe = 0.15 min.
 Time of concentration (TC) = 6.65 min.

 Process from Point/Station 401.000 to Point/Station 71.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 6.65 min.
 Rainfall intensity = 3.117(In/Hr) for a 10.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 1.021(CFS) for 0.390(Ac.)
 Total runoff = 2.027(CFS) Total area = 0.77(Ac.)

 Process from Point/Station 401.000 to Point/Station 71.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 6.65 min.
 Rainfall intensity = 3.117(In/Hr) for a 10.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.393(CFS) for 0.150(Ac.)
 Total runoff = 2.420(CFS) Total area = 0.92(Ac.)

Process from Point/Station 71.000 to Point/Station 72.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 533.490(Ft.)
 Downstream point/station elevation = 532.560(Ft.)
 Pipe length = 186.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.420(CFS)
 Given pipe size = 42.00(In.)
 Calculated individual pipe flow = 2.420(CFS)
 Normal flow depth in pipe = 5.30(In.)
 Flow top width inside pipe = 27.90(In.)
 Critical Depth = 5.55(In.)
 Pipe flow velocity = 3.43(Ft/s)
 Travel time through pipe = 0.90 min.
 Time of concentration (TC) = 7.55 min.

+++++
 Process from Point/Station 72.000 to Point/Station 67.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 532.560(Ft.)
 Downstream point/station elevation = 532.250(Ft.)
 Pipe length = 61.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.420(CFS)
 Given pipe size = 42.00(In.)
 Calculated individual pipe flow = 2.420(CFS)
 Normal flow depth in pipe = 5.29(In.)
 Flow top width inside pipe = 27.86(In.)
 Critical Depth = 5.55(In.)
 Pipe flow velocity = 3.46(Ft/s)
 Travel time through pipe = 0.29 min.
 Time of concentration (TC) = 7.85 min.

+++++
 Process from Point/Station 72.000 to Point/Station 67.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 7.85 min.
 Rainfall intensity = 2.877(In/Hr) for a 10.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 5.172(CFS) for 2.140(Ac.)
 Total runoff = 7.592(CFS) Total area = 3.06(Ac.)

+++++
 Process from Point/Station 72.000 to Point/Station 67.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 3.060(Ac.)
 Runoff from this stream = 7.592(CFS)
 Time of concentration = 7.85 min.
 Rainfall intensity = 2.877(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	21.538	10.43	2.515
2	7.592	7.85	2.877

Qmax(1) =

$$1.000 * 1.000 * 21.538 + 0.874 * 1.000 * 7.592 + = 28.174$$

Qmax(2) =
 1.000 * 0.752 * 21.538) +
 1.000 * 1.000 * 7.592) + = 23.790

Total of 2 streams to confluence:
 Flow rates before confluence point:
 21.538 7.592
 Maximum flow rates at confluence using above data:
 28.174 23.790
 Area of streams before confluence:
 8.970 3.060
 Results of confluence:
 Total flow rate = 28.174(CFS)
 Time of concentration = 10.432 min.
 Effective stream area after confluence = 12.030(Ac.)

+++++
 Process from Point/Station 91.000 to Point/Station 80.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 155.000(Ft.)
 Highest elevation = 545.810(Ft.)
 Lowest elevation = 544.380(Ft.)
 Elevation difference = 1.430(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 5.99 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.8400) * (155.000^{.5})] / (0.923^{(1/3)}) = 5.99$
 Rainfall intensity (I) = 3.282(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 1.406(CFS)
 Total initial stream area = 0.510(Ac.)

+++++
 Process from Point/Station 91.000 to Point/Station 80.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 5.99 min.
 Rainfall intensity = 3.282(In/Hr) for a 10.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 1.020(CFS) for 0.370(Ac.)
 Total runoff = 2.426(CFS) Total area = 0.88(Ac.)

+++++
 Process from Point/Station 80.000 to Point/Station 67.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 540.190(Ft.)
 Downstream point/station elevation = 532.250(Ft.)
 Pipe length = 40.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.426(CFS)
 Given pipe size = 12.00(In.)
 Calculated individual pipe flow = 2.426(CFS)
 Normal flow depth in pipe = 3.17(In.)
 Flow top width inside pipe = 10.58(In.)
 Critical Depth = 8.00(In.)
 Pipe flow velocity = 14.61(Ft/s)
 Travel time through pipe = 0.05 min.
 Time of concentration (TC) = 6.03 min.

+++++

Process from Point/Station 80.000 to Point/Station 67.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3

Stream flow area = 0.880(Ac.)
 Runoff from this stream = 2.426(CFS)
 Time of concentration = 6.03 min.
 Rainfall intensity = 3.270(In/Hr)
 Summary of stream data:

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

1	21.538	10.43	2.515
2	7.592	7.85	2.877
3	2.426	6.03	3.270

Qmax(1) =
 1.000 * 1.000 * 21.538) +
 0.874 * 1.000 * 7.592) +
 0.769 * 1.000 * 2.426) + = 30.040

Qmax(2) =
 1.000 * 0.752 * 21.538) +
 1.000 * 1.000 * 7.592) +
 0.880 * 1.000 * 2.426) + = 25.925

Qmax(3) =
 1.000 * 0.578 * 21.538) +
 1.000 * 0.769 * 7.592) +
 1.000 * 1.000 * 2.426) + = 20.713

Total of 3 streams to confluence:

Flow rates before confluence point:

21.538 7.592 2.426

Maximum flow rates at confluence using above data:

30.040 25.925 20.713

Area of streams before confluence:

8.970 3.060 0.880

Results of confluence:

Total flow rate = 30.040(CFS)

Time of concentration = 10.432 min.

Effective stream area after confluence = 12.910(Ac.)

+++++
 Process from Point/Station 402.000 to Point/Station 403.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea

Initial subarea flow distance = 102.000(Ft.)

Highest elevation = 544.650(Ft.)

Lowest elevation = 542.670(Ft.)

Elevation difference = 1.980(Ft.)

Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 3.79 min.

TC = $[1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})]$

TC = $[1.8 * (1.1 - 0.8400) * (102.000^{.5})] / (1.941^{(1/3)})] = 3.79$

Setting time of concentration to 5 minutes

Rainfall intensity (I) = 3.592(In/Hr) for a 10.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.840

Subarea runoff = 1.720(CFS)

Total initial stream area = 0.570(Ac.)

+++++
 Process from Point/Station 402.000 to Point/Station 403.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 5.00 min.
 Rainfall intensity = 3.592(In/Hr) for a 10.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 0.815(CFS) for 0.270(Ac.)
 Total runoff = 2.535(CFS) Total area = 0.84(Ac.)

+++++
 Process from Point/Station 403.000 to Point/Station 67.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 539.670(Ft.)
 Downstream point/station elevation = 532.250(Ft.)
 Pipe length = 34.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.535(CFS)
 Given pipe size = 12.00(In.)
 Calculated individual pipe flow = 2.535(CFS)
 Normal flow depth in pipe = 3.16(In.)
 Flow top width inside pipe = 10.57(In.)
 Critical Depth = 8.18(In.)
 Pipe flow velocity = 15.31(Ft/s)
 Travel time through pipe = 0.04 min.
 Time of concentration (TC) = 5.04 min.

+++++
 Process from Point/Station 403.000 to Point/Station 67.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 4
 Stream flow area = 0.840(Ac.)
 Runoff from this stream = 2.535(CFS)
 Time of concentration = 5.04 min.
 Rainfall intensity = 3.579(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	21.538	10.43	2.515
2	7.592	7.85	2.877
3	2.426	6.03	3.270
4	2.535	5.04	3.579

Qmax(1) =

1.000 *	1.000 *	21.538) +	
0.874 *	1.000 *	7.592) +	
0.769 *	1.000 *	2.426) +	
0.703 *	1.000 *	2.535) + =	31.821

Qmax(2) =

1.000 *	0.752 *	21.538) +	
1.000 *	1.000 *	7.592) +	
0.880 *	1.000 *	2.426) +	
0.804 *	1.000 *	2.535) + =	27.963

Qmax(3) =

1.000 *	0.578 *	21.538) +	
1.000 *	0.769 *	7.592) +	
1.000 *	1.000 *	2.426) +	
0.914 *	1.000 *	2.535) + =	23.029

Qmax(4) =

1.000 *	0.483 *	21.538) +	
1.000 *	0.642 *	7.592) +	
1.000 *	0.835 *	2.426) +	
1.000 *	1.000 *	2.535) + =	19.834

Total of 4 streams to confluence:

Flow rates before confluence point:
 21.538 7.592 2.426 2.535
 Maximum flow rates at confluence using above data:
 31.821 27.963 23.029 19.834
 Area of streams before confluence:
 8.970 3.060 0.880 0.840
 Results of confluence:
 Total flow rate = 31.821(CFS)
 Time of concentration = 10.432 min.
 Effective stream area after confluence = 13.750(Ac.)

+++++
 Process from Point/Station 67.000 to Point/Station 68.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 528.710(Ft.)
 Downstream point/station elevation = 528.500(Ft.)
 Pipe length = 27.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 31.821(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 31.821(CFS)
 Normal flow depth in pipe = 18.87(In.)
 Flow top width inside pipe = 35.96(In.)
 Critical Depth = 21.97(In.)
 Pipe flow velocity = 8.49(Ft/s)
 Travel time through pipe = 0.05 min.
 Time of concentration (TC) = 10.49 min.

+++++
 Process from Point/Station 67.000 to Point/Station 68.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 10.49 min.
 Rainfall intensity = 2.509(In/Hr) for a 10.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.105(CFS) for 0.050(Ac.)
 Total runoff = 31.927(CFS) Total area = 13.80(Ac.)

+++++
 Process from Point/Station 67.000 to Point/Station 68.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
 Stream flow area = 13.800(Ac.)
 Runoff from this stream = 31.927(CFS)
 Time of concentration = 10.49 min.
 Rainfall intensity = 2.509(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	27.687	12.87	2.279
2	31.927	10.49	2.509

Qmax(1) =
 1.000 * 1.000 * 27.687) +
 0.909 * 1.000 * 31.927) + = 56.693

Qmax(2) =
 1.000 * 0.815 * 27.687) +
 1.000 * 1.000 * 31.927) + = 54.485

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 27.687 31.927
 Maximum flow rates at confluence using above data:
 56.693 54.485
 Area of streams before confluence:
 22.840 13.800

Results of confluence:
 Total flow rate = 56.693(CFS)
 Time of concentration = 12.869 min.
 Effective stream area after confluence = 36.640(Ac.)

+++++
 Process from Point/Station 92.000 to Point/Station 93.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 170.000(Ft.)
 Highest elevation = 545.270(Ft.)
 Lowest elevation = 533.000(Ft.)
 Elevation difference = 12.270(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 3.16 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.8400) * (170.000^{.5})] / (7.218^{(1/3)}) = 3.16$
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 3.592(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 0.543(CFS)
 Total initial stream area = 0.180(Ac.)

+++++
 Process from Point/Station 303.000 to Point/Station 70.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 319.000(Ft.)
 Highest elevation = 550.000(Ft.)
 Lowest elevation = 537.600(Ft.)
 Elevation difference = 12.400(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 5.32 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.8400) * (319.000^{.5})] / (3.887^{(1/3)}) = 5.32$
 Rainfall intensity (I) = 3.483(In/Hr) for a 10.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 1.258(CFS)
 Total initial stream area = 0.430(Ac.)
 End of computations, total study area = 37.250 (Ac.)

San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4
Rational method hydrology program based on
San Diego County Flood Control Division 1985 hydrology manual
Rational Hydrology Study Date: 06/28/21

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

Program License Serial Number 4035

Rational hydrology study storm event year is 25.0
English (in-lb) input data Units used
English (in) rainfall data used

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

+++++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type]
Initial subarea flow distance = 1408.000(Ft.)
Highest elevation = 595.900(Ft.)
Lowest elevation = 560.000(Ft.)
Elevation difference = 35.900(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 7.42 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.9500) * (1408.000^{.5})] / (2.550^{(1/3)}) = 7.42$
Rainfall intensity (I) = 3.206(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff = 5.787(CFS)
Total initial stream area = 1.900(Ac.)

+++++
Process from Point/Station 2.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 549.300(Ft.)
Downstream point/station elevation = 549.080(Ft.)
Pipe length = 22.25(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.787(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 5.787(CFS)
Normal flow depth in pipe = 9.57(In.)
Flow top width inside pipe = 17.96(In.)
Critical Depth = 11.15(In.)
Pipe flow velocity = 6.06(Ft/s)

Travel time through pipe = 0.06 min.
 Time of concentration (TC) = 7.48 min.

+++++
 Process from Point/Station 3.000 to Point/Station 4.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 547.820(Ft.)
 Downstream point/station elevation = 546.510(Ft.)
 Pipe length = 99.56(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 5.787(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 5.787(CFS)
 Normal flow depth in pipe = 7.10(In.)
 Flow top width inside pipe = 25.50(In.)
 Critical Depth = 9.54(In.)
 Pipe flow velocity = 6.51(Ft/s)
 Travel time through pipe = 0.25 min.
 Time of concentration (TC) = 7.73 min.

+++++
 Process from Point/Station 3.000 to Point/Station 4.000
 ***** CONFLUENCE OF MINOR STREAMS *****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 1.900(Ac.)
 Runoff from this stream = 5.787(CFS)
 Time of concentration = 7.73 min.
 Rainfall intensity = 3.147(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	5.787	7.73	3.147

Qmax(1) =
 1.000 * 1.000 * 5.787) + = 5.787

Total of 1 streams to confluence:
 Flow rates before confluence point:
 5.787
 Maximum flow rates at confluence using above data:
 5.787
 Area of streams before confluence:
 1.900
 Results of confluence:
 Total flow rate = 5.787(CFS)
 Time of concentration = 7.732 min.
 Effective stream area after confluence = 1.900(Ac.)

+++++
 Process from Point/Station 55.000 to Point/Station 300.000
 ***** INITIAL AREA EVALUATION *****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 203.000(Ft.)
 Highest elevation = 559.500(Ft.)
 Lowest elevation = 557.580(Ft.)
 Elevation difference = 1.920(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 6.79 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.840) * (203.000^{.5})] / (0.946^{(1/3)}) = 6.79$

Rainfall intensity (I) = 3.335(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 0.756(CFS)
 Total initial stream area = 0.270(Ac.)

+++++
 Process from Point/Station 300.000 to Point/Station 301.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 553.420(Ft.)
 Downstream point/station elevation = 551.000(Ft.)
 Pipe length = 484.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.756(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 0.756(CFS)
 Normal flow depth in pipe = 3.88(In.)
 Flow top width inside pipe = 14.80(In.)
 Critical Depth = 3.87(In.)
 Pipe flow velocity = 2.70(Ft/s)
 Travel time through pipe = 2.99 min.
 Time of concentration (TC) = 9.78 min.

+++++
 Process from Point/Station 300.000 to Point/Station 301.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 9.78 min.
 Rainfall intensity = 2.840(In/Hr) for a 25.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.859(CFS) for 0.360(Ac.)
 Total runoff = 1.615(CFS) Total area = 0.63(Ac.)

+++++
 Process from Point/Station 300.000 to Point/Station 301.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 9.78 min.
 Rainfall intensity = 2.840(In/Hr) for a 25.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.334(CFS) for 0.140(Ac.)
 Total runoff = 1.949(CFS) Total area = 0.77(Ac.)

+++++
 Process from Point/Station 301.000 to Point/Station 302.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 551.000(Ft.)
 Downstream point/station elevation = 549.500(Ft.)
 Pipe length = 6.30(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.949(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 1.949(CFS)
 Normal flow depth in pipe = 2.40(In.)
 Flow top width inside pipe = 12.23(In.)
 Critical Depth = 6.31(In.)
 Pipe flow velocity = 13.93(Ft/s)
 Travel time through pipe = 0.01 min.
 Time of concentration (TC) = 9.79 min.

+++++

Process from Point/Station 302.000 to Point/Station 56.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 549.500(Ft.)
 Downstream point/station elevation = 548.890(Ft.)
 Pipe length = 3.50(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.949(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 1.949(CFS)
 Normal flow depth in pipe = 2.59(In.)
 Flow top width inside pipe = 12.63(In.)
 Critical Depth = 6.31(In.)
 Pipe flow velocity = 12.49(Ft/s)
 Travel time through pipe = 0.00 min.
 Time of concentration (TC) = 9.79 min.

+++++
 Process from Point/Station 302.000 to Point/Station 56.000
 **** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 Time of concentration = 9.79 min.
 Rainfall intensity = 2.838(In/Hr) for a 25.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.950
 Subarea runoff = 1.348(CFS) for 0.500(Ac.)
 Total runoff = 3.297(CFS) Total area = 1.27(Ac.)

+++++
 Process from Point/Station 56.000 to Point/Station 4.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 548.890(Ft.)
 Downstream point/station elevation = 546.510(Ft.)
 Pipe length = 101.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.297(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 3.297(CFS)
 Normal flow depth in pipe = 5.52(In.)
 Flow top width inside pipe = 16.60(In.)
 Critical Depth = 8.30(In.)
 Pipe flow velocity = 7.17(Ft/s)
 Travel time through pipe = 0.23 min.
 Time of concentration (TC) = 10.03 min.

+++++
 Process from Point/Station 56.000 to Point/Station 4.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 1.270(Ac.)
 Runoff from this stream = 3.297(CFS)
 Time of concentration = 10.03 min.
 Rainfall intensity = 2.809(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	5.787	7.73	3.147

2 3.297 10.03 2.809
Qmax(1) =
 1.000 * 1.000 * 5.787) +
 1.000 * 0.771 * 3.297) + = 8.330
Qmax(2) =
 0.893 * 1.000 * 5.787) +
 1.000 * 1.000 * 3.297) + = 8.463

Total of 2 streams to confluence:
Flow rates before confluence point:
 5.787 3.297
Maximum flow rates at confluence using above data:
 8.330 8.463
Area of streams before confluence:
 1.900 1.270
Results of confluence:
Total flow rate = 8.463(CFS)
Time of concentration = 10.026 min.
Effective stream area after confluence = 3.170(Ac.)

+++++
Process from Point/Station 4.000 to Point/Station 108.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.510(Ft.)
Downstream point/station elevation = 542.920(Ft.)
Pipe length = 431.22(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 8.463(CFS)
Given pipe size = 42.00(In.)
Calculated individual pipe flow = 8.463(CFS)
Normal flow depth in pipe = 9.34(In.)
Flow top width inside pipe = 34.93(In.)
Critical Depth = 10.53(In.)
Pipe flow velocity = 5.31(Ft/s)
Travel time through pipe = 1.35 min.
Time of concentration (TC) = 11.38 min.

+++++
Process from Point/Station 4.000 to Point/Station 108.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
Stream flow area = 3.170(Ac.)
Runoff from this stream = 8.463(CFS)
Time of concentration = 11.38 min.
Rainfall intensity = 2.659(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	8.463	11.38	2.659

Qmax(1) =
 1.000 * 1.000 * 8.463) + = 8.463

Total of 1 main streams to confluence:
Flow rates before confluence point:
 8.463
Maximum flow rates at confluence using above data:
 8.463
Area of streams before confluence:
 3.170

Results of confluence:

Total flow rate = 8.463(CFS)

Time of concentration = 11.380 min.

Effective stream area after confluence = 3.170(Ac.)

++++
Process from Point/Station 107.000 to Point/Station 107.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.450 given for subarea
Rainfall intensity (I) = 2.699(In/Hr) for a 25.0 year storm
User specified values are as follows:
TC = 11.00 min. Rain intensity = 2.70(In/Hr)
Total area = 19.100(Ac.) Total runoff = 19.000(CFS)

++++
Process from Point/Station 107.000 to Point/Station 108.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.410(Ft.)
Downstream point/station elevation = 542.770(Ft.)
Pipe length = 126.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.000(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 19.000(CFS)
Normal flow depth in pipe = 11.67(In.)
Flow top width inside pipe = 29.25(In.)
Critical Depth = 17.74(In.)
Pipe flow velocity = 10.76(Ft/s)
Travel time through pipe = 0.20 min.
Time of concentration (TC) = 11.20 min.

++++
Process from Point/Station 107.000 to Point/Station 108.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2

Stream flow area = 19.100(Ac.)

Runoff from this stream = 19.000(CFS)

Time of concentration = 11.20 min.

Rainfall intensity = 2.678(In/Hr)

Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	8.463	11.38	2.659
2	19.000	11.20	2.678

Qmax(1) =

1.000 *	1.000 *	8.463) +	
0.993 *	1.000 *	19.000) + =	27.328

Qmax(2) =

1.000 *	0.984 *	8.463) +	
1.000 *	1.000 *	19.000) + =	27.325

Total of 2 main streams to confluence:

Flow rates before confluence point:

8.463 19.000

Maximum flow rates at confluence using above data:

27.328 27.325

Area of streams before confluence:

3.170 19.100

Results of confluence:

Total flow rate = 27.328(CFS)

Time of concentration = 11.380 min.

Effective stream area after confluence = 22.270(Ac.)

+++++
Process from Point/Station 60.000 to Point/Station 61.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
Initial subarea flow distance = 400.000(Ft.)
Highest elevation = 559.700(Ft.)
Lowest elevation = 551.370(Ft.)
Elevation difference = 8.330(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 7.33 min.
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.840) * (400.000^{.5}) / (2.083^{(1/3)})] = 7.33$
Rainfall intensity (I) = 3.223(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
Subarea runoff = 1.543(CFS)
Total initial stream area = 0.570(Ac.)

+++++
Process from Point/Station 61.000 to Point/Station 303.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.500(Ft.)
Downstream point/station elevation = 545.140(Ft.)
Pipe length = 12.42(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.543(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 1.543(CFS)
Normal flow depth in pipe = 3.57(In.)
Flow top width inside pipe = 14.36(In.)
Critical Depth = 5.58(In.)
Pipe flow velocity = 6.20(Ft/s)
Travel time through pipe = 0.03 min.
Time of concentration (TC) = 7.36 min.

+++++
Process from Point/Station 303.000 to Point/Station 108.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.140(Ft.)
Downstream point/station elevation = 542.770(Ft.)
Pipe length = 22.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.543(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 1.543(CFS)
Normal flow depth in pipe = 2.26(In.)
Flow top width inside pipe = 15.83(In.)
Critical Depth = 4.83(In.)
Pipe flow velocity = 9.18(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 7.40 min.

+++++
Process from Point/Station 303.000 to Point/Station 108.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 3

Stream flow area = 0.570(Ac.)

Runoff from this stream = 1.543(CFS)

Time of concentration = 7.40 min.

Rainfall intensity = 3.209(In/Hr)

Summary of stream data:

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

1	8.463	11.38	2.659
---	-------	-------	-------

2	19.000	11.20	2.678
---	--------	-------	-------

3	1.543	7.40	3.209
---	-------	------	-------

Qmax(1) =

1.000 * 1.000 * 8.463) +
0.993 * 1.000 * 19.000) +
0.829 * 1.000 * 1.543) + = 28.607

Qmax(2) =

1.000 * 0.984 * 8.463) +
1.000 * 1.000 * 19.000) +
0.835 * 1.000 * 1.543) + = 28.613

Qmax(3) =

1.000 * 0.651 * 8.463) +
1.000 * 0.661 * 19.000) +
1.000 * 1.000 * 1.543) + = 19.612

Total of 3 main streams to confluence:

Flow rates before confluence point:

8.463 19.000 1.543

Maximum flow rates at confluence using above data:

28.607 28.613 19.612

Area of streams before confluence:

3.170 19.100 0.570

Results of confluence:

Total flow rate = 28.613(CFS)

Time of concentration = 11.195 min.

Effective stream area after confluence = 22.840(Ac.)

+++++

Process from Point/Station 108.000 to Point/Station 109.000

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

Upstream point/station elevation = 542.420(Ft.)

Downstream point/station elevation = 542.140(Ft.)

Pipe length = 59.60(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 28.613(CFS)

Given pipe size = 48.00(In.)

Calculated individual pipe flow = 28.613(CFS)

Normal flow depth in pipe = 17.72(In.)

Flow top width inside pipe = 46.33(In.)

Critical Depth = 19.01(In.)

Pipe flow velocity = 6.79(Ft/s)

Travel time through pipe = 0.15 min.

Time of concentration (TC) = 11.34 min.

+++++

Process from Point/Station 109.000 to Point/Station 13.000

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

Upstream point/station elevation = 541.190(Ft.)

Downstream point/station elevation = 539.900(Ft.)
 Pipe length = 67.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 28.613(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 28.613(CFS)
 Normal flow depth in pipe = 12.29(In.)
 Flow top width inside pipe = 41.90(In.)
 Critical Depth = 19.01(In.)
 Pipe flow velocity = 11.27(Ft/s)
 Travel time through pipe = 0.10 min.
 Time of concentration (TC) = 11.44 min.

++++++
 Process from Point/Station 13.000 to Point/Station 14.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 539.480(Ft.)
 Downstream point/station elevation = 535.250(Ft.)
 Pipe length = 254.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 28.613(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 28.613(CFS)
 Normal flow depth in pipe = 12.75(In.)
 Flow top width inside pipe = 42.40(In.)
 Critical Depth = 19.01(In.)
 Pipe flow velocity = 10.70(Ft/s)
 Travel time through pipe = 0.40 min.
 Time of concentration (TC) = 11.84 min.

++++++
 Process from Point/Station 14.000 to Point/Station 15.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 534.830(Ft.)
 Downstream point/station elevation = 533.560(Ft.)
 Pipe length = 127.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 28.613(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 28.613(CFS)
 Normal flow depth in pipe = 14.53(In.)
 Flow top width inside pipe = 44.11(In.)
 Critical Depth = 19.01(In.)
 Pipe flow velocity = 8.92(Ft/s)
 Travel time through pipe = 0.24 min.
 Time of concentration (TC) = 12.07 min.

++++++
 Process from Point/Station 15.000 to Point/Station 16.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 533.140(Ft.)
 Downstream point/station elevation = 530.850(Ft.)
 Pipe length = 227.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 28.613(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 28.613(CFS)
 Normal flow depth in pipe = 14.50(In.)
 Flow top width inside pipe = 44.08(In.)
 Critical Depth = 19.01(In.)
 Pipe flow velocity = 8.94(Ft/s)
 Travel time through pipe = 0.42 min.
 Time of concentration (TC) = 12.50 min.

+++++
 Process from Point/Station 16.000 to Point/Station 68.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 530.490(Ft.)
 Downstream point/station elevation = 528.500(Ft.)
 Pipe length = 193.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 28.613(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 28.613(CFS)
 Normal flow depth in pipe = 14.41(In.)
 Flow top width inside pipe = 44.00(In.)
 Critical Depth = 19.01(In.)
 Pipe flow velocity = 9.01(Ft/s)
 Travel time through pipe = 0.36 min.
 Time of concentration (TC) = 12.85 min.

+++++
 Process from Point/Station 16.000 to Point/Station 68.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 1
 Stream flow area = 22.840(Ac.)
 Runoff from this stream = 28.613(CFS)
 Time of concentration = 12.85 min.
 Rainfall intensity = 2.522(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	28.613	12.85	2.522

Qmax(1) =
 $1.000 * 1.000 * 28.613 + = 28.613$

Total of 1 main streams to confluence:
 Flow rates before confluence point:
 28.613
 Maximum flow rates at confluence using above data:
 28.613
 Area of streams before confluence:
 22.840

Results of confluence:
 Total flow rate = 28.613(CFS)
 Time of concentration = 12.854 min.
 Effective stream area after confluence = 22.840(Ac.)

+++++
 Process from Point/Station 52.000 to Point/Station 53.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 81.000(Ft.)
 Highest elevation = 544.910(Ft.)
 Lowest elevation = 544.480(Ft.)
 Elevation difference = 0.430(Ft.)
 Time of concentration calculated by the urban areas overland flow method (App X-C) = 5.20 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.840) * (81.000^{.5})] / (0.531^{(1/3)}) = 5.20$
 Rainfall intensity (I) = 3.773(In/Hr) for a 25.0 year storm

Effective runoff coefficient used for area ($Q=KCIA$) is $C = 0.840$
Subarea runoff = 1.521(CFS)
Total initial stream area = 0.480(Ac.)

+++++
Process from Point/Station 52.000 to Point/Station 53.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.20 min.
Rainfall intensity = 3.773(In/Hr) for a 25.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 0.158(CFS) for 0.050(Ac.)
Total runoff = 1.680(CFS) Total area = 0.53(Ac.)

+++++
Process from Point/Station 53.000 to Point/Station 54.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 541.840(Ft.)
Downstream point/station elevation = 541.280(Ft.)
Pipe length = 112.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.680(CFS)
Given pipe size = 12.00(In.)
Calculated individual pipe flow = 1.680(CFS)
Normal flow depth in pipe = 7.17(In.)
Flow top width inside pipe = 11.77(In.)
Critical Depth = 6.61(In.)
Pipe flow velocity = 3.43(Ft/s)
Travel time through pipe = 0.54 min.
Time of concentration (TC) = 5.75 min.

+++++
Process from Point/Station 53.000 to Point/Station 54.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.75 min.
Rainfall intensity = 3.601(In/Hr) for a 25.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 1.361(CFS) for 0.450(Ac.)
Total runoff = 3.041(CFS) Total area = 0.98(Ac.)

+++++
Process from Point/Station 54.000 to Point/Station 57.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 541.280(Ft.)
Downstream point/station elevation = 540.380(Ft.)
Pipe length = 180.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.041(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 3.041(CFS)
Normal flow depth in pipe = 7.09(In.)
Flow top width inside pipe = 21.90(In.)
Critical Depth = 7.29(In.)
Pipe flow velocity = 3.92(Ft/s)
Travel time through pipe = 0.77 min.
Time of concentration (TC) = 6.51 min.

+++++
Process from Point/Station 54.000 to Point/Station 57.000

**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 6.51 min.
 Rainfall intensity = 3.400(In/Hr) for a 25.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 1.514(CFS) for 0.530(Ac.)
 Total runoff = 4.555(CFS) Total area = 1.51(Ac.)

+++++
 Process from Point/Station 54.000 to Point/Station 57.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 6.51 min.
 Rainfall intensity = 3.400(In/Hr) for a 25.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 0.286(CFS) for 0.100(Ac.)
 Total runoff = 4.840(CFS) Total area = 1.61(Ac.)

+++++
 Process from Point/Station 57.000 to Point/Station 58.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 540.300(Ft.)
 Downstream point/station elevation = 539.350(Ft.)
 Pipe length = 206.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.840(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 4.840(CFS)
 Normal flow depth in pipe = 9.26(In.)
 Flow top width inside pipe = 23.36(In.)
 Critical Depth = 9.28(In.)
 Pipe flow velocity = 4.33(Ft/s)
 Travel time through pipe = 0.79 min.
 Time of concentration (TC) = 7.30 min.

+++++
 Process from Point/Station 58.000 to Point/Station 62.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 539.350(Ft.)
 Downstream point/station elevation = 538.770(Ft.)
 Pipe length = 115.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.840(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 4.840(CFS)
 Normal flow depth in pipe = 9.04(In.)
 Flow top width inside pipe = 23.26(In.)
 Critical Depth = 9.28(In.)
 Pipe flow velocity = 4.48(Ft/s)
 Travel time through pipe = 0.43 min.
 Time of concentration (TC) = 7.73 min.

+++++
 Process from Point/Station 62.000 to Point/Station 63.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 538.770(Ft.)
 Downstream point/station elevation = 537.030(Ft.)
 Pipe length = 347.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 4.840(CFS)
 Given pipe size = 24.00(In.)

Calculated individual pipe flow = 4.840(CFS)
 Normal flow depth in pipe = 9.05(In.)
 Flow top width inside pipe = 23.26(In.)
 Critical Depth = 9.28(In.)
 Pipe flow velocity = 4.47(Ft/s)
 Travel time through pipe = 1.30 min.
 Time of concentration (TC) = 9.03 min.

+++++
 Process from Point/Station 62.000 to Point/Station 63.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 9.03 min.
 Rainfall intensity = 2.940(In/Hr) for a 25.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 11.682(CFS) for 4.730(Ac.)
 Total runoff = 16.523(CFS) Total area = 6.34(Ac.)

+++++
 Process from Point/Station 63.000 to Point/Station 64.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 537.030(Ft.)
 Downstream point/station elevation = 536.480(Ft.)
 Pipe length = 84.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 16.523(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 16.523(CFS)
 Normal flow depth in pipe = 17.84(In.)
 Flow top width inside pipe = 20.97(In.)
 Critical Depth = 17.59(In.)
 Pipe flow velocity = 6.60(Ft/s)
 Travel time through pipe = 0.21 min.
 Time of concentration (TC) = 9.24 min.

+++++
 Process from Point/Station 63.000 to Point/Station 64.000
 ***** CONFLUENCE OF MINOR STREAMS *****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 6.340(Ac.)
 Runoff from this stream = 16.523(CFS)
 Time of concentration = 9.24 min.
 Rainfall intensity = 2.911(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	16.523	9.24	2.911

Q_{max}(1) =
 $1.000 * 1.000 * 16.523) + = 16.523$

Total of 1 streams to confluence:
 Flow rates before confluence point:
 16.523
 Maximum flow rates at confluence using above data:
 16.523
 Area of streams before confluence:
 6.340
 Results of confluence:
 Total flow rate = 16.523(CFS)

Time of concentration = 9.239 min.
Effective stream area after confluence = 6.340(Ac.)

+++++
Process from Point/Station 52.000 to Point/Station 201.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
Initial subarea flow distance = 90.000(Ft.)
Highest elevation = 544.890(Ft.)
Lowest elevation = 544.050(Ft.)
Elevation difference = 0.840(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 4.54 min.
 $TC = [1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.840) * (90.000^{.5})] / (0.933^{(1/3)}) = 4.54$
Setting time of concentration to 5 minutes
Rainfall intensity (I) = 3.845(In/Hr) for a 25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
Subarea runoff = 1.421(CFS)
Total initial stream area = 0.440(Ac.)

+++++
Process from Point/Station 52.000 to Point/Station 201.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.00 min.
Rainfall intensity = 3.845(In/Hr) for a 25.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
Subarea runoff = 0.549(CFS) for 0.170(Ac.)
Total runoff = 1.970(CFS) Total area = 0.61(Ac.)

+++++
Process from Point/Station 52.000 to Point/Station 201.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.00 min.
Rainfall intensity = 3.845(In/Hr) for a 25.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
Subarea runoff = 0.258(CFS) for 0.080(Ac.)
Total runoff = 2.229(CFS) Total area = 0.69(Ac.)

+++++
Process from Point/Station 201.000 to Point/Station 202.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 541.640(Ft.)
Downstream point/station elevation = 541.190(Ft.)
Pipe length = 89.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.229(CFS)
Given pipe size = 12.00(In.)
Calculated individual pipe flow = 2.229(CFS)
Normal flow depth in pipe = 8.73(In.)
Flow top width inside pipe = 10.69(In.)
Critical Depth = 7.66(In.)
Pipe flow velocity = 3.64(Ft/s)
Travel time through pipe = 0.41 min.
Time of concentration (TC) = 5.41 min.

+++++

Process from Point/Station 201.000 to Point/Station 202.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.41 min.
Rainfall intensity = 3.705(In/Hr) for a 25.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 1.743(CFS) for 0.560(Ac.)
Total runoff = 3.971(CFS) Total area = 1.25(Ac.)

++++
Process from Point/Station 201.000 to Point/Station 202.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.41 min.
Rainfall intensity = 3.705(In/Hr) for a 25.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 0.840(CFS) for 0.270(Ac.)
Total runoff = 4.812(CFS) Total area = 1.52(Ac.)

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

Upstream point/station elevation = 541.190(Ft.)
Downstream point/station elevation = 539.600(Ft.)
Pipe length = 242.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.812(CFS)
Given pipe size = 15.00(In.)
Calculated individual pipe flow = 4.812(CFS)
Normal flow depth in pipe = 11.32(In.)
Flow top width inside pipe = 12.91(In.)
Critical Depth = 10.68(In.)
Pipe flow velocity = 4.84(Ft/s)
Travel time through pipe = 0.83 min.
Time of concentration (TC) = 6.24 min.

++++
Process from Point/Station 203.000 to Point/Station 64.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 539.600(Ft.)
Downstream point/station elevation = 536.480(Ft.)
Pipe length = 300.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 4.812(CFS)
Given pipe size = 15.00(In.)
Calculated individual pipe flow = 4.812(CFS)
Normal flow depth in pipe = 9.52(In.)
Flow top width inside pipe = 14.45(In.)
Critical Depth = 10.68(In.)
Pipe flow velocity = 5.86(Ft/s)
Travel time through pipe = 0.85 min.
Time of concentration (TC) = 7.09 min.

++++
Process from Point/Station 203.000 to Point/Station 64.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 7.09 min.
Rainfall intensity = 3.271(In/Hr) for a 25.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$

Subarea runoff = 2.005(CFS) for 0.730(Ac.)
 Total runoff = 6.817(CFS) Total area = 2.25(Ac.)

+++++
 Process from Point/Station 203.000 to Point/Station 64.000
 ***** CONFLUENCE OF MINOR STREAMS *****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 2.250(Ac.)
 Runoff from this stream = 6.817(CFS)
 Time of concentration = 7.09 min.
 Rainfall intensity = 3.271(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	16.523	9.24	2.911
2	6.817	7.09	3.271

Qmax(1) =
 1.000 * 1.000 * 16.523) +
 0.890 * 1.000 * 6.817) + = 22.589

Qmax(2) =
 1.000 * 0.768 * 16.523) +
 1.000 * 1.000 * 6.817) + = 19.504

Total of 2 streams to confluence:
 Flow rates before confluence point:
 16.523 6.817
 Maximum flow rates at confluence using above data:
 22.589 19.504
 Area of streams before confluence:
 6.340 2.250

Results of confluence:
 Total flow rate = 22.589(CFS)
 Time of concentration = 9.239 min.
 Effective stream area after confluence = 8.590(Ac.)

+++++
 Process from Point/Station 64.000 to Point/Station 65.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 536.480(Ft.)
 Downstream point/station elevation = 534.950(Ft.)
 Pipe length = 306.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 22.589(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 22.589(CFS)
 Normal flow depth in pipe = 17.55(In.)
 Flow top width inside pipe = 35.99(In.)
 Critical Depth = 18.37(In.)
 Pipe flow velocity = 6.60(Ft/s)
 Travel time through pipe = 0.77 min.
 Time of concentration (TC) = 10.01 min.

+++++
 Process from Point/Station 64.000 to Point/Station 65.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 10.01 min.
 Rainfall intensity = 2.811(In/Hr) for a 25.0 year storm

Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 0.897(CFS) for 0.380(Ac.)
 Total runoff = 23.487(CFS) Total area = 8.97(Ac.)

 Process from Point/Station 65.000 to Point/Station 304.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 534.950(Ft.)
 Downstream point/station elevation = 534.360(Ft.)
 Pipe length = 117.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 23.487(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 23.487(CFS)
 Normal flow depth in pipe = 17.91(In.)
 Flow top width inside pipe = 36.00(In.)
 Critical Depth = 18.73(In.)
 Pipe flow velocity = 6.69(Ft/s)
 Travel time through pipe = 0.29 min.
 Time of concentration (TC) = 10.30 min.

 Process from Point/Station 304.000 to Point/Station 67.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 534.360(Ft.)
 Downstream point/station elevation = 532.250(Ft.)
 Pipe length = 28.16(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 23.487(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 23.487(CFS)
 Normal flow depth in pipe = 8.72(In.)
 Flow top width inside pipe = 30.85(In.)
 Critical Depth = 18.73(In.)
 Pipe flow velocity = 17.77(Ft/s)
 Travel time through pipe = 0.03 min.
 Time of concentration (TC) = 10.33 min.

 Process from Point/Station 304.000 to Point/Station 67.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 8.970(Ac.)
 Runoff from this stream = 23.487(CFS)
 Time of concentration = 10.33 min.
 Rainfall intensity = 2.773(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	23.487	10.33	2.773

$Q_{\max}(1) = 1.000 * 1.000 * 23.487 + = 23.487$

Total of 1 streams to confluence:
 Flow rates before confluence point:
 23.487
 Maximum flow rates at confluence using above data:
 23.487
 Area of streams before confluence:
 8.970

Results of confluence:
 Total flow rate = 23.487(CFS)
 Time of concentration = 10.330 min.
 Effective stream area after confluence = 8.970(Ac.)

+++++

Process from Point/Station 400.000 to Point/Station 401.000
 ***** INITIAL AREA EVALUATION *****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 284.000(Ft.)
 Highest elevation = 546.430(Ft.)
 Lowest elevation = 541.360(Ft.)
 Elevation difference = 5.070(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 6.50 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.8400) * (284.000^{.5})] / (1.785^{(1/3)}) = 6.50$
 Rainfall intensity (I) = 3.402(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 1.086(CFS)
 Total initial stream area = 0.380(Ac.)

+++++

Process from Point/Station 401.000 to Point/Station 71.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 537.360(Ft.)
 Downstream point/station elevation = 533.490(Ft.)
 Pipe length = 63.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.086(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 1.086(CFS)
 Normal flow depth in pipe = 2.51(In.)
 Flow top width inside pipe = 12.46(In.)
 Critical Depth = 4.67(In.)
 Pipe flow velocity = 7.27(Ft/s)
 Travel time through pipe = 0.14 min.
 Time of concentration (TC) = 6.65 min.

+++++

Process from Point/Station 401.000 to Point/Station 71.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 6.65 min.
 Rainfall intensity = 3.368(In/Hr) for a 25.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 1.103(CFS) for 0.390(Ac.)
 Total runoff = 2.189(CFS) Total area = 0.77(Ac.)

+++++

Process from Point/Station 401.000 to Point/Station 71.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 6.65 min.
 Rainfall intensity = 3.368(In/Hr) for a 25.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.424(CFS) for 0.150(Ac.)
 Total runoff = 2.614(CFS) Total area = 0.92(Ac.)

+++++
 Process from Point/Station 71.000 to Point/Station 72.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 533.490(Ft.)
 Downstream point/station elevation = 532.560(Ft.)
 Pipe length = 186.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.614(CFS)
 Given pipe size = 42.00(In.)
 Calculated individual pipe flow = 2.614(CFS)
 Normal flow depth in pipe = 5.50(In.)
 Flow top width inside pipe = 28.34(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 3.51(Ft/s)
 Travel time through pipe = 0.88 min.
 Time of concentration (TC) = 7.53 min.

+++++
 Process from Point/Station 72.000 to Point/Station 67.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 532.560(Ft.)
 Downstream point/station elevation = 532.250(Ft.)
 Pipe length = 61.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.614(CFS)
 Given pipe size = 42.00(In.)
 Calculated individual pipe flow = 2.614(CFS)
 Normal flow depth in pipe = 5.48(In.)
 Flow top width inside pipe = 28.30(In.)
 Critical depth could not be calculated.
 Pipe flow velocity = 3.54(Ft/s)
 Travel time through pipe = 0.29 min.
 Time of concentration (TC) = 7.82 min.

+++++
 Process from Point/Station 72.000 to Point/Station 67.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 7.82 min.
 Rainfall intensity = 3.132(In/Hr) for a 25.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 5.631(CFS) for 2.140(Ac.)
 Total runoff = 8.245(CFS) Total area = 3.06(Ac.)

+++++
 Process from Point/Station 72.000 to Point/Station 67.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 3.060(Ac.)
 Runoff from this stream = 8.245(CFS)
 Time of concentration = 7.82 min.
 Rainfall intensity = 3.132(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	23.487	10.33	2.773
2	8.245	7.82	3.132

Qmax(1) =
 $1.000 * 1.000 * 23.487) +$

$0.885 * 1.000 * 8.245) + = 30.786$
 $Q_{max(2)} = 1.000 * 0.757 * 23.487) +$
 $1.000 * 1.000 * 8.245) + = 26.015$

Total of 2 streams to confluence:

Flow rates before confluence point:

23.487 8.245

Maximum flow rates at confluence using above data:

30.786 26.015

Area of streams before confluence:

8.970 3.060

Results of confluence:

Total flow rate = 30.786(CFS)

Time of concentration = 10.330 min.

Effective stream area after confluence = 12.030(Ac.)

++++++
 Process from Point/Station 91.000 to Point/Station 80.000
 ***** INITIAL AREA EVALUATION *****

User specified 'C' value of 0.840 given for subarea

Initial subarea flow distance = 155.000(Ft.)

Highest elevation = 545.810(Ft.)

Lowest elevation = 544.380(Ft.)

Elevation difference = 1.430(Ft.)

Time of concentration calculated by the urban

areas overland flow method (App X-C) = 5.99 min.

$TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$

$TC = [1.8 * (1.1 - 0.8400) * (155.000^{.5})] / (0.923^{(1/3)}) = 5.99$

Rainfall intensity (I) = 3.534(In/Hr) for a 25.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.840

Subarea runoff = 1.514(CFS)

Total initial stream area = 0.510(Ac.)

++++++
 Process from Point/Station 91.000 to Point/Station 80.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea

Time of concentration = 5.99 min.

Rainfall intensity = 3.534(In/Hr) for a 25.0 year storm

Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840

Subarea runoff = 1.098(CFS) for 0.370(Ac.)

Total runoff = 2.612(CFS) Total area = 0.88(Ac.)

++++++
 Process from Point/Station 80.000 to Point/Station 67.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 540.190(Ft.)

Downstream point/station elevation = 532.250(Ft.)

Pipe length = 40.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 2.612(CFS)

Given pipe size = 12.00(In.)

Calculated individual pipe flow = 2.612(CFS)

Normal flow depth in pipe = 3.29(In.)

Flow top width inside pipe = 10.71(In.)

Critical Depth = 8.32(In.)

Pipe flow velocity = 14.93(Ft/s)

Travel time through pipe = 0.04 min.

Time of concentration (TC) = 6.03 min.

+++++
 Process from Point/Station 80.000 to Point/Station 67.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
 Stream flow area = 0.880(Ac.)
 Runoff from this stream = 2.612(CFS)
 Time of concentration = 6.03 min.
 Rainfall intensity = 3.522(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	23.487	10.33	2.773
2	8.245	7.82	3.132
3	2.612	6.03	3.522

Qmax(1) =
 $1.000 * 1.000 * 23.487 + 0.885 * 1.000 * 8.245 + 0.787 * 1.000 * 2.612 = 32.842$

Qmax(2) =
 $1.000 * 0.757 * 23.487 + 1.000 * 1.000 * 8.245 + 0.889 * 1.000 * 2.612 = 28.338$

Qmax(3) =
 $1.000 * 0.584 * 23.487 + 1.000 * 0.772 * 8.245 + 1.000 * 1.000 * 2.612 = 22.683$

Total of 3 streams to confluence:
 Flow rates before confluence point:
 23.487 8.245 2.612
 Maximum flow rates at confluence using above data:
 32.842 28.338 22.683
 Area of streams before confluence:
 8.970 3.060 0.880
 Results of confluence:
 Total flow rate = 32.842(CFS)
 Time of concentration = 10.330 min.
 Effective stream area after confluence = 12.910(Ac.)

+++++
 Process from Point/Station 402.000 to Point/Station 403.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 102.000(Ft.)
 Highest elevation = 544.650(Ft.)
 Lowest elevation = 542.670(Ft.)
 Elevation difference = 1.980(Ft.)
 Time of concentration calculated by the urban areas overland flow method (App X-C) = 3.79 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.840) * (102.000^{.5})] / (1.941^{(1/3)}) = 3.79$
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 3.845(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 1.841(CFS)
 Total initial stream area = 0.570(Ac.)

+++++
 Process from Point/Station 402.000 to Point/Station 403.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.00 min.
Rainfall intensity = 3.845(In/Hr) for a 25.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
Subarea runoff = 0.872(CFS) for 0.270(Ac.)
Total runoff = 2.713(CFS) Total area = 0.84(Ac.)

+++++
Process from Point/Station 403.000 to Point/Station 67.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 539.670(Ft.)
Downstream point/station elevation = 532.250(Ft.)
Pipe length = 34.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.713(CFS)
Given pipe size = 12.00(In.)
Calculated individual pipe flow = 2.713(CFS)
Normal flow depth in pipe = 3.28(In.)
Flow top width inside pipe = 10.69(In.)
Critical Depth = 8.47(In.)
Pipe flow velocity = 15.61(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 5.04 min.

+++++
Process from Point/Station 403.000 to Point/Station 67.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 4
Stream flow area = 0.840(Ac.)
Runoff from this stream = 2.713(CFS)
Time of concentration = 5.04 min.
Rainfall intensity = 3.832(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	23.487	10.33	2.773
2	8.245	7.82	3.132
3	2.612	6.03	3.522
4	2.713	5.04	3.832

Qmax(1) =

1.000 *	1.000 *	23.487) +	
0.885 *	1.000 *	8.245) +	
0.787 *	1.000 *	2.612) +	
0.724 *	1.000 *	2.713) + =	34.806

Qmax(2) =

1.000 *	0.757 *	23.487) +	
1.000 *	1.000 *	8.245) +	
0.889 *	1.000 *	2.612) +	
0.817 *	1.000 *	2.713) + =	30.556

Qmax(3) =

1.000 *	0.584 *	23.487) +	
1.000 *	0.772 *	8.245) +	
1.000 *	1.000 *	2.612) +	
0.919 *	1.000 *	2.713) + =	25.177

Qmax(4) =

1.000 *	0.488 *	23.487) +	
1.000 *	0.644 *	8.245) +	
1.000 *	0.835 *	2.612) +	
1.000 *	1.000 *	2.713) + =	21.659

Total of 4 streams to confluence:
Flow rates before confluence point:
23.487 8.245 2.612 2.713
Maximum flow rates at confluence using above data:
34.806 30.556 25.177 21.659
Area of streams before confluence:
8.970 3.060 0.880 0.840
Results of confluence:
Total flow rate = 34.806(CFS)
Time of concentration = 10.330 min.
Effective stream area after confluence = 13.750(Ac.)

+++++
Process from Point/Station 67.000 to Point/Station 68.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 528.710(Ft.)
Downstream point/station elevation = 528.500(Ft.)
Pipe length = 27.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 34.806(CFS)
Given pipe size = 36.00(In.)
Calculated individual pipe flow = 34.806(CFS)
Normal flow depth in pipe = 19.92(In.)
Flow top width inside pipe = 35.79(In.)
Critical Depth = 23.01(In.)
Pipe flow velocity = 8.67(Ft/s)
Travel time through pipe = 0.05 min.
Time of concentration (TC) = 10.38 min.

+++++
Process from Point/Station 67.000 to Point/Station 68.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 10.38 min.
Rainfall intensity = 2.767(In/Hr) for a 25.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 0.116(CFS) for 0.050(Ac.)
Total runoff = 34.922(CFS) Total area = 13.80(Ac.)

+++++
Process from Point/Station 67.000 to Point/Station 68.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2
Stream flow area = 13.800(Ac.)
Runoff from this stream = 34.922(CFS)
Time of concentration = 10.38 min.
Rainfall intensity = 2.767(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	28.613	12.85	2.522
2	34.922	10.38	2.767

Qmax(1) =
1.000 * 1.000 * 28.613) +
0.912 * 1.000 * 34.922) + = 60.447
Qmax(2) =
1.000 * 0.808 * 28.613) +
1.000 * 1.000 * 34.922) + = 58.032

Total of 2 main streams to confluence:
 Flow rates before confluence point:
 28.613 34.922
 Maximum flow rates at confluence using above data:
 60.447 58.032
 Area of streams before confluence:
 22.840 13.800

Results of confluence:
 Total flow rate = 60.447(CFS)
 Time of concentration = 12.854 min.
 Effective stream area after confluence = 36.640(Ac.)

+++++
 Process from Point/Station 92.000 to Point/Station 93.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 170.000(Ft.)
 Highest elevation = 545.270(Ft.)
 Lowest elevation = 533.000(Ft.)
 Elevation difference = 12.270(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 3.16 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.8400) * (170.000^{.5})] / (7.218^{(1/3)}) = 3.16$
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 3.845(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 0.581(CFS)
 Total initial stream area = 0.180(Ac.)

+++++
 Process from Point/Station 303.000 to Point/Station 70.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 319.000(Ft.)
 Highest elevation = 550.000(Ft.)
 Lowest elevation = 537.600(Ft.)
 Elevation difference = 12.400(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 5.32 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% \text{ slope}^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.8400) * (319.000^{.5})] / (3.887^{(1/3)}) = 5.32$
 Rainfall intensity (I) = 3.735(In/Hr) for a 25.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 1.349(CFS)
 Total initial stream area = 0.430(Ac.)
 End of computations, total study area = 37.250 (Ac.)

San Diego County Rational Hydrology Program
 CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4
 Rational method hydrology program based on
 San Diego County Flood Control Division 1985 hydrology manual
 Rational Hydrology Study Date: 06/28/21

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

Program License Serial Number 4035

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

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

 Process from Point/Station 1.000 to Point/Station 2.000
 **** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 Initial subarea flow distance = 1408.000(Ft.)
 Highest elevation = 595.900(Ft.)
 Lowest elevation = 560.000(Ft.)
 Elevation difference = 35.900(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 7.42 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.9500) * (1408.000^{.5})] / (2.550^{(1/3)}) = 7.42$
 Rainfall intensity (I) = 3.602(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
 Subarea runoff = 6.501(CFS)
 Total initial stream area = 1.900(Ac.)

 Process from Point/Station 2.000 to Point/Station 3.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 549.300(Ft.)
 Downstream point/station elevation = 549.080(Ft.)
 Pipe length = 22.25(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.501(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 6.501(CFS)
 Normal flow depth in pipe = 10.28(In.)
 Flow top width inside pipe = 17.82(In.)

Critical Depth = 11.83(In.)
 Pipe flow velocity = 6.23(Ft/s)
 Travel time through pipe = 0.06 min.
 Time of concentration (TC) = 7.48 min.

 Process from Point/Station 3.000 to Point/Station 4.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 547.820(Ft.)
 Downstream point/station elevation = 546.510(Ft.)
 Pipe length = 99.56(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 6.501(CFS)
 Given pipe size = 30.00(In.)
 Calculated individual pipe flow = 6.501(CFS)
 Normal flow depth in pipe = 7.54(In.)
 Flow top width inside pipe = 26.02(In.)
 Critical Depth = 10.13(In.)
 Pipe flow velocity = 6.73(Ft/s)
 Travel time through pipe = 0.25 min.
 Time of concentration (TC) = 7.72 min.

 Process from Point/Station 3.000 to Point/Station 4.000
 ***** CONFLUENCE OF MINOR STREAMS *****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 1.900(Ac.)
 Runoff from this stream = 6.501(CFS)
 Time of concentration = 7.72 min.
 Rainfall intensity = 3.542(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	6.501	7.72	3.542

Qmax(1) =
 $1.000 * 1.000 * 6.501 + = 6.501$

Total of 1 streams to confluence:
 Flow rates before confluence point:
 6.501
 Maximum flow rates at confluence using above data:
 6.501
 Area of streams before confluence:
 1.900
 Results of confluence:
 Total flow rate = 6.501(CFS)
 Time of concentration = 7.722 min.
 Effective stream area after confluence = 1.900(Ac.)

 Process from Point/Station 55.000 to Point/Station 300.000
 ***** INITIAL AREA EVALUATION *****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 203.000(Ft.)
 Highest elevation = 559.500(Ft.)
 Lowest elevation = 557.580(Ft.)
 Elevation difference = 1.920(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 6.79 min.

$TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.8400) * (203.000^{.5})] / (0.946^{(1/3)}) = 6.79$
 Rainfall intensity (I) = 3.735(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 0.847(CFS)
 Total initial stream area = 0.270(Ac.)

++++++
 Process from Point/Station 300.000 to Point/Station 301.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 553.420(Ft.)
 Downstream point/station elevation = 551.000(Ft.)
 Pipe length = 484.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 0.847(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 0.847(CFS)
 Normal flow depth in pipe = 4.10(In.)
 Flow top width inside pipe = 15.10(In.)
 Critical Depth = 4.11(In.)
 Pipe flow velocity = 2.79(Ft/s)
 Travel time through pipe = 2.89 min.
 Time of concentration (TC) = 9.68 min.

++++++
 Process from Point/Station 300.000 to Point/Station 301.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 9.68 min.
 Rainfall intensity = 3.232(In/Hr) for a 50.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.977(CFS) for 0.360(Ac.)
 Total runoff = 1.825(CFS) Total area = 0.63(Ac.)

++++++
 Process from Point/Station 300.000 to Point/Station 301.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 9.68 min.
 Rainfall intensity = 3.232(In/Hr) for a 50.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.380(CFS) for 0.140(Ac.)
 Total runoff = 2.205(CFS) Total area = 0.77(Ac.)

++++++
 Process from Point/Station 301.000 to Point/Station 302.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 551.000(Ft.)
 Downstream point/station elevation = 549.500(Ft.)
 Pipe length = 6.30(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.205(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 2.205(CFS)
 Normal flow depth in pipe = 2.54(In.)
 Flow top width inside pipe = 12.54(In.)
 Critical Depth = 6.72(In.)
 Pipe flow velocity = 14.45(Ft/s)
 Travel time through pipe = 0.01 min.
 Time of concentration (TC) = 9.69 min.

 Process from Point/Station 302.000 to Point/Station 56.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 549.500(Ft.)
 Downstream point/station elevation = 548.890(Ft.)
 Pipe length = 3.50(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.205(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 2.205(CFS)
 Normal flow depth in pipe = 2.74(In.)
 Flow top width inside pipe = 12.94(In.)
 Critical Depth = 6.72(In.)
 Pipe flow velocity = 12.95(Ft/s)
 Travel time through pipe = 0.00 min.
 Time of concentration (TC) = 9.69 min.

 Process from Point/Station 302.000 to Point/Station 56.000
 ***** SUBAREA FLOW ADDITION *****

Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 [INDUSTRIAL area type]
 Time of concentration = 9.69 min.
 Rainfall intensity = 3.230(In/Hr) for a 50.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.950$
 Subarea runoff = 1.534(CFS) for 0.500(Ac.)
 Total runoff = 3.739(CFS) Total area = 1.27(Ac.)

 Process from Point/Station 56.000 to Point/Station 4.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 548.890(Ft.)
 Downstream point/station elevation = 546.510(Ft.)
 Pipe length = 101.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.739(CFS)
 Given pipe size = 18.00(In.)
 Calculated individual pipe flow = 3.739(CFS)
 Normal flow depth in pipe = 5.89(In.)
 Flow top width inside pipe = 16.89(In.)
 Critical Depth = 8.87(In.)
 Pipe flow velocity = 7.43(Ft/s)
 Travel time through pipe = 0.23 min.
 Time of concentration (TC) = 9.92 min.

 Process from Point/Station 56.000 to Point/Station 4.000
 ***** CONFLUENCE OF MINOR STREAMS *****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 1.270(Ac.)
 Runoff from this stream = 3.739(CFS)
 Time of concentration = 9.92 min.
 Rainfall intensity = 3.201(In/Hr)
 Summary of stream data:

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

1	6.501	7.72	3.542
2	3.739	9.92	3.201

Qmax(1) =

1.000 *	1.000 *	6.501) +	
1.000 *	0.778 *	3.739) + =	9.411

Qmax(2) =

0.904 *	1.000 *	6.501) +	
1.000 *	1.000 *	3.739) + =	9.613

Total of 2 streams to confluence:
Flow rates before confluence point:
6.501 3.739
Maximum flow rates at confluence using above data:
9.411 9.613
Area of streams before confluence:
1.900 1.270
Results of confluence:
Total flow rate = 9.613(CFS)
Time of concentration = 9.920 min.
Effective stream area after confluence = 3.170(Ac.)

+++++

Process from Point/Station 4.000 to Point/Station 108.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.510(Ft.)
Downstream point/station elevation = 542.920(Ft.)
Pipe length = 431.22(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 9.613(CFS)
Given pipe size = 42.00(In.)
Calculated individual pipe flow = 9.613(CFS)
Normal flow depth in pipe = 9.96(In.)
Flow top width inside pipe = 35.73(In.)
Critical Depth = 11.22(In.)
Pipe flow velocity = 5.51(Ft/s)
Travel time through pipe = 1.30 min.
Time of concentration (TC) = 11.22 min.

+++++

Process from Point/Station 4.000 to Point/Station 108.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 3.170(Ac.)
Runoff from this stream = 9.613(CFS)
Time of concentration = 11.22 min.
Rainfall intensity = 3.046(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	9.613	11.22	3.046

Qmax(1) =

1.000 *	1.000 *	9.613) + =	9.613
---------	---------	------------	-------

Total of 1 main streams to confluence:
Flow rates before confluence point:
9.613
Maximum flow rates at confluence using above data:
9.613
Area of streams before confluence:

3.170

Results of confluence:

Total flow rate = 9.613(CFS)

Time of concentration = 11.225 min.

Effective stream area after confluence = 3.170(Ac.)

++++
Process from Point/Station 107.000 to Point/Station 107.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.450 given for subarea
Rainfall intensity (I) = 3.071(In/Hr) for a 50.0 year storm
User specified values are as follows:
TC = 11.00 min. Rain intensity = 3.07(In/Hr)
Total area = 19.100(Ac.) Total runoff = 19.000(CFS)

++++
Process from Point/Station 107.000 to Point/Station 108.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.410(Ft.)
Downstream point/station elevation = 542.770(Ft.)
Pipe length = 126.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 19.000(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 19.000(CFS)
Normal flow depth in pipe = 11.67(In.)
Flow top width inside pipe = 29.25(In.)
Critical Depth = 17.74(In.)
Pipe flow velocity = 10.76(Ft/s)
Travel time through pipe = 0.20 min.
Time of concentration (TC) = 11.20 min.

++++
Process from Point/Station 107.000 to Point/Station 108.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 2

Stream flow area = 19.100(Ac.)

Runoff from this stream = 19.000(CFS)

Time of concentration = 11.20 min.

Rainfall intensity = 3.049(In/Hr)

Summary of stream data:

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

1	9.613	11.22	3.046
---	-------	-------	-------

2	19.000	11.20	3.049
---	--------	-------	-------

Qmax(1) =

$1.000 * 1.000 * 9.613 + 0.999 * 1.000 * 19.000 + = 28.593$

Qmax(2) =

$1.000 * 0.997 * 9.613 + 1.000 * 1.000 * 19.000 + = 28.588$

Total of 2 main streams to confluence:

Flow rates before confluence point:

9.613 19.000

Maximum flow rates at confluence using above data:

28.593 28.588
Area of streams before confluence:
3.170 19.100

Results of confluence:
Total flow rate = 28.593(CFS)
Time of concentration = 11.225 min.
Effective stream area after confluence = 22.270(Ac.)

Process from Point/Station 60.000 to Point/Station 61.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
Initial subarea flow distance = 400.000(Ft.)
Highest elevation = 559.700(Ft.)
Lowest elevation = 551.370(Ft.)
Elevation difference = 8.330(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 7.33 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.8400) * (400.000^{.5})] / (2.083^{(1/3)}) = 7.33$
Rainfall intensity (I) = 3.619(In/Hr) for a 50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
Subarea runoff = 1.733(CFS)
Total initial stream area = 0.570(Ac.)

Process from Point/Station 61.000 to Point/Station 303.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.500(Ft.)
Downstream point/station elevation = 545.140(Ft.)
Pipe length = 12.42(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.733(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 1.733(CFS)
Normal flow depth in pipe = 3.79(In.)
Flow top width inside pipe = 14.67(In.)
Critical Depth = 5.93(In.)
Pipe flow velocity = 6.41(Ft/s)
Travel time through pipe = 0.03 min.
Time of concentration (TC) = 7.36 min.

Process from Point/Station 303.000 to Point/Station 108.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 545.140(Ft.)
Downstream point/station elevation = 542.770(Ft.)
Pipe length = 22.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.733(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 1.733(CFS)
Normal flow depth in pipe = 2.39(In.)
Flow top width inside pipe = 16.23(In.)
Critical Depth = 5.13(In.)
Pipe flow velocity = 9.51(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 7.40 min.

Process from Point/Station 303.000 to Point/Station 108.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 3
 Stream flow area = 0.570(Ac.)
 Runoff from this stream = 1.733(CFS)
 Time of concentration = 7.40 min.
 Rainfall intensity = 3.605(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	9.613	11.22	3.046
2	19.000	11.20	3.049
3	1.733	7.40	3.605

Qmax(1) =
 1.000 * 1.000 * 9.613) +
 0.999 * 1.000 * 19.000) +
 0.845 * 1.000 * 1.733) + = 30.058

Qmax(2) =
 1.000 * 0.997 * 9.613) +
 1.000 * 1.000 * 19.000) +
 0.846 * 1.000 * 1.733) + = 30.054

Qmax(3) =
 1.000 * 0.659 * 9.613) +
 1.000 * 0.661 * 19.000) +
 1.000 * 1.000 * 1.733) + = 20.631

Total of 3 main streams to confluence:
 Flow rates before confluence point:
 9.613 19.000 1.733
 Maximum flow rates at confluence using above data:
 30.058 30.054 20.631
 Area of streams before confluence:
 3.170 19.100 0.570

Results of confluence:
 Total flow rate = 30.058(CFS)
 Time of concentration = 11.225 min.
 Effective stream area after confluence = 22.840(Ac.)

 Process from Point/Station 108.000 to Point/Station 109.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 542.420(Ft.)
 Downstream point/station elevation = 542.140(Ft.)
 Pipe length = 59.60(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 30.058(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 30.058(CFS)
 Normal flow depth in pipe = 18.19(In.)
 Flow top width inside pipe = 46.57(In.)
 Critical Depth = 19.50(In.)
 Pipe flow velocity = 6.88(Ft/s)
 Travel time through pipe = 0.14 min.
 Time of concentration (TC) = 11.37 min.

 Process from Point/Station 109.000 to Point/Station 13.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 541.190(Ft.)
Downstream point/station elevation = 539.900(Ft.)
Pipe length = 67.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 30.058(CFS)
Given pipe size = 48.00(In.)
Calculated individual pipe flow = 30.058(CFS)
Normal flow depth in pipe = 12.60(In.)
Flow top width inside pipe = 42.24(In.)
Critical Depth = 19.50(In.)
Pipe flow velocity = 11.43(Ft/s)
Travel time through pipe = 0.10 min.
Time of concentration (TC) = 11.47 min.

+++++
Process from Point/Station 13.000 to Point/Station 14.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 539.480(Ft.)
Downstream point/station elevation = 535.250(Ft.)
Pipe length = 254.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 30.058(CFS)
Given pipe size = 48.00(In.)
Calculated individual pipe flow = 30.058(CFS)
Normal flow depth in pipe = 13.07(In.)
Flow top width inside pipe = 42.73(In.)
Critical Depth = 19.50(In.)
Pipe flow velocity = 10.85(Ft/s)
Travel time through pipe = 0.39 min.
Time of concentration (TC) = 11.86 min.

+++++
Process from Point/Station 14.000 to Point/Station 15.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 534.830(Ft.)
Downstream point/station elevation = 533.560(Ft.)
Pipe length = 127.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 30.058(CFS)
Given pipe size = 48.00(In.)
Calculated individual pipe flow = 30.058(CFS)
Normal flow depth in pipe = 14.91(In.)
Flow top width inside pipe = 44.42(In.)
Critical Depth = 19.50(In.)
Pipe flow velocity = 9.04(Ft/s)
Travel time through pipe = 0.23 min.
Time of concentration (TC) = 12.09 min.

+++++
Process from Point/Station 15.000 to Point/Station 16.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 533.140(Ft.)
Downstream point/station elevation = 530.850(Ft.)
Pipe length = 227.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 30.058(CFS)
Given pipe size = 48.00(In.)
Calculated individual pipe flow = 30.058(CFS)
Normal flow depth in pipe = 14.87(In.)
Flow top width inside pipe = 44.39(In.)
Critical Depth = 19.50(In.)
Pipe flow velocity = 9.07(Ft/s)
Travel time through pipe = 0.42 min.
Time of concentration (TC) = 12.51 min.

+++++
 Process from Point/Station 16.000 to Point/Station 68.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 530.490(Ft.)
 Downstream point/station elevation = 528.500(Ft.)
 Pipe length = 193.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 30.058(CFS)
 Given pipe size = 48.00(In.)
 Calculated individual pipe flow = 30.058(CFS)
 Normal flow depth in pipe = 14.79(In.)
 Flow top width inside pipe = 44.32(In.)
 Critical Depth = 19.50(In.)
 Pipe flow velocity = 9.14(Ft/s)
 Travel time through pipe = 0.35 min.
 Time of concentration (TC) = 12.86 min.

+++++
 Process from Point/Station 16.000 to Point/Station 68.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:

In Main Stream number: 1
 Stream flow area = 22.840(Ac.)
 Runoff from this stream = 30.058(CFS)
 Time of concentration = 12.86 min.
 Rainfall intensity = 2.884(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	30.058	12.86	2.884

Qmax(1) =
 $1.000 * 1.000 * 30.058 + = 30.058$

Total of 1 main streams to confluence:
 Flow rates before confluence point:
 30.058
 Maximum flow rates at confluence using above data:
 30.058
 Area of streams before confluence:
 22.840

Results of confluence:
 Total flow rate = 30.058(CFS)
 Time of concentration = 12.860 min.
 Effective stream area after confluence = 22.840(Ac.)

+++++
 Process from Point/Station 52.000 to Point/Station 53.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 81.000(Ft.)
 Highest elevation = 544.910(Ft.)
 Lowest elevation = 544.480(Ft.)
 Elevation difference = 0.430(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 5.20 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$

$TC = [1.8 * (1.1 - 0.8400) * (81.000^{.5}) / (0.531^{(1/3)})] = 5.20$
 Rainfall intensity (I) = 4.191(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 1.690(CFS)
 Total initial stream area = 0.480(Ac.)

++++++
 Process from Point/Station 52.000 to Point/Station 53.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 5.20 min.
 Rainfall intensity = 4.191(In/Hr) for a 50.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.176(CFS) for 0.050(Ac.)
 Total runoff = 1.866(CFS) Total area = 0.53(Ac.)

++++++
 Process from Point/Station 53.000 to Point/Station 54.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 541.840(Ft.)
 Downstream point/station elevation = 541.280(Ft.)
 Pipe length = 112.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 1.866(CFS)
 Given pipe size = 12.00(In.)
 Calculated individual pipe flow = 1.866(CFS)
 Normal flow depth in pipe = 7.69(In.)
 Flow top width inside pipe = 11.52(In.)
 Critical Depth = 6.98(In.)
 Pipe flow velocity = 3.51(Ft/s)
 Travel time through pipe = 0.53 min.
 Time of concentration (TC) = 5.73 min.

++++++
 Process from Point/Station 53.000 to Point/Station 54.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 5.73 min.
 Rainfall intensity = 4.016(In/Hr) for a 50.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 1.518(CFS) for 0.450(Ac.)
 Total runoff = 3.384(CFS) Total area = 0.98(Ac.)

++++++
 Process from Point/Station 54.000 to Point/Station 57.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 541.280(Ft.)
 Downstream point/station elevation = 540.380(Ft.)
 Pipe length = 180.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 3.384(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 3.384(CFS)
 Normal flow depth in pipe = 7.49(In.)
 Flow top width inside pipe = 22.24(In.)
 Critical Depth = 7.71(In.)
 Pipe flow velocity = 4.04(Ft/s)
 Travel time through pipe = 0.74 min.
 Time of concentration (TC) = 6.48 min.

+++++
Process from Point/Station 54.000 to Point/Station 57.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 6.48 min.
Rainfall intensity = 3.811(In/Hr) for a 50.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
Subarea runoff = 1.697(CFS) for 0.530(Ac.)
Total runoff = 5.080(CFS) Total area = 1.51(Ac.)

+++++
Process from Point/Station 54.000 to Point/Station 57.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 6.48 min.
Rainfall intensity = 3.811(In/Hr) for a 50.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
Subarea runoff = 0.320(CFS) for 0.100(Ac.)
Total runoff = 5.401(CFS) Total area = 1.61(Ac.)

+++++
Process from Point/Station 57.000 to Point/Station 58.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 540.300(Ft.)
Downstream point/station elevation = 539.350(Ft.)
Pipe length = 206.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.401(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 5.401(CFS)
Normal flow depth in pipe = 9.82(In.)
Flow top width inside pipe = 23.60(In.)
Critical Depth = 9.84(In.)
Pipe flow velocity = 4.46(Ft/s)
Travel time through pipe = 0.77 min.
Time of concentration (TC) = 7.25 min.

+++++
Process from Point/Station 58.000 to Point/Station 62.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 539.350(Ft.)
Downstream point/station elevation = 538.770(Ft.)
Pipe length = 115.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 5.401(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 5.401(CFS)
Normal flow depth in pipe = 9.59(In.)
Flow top width inside pipe = 23.51(In.)
Critical Depth = 9.84(In.)
Pipe flow velocity = 4.61(Ft/s)
Travel time through pipe = 0.42 min.
Time of concentration (TC) = 7.66 min.

+++++
Process from Point/Station 62.000 to Point/Station 63.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 538.770(Ft.)
Downstream point/station elevation = 537.030(Ft.)
Pipe length = 347.00(Ft.) Manning's N = 0.013

No. of pipes = 1 Required pipe flow = 5.401(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 5.401(CFS)
 Normal flow depth in pipe = 9.60(In.)
 Flow top width inside pipe = 23.51(In.)
 Critical Depth = 9.84(In.)
 Pipe flow velocity = 4.60(Ft/s)
 Travel time through pipe = 1.26 min.
 Time of concentration (TC) = 8.92 min.

 Process from Point/Station 62.000 to Point/Station 63.000
 ***** SUBAREA FLOW ADDITION *****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 8.92 min.
 Rainfall intensity = 3.340(In/Hr) for a 50.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 13.272(CFS) for 4.730(Ac.)
 Total runoff = 18.673(CFS) Total area = 6.34(Ac.)

 Process from Point/Station 63.000 to Point/Station 64.000
 ***** PIPEFLOW TRAVEL TIME (User specified size) *****

Upstream point/station elevation = 537.030(Ft.)
 Downstream point/station elevation = 536.480(Ft.)
 Pipe length = 84.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 18.673(CFS)
 Given pipe size = 24.00(In.)
 Calculated individual pipe flow = 18.673(CFS)
 Normal flow depth in pipe = 20.16(In.)
 Flow top width inside pipe = 17.60(In.)
 Critical Depth = 18.66(In.)
 Pipe flow velocity = 6.63(Ft/s)
 Travel time through pipe = 0.21 min.
 Time of concentration (TC) = 9.13 min.

 Process from Point/Station 63.000 to Point/Station 64.000
 ***** CONFLUENCE OF MINOR STREAMS *****

Along Main Stream number: 1 in normal stream number 1
 Stream flow area = 6.340(Ac.)
 Runoff from this stream = 18.673(CFS)
 Time of concentration = 9.13 min.
 Rainfall intensity = 3.309(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	18.673	9.13	3.309

$Q_{max}(1) = 1.000 * 1.000 * 18.673 + = 18.673$

Total of 1 streams to confluence:
 Flow rates before confluence point:
 18.673
 Maximum flow rates at confluence using above data:
 18.673
 Area of streams before confluence:
 6.340

Results of confluence:
 Total flow rate = 18.673(CFS)
 Time of concentration = 9.130 min.
 Effective stream area after confluence = 6.340(Ac.)

Process from Point/Station 52.000 to Point/Station 201.000
 **** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
 Initial subarea flow distance = 90.000(Ft.)
 Highest elevation = 544.890(Ft.)
 Lowest elevation = 544.050(Ft.)
 Elevation difference = 0.840(Ft.)
 Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 4.54 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$
 $TC = [1.8 * (1.1 - 0.8400) * (90.000^{.5})] / (0.933^{(1/3)}) = 4.54$
 Setting time of concentration to 5 minutes
 Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
 Subarea runoff = 1.576(CFS)
 Total initial stream area = 0.440(Ac.)

Process from Point/Station 52.000 to Point/Station 201.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 5.00 min.
 Rainfall intensity = 4.265(In/Hr) for a 50.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.609(CFS) for 0.170(Ac.)
 Total runoff = 2.185(CFS) Total area = 0.61(Ac.)

Process from Point/Station 52.000 to Point/Station 201.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 5.00 min.
 Rainfall intensity = 4.265(In/Hr) for a 50.0 year storm
 Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
 Subarea runoff = 0.287(CFS) for 0.080(Ac.)
 Total runoff = 2.472(CFS) Total area = 0.69(Ac.)

Process from Point/Station 201.000 to Point/Station 202.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 541.640(Ft.)
 Downstream point/station elevation = 541.190(Ft.)
 Pipe length = 89.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.472(CFS)
 Given pipe size = 12.00(In.)
 Calculated individual pipe flow = 2.472(CFS)
 Normal flow depth in pipe = 9.59(In.)
 Flow top width inside pipe = 9.62(In.)
 Critical Depth = 8.08(In.)
 Pipe flow velocity = 3.68(Ft/s)
 Travel time through pipe = 0.40 min.
 Time of concentration (TC) = 5.40 min.

+++++
Process from Point/Station 201.000 to Point/Station 202.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.40 min.
Rainfall intensity = 4.121(In/Hr) for a 50.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 1.939(CFS) for 0.560(Ac.)
Total runoff = 4.411(CFS) Total area = 1.25(Ac.)

+++++
Process from Point/Station 201.000 to Point/Station 202.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.40 min.
Rainfall intensity = 4.121(In/Hr) for a 50.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 0.935(CFS) for 0.270(Ac.)
Total runoff = 5.345(CFS) Total area = 1.52(Ac.)

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

Upstream point/station elevation = 541.190(Ft.)
Downstream point/station elevation = 539.600(Ft.)
Pipe length = 242.00(Ft.) Manning's $N = 0.013$
No. of pipes = 1 Required pipe flow = 5.345(CFS)
Given pipe size = 15.00(In.)
Calculated individual pipe flow = 5.345(CFS)
Normal flow depth in pipe = 15.00(In.)
Flow top width inside pipe = 0.00(In.)
Critical Depth = 11.24(In.)
Pipe flow velocity = 4.27(Ft/s)
Travel time through pipe = 0.95 min.
Time of concentration (TC) = 6.35 min.

+++++
Process from Point/Station 203.000 to Point/Station 64.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 539.600(Ft.)
Downstream point/station elevation = 536.480(Ft.)
Pipe length = 300.00(Ft.) Manning's $N = 0.013$
No. of pipes = 1 Required pipe flow = 5.345(CFS)
Given pipe size = 15.00(In.)
Calculated individual pipe flow = 5.345(CFS)
Normal flow depth in pipe = 10.25(In.)
Flow top width inside pipe = 13.95(In.)
Critical Depth = 11.24(In.)
Pipe flow velocity = 5.98(Ft/s)
Travel time through pipe = 0.84 min.
Time of concentration (TC) = 7.19 min.

+++++
Process from Point/Station 203.000 to Point/Station 64.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 7.19 min.

Rainfall intensity = 3.649(In/Hr) for a 50.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 2.238(CFS) for 0.730(Ac.)
 Total runoff = 7.583(CFS) Total area = 2.25(Ac.)

 Process from Point/Station 203.000 to Point/Station 64.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 2.250(Ac.)
 Runoff from this stream = 7.583(CFS)
 Time of concentration = 7.19 min.
 Rainfall intensity = 3.649(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	18.673	9.13	3.309
2	7.583	7.19	3.649

$Q_{max}(1) = 1.000 * 1.000 * 18.673) + 0.907 * 1.000 * 7.583) + = 25.549$
 $Q_{max}(2) = 1.000 * 0.787 * 18.673) + 1.000 * 1.000 * 7.583) + = 22.278$

Total of 2 streams to confluence:
 Flow rates before confluence point:
 18.673 7.583
 Maximum flow rates at confluence using above data:
 25.549 22.278
 Area of streams before confluence:
 6.340 2.250
 Results of confluence:
 Total flow rate = 25.549(CFS)
 Time of concentration = 9.130 min.
 Effective stream area after confluence = 8.590(Ac.)

 Process from Point/Station 64.000 to Point/Station 65.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 536.480(Ft.)
 Downstream point/station elevation = 534.950(Ft.)
 Pipe length = 306.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 25.549(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 25.549(CFS)
 Normal flow depth in pipe = 18.89(In.)
 Flow top width inside pipe = 35.96(In.)
 Critical Depth = 19.57(In.)
 Pipe flow velocity = 6.81(Ft/s)
 Travel time through pipe = 0.75 min.
 Time of concentration (TC) = 9.88 min.

 Process from Point/Station 64.000 to Point/Station 65.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 9.88 min.

Rainfall intensity = 3.206(In/Hr) for a 50.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 1.023(CFS) for 0.380(Ac.)
 Total runoff = 26.573(CFS) Total area = 8.97(Ac.)

Process from Point/Station 65.000 to Point/Station 304.000

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

Upstream point/station elevation = 534.950(Ft.)
 Downstream point/station elevation = 534.360(Ft.)
 Pipe length = 117.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 26.573(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 26.573(CFS)
 Normal flow depth in pipe = 19.29(In.)
 Flow top width inside pipe = 35.91(In.)
 Critical Depth = 20.00(In.)
 Pipe flow velocity = 6.89(Ft/s)
 Travel time through pipe = 0.28 min.
 Time of concentration (TC) = 10.16 min.

Process from Point/Station 304.000 to Point/Station 67.000

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

Upstream point/station elevation = 534.360(Ft.)
 Downstream point/station elevation = 532.250(Ft.)
 Pipe length = 28.16(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 26.573(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 26.573(CFS)
 Normal flow depth in pipe = 9.28(In.)
 Flow top width inside pipe = 31.49(In.)
 Critical Depth = 20.00(In.)
 Pipe flow velocity = 18.42(Ft/s)
 Travel time through pipe = 0.03 min.
 Time of concentration (TC) = 10.19 min.

Process from Point/Station 304.000 to Point/Station 67.000

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

Along Main Stream number: 1 in normal stream number 1

Stream flow area = 8.970(Ac.)
 Runoff from this stream = 26.573(CFS)
 Time of concentration = 10.19 min.
 Rainfall intensity = 3.167(In/Hr)
 Summary of stream data:

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

1	26.573	10.19	3.167
---	--------	-------	-------

$Q_{\max}(1) =$

$1.000 * 1.000 * 26.573) + = 26.573$

Total of 1 streams to confluence:

Flow rates before confluence point:

26.573

Maximum flow rates at confluence using above data:

26.573

Area of streams before confluence:

8.970

Results of confluence:

Total flow rate = 26.573(CFS)

Time of concentration = 10.187 min.

Effective stream area after confluence = 8.970(Ac.)

++++
Process from Point/Station 400.000 to Point/Station 401.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
Initial subarea flow distance = 284.000(Ft.)
Highest elevation = 546.430(Ft.)
Lowest elevation = 541.360(Ft.)
Elevation difference = 5.070(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 6.50 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.8400) * (284.000^{.5})] / (1.785^{(1/3)}) = 6.50$
Rainfall intensity (I) = 3.805(In/Hr) for a 50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
Subarea runoff = 1.215(CFS)
Total initial stream area = 0.380(Ac.)

++++
Process from Point/Station 401.000 to Point/Station 71.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 537.360(Ft.)
Downstream point/station elevation = 533.490(Ft.)
Pipe length = 63.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.215(CFS)
Given pipe size = 18.00(In.)
Calculated individual pipe flow = 1.215(CFS)
Normal flow depth in pipe = 2.65(In.)
Flow top width inside pipe = 12.75(In.)
Critical Depth = 4.94(In.)
Pipe flow velocity = 7.52(Ft/s)
Travel time through pipe = 0.14 min.
Time of concentration (TC) = 6.64 min.

++++
Process from Point/Station 401.000 to Point/Station 71.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 6.64 min.
Rainfall intensity = 3.771(In/Hr) for a 50.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
Subarea runoff = 1.235(CFS) for 0.390(Ac.)
Total runoff = 2.450(CFS) Total area = 0.77(Ac.)

++++
Process from Point/Station 401.000 to Point/Station 71.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 6.64 min.
Rainfall intensity = 3.771(In/Hr) for a 50.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
Subarea runoff = 0.475(CFS) for 0.150(Ac.)
Total runoff = 2.925(CFS) Total area = 0.92(Ac.)

 Process from Point/Station 71.000 to Point/Station 72.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 533.490(Ft.)
 Downstream point/station elevation = 532.560(Ft.)
 Pipe length = 186.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.925(CFS)
 Given pipe size = 42.00(In.)
 Calculated individual pipe flow = 2.925(CFS)
 Normal flow depth in pipe = 5.81(In.)
 Flow top width inside pipe = 29.01(In.)
 Critical Depth = 6.10(In.)
 Pipe flow velocity = 3.64(Ft/s)
 Travel time through pipe = 0.85 min.
 Time of concentration (TC) = 7.49 min.

 Process from Point/Station 72.000 to Point/Station 67.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 532.560(Ft.)
 Downstream point/station elevation = 532.250(Ft.)
 Pipe length = 61.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 2.925(CFS)
 Given pipe size = 42.00(In.)
 Calculated individual pipe flow = 2.925(CFS)
 Normal flow depth in pipe = 5.79(In.)
 Flow top width inside pipe = 28.96(In.)
 Critical Depth = 6.10(In.)
 Pipe flow velocity = 3.66(Ft/s)
 Travel time through pipe = 0.28 min.
 Time of concentration (TC) = 7.77 min.

 Process from Point/Station 72.000 to Point/Station 67.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 7.77 min.
 Rainfall intensity = 3.533(In/Hr) for a 50.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 6.350(CFS) for 2.140(Ac.)
 Total runoff = 9.276(CFS) Total area = 3.06(Ac.)

 Process from Point/Station 72.000 to Point/Station 67.000
 **** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
 Stream flow area = 3.060(Ac.)
 Runoff from this stream = 9.276(CFS)
 Time of concentration = 7.77 min.
 Rainfall intensity = 3.533(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	26.573	10.19	3.167
2	9.276	7.77	3.533

Qmax(1) =

$$Q_{\max}(2) = \begin{array}{l} 1.000 * 1.000 * 26.573 + \\ 0.896 * 1.000 * 9.276 + = 34.887 \\ \\ 1.000 * 0.763 * 26.573 + \\ 1.000 * 1.000 * 9.276 + = 29.547 \end{array}$$

Total of 2 streams to confluence:

Flow rates before confluence point:

26.573 9.276

Maximum flow rates at confluence using above data:

34.887 29.547

Area of streams before confluence:

8.970 3.060

Results of confluence:

Total flow rate = 34.887(CFS)

Time of concentration = 10.187 min.

Effective stream area after confluence = 12.030(Ac.)

Process from Point/Station 91.000 to Point/Station 80.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
Initial subarea flow distance = 155.000(Ft.)
Highest elevation = 545.810(Ft.)
Lowest elevation = 544.380(Ft.)
Elevation difference = 1.430(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 5.99 min.
TC = $[1.8 * (1.1 - C) * \text{distance}(\text{Ft.})^{.5}] / (\% \text{ slope}^{1/3})$
TC = $[1.8 * (1.1 - 0.8400) * (155.000^{.5})] / (0.923^{1/3}) = 5.99$
Rainfall intensity (I) = 3.942(In/Hr) for a 50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
Subarea runoff = 1.689(CFS)
Total initial stream area = 0.510(Ac.)

Process from Point/Station 91.000 to Point/Station 80.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.99 min.
Rainfall intensity = 3.942(In/Hr) for a 50.0 year storm
Runoff coefficient used for sub-area, Rational method, Q=KCIA, C = 0.840
Subarea runoff = 1.225(CFS) for 0.370(Ac.)
Total runoff = 2.914(CFS) Total area = 0.88(Ac.)

Process from Point/Station 80.000 to Point/Station 67.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 540.190(Ft.)
Downstream point/station elevation = 532.250(Ft.)
Pipe length = 40.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.914(CFS)
Given pipe size = 12.00(In.)
Calculated individual pipe flow = 2.914(CFS)
Normal flow depth in pipe = 3.48(In.)
Flow top width inside pipe = 10.89(In.)
Critical Depth = 8.78(In.)
Pipe flow velocity = 15.40(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 6.03 min.

 Process from Point/Station 80.000 to Point/Station 67.000
 ***** CONFLUENCE OF MINOR STREAMS *****

Along Main Stream number: 1 in normal stream number 3
 Stream flow area = 0.880(Ac.)
 Runoff from this stream = 2.914(CFS)
 Time of concentration = 6.03 min.
 Rainfall intensity = 3.930(In/Hr)
 Summary of stream data:

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

1	26.573	10.19	3.167
2	9.276	7.77	3.533
3	2.914	6.03	3.930

Qmax(1) =
 $1.000 * 1.000 * 26.573) +$
 $0.896 * 1.000 * 9.276) +$
 $0.806 * 1.000 * 2.914) + = 37.235$

Qmax(2) =
 $1.000 * 0.763 * 26.573) +$
 $1.000 * 1.000 * 9.276) +$
 $0.899 * 1.000 * 2.914) + = 32.166$

Qmax(3) =
 $1.000 * 0.592 * 26.573) +$
 $1.000 * 0.776 * 9.276) +$
 $1.000 * 1.000 * 2.914) + = 25.833$

Total of 3 streams to confluence:
 Flow rates before confluence point:

26.573 9.276 2.914

Maximum flow rates at confluence using above data:

37.235 32.166 25.833

Area of streams before confluence:

8.970 3.060 0.880

Results of confluence:

Total flow rate = 37.235(CFS)

Time of concentration = 10.187 min.

Effective stream area after confluence = 12.910(Ac.)

 Process from Point/Station 402.000 to Point/Station 403.000
 ***** INITIAL AREA EVALUATION *****

User specified 'C' value of 0.840 given for subarea

Initial subarea flow distance = 102.000(Ft.)

Highest elevation = 544.650(Ft.)

Lowest elevation = 542.670(Ft.)

Elevation difference = 1.980(Ft.)

Time of concentration calculated by the urban
 areas overland flow method (App X-C) = 3.79 min.

$TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})$

$TC = [1.8 * (1.1 - 0.8400) * (102.000^{.5})] / (1.941^{(1/3)}) = 3.79$

Setting time of concentration to 5 minutes

Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm

Effective runoff coefficient used for area (Q=KCIA) is C = 0.840

Subarea runoff = 2.042(CFS)

Total initial stream area = 0.570(Ac.)

 Process from Point/Station 402.000 to Point/Station 403.000

**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
Time of concentration = 5.00 min.
Rainfall intensity = 4.265(In/Hr) for a 50.0 year storm
Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
Subarea runoff = 0.967(CFS) for 0.270(Ac.)
Total runoff = 3.010(CFS) Total area = 0.84(Ac.)

+++++
Process from Point/Station 403.000 to Point/Station 67.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 539.670(Ft.)
Downstream point/station elevation = 532.250(Ft.)
Pipe length = 34.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.010(CFS)
Given pipe size = 12.00(In.)
Calculated individual pipe flow = 3.010(CFS)
Normal flow depth in pipe = 3.45(In.)
Flow top width inside pipe = 10.87(In.)
Critical Depth = 8.93(In.)
Pipe flow velocity = 16.08(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 5.04 min.

+++++
Process from Point/Station 403.000 to Point/Station 67.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 4
Stream flow area = 0.840(Ac.)
Runoff from this stream = 3.010(CFS)
Time of concentration = 5.04 min.
Rainfall intensity = 4.252(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	26.573	10.19	3.167
2	9.276	7.77	3.533
3	2.914	6.03	3.930
4	3.010	5.04	4.252

Qmax(1) =
 $1.000 * 1.000 * 26.573) +$
 $0.896 * 1.000 * 9.276) +$
 $0.806 * 1.000 * 2.914) +$
 $0.745 * 1.000 * 3.010) + = 39.477$

Qmax(2) =
 $1.000 * 0.763 * 26.573) +$
 $1.000 * 1.000 * 9.276) +$
 $0.899 * 1.000 * 2.914) +$
 $0.831 * 1.000 * 3.010) + = 34.667$

Qmax(3) =
 $1.000 * 0.592 * 26.573) +$
 $1.000 * 0.776 * 9.276) +$
 $1.000 * 1.000 * 2.914) +$
 $0.924 * 1.000 * 3.010) + = 28.615$

Qmax(4) =
 $1.000 * 0.494 * 26.573) +$
 $1.000 * 0.648 * 9.276) +$
 $1.000 * 0.835 * 2.914) +$
 $1.000 * 1.000 * 3.010) + = 24.587$

Total of 4 streams to confluence:
 Flow rates before confluence point:
 26.573 9.276 2.914 3.010
 Maximum flow rates at confluence using above data:
 39.477 34.667 28.615 24.587
 Area of streams before confluence:
 8.970 3.060 0.880 0.840
 Results of confluence:
 Total flow rate = 39.477(CFS)
 Time of concentration = 10.187 min.
 Effective stream area after confluence = 13.750(Ac.)

 Process from Point/Station 67.000 to Point/Station 68.000
 **** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 528.710(Ft.)
 Downstream point/station elevation = 528.500(Ft.)
 Pipe length = 27.00(Ft.) Manning's N = 0.013
 No. of pipes = 1 Required pipe flow = 39.477(CFS)
 Given pipe size = 36.00(In.)
 Calculated individual pipe flow = 39.477(CFS)
 Normal flow depth in pipe = 21.59(In.)
 Flow top width inside pipe = 35.28(In.)
 Critical Depth = 24.55(In.)
 Pipe flow velocity = 8.92(Ft/s)
 Travel time through pipe = 0.05 min.
 Time of concentration (TC) = 10.24 min.

 Process from Point/Station 67.000 to Point/Station 68.000
 **** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.840 given for subarea
 Time of concentration = 10.24 min.
 Rainfall intensity = 3.160(In/Hr) for a 50.0 year storm
 Runoff coefficient used for sub-area, Rational method, $Q=KCIA$, $C = 0.840$
 Subarea runoff = 0.133(CFS) for 0.050(Ac.)
 Total runoff = 39.609(CFS) Total area = 13.80(Ac.)

 Process from Point/Station 67.000 to Point/Station 68.000
 **** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
 In Main Stream number: 2
 Stream flow area = 13.800(Ac.)
 Runoff from this stream = 39.609(CFS)
 Time of concentration = 10.24 min.
 Rainfall intensity = 3.160(In/Hr)
 Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	30.058	12.86	2.884
2	39.609	10.24	3.160
Qmax(1) =			
	1.000 *	1.000 *	30.058) +
	0.912 *	1.000 *	39.609) + = 66.199
Qmax(2) =			
	1.000 *	0.796 *	30.058) +

$$1.000 * 1.000 * 39.609) + = 63.538$$

Total of 2 main streams to confluence:

Flow rates before confluence point:

30.058 39.609

Maximum flow rates at confluence using above data:

66.199 63.538

Area of streams before confluence:

22.840 13.800

Results of confluence:

Total flow rate = 66.199(CFS)

Time of concentration = 12.860 min.

Effective stream area after confluence = 36.640(Ac.)

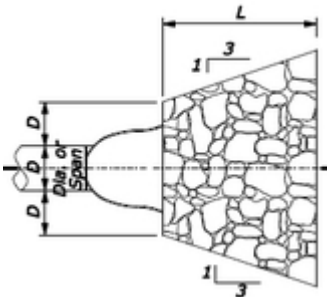
+++++
Process from Point/Station 92.000 to Point/Station 93.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
Initial subarea flow distance = 170.000(Ft.)
Highest elevation = 545.270(Ft.)
Lowest elevation = 533.000(Ft.)
Elevation difference = 12.270(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 3.16 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.8400) * (170.000^{.5})] / (7.218^{(1/3)}) = 3.16$
Setting time of concentration to 5 minutes
Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
Subarea runoff = 0.645(CFS)
Total initial stream area = 0.180(Ac.)

+++++
Process from Point/Station 303.000 to Point/Station 70.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.840 given for subarea
Initial subarea flow distance = 319.000(Ft.)
Highest elevation = 550.000(Ft.)
Lowest elevation = 537.600(Ft.)
Elevation difference = 12.400(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 5.32 min.
 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.8400) * (319.000^{.5})] / (3.887^{(1/3)}) = 5.32$
Rainfall intensity (I) = 4.151(In/Hr) for a 50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
Subarea runoff = 1.499(CFS)
Total initial stream area = 0.430(Ac.)
End of computations, total study area = 37.250 (Ac.)

HEC-14 Riprap Apron

HEC-14 Riprap Apron	
	
Units: English	
RSP class: Caltrans (new)	
Input	
Pipe flow Q (cfs):	30
Pipe diameter D (in):	48
Pipe slope S (%):	0.5
Mannings n:	.05
Tailwater depth TW (ft):	0.0
Riprap specific gravity:	2.65
Results	
Normal depth h_n (in):	48.000
Average velocity V (ft/s):	2.387
Froude number Fr:	0.000
Mean rock size D_{50} (in):	2.177
Mean rock weight W (lb):	0.839
Riprap class:	Class I
Class D_{50} (in):	6.923
Riprap thickness T (ft):	2.019
Riprap length L (ft):	16.000
Revised: 04 Mar 2018.	

8. DETENTION BASIN CALCULATIONS

RUN DATE 5/9/2021

HYDROGRAPH FILE NAME 5 YEAR HYDROGRAPH

TIME OF CONCENTRATION 11 MIN.

6 HOUR RAINFALL 1.3 INCHES

BASIN AREA 13.75 ACRES

RUNOFF COEFFICIENT 0.84

PEAK DISCHARGE 27.22 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 11	DISCHARGE (CFS) = 0.9
TIME (MIN) = 22	DISCHARGE (CFS) = 0.9
TIME (MIN) = 33	DISCHARGE (CFS) = 1
TIME (MIN) = 44	DISCHARGE (CFS) = 1
TIME (MIN) = 55	DISCHARGE (CFS) = 1
TIME (MIN) = 66	DISCHARGE (CFS) = 1
TIME (MIN) = 77	DISCHARGE (CFS) = 1.1
TIME (MIN) = 88	DISCHARGE (CFS) = 1.1
TIME (MIN) = 99	DISCHARGE (CFS) = 1.2
TIME (MIN) = 110	DISCHARGE (CFS) = 1.2
TIME (MIN) = 121	DISCHARGE (CFS) = 1.3
TIME (MIN) = 132	DISCHARGE (CFS) = 1.4
TIME (MIN) = 143	DISCHARGE (CFS) = 1.5
TIME (MIN) = 154	DISCHARGE (CFS) = 1.6
TIME (MIN) = 165	DISCHARGE (CFS) = 1.7
TIME (MIN) = 176	DISCHARGE (CFS) = 1.9
TIME (MIN) = 187	DISCHARGE (CFS) = 2.1
TIME (MIN) = 198	DISCHARGE (CFS) = 2.3
TIME (MIN) = 209	DISCHARGE (CFS) = 2.8
TIME (MIN) = 220	DISCHARGE (CFS) = 3.2
TIME (MIN) = 231	DISCHARGE (CFS) = 4.7
TIME (MIN) = 242	DISCHARGE (CFS) = 3.2
TIME (MIN) = 253	DISCHARGE (CFS) = 27.22
TIME (MIN) = 264	DISCHARGE (CFS) = 3.8
TIME (MIN) = 275	DISCHARGE (CFS) = 2.5
TIME (MIN) = 286	DISCHARGE (CFS) = 2
TIME (MIN) = 297	DISCHARGE (CFS) = 1.7
TIME (MIN) = 308	DISCHARGE (CFS) = 1.4
TIME (MIN) = 319	DISCHARGE (CFS) = 1.3
TIME (MIN) = 330	DISCHARGE (CFS) = 1.2
TIME (MIN) = 341	DISCHARGE (CFS) = 1.1
TIME (MIN) = 352	DISCHARGE (CFS) = 1
TIME (MIN) = 363	DISCHARGE (CFS) = 0.9
TIME (MIN) = 374	DISCHARGE (CFS) = 0

RUN DATE 5/9/2021

HYDROGRAPH FILE NAME 10 YEAR HYDROGRAPH

TIME OF CONCENTRATION 11 MIN.

6 HOUR RAINFALL 1.52 INCHES

BASIN AREA 13.75 ACRES

RUNOFF COEFFICIENT 0.84

PEAK DISCHARGE 31.6 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 11	DISCHARGE (CFS) = 1
TIME (MIN) = 22	DISCHARGE (CFS) = 1.1
TIME (MIN) = 33	DISCHARGE (CFS) = 1.1
TIME (MIN) = 44	DISCHARGE (CFS) = 1.1
TIME (MIN) = 55	DISCHARGE (CFS) = 1.2
TIME (MIN) = 66	DISCHARGE (CFS) = 1.2
TIME (MIN) = 77	DISCHARGE (CFS) = 1.3
TIME (MIN) = 88	DISCHARGE (CFS) = 1.3
TIME (MIN) = 99	DISCHARGE (CFS) = 1.4
TIME (MIN) = 110	DISCHARGE (CFS) = 1.5
TIME (MIN) = 121	DISCHARGE (CFS) = 1.6
TIME (MIN) = 132	DISCHARGE (CFS) = 1.6
TIME (MIN) = 143	DISCHARGE (CFS) = 1.8
TIME (MIN) = 154	DISCHARGE (CFS) = 1.8
TIME (MIN) = 165	DISCHARGE (CFS) = 2
TIME (MIN) = 176	DISCHARGE (CFS) = 2.2
TIME (MIN) = 187	DISCHARGE (CFS) = 2.5
TIME (MIN) = 198	DISCHARGE (CFS) = 2.7
TIME (MIN) = 209	DISCHARGE (CFS) = 3.3
TIME (MIN) = 220	DISCHARGE (CFS) = 3.8
TIME (MIN) = 231	DISCHARGE (CFS) = 5.5
TIME (MIN) = 242	DISCHARGE (CFS) = 4
TIME (MIN) = 253	DISCHARGE (CFS) = 31.6
TIME (MIN) = 264	DISCHARGE (CFS) = 4.4
TIME (MIN) = 275	DISCHARGE (CFS) = 3
TIME (MIN) = 286	DISCHARGE (CFS) = 2.3
TIME (MIN) = 297	DISCHARGE (CFS) = 1.9
TIME (MIN) = 308	DISCHARGE (CFS) = 1.7
TIME (MIN) = 319	DISCHARGE (CFS) = 1.5
TIME (MIN) = 330	DISCHARGE (CFS) = 1.4
TIME (MIN) = 341	DISCHARGE (CFS) = 1.3
TIME (MIN) = 352	DISCHARGE (CFS) = 1.2
TIME (MIN) = 363	DISCHARGE (CFS) = 1.1
TIME (MIN) = 374	DISCHARGE (CFS) = 0

RUN DATE 5/9/2021

HYDROGRAPH FILE NAME 25 YEAR HYDROGRAPH

TIME OF CONCENTRATION 10 MIN.

6 HOUR RAINFALL 1.84 INCHES

BASIN AREA 13.75 ACRES

RUNOFF COEFFICIENT 0.84

PEAK DISCHARGE 34.65 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 10	DISCHARGE (CFS) = 1.3
TIME (MIN) = 20	DISCHARGE (CFS) = 1.3
TIME (MIN) = 30	DISCHARGE (CFS) = 1.3
TIME (MIN) = 40	DISCHARGE (CFS) = 1.4
TIME (MIN) = 50	DISCHARGE (CFS) = 1.4
TIME (MIN) = 60	DISCHARGE (CFS) = 1.5
TIME (MIN) = 70	DISCHARGE (CFS) = 1.5
TIME (MIN) = 80	DISCHARGE (CFS) = 1.6
TIME (MIN) = 90	DISCHARGE (CFS) = 1.7
TIME (MIN) = 100	DISCHARGE (CFS) = 1.7
TIME (MIN) = 110	DISCHARGE (CFS) = 1.8
TIME (MIN) = 120	DISCHARGE (CFS) = 1.9
TIME (MIN) = 130	DISCHARGE (CFS) = 2
TIME (MIN) = 140	DISCHARGE (CFS) = 2.1
TIME (MIN) = 150	DISCHARGE (CFS) = 2.3
TIME (MIN) = 160	DISCHARGE (CFS) = 2.4
TIME (MIN) = 170	DISCHARGE (CFS) = 2.6
TIME (MIN) = 180	DISCHARGE (CFS) = 2.8
TIME (MIN) = 190	DISCHARGE (CFS) = 3.2
TIME (MIN) = 200	DISCHARGE (CFS) = 3.5
TIME (MIN) = 210	DISCHARGE (CFS) = 4.2
TIME (MIN) = 220	DISCHARGE (CFS) = 4.8
TIME (MIN) = 230	DISCHARGE (CFS) = 7.1
TIME (MIN) = 240	DISCHARGE (CFS) = 11.1
TIME (MIN) = 250	DISCHARGE (CFS) = 34.65
TIME (MIN) = 260	DISCHARGE (CFS) = 5.7
TIME (MIN) = 270	DISCHARGE (CFS) = 3.8
TIME (MIN) = 280	DISCHARGE (CFS) = 3
TIME (MIN) = 290	DISCHARGE (CFS) = 2.5
TIME (MIN) = 300	DISCHARGE (CFS) = 2.2
TIME (MIN) = 310	DISCHARGE (CFS) = 1.9
TIME (MIN) = 320	DISCHARGE (CFS) = 1.8
TIME (MIN) = 330	DISCHARGE (CFS) = 1.6
TIME (MIN) = 340	DISCHARGE (CFS) = 1.5
TIME (MIN) = 350	DISCHARGE (CFS) = 1.4
TIME (MIN) = 360	DISCHARGE (CFS) = 1.3
TIME (MIN) = 370	DISCHARGE (CFS) = 0

RUN DATE 5/9/2021

HYDROGRAPH FILE NAME **50 YEAR HYDROGRAPH**

TIME OF CONCENTRATION 10 MIN.

6 HOUR RAINFALL 2.09 INCHES

BASIN AREA 13.75 ACRES

RUNOFF COEFFICIENT 0.84

PEAK DISCHARGE 39.24 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 10	DISCHARGE (CFS) = 1.4
TIME (MIN) = 20	DISCHARGE (CFS) = 1.5
TIME (MIN) = 30	DISCHARGE (CFS) = 1.5
TIME (MIN) = 40	DISCHARGE (CFS) = 1.6
TIME (MIN) = 50	DISCHARGE (CFS) = 1.6
TIME (MIN) = 60	DISCHARGE (CFS) = 1.7
TIME (MIN) = 70	DISCHARGE (CFS) = 1.7
TIME (MIN) = 80	DISCHARGE (CFS) = 1.8
TIME (MIN) = 90	DISCHARGE (CFS) = 1.9
TIME (MIN) = 100	DISCHARGE (CFS) = 1.9
TIME (MIN) = 110	DISCHARGE (CFS) = 2.1
TIME (MIN) = 120	DISCHARGE (CFS) = 2.1
TIME (MIN) = 130	DISCHARGE (CFS) = 2.3
TIME (MIN) = 140	DISCHARGE (CFS) = 2.4
TIME (MIN) = 150	DISCHARGE (CFS) = 2.6
TIME (MIN) = 160	DISCHARGE (CFS) = 2.7
TIME (MIN) = 170	DISCHARGE (CFS) = 3
TIME (MIN) = 180	DISCHARGE (CFS) = 3.2
TIME (MIN) = 190	DISCHARGE (CFS) = 3.6
TIME (MIN) = 200	DISCHARGE (CFS) = 3.9
TIME (MIN) = 210	DISCHARGE (CFS) = 4.8
TIME (MIN) = 220	DISCHARGE (CFS) = 5.5
TIME (MIN) = 230	DISCHARGE (CFS) = 8.1
TIME (MIN) = 240	DISCHARGE (CFS) = 12.8
TIME (MIN) = 250	DISCHARGE (CFS) = 39.24
TIME (MIN) = 260	DISCHARGE (CFS) = 6.5
TIME (MIN) = 270	DISCHARGE (CFS) = 4.3
TIME (MIN) = 280	DISCHARGE (CFS) = 3.4
TIME (MIN) = 290	DISCHARGE (CFS) = 2.8
TIME (MIN) = 300	DISCHARGE (CFS) = 2.5
TIME (MIN) = 310	DISCHARGE (CFS) = 2.2
TIME (MIN) = 320	DISCHARGE (CFS) = 2
TIME (MIN) = 330	DISCHARGE (CFS) = 1.8
TIME (MIN) = 340	DISCHARGE (CFS) = 1.7
TIME (MIN) = 350	DISCHARGE (CFS) = 1.6
TIME (MIN) = 360	DISCHARGE (CFS) = 1.5
TIME (MIN) = 370	DISCHARGE (CFS) = 0

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

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	27.22	10	230	53,772	----	-----	-----	<no description>
2	Reservoir	2.621	10	250	50,752	1	534.49	43,445	<no description>
Routing Calculations REV.gpw					Return Period: 5 Year			Sunday, May 9, 2021	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

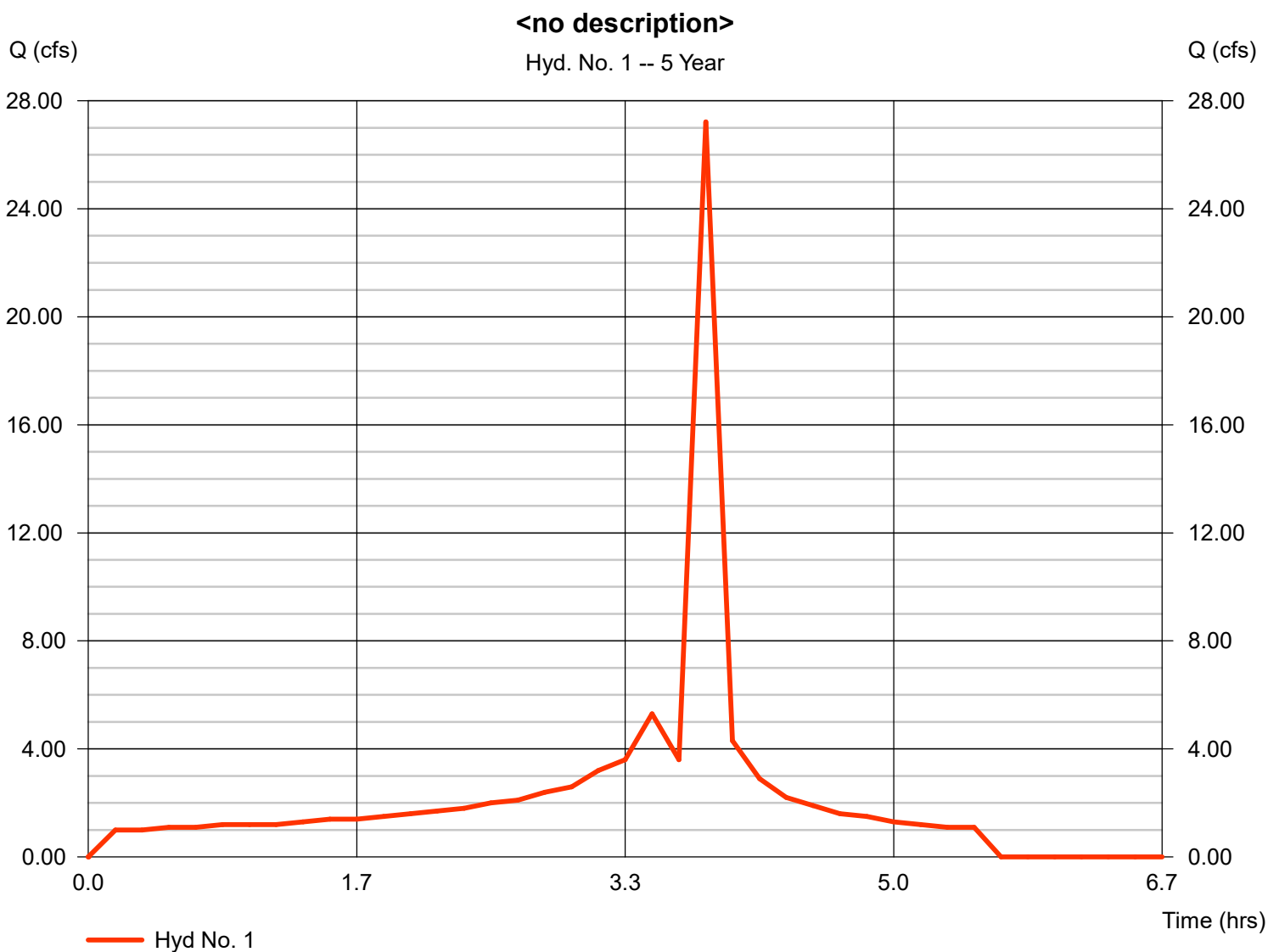
Sunday, May 9, 2021

Hyd. No. 1

<no description>

Hydrograph type = Manual
 Storm frequency = 5 yrs
 Time interval = 10 min

Peak discharge = 27.22 cfs
 Time to peak = 3.83 hrs
 Hyd. volume = 53,772 cuft



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Sunday, May 9, 2021

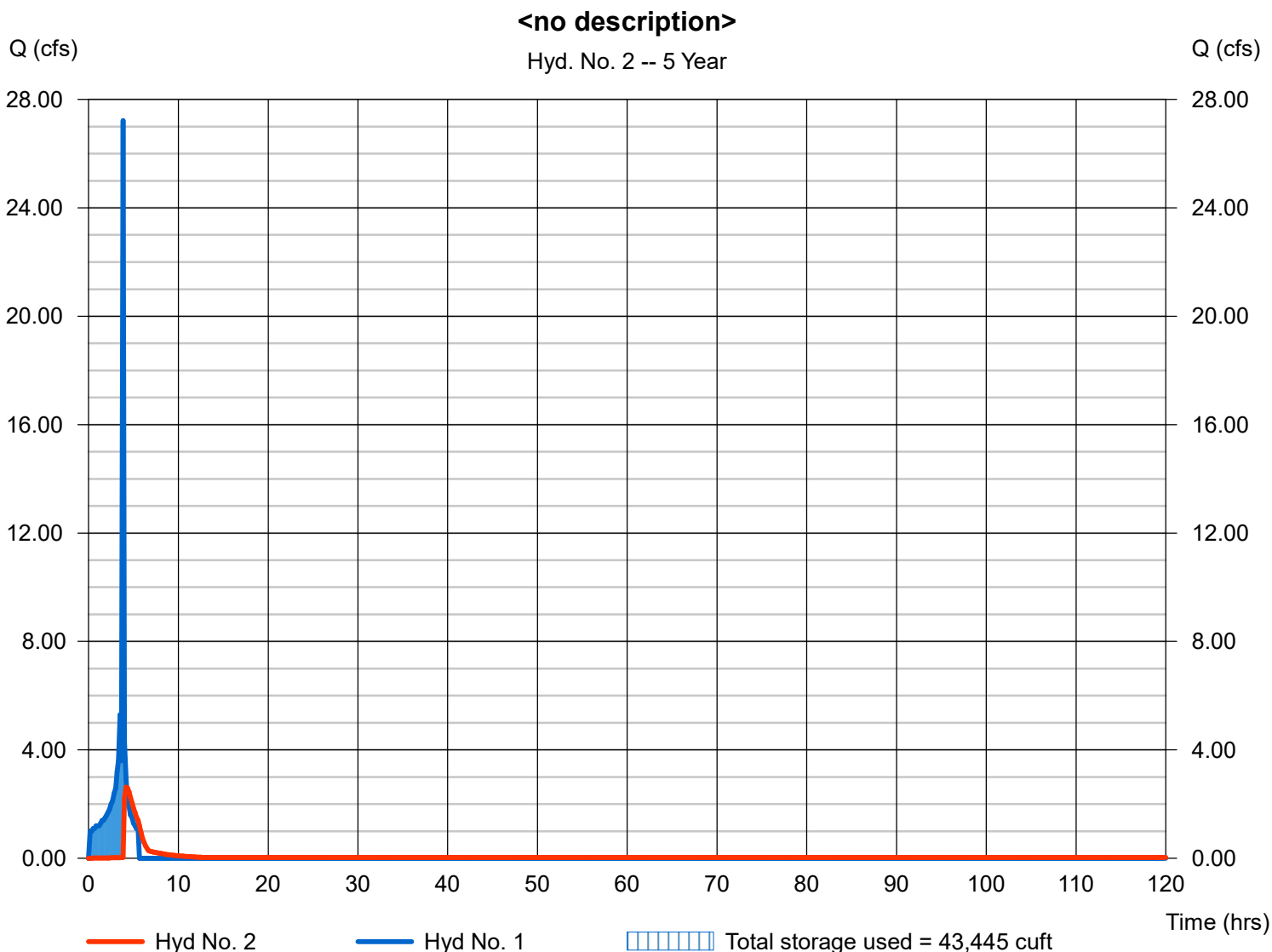
Hyd. No. 2

<no description>

Hydrograph type = Reservoir
 Storm frequency = 5 yrs
 Time interval = 10 min
 Inflow hyd. No. = 1 - <no description>
 Reservoir name = <New Pond>

Peak discharge = 2.621 cfs
 Time to peak = 4.17 hrs
 Hyd. volume = 50,752 cuft
 Max. Elevation = 534.49 ft
 Max. Storage = 43,445 cuft

Storage Indication method used.



Pond Report

4

Hydraflow Hydrographs by Intelisolve v9.23

Sunday, May 9, 2021

Pond No. 1 - <New Pond>

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 532.75 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	532.75	23,443	0	0
0.25	533.00	23,856	5,912	5,912
1.25	534.00	25,565	24,711	30,623
2.25	535.00	27,279	26,422	57,045
2.75	535.50	28,120	13,850	70,895
3.25	536.00	28,824	14,236	85,131
3.75	536.50	29,641	14,616	99,747

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	1.00	0.00	0.00
Span (in)	= 36.00	1.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 528.00	532.75	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 2.90	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)	= 6.75	0.00	0.00	0.00
Crest El. (ft)	= 534.25	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	---	---	---
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	Civ A cfs	Civ B cfs	Civ 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	532.75	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.03	591	532.78	61.35 ic	0.00 ic	---	---	0.00	---	---	---	---	---	0.001
0.05	1,182	532.80	61.35 ic	0.00 ic	---	---	0.00	---	---	---	---	---	0.003
0.08	1,774	532.83	61.35 ic	0.00 ic	---	---	0.00	---	---	---	---	---	0.005
0.10	2,365	532.85	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.006
0.13	2,956	532.88	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.008
0.15	3,547	532.90	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.009
0.18	4,139	532.93	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.010
0.20	4,730	532.95	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.010
0.23	5,321	532.98	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.011
0.25	5,912	533.00	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.012
0.35	8,383	533.10	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.015
0.45	10,854	533.20	61.35 ic	0.02 ic	---	---	0.00	---	---	---	---	---	0.017
0.55	13,326	533.30	61.35 ic	0.02 ic	---	---	0.00	---	---	---	---	---	0.019
0.65	15,797	533.40	61.35 ic	0.02 ic	---	---	0.00	---	---	---	---	---	0.020
0.75	18,268	533.50	61.35 ic	0.02 ic	---	---	0.00	---	---	---	---	---	0.022
0.85	20,739	533.60	61.35 ic	0.02 ic	---	---	0.00	---	---	---	---	---	0.024
0.95	23,210	533.70	61.35 ic	0.03 ic	---	---	0.00	---	---	---	---	---	0.025
1.05	25,681	533.80	61.35 ic	0.03 ic	---	---	0.00	---	---	---	---	---	0.026
1.15	28,152	533.90	61.35 ic	0.03 ic	---	---	0.00	---	---	---	---	---	0.028
1.25	30,623	534.00	61.35 ic	0.03 ic	---	---	0.00	---	---	---	---	---	0.029
1.35	33,265	534.10	61.35 ic	0.03 ic	---	---	0.00	---	---	---	---	---	0.030
1.45	35,907	534.20	61.35 ic	0.03 ic	---	---	0.00	---	---	---	---	---	0.031
1.55	38,549	534.30	61.35 ic	0.03 ic	---	---	0.25	---	---	---	---	---	0.283
1.65	41,192	534.40	61.35 ic	0.03 ic	---	---	1.30	---	---	---	---	---	1.338
1.75	43,834	534.50	61.35 ic	0.03 ic	---	---	2.81	---	---	---	---	---	2.842
1.85	46,476	534.60	61.35 ic	0.04 ic	---	---	4.65	---	---	---	---	---	4.687
1.95	49,118	534.70	61.35 ic	0.04 ic	---	---	6.78	---	---	---	---	---	6.818
2.05	51,760	534.80	61.35 ic	0.04 ic	---	---	9.16	---	---	---	---	---	9.201
2.15	54,403	534.90	61.35 ic	0.04 ic	---	---	11.77	---	---	---	---	---	11.81
2.25	57,045	535.00	61.35 ic	0.04 ic	---	---	14.60	---	---	---	---	---	14.64
2.30	58,430	535.05	61.35 ic	0.04 ic	---	---	16.08	---	---	---	---	---	16.12
2.35	59,815	535.10	61.35 ic	0.04 ic	---	---	17.61	---	---	---	---	---	17.65
2.40	61,200	535.15	61.35 ic	0.04 ic	---	---	14.53 ic	---	---	---	---	---	14.57
2.45	62,585	535.20	61.35 ic	0.04 ic	---	---	14.92 ic	---	---	---	---	---	14.96
2.50	63,970	535.25	61.35 ic	0.04 ic	---	---	15.31 ic	---	---	---	---	---	15.35
2.55	65,355	535.30	61.35 ic	0.04 ic	---	---	15.69 ic	---	---	---	---	---	15.73

Continues on next page...

<New Pond>

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
2.60	66,740	535.35	61.35 ic	0.04 ic	---	---	16.06 ic	---	---	---	---	---	16.10
2.65	68,125	535.40	61.35 ic	0.04 ic	---	---	16.42 ic	---	---	---	---	---	16.46
2.70	69,510	535.45	61.35 ic	0.04 ic	---	---	16.77 ic	---	---	---	---	---	16.81
2.75	70,895	535.50	61.35 ic	0.04 ic	---	---	17.12 ic	---	---	---	---	---	17.16
2.80	72,318	535.55	61.35 ic	0.04 ic	---	---	17.46 ic	---	---	---	---	---	17.50
2.85	73,742	535.60	61.35 ic	0.04 ic	---	---	17.79 ic	---	---	---	---	---	17.83
2.90	75,165	535.65	61.35 ic	0.04 ic	---	---	18.12 ic	---	---	---	---	---	18.16
2.95	76,589	535.70	61.35 ic	0.04 ic	---	---	18.44 ic	---	---	---	---	---	18.48
3.00	78,013	535.75	61.35 ic	0.05 ic	---	---	18.75 ic	---	---	---	---	---	18.80
3.05	79,436	535.80	61.35 ic	0.05 ic	---	---	19.06 ic	---	---	---	---	---	19.11
3.10	80,860	535.85	61.35 ic	0.05 ic	---	---	19.37 ic	---	---	---	---	---	19.41
3.15	82,283	535.90	61.35 ic	0.05 ic	---	---	19.67 ic	---	---	---	---	---	19.71
3.20	83,707	535.95	61.35 ic	0.05 ic	---	---	19.96 ic	---	---	---	---	---	20.01
3.25	85,131	536.00	61.35 ic	0.05 ic	---	---	20.25 ic	---	---	---	---	---	20.30
3.30	86,592	536.05	61.35 ic	0.05 ic	---	---	20.54 ic	---	---	---	---	---	20.59
3.35	88,054	536.10	61.35 ic	0.05 ic	---	---	20.83 ic	---	---	---	---	---	20.87
3.40	89,516	536.15	61.35 ic	0.05 ic	---	---	21.10 ic	---	---	---	---	---	21.15
3.45	90,977	536.20	61.35 ic	0.05 ic	---	---	21.38 ic	---	---	---	---	---	21.43
3.50	92,439	536.25	61.35 ic	0.05 ic	---	---	21.65 ic	---	---	---	---	---	21.70
3.55	93,900	536.30	61.35 ic	0.05 ic	---	---	21.92 ic	---	---	---	---	---	21.97
3.60	95,362	536.35	61.35 ic	0.05 ic	---	---	22.19 ic	---	---	---	---	---	22.24
3.65	96,824	536.40	61.35 ic	0.05 ic	---	---	22.45 ic	---	---	---	---	---	22.50
3.70	98,285	536.45	61.35 ic	0.05 ic	---	---	22.71 ic	---	---	---	---	---	22.76
3.75	99,747	536.50	61.35 ic	0.05 ic	---	---	22.97 ic	---	---	---	---	---	23.02

...End

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

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	31.60	10	250	69,120	----	-----	-----	<no description>
2	Reservoir	8.789	10	260	66,084	1	534.82	51,304	<no description>
Routing Calculations REV.gpw					Return Period: 10 Year			Sunday, May 9, 2021	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

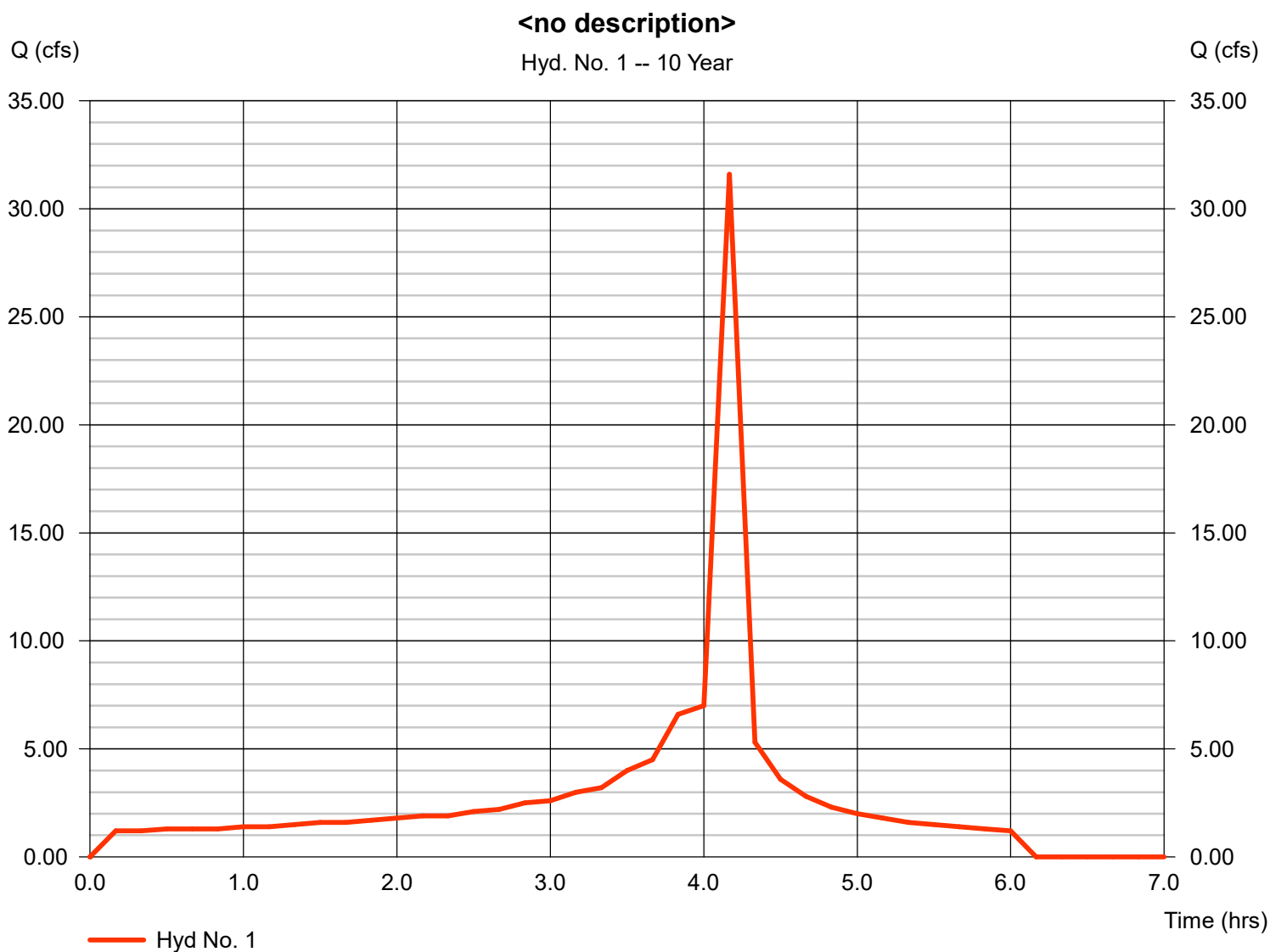
Sunday, May 9, 2021

Hyd. No. 1

<no description>

Hydrograph type = Manual
 Storm frequency = 10 yrs
 Time interval = 10 min

Peak discharge = 31.60 cfs
 Time to peak = 4.17 hrs
 Hyd. volume = 69,120 cuft



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Sunday, May 9, 2021

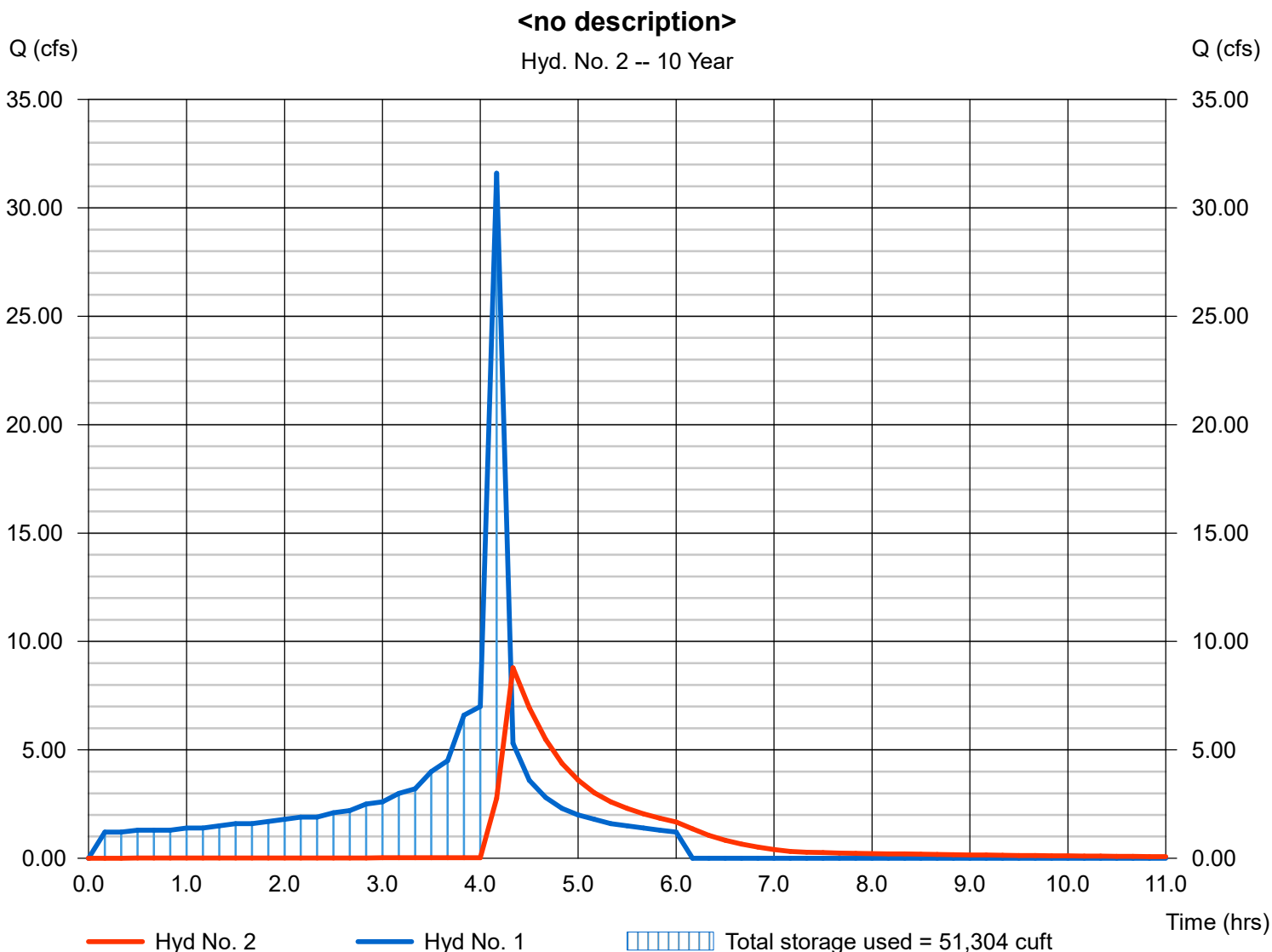
Hyd. No. 2

<no description>

Hydrograph type = Reservoir
 Storm frequency = 10 yrs
 Time interval = 10 min
 Inflow hyd. No. = 1 - <no description>
 Reservoir name = <New Pond>

Peak discharge = 8.789 cfs
 Time to peak = 4.33 hrs
 Hyd. volume = 66,084 cuft
 Max. Elevation = 534.82 ft
 Max. Storage = 51,304 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

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	34.65	10	250	84,210	----	-----	-----	<no description>
2	Reservoir	14.63	10	260	81,171	1	535.09	57,039	<no description>
Routing Calculations REV.gpw					Return Period: 25 Year			Sunday, May 9, 2021	

Hydrograph Report

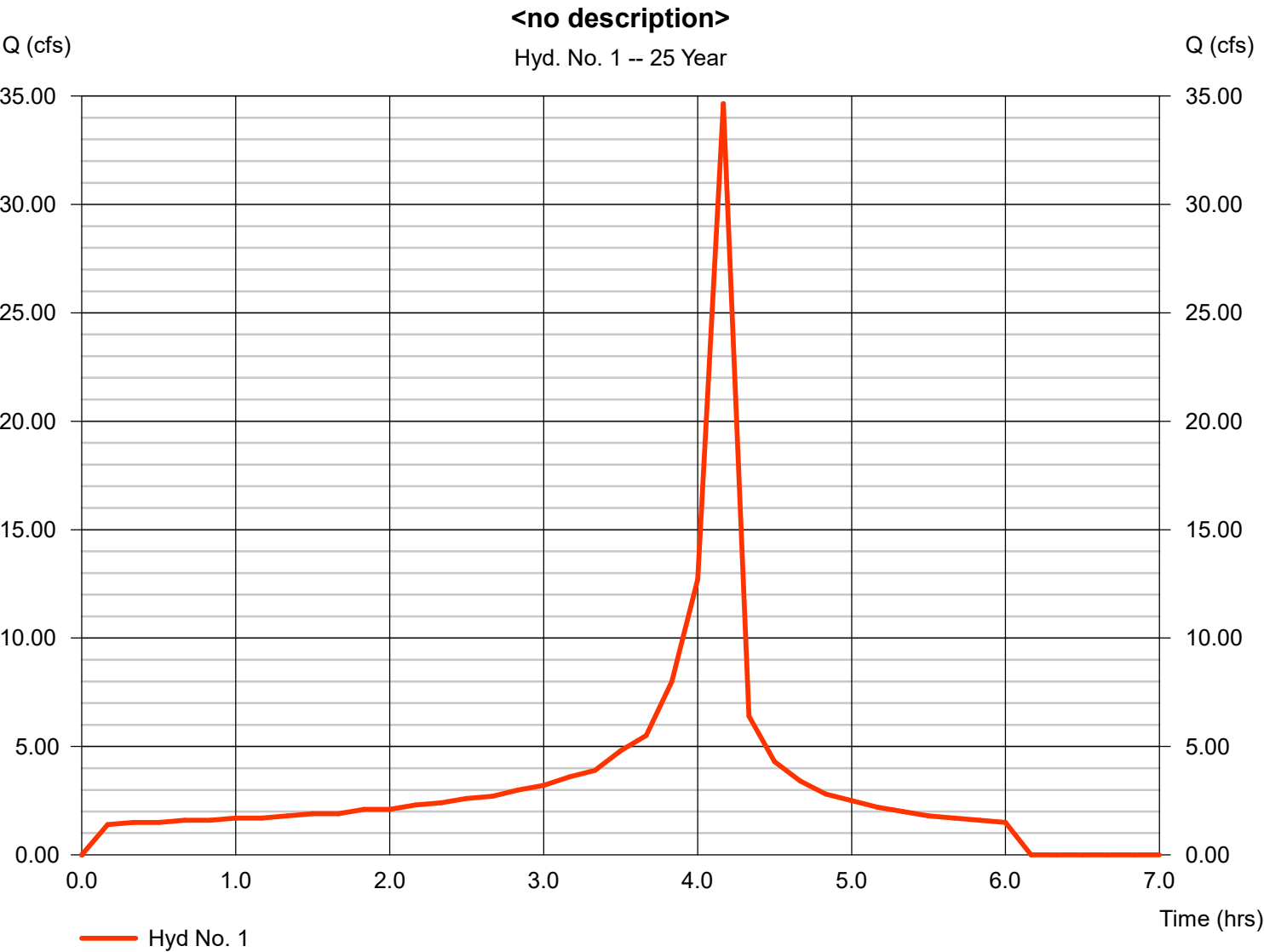
Hydraflow Hydrographs by Intelisolve v9.23

Sunday, May 9, 2021

Hyd. No. 1

<no description>

Hydrograph type	= Manual	Peak discharge	= 34.65 cfs
Storm frequency	= 25 yrs	Time to peak	= 4.17 hrs
Time interval	= 10 min	Hyd. volume	= 84,210 cuft



Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Sunday, May 9, 2021

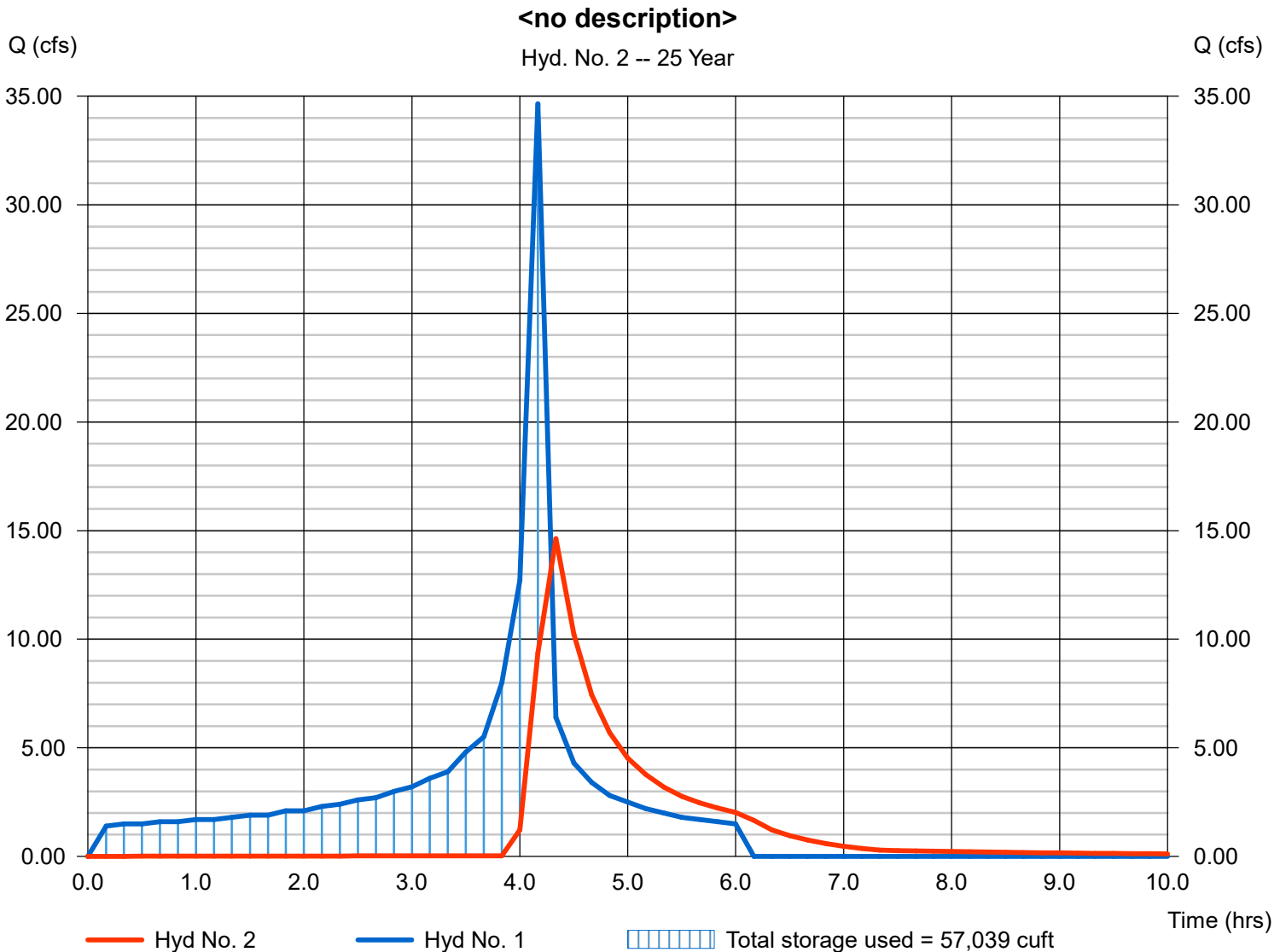
Hyd. No. 2

<no description>

Hydrograph type = Reservoir
 Storm frequency = 25 yrs
 Time interval = 10 min
 Inflow hyd. No. = 1 - <no description>
 Reservoir name = <New Pond>

Peak discharge = 14.63 cfs
 Time to peak = 4.33 hrs
 Hyd. volume = 81,171 cuft
 Max. Elevation = 535.09 ft
 Max. Storage = 57,039 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

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	39.24	10	250	95,604	----	-----	-----	<no description>
2	Reservoir	14.69	10	260	92,564	1	535.25	61,621	<no description>
Routing Calculations REV.gpw					Return Period: 50 Year			Sunday, May 9, 2021	

Hydrograph Report

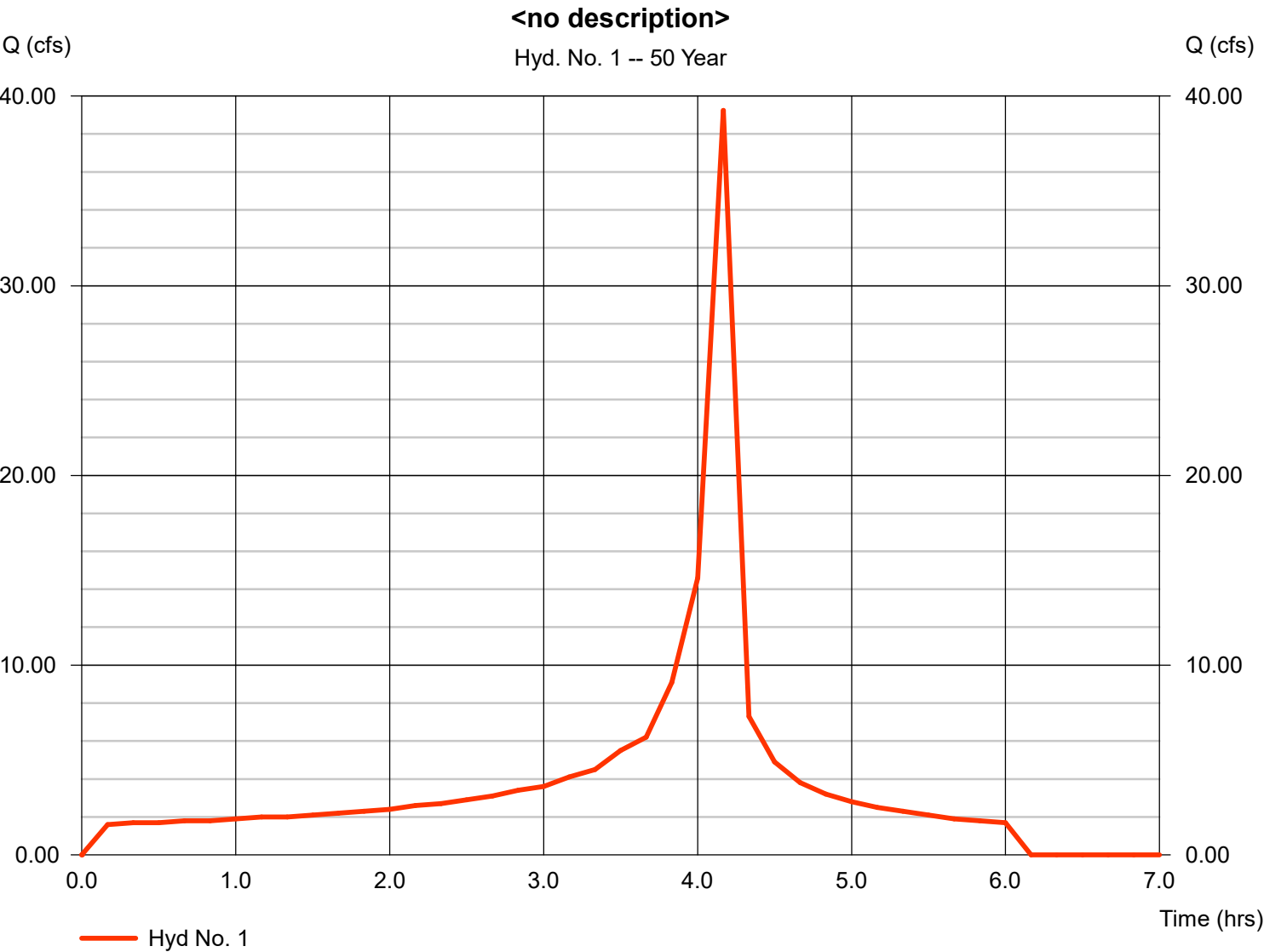
Hydraflow Hydrographs by Intelisolve v9.23

Sunday, May 9, 2021

Hyd. No. 1

<no description>

Hydrograph type	= Manual	Peak discharge	= 39.24 cfs
Storm frequency	= 50 yrs	Time to peak	= 4.17 hrs
Time interval	= 10 min	Hyd. volume	= 95,604 cuft



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

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	27.22	10	230	53,772	----	-----	-----	<no description>
2	Reservoir	2.621	10	250	50,752	1	534.49	43,445	<no description>
Routing Calculations REV.gpw					Return Period: 5 Year			Sunday, May 9, 2021	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Sunday, May 9, 2021

Hyd. No. 1

<no description>

Hydrograph type = Manual
 Storm frequency = 5 yrs
 Time interval = 10 min

Peak discharge = 27.22 cfs
 Time to peak = 3.83 hrs
 Hyd. volume = 53,772 cuft

Hydrograph Discharge Table

(Printed values >= 1.00% of Qp.)

Time -- Outflow
(hrs cfs)

0.17	1.000
0.33	1.000
0.50	1.100
0.67	1.100
0.83	1.200
1.00	1.200
1.17	1.200
1.33	1.300
1.50	1.400
1.67	1.400
1.83	1.500
2.00	1.600
2.17	1.700
2.33	1.800
2.50	2.000
2.67	2.100
2.83	2.400
3.00	2.600
3.17	3.200
3.33	3.600
3.50	5.300
3.67	3.600
3.83	27.22 <<
4.00	4.300
4.17	2.900
4.33	2.200
4.50	1.900
4.67	1.600
4.83	1.500
5.00	1.300
5.17	1.200
5.33	1.100
5.50	1.100

...End

Hydrograph Report

Hyd. No. 2

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 2.621 cfs
Storm frequency	= 5 yrs	Time to peak	= 4.17 hrs
Time interval	= 10 min	Hyd. volume	= 50,752 cuft
Inflow hyd. No.	= 1 - <no description>	Reservoir name	= <New Pond>
Max. Elevation	= 534.49 ft	Max. Storage	= 43,445 cuft

Storage Indication method used.

(Printed values >= 1.00% of Qp.)

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
3.83	27.22 <<	534.13	61.35	0.030	----	----	----	----	----	----	----	0.030
4.00	4.300	534.46	61.35	0.034	----	----	2.184	----	----	----	----	2.217
4.17	2.900	534.49 <<	61.35	0.034	----	----	2.586	----	----	----	----	2.621 <<
4.33	2.200	534.48	61.35	0.034	----	----	2.566	----	----	----	----	2.600
4.50	1.900	534.47	61.35	0.034	----	----	2.406	----	----	----	----	2.440
4.67	1.600	534.46	61.35	0.034	----	----	2.205	----	----	----	----	2.238
4.83	1.500	534.45	61.35	0.034	----	----	2.004	----	----	----	----	2.038
5.00	1.300	534.43	61.35	0.034	----	----	1.818	----	----	----	----	1.852
5.17	1.200	534.42	61.35	0.034	----	----	1.642	----	----	----	----	1.676
5.33	1.100	534.41	61.35	0.033	----	----	1.489	----	----	----	----	1.523
5.50	1.100	534.40	61.35	0.033	----	----	1.366	----	----	----	----	1.399
5.67	0.000	534.39	61.35	0.033	----	----	1.168	----	----	----	----	1.201
5.83	0.000	534.36	61.35	0.033	----	----	0.911	----	----	----	----	0.944
6.00	0.000	534.34	61.35	0.033	----	----	0.709	----	----	----	----	0.742
6.17	0.000	534.33	61.35	0.033	----	----	0.551	----	----	----	----	0.583
6.33	0.000	534.32	61.35	0.032	----	----	0.426	----	----	----	----	0.459
6.50	0.000	534.31	61.35	0.032	----	----	0.328	----	----	----	----	0.361
6.67	0.000	534.30	61.35	0.032	----	----	0.251	----	----	----	----	0.283
6.83	0.000	534.29	61.35	0.032	----	----	0.235	----	----	----	----	0.267
7.00	0.000	534.29	61.35	0.032	----	----	0.220	----	----	----	----	0.252
7.17	0.000	534.28	61.35	0.032	----	----	0.206	----	----	----	----	0.238
7.33	0.000	534.28	61.35	0.032	----	----	0.193	----	----	----	----	0.225
7.50	0.000	534.27	61.35	0.032	----	----	0.181	----	----	----	----	0.213
7.67	0.000	534.27	61.35	0.032	----	----	0.169	----	----	----	----	0.201
7.83	0.000	534.26	61.35	0.032	----	----	0.158	----	----	----	----	0.190
8.00	0.000	534.26	61.35	0.032	----	----	0.147	----	----	----	----	0.179
8.17	0.000	534.25	61.35	0.032	----	----	0.137	----	----	----	----	0.169
8.33	0.000	534.25	61.35	0.032	----	----	0.128	----	----	----	----	0.160
8.50	0.000	534.25	61.35	0.032	----	----	0.119	----	----	----	----	0.151
8.67	0.000	534.24	61.35	0.032	----	----	0.111	----	----	----	----	0.142
8.83	0.000	534.24	61.35	0.032	----	----	0.103	----	----	----	----	0.135
9.00	0.000	534.24	61.35	0.032	----	----	0.096	----	----	----	----	0.127
9.17	0.000	534.24	61.35	0.032	----	----	0.089	----	----	----	----	0.120
9.33	0.000	534.23	61.35	0.032	----	----	0.082	----	----	----	----	0.113
9.50	0.000	534.23	61.35	0.031	----	----	0.076	----	----	----	----	0.107
9.67	0.000	534.23	61.35	0.031	----	----	0.070	----	----	----	----	0.101
9.83	0.000	534.23	61.35	0.031	----	----	0.064	----	----	----	----	0.095
10.00	0.000	534.22	61.35	0.031	----	----	0.059	----	----	----	----	0.090
10.17	0.000	534.22	61.35	0.031	----	----	0.054	----	----	----	----	0.085
10.33	0.000	534.22	61.35	0.031	----	----	0.049	----	----	----	----	0.080
10.50	0.000	534.22	61.35	0.031	----	----	0.045	----	----	----	----	0.076
10.67	0.000	534.22	61.35	0.031	----	----	0.040	----	----	----	----	0.072

<no description>

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
10.83	0.000	534.21	61.35	0.031	----	----	0.036	----	----	----	----	0.068
11.00	0.000	534.21	61.35	0.031	----	----	0.033	----	----	----	----	0.064
11.17	0.000	534.21	61.35	0.031	----	----	0.029	----	----	----	----	0.060
11.33	0.000	534.21	61.35	0.031	----	----	0.026	----	----	----	----	0.057
11.50	0.000	534.21	61.35	0.031	----	----	0.023	----	----	----	----	0.054
11.67	0.000	534.21	61.35	0.031	----	----	0.020	----	----	----	----	0.051
11.83	0.000	534.21	61.35	0.031	----	----	0.017	----	----	----	----	0.048
12.00	0.000	534.21	61.35	0.031	----	----	0.014	----	----	----	----	0.045
12.17	0.000	534.20	61.35	0.031	----	----	0.012	----	----	----	----	0.043
12.33	0.000	534.20	61.35	0.031	----	----	0.009	----	----	----	----	0.040
12.50	0.000	534.20	61.35	0.031	----	----	0.007	----	----	----	----	0.038
12.67	0.000	534.20	61.35	0.031	----	----	0.005	----	----	----	----	0.036
12.83	0.000	534.20	61.35	0.031	----	----	0.003	----	----	----	----	0.034
13.00	0.000	534.20	61.35	0.031	----	----	0.001	----	----	----	----	0.032
13.17	0.000	534.20	61.35	0.031	----	----	----	----	----	----	----	0.031
13.33	0.000	534.20	61.35	0.031	----	----	----	----	----	----	----	0.031
13.50	0.000	534.20	61.35	0.031	----	----	----	----	----	----	----	0.031
13.67	0.000	534.20	61.35	0.031	----	----	----	----	----	----	----	0.031
13.83	0.000	534.20	61.35	0.031	----	----	----	----	----	----	----	0.031
14.00	0.000	534.20	61.35	0.031	----	----	----	----	----	----	----	0.031
14.17	0.000	534.20	61.35	0.031	----	----	----	----	----	----	----	0.031
14.33	0.000	534.19	61.35	0.031	----	----	----	----	----	----	----	0.031
14.50	0.000	534.19	61.35	0.031	----	----	----	----	----	----	----	0.031
14.67	0.000	534.19	61.35	0.031	----	----	----	----	----	----	----	0.031
14.83	0.000	534.19	61.35	0.031	----	----	----	----	----	----	----	0.031
15.00	0.000	534.19	61.35	0.031	----	----	----	----	----	----	----	0.031
15.17	0.000	534.19	61.35	0.031	----	----	----	----	----	----	----	0.031
15.33	0.000	534.19	61.35	0.031	----	----	----	----	----	----	----	0.031
15.50	0.000	534.19	61.35	0.031	----	----	----	----	----	----	----	0.031
15.67	0.000	534.19	61.35	0.031	----	----	----	----	----	----	----	0.031
15.83	0.000	534.19	61.35	0.031	----	----	----	----	----	----	----	0.031
16.00	0.000	534.19	61.35	0.031	----	----	----	----	----	----	----	0.031
16.17	0.000	534.19	61.35	0.031	----	----	----	----	----	----	----	0.031
16.33	0.000	534.19	61.35	0.031	----	----	----	----	----	----	----	0.031
16.50	0.000	534.19	61.35	0.031	----	----	----	----	----	----	----	0.031
16.67	0.000	534.18	61.35	0.031	----	----	----	----	----	----	----	0.031
16.83	0.000	534.18	61.35	0.031	----	----	----	----	----	----	----	0.031
17.00	0.000	534.18	61.35	0.031	----	----	----	----	----	----	----	0.031
17.17	0.000	534.18	61.35	0.031	----	----	----	----	----	----	----	0.031
17.33	0.000	534.18	61.35	0.031	----	----	----	----	----	----	----	0.031
17.50	0.000	534.18	61.35	0.031	----	----	----	----	----	----	----	0.031
17.67	0.000	534.18	61.35	0.031	----	----	----	----	----	----	----	0.031
17.83	0.000	534.18	61.35	0.031	----	----	----	----	----	----	----	0.031
18.00	0.000	534.18	61.35	0.031	----	----	----	----	----	----	----	0.031
18.17	0.000	534.18	61.35	0.031	----	----	----	----	----	----	----	0.031
18.33	0.000	534.18	61.35	0.031	----	----	----	----	----	----	----	0.031
18.50	0.000	534.18	61.35	0.031	----	----	----	----	----	----	----	0.031
18.67	0.000	534.18	61.35	0.031	----	----	----	----	----	----	----	0.031
18.83	0.000	534.18	61.35	0.031	----	----	----	----	----	----	----	0.031
19.00	0.000	534.18	61.35	0.031	----	----	----	----	----	----	----	0.031
19.17	0.000	534.17	61.35	0.031	----	----	----	----	----	----	----	0.031
19.33	0.000	534.17	61.35	0.031	----	----	----	----	----	----	----	0.031
19.50	0.000	534.17	61.35	0.031	----	----	----	----	----	----	----	0.031
19.67	0.000	534.17	61.35	0.031	----	----	----	----	----	----	----	0.031
19.83	0.000	534.17	61.35	0.031	----	----	----	----	----	----	----	0.031
20.00	0.000	534.17	61.35	0.031	----	----	----	----	----	----	----	0.031

Continues on next page...

Hydrograph Discharge Table

[illegible]

Continues on next page...

[illegible]

Continues on next page...

[illegible]

Continues on next page...

[illegible]

Continues on next page...

[illegible]

Continues on next page...

[illegible]

Continues on next page...

[illegible]

Continues on next page...

[illegible]

Continues on next page...

[illegible]

Continues on next page...

<no description>

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
113.50	0.000	533.79	61.35	0.026	----	----	----	----	----	----	----	0.026
113.67	0.000	533.79	61.35	0.026	----	----	----	----	----	----	----	0.026
113.83	0.000	533.79	61.35	0.026	----	----	----	----	----	----	----	0.026
114.00	0.000	533.79	61.35	0.026	----	----	----	----	----	----	----	0.026
114.17	0.000	533.79	61.35	0.026	----	----	----	----	----	----	----	0.026
114.33	0.000	533.79	61.35	0.026	----	----	----	----	----	----	----	0.026
114.50	0.000	533.79	61.35	0.026	----	----	----	----	----	----	----	0.026
114.67	0.000	533.79	61.35	0.026	----	----	----	----	----	----	----	0.026

...End

Pond Report

16

Hydraflow Hydrographs by Intelisolve v9.23

Sunday, May 9, 2021

Pond No. 1 - <New Pond>

Pond Data

Contours - User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 532.75 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	532.75	23,443	0	0
0.25	533.00	23,856	5,912	5,912
1.25	534.00	25,565	24,711	30,623
2.25	535.00	27,279	26,422	57,045
2.75	535.50	28,120	13,850	70,895
3.25	536.00	28,824	14,236	85,131
3.75	536.50	29,641	14,616	99,747

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	1.00	0.00	0.00
Span (in)	= 36.00	1.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 528.00	532.75	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 2.90	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)	= 6.75	0.00	0.00	0.00
Crest El. (ft)	= 534.25	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	---	---	---
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	Civ A cfs	Civ B cfs	Civ 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	532.75	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.03	591	532.78	61.35 ic	0.00 ic	---	---	0.00	---	---	---	---	---	0.001
0.05	1,182	532.80	61.35 ic	0.00 ic	---	---	0.00	---	---	---	---	---	0.003
0.08	1,774	532.83	61.35 ic	0.00 ic	---	---	0.00	---	---	---	---	---	0.005
0.10	2,365	532.85	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.006
0.13	2,956	532.88	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.008
0.15	3,547	532.90	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.009
0.18	4,139	532.93	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.010
0.20	4,730	532.95	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.010
0.23	5,321	532.98	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.011
0.25	5,912	533.00	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.012
0.35	8,383	533.10	61.35 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.015
0.45	10,854	533.20	61.35 ic	0.02 ic	---	---	0.00	---	---	---	---	---	0.017
0.55	13,326	533.30	61.35 ic	0.02 ic	---	---	0.00	---	---	---	---	---	0.019
0.65	15,797	533.40	61.35 ic	0.02 ic	---	---	0.00	---	---	---	---	---	0.020
0.75	18,268	533.50	61.35 ic	0.02 ic	---	---	0.00	---	---	---	---	---	0.022
0.85	20,739	533.60	61.35 ic	0.02 ic	---	---	0.00	---	---	---	---	---	0.024
0.95	23,210	533.70	61.35 ic	0.03 ic	---	---	0.00	---	---	---	---	---	0.025
1.05	25,681	533.80	61.35 ic	0.03 ic	---	---	0.00	---	---	---	---	---	0.026
1.15	28,152	533.90	61.35 ic	0.03 ic	---	---	0.00	---	---	---	---	---	0.028
1.25	30,623	534.00	61.35 ic	0.03 ic	---	---	0.00	---	---	---	---	---	0.029
1.35	33,265	534.10	61.35 ic	0.03 ic	---	---	0.00	---	---	---	---	---	0.030
1.45	35,907	534.20	61.35 ic	0.03 ic	---	---	0.00	---	---	---	---	---	0.031
1.55	38,549	534.30	61.35 ic	0.03 ic	---	---	0.25	---	---	---	---	---	0.283
1.65	41,192	534.40	61.35 ic	0.03 ic	---	---	1.30	---	---	---	---	---	1.338
1.75	43,834	534.50	61.35 ic	0.03 ic	---	---	2.81	---	---	---	---	---	2.842
1.85	46,476	534.60	61.35 ic	0.04 ic	---	---	4.65	---	---	---	---	---	4.687
1.95	49,118	534.70	61.35 ic	0.04 ic	---	---	6.78	---	---	---	---	---	6.818
2.05	51,760	534.80	61.35 ic	0.04 ic	---	---	9.16	---	---	---	---	---	9.201
2.15	54,403	534.90	61.35 ic	0.04 ic	---	---	11.77	---	---	---	---	---	11.81
2.25	57,045	535.00	61.35 ic	0.04 ic	---	---	14.60	---	---	---	---	---	14.64
2.30	58,430	535.05	61.35 ic	0.04 ic	---	---	16.08	---	---	---	---	---	16.12
2.35	59,815	535.10	61.35 ic	0.04 ic	---	---	17.61	---	---	---	---	---	17.65
2.40	61,200	535.15	61.35 ic	0.04 ic	---	---	14.53 ic	---	---	---	---	---	14.57
2.45	62,585	535.20	61.35 ic	0.04 ic	---	---	14.92 ic	---	---	---	---	---	14.96
2.50	63,970	535.25	61.35 ic	0.04 ic	---	---	15.31 ic	---	---	---	---	---	15.35
2.55	65,355	535.30	61.35 ic	0.04 ic	---	---	15.69 ic	---	---	---	---	---	15.73

Continues on next page...

<New Pond>

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
2.60	66,740	535.35	61.35 ic	0.04 ic	---	---	16.06 ic	---	---	---	---	---	16.10
2.65	68,125	535.40	61.35 ic	0.04 ic	---	---	16.42 ic	---	---	---	---	---	16.46
2.70	69,510	535.45	61.35 ic	0.04 ic	---	---	16.77 ic	---	---	---	---	---	16.81
2.75	70,895	535.50	61.35 ic	0.04 ic	---	---	17.12 ic	---	---	---	---	---	17.16
2.80	72,318	535.55	61.35 ic	0.04 ic	---	---	17.46 ic	---	---	---	---	---	17.50
2.85	73,742	535.60	61.35 ic	0.04 ic	---	---	17.79 ic	---	---	---	---	---	17.83
2.90	75,165	535.65	61.35 ic	0.04 ic	---	---	18.12 ic	---	---	---	---	---	18.16
2.95	76,589	535.70	61.35 ic	0.04 ic	---	---	18.44 ic	---	---	---	---	---	18.48
3.00	78,013	535.75	61.35 ic	0.05 ic	---	---	18.75 ic	---	---	---	---	---	18.80
3.05	79,436	535.80	61.35 ic	0.05 ic	---	---	19.06 ic	---	---	---	---	---	19.11
3.10	80,860	535.85	61.35 ic	0.05 ic	---	---	19.37 ic	---	---	---	---	---	19.41
3.15	82,283	535.90	61.35 ic	0.05 ic	---	---	19.67 ic	---	---	---	---	---	19.71
3.20	83,707	535.95	61.35 ic	0.05 ic	---	---	19.96 ic	---	---	---	---	---	20.01
3.25	85,131	536.00	61.35 ic	0.05 ic	---	---	20.25 ic	---	---	---	---	---	20.30
3.30	86,592	536.05	61.35 ic	0.05 ic	---	---	20.54 ic	---	---	---	---	---	20.59
3.35	88,054	536.10	61.35 ic	0.05 ic	---	---	20.83 ic	---	---	---	---	---	20.87
3.40	89,516	536.15	61.35 ic	0.05 ic	---	---	21.10 ic	---	---	---	---	---	21.15
3.45	90,977	536.20	61.35 ic	0.05 ic	---	---	21.38 ic	---	---	---	---	---	21.43
3.50	92,439	536.25	61.35 ic	0.05 ic	---	---	21.65 ic	---	---	---	---	---	21.70
3.55	93,900	536.30	61.35 ic	0.05 ic	---	---	21.92 ic	---	---	---	---	---	21.97
3.60	95,362	536.35	61.35 ic	0.05 ic	---	---	22.19 ic	---	---	---	---	---	22.24
3.65	96,824	536.40	61.35 ic	0.05 ic	---	---	22.45 ic	---	---	---	---	---	22.50
3.70	98,285	536.45	61.35 ic	0.05 ic	---	---	22.71 ic	---	---	---	---	---	22.76
3.75	99,747	536.50	61.35 ic	0.05 ic	---	---	22.97 ic	---	---	---	---	---	23.02

...End

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

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	31.60	10	250	69,120	----	-----	-----	<no description>
2	Reservoir	8.789	10	260	66,084	1	534.82	51,304	<no description>
Routing Calculations REV.gpw					Return Period: 10 Year			Sunday, May 9, 2021	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Sunday, May 9, 2021

Hyd. No. 1

<no description>

Hydrograph type = Manual
 Storm frequency = 10 yrs
 Time interval = 10 min

Peak discharge = 31.60 cfs
 Time to peak = 4.17 hrs
 Hyd. volume = 69,120 cuft

Hydrograph Discharge Table

(Printed values >= 1.00% of Qp.)

Time -- Outflow
(hrs cfs)

0.17	1.200
0.33	1.200
0.50	1.300
0.67	1.300
0.83	1.300
1.00	1.400
1.17	1.400
1.33	1.500
1.50	1.600
1.67	1.600
1.83	1.700
2.00	1.800
2.17	1.900
2.33	1.900
2.50	2.100
2.67	2.200
2.83	2.500
3.00	2.600
3.17	3.000
3.33	3.200
3.50	4.000
3.67	4.500
3.83	6.600
4.00	7.000
4.17	31.60 <<
4.33	5.300
4.50	3.600
4.67	2.800
4.83	2.300
5.00	2.000
5.17	1.800
5.33	1.600
5.50	1.500
5.67	1.400
5.83	1.300
6.00	1.200

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Sunday, May 9, 2021

Hyd. No. 2

<no description>

Hydrograph type = Reservoir
 Storm frequency = 10 yrs
 Time interval = 10 min
 Inflow hyd. No. = 1 - <no description>
 Max. Elevation = 534.82 ft

Peak discharge = 8.789 cfs
 Time to peak = 4.33 hrs
 Hyd. volume = 66,084 cuft
 Reservoir name = <New Pond>
 Max. Storage = 51,304 cuft

Storage Indication method used.

Hydrograph Discharge Table

(Printed values >= 1.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
4.17	31.60 <<	534.49	61.35	0.034	----	----	2.731	----	----	----	----	2.766
4.33	5.300	534.78 <<	61.35	0.037	----	----	8.752	----	----	----	----	8.789 <<
4.50	3.600	534.71	61.35	0.036	----	----	6.905	----	----	----	----	6.941
4.67	2.800	534.64	61.35	0.036	----	----	5.437	----	----	----	----	5.473
4.83	2.300	534.58	61.35	0.035	----	----	4.337	----	----	----	----	4.373
5.00	2.000	534.54	61.35	0.035	----	----	3.568	----	----	----	----	3.603
5.17	1.800	534.51	61.35	0.034	----	----	2.979	----	----	----	----	3.013
5.33	1.600	534.48	61.35	0.034	----	----	2.569	----	----	----	----	2.603
5.50	1.500	534.46	61.35	0.034	----	----	2.262	----	----	----	----	2.296
5.67	1.400	534.45	61.35	0.034	----	----	2.016	----	----	----	----	2.049
5.83	1.300	534.43	61.35	0.034	----	----	1.811	----	----	----	----	1.845
6.00	1.200	534.42	61.35	0.034	----	----	1.638	----	----	----	----	1.672
6.17	0.000	534.40	61.35	0.033	----	----	1.326	----	----	----	----	1.359
6.33	0.000	534.37	61.35	0.033	----	----	1.030	----	----	----	----	1.063
6.50	0.000	534.35	61.35	0.033	----	----	0.803	----	----	----	----	0.835
6.67	0.000	534.34	61.35	0.033	----	----	0.624	----	----	----	----	0.657
6.83	0.000	534.32	61.35	0.032	----	----	0.484	----	----	----	----	0.516
7.00	0.000	534.31	61.35	0.032	----	----	0.374	----	----	----	----	0.406
7.17	0.000	534.30	61.35	0.032	----	----	0.287	----	----	----	----	0.319
7.33	0.000	534.30	61.35	0.032	----	----	0.242	----	----	----	----	0.275
7.50	0.000	534.29	61.35	0.032	----	----	0.227	----	----	----	----	0.259
7.67	0.000	534.28	61.35	0.032	----	----	0.213	----	----	----	----	0.245
7.83	0.000	534.28	61.35	0.032	----	----	0.199	----	----	----	----	0.231
8.00	0.000	534.27	61.35	0.032	----	----	0.186	----	----	----	----	0.218
8.17	0.000	534.27	61.35	0.032	----	----	0.174	----	----	----	----	0.206
8.33	0.000	534.27	61.35	0.032	----	----	0.163	----	----	----	----	0.195
8.50	0.000	534.26	61.35	0.032	----	----	0.152	----	----	----	----	0.184
8.67	0.000	534.26	61.35	0.032	----	----	0.142	----	----	----	----	0.174
8.83	0.000	534.25	61.35	0.032	----	----	0.132	----	----	----	----	0.164
9.00	0.000	534.25	61.35	0.032	----	----	0.123	----	----	----	----	0.155
9.17	0.000	534.25	61.35	0.032	----	----	0.115	----	----	----	----	0.146
9.33	0.000	534.24	61.35	0.032	----	----	0.107	----	----	----	----	0.138
9.50	0.000	534.24	61.35	0.032	----	----	0.099	----	----	----	----	0.131
9.67	0.000	534.24	61.35	0.032	----	----	0.092	----	----	----	----	0.123
9.83	0.000	534.23	61.35	0.032	----	----	0.085	----	----	----	----	0.116
10.00	0.000	534.23	61.35	0.032	----	----	0.078	----	----	----	----	0.110
10.17	0.000	534.23	61.35	0.031	----	----	0.072	----	----	----	----	0.104
10.33	0.000	534.23	61.35	0.031	----	----	0.067	----	----	----	----	0.098
10.50	0.000	534.22	61.35	0.031	----	----	0.061	----	----	----	----	0.093

...End

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

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	34.65	10	250	84,210	----	-----	-----	<no description>
2	Reservoir	14.63	10	260	81,171	1	535.09	57,039	<no description>
Routing Calculations REV.gpw					Return Period: 25 Year			Sunday, May 9, 2021	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Sunday, May 9, 2021

Hyd. No. 1

<no description>

Hydrograph type = Manual
 Storm frequency = 25 yrs
 Time interval = 10 min

Peak discharge = 34.65 cfs
 Time to peak = 4.17 hrs
 Hyd. volume = 84,210 cuft

Hydrograph Discharge Table

(Printed values >= 1.00% of Qp.)

Time -- Outflow
(hrs cfs)

0.17	1.400
0.33	1.500
0.50	1.500
0.67	1.600
0.83	1.600
1.00	1.700
1.17	1.700
1.33	1.800
1.50	1.900
1.67	1.900
1.83	2.100
2.00	2.100
2.17	2.300
2.33	2.400
2.50	2.600
2.67	2.700
2.83	3.000
3.00	3.200
3.17	3.600
3.33	3.900
3.50	4.800
3.67	5.500
3.83	8.000
4.00	12.70
4.17	34.65 <<
4.33	6.400
4.50	4.300
4.67	3.400
4.83	2.800
5.00	2.500
5.17	2.200
5.33	2.000
5.50	1.800
5.67	1.700
5.83	1.600
6.00	1.500

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Sunday, May 9, 2021

Hyd. No. 2

<no description>

Hydrograph type = Reservoir
 Storm frequency = 25 yrs
 Time interval = 10 min
 Inflow hyd. No. = 1 - <no description>
 Max. Elevation = 535.09 ft

Peak discharge = 14.63 cfs
 Time to peak = 4.33 hrs
 Hyd. volume = 81,171 cuft
 Reservoir name = <New Pond>
 Max. Storage = 57,039 cuft

Storage Indication method used.

Hydrograph Discharge Table

(Printed values >= 1.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
4.00	12.70	534.39	61.35	0.033	----	----	1.184	----	----	----	----	1.217
4.17	34.65 <<	534.81	61.35	0.037	----	----	9.323	----	----	----	----	9.360
4.33	6.400	535.00 <<	61.35	0.039	----	----	14.59	----	----	----	----	14.63 <<
4.50	4.300	534.84	61.35	0.038	----	----	10.18	----	----	----	----	10.22
4.67	3.400	534.73	61.35	0.037	----	----	7.401	----	----	----	----	7.437
4.83	2.800	534.65	61.35	0.036	----	----	5.658	----	----	----	----	5.695
5.00	2.500	534.59	61.35	0.035	----	----	4.493	----	----	----	----	4.528
5.17	2.200	534.55	61.35	0.035	----	----	3.739	----	----	----	----	3.774
5.33	2.000	534.52	61.35	0.035	----	----	3.160	----	----	----	----	3.194
5.50	1.800	534.49	61.35	0.034	----	----	2.727	----	----	----	----	2.761
5.67	1.700	534.47	61.35	0.034	----	----	2.432	----	----	----	----	2.466
5.83	1.600	534.46	61.35	0.034	----	----	2.194	----	----	----	----	2.228
6.00	1.500	534.45	61.35	0.034	----	----	1.996	----	----	----	----	2.030
6.17	0.000	534.42	61.35	0.034	----	----	1.623	----	----	----	----	1.657
6.33	0.000	534.39	61.35	0.033	----	----	1.184	----	----	----	----	1.217
6.50	0.000	534.36	61.35	0.033	----	----	0.924	----	----	----	----	0.957
6.67	0.000	534.34	61.35	0.033	----	----	0.720	----	----	----	----	0.752
6.83	0.000	534.33	61.35	0.033	----	----	0.559	----	----	----	----	0.591
7.00	0.000	534.32	61.35	0.032	----	----	0.432	----	----	----	----	0.465
7.17	0.000	534.31	61.35	0.032	----	----	0.333	----	----	----	----	0.365
7.33	0.000	534.30	61.35	0.032	----	----	0.255	----	----	----	----	0.287
7.50	0.000	534.29	61.35	0.032	----	----	0.236	----	----	----	----	0.268
7.67	0.000	534.29	61.35	0.032	----	----	0.221	----	----	----	----	0.253
7.83	0.000	534.28	61.35	0.032	----	----	0.207	----	----	----	----	0.239
8.00	0.000	534.28	61.35	0.032	----	----	0.194	----	----	----	----	0.226
8.17	0.000	534.27	61.35	0.032	----	----	0.181	----	----	----	----	0.213
8.33	0.000	534.27	61.35	0.032	----	----	0.170	----	----	----	----	0.201
8.50	0.000	534.26	61.35	0.032	----	----	0.158	----	----	----	----	0.190
8.67	0.000	534.26	61.35	0.032	----	----	0.148	----	----	----	----	0.180
8.83	0.000	534.25	61.35	0.032	----	----	0.138	----	----	----	----	0.170
9.00	0.000	534.25	61.35	0.032	----	----	0.129	----	----	----	----	0.160
9.17	0.000	534.25	61.35	0.032	----	----	0.120	----	----	----	----	0.151

...End

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.23

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	39.24	10	250	95,604	----	-----	-----	<no description>
2	Reservoir	14.69	10	260	92,564	1	535.25	61,621	<no description>
Routing Calculations REV.gpw					Return Period: 50 Year			Sunday, May 9, 2021	

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Sunday, May 9, 2021

Hyd. No. 1

<no description>

Hydrograph type = Manual
 Storm frequency = 50 yrs
 Time interval = 10 min

Peak discharge = 39.24 cfs
 Time to peak = 4.17 hrs
 Hyd. volume = 95,604 cuft

Hydrograph Discharge Table

(Printed values >= 1.00% of Qp.)

Time -- Outflow
(hrs cfs)

0.17	1.600
0.33	1.700
0.50	1.700
0.67	1.800
0.83	1.800
1.00	1.900
1.17	2.000
1.33	2.000
1.50	2.100
1.67	2.200
1.83	2.300
2.00	2.400
2.17	2.600
2.33	2.700
2.50	2.900
2.67	3.100
2.83	3.400
3.00	3.600
3.17	4.100
3.33	4.500
3.50	5.500
3.67	6.200
3.83	9.100
4.00	14.60
4.17	39.24 <<
4.33	7.300
4.50	4.900
4.67	3.800
4.83	3.200
5.00	2.800
5.17	2.500
5.33	2.300
5.50	2.100
5.67	1.900
5.83	1.800
6.00	1.700

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Sunday, May 9, 2021

Hyd. No. 2

<no description>

Hydrograph type = Reservoir
 Storm frequency = 50 yrs
 Time interval = 10 min
 Inflow hyd. No. = 1 - <no description>
 Max. Elevation = 535.25 ft

Peak discharge = 14.69 cfs
 Time to peak = 4.33 hrs
 Hyd. volume = 92,564 cuft
 Reservoir name = <New Pond>
 Max. Storage = 61,621 cuft

Storage Indication method used.

Hydrograph Discharge Table

(Printed values >= 1.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
3.83	9.100	534.34	61.35	0.033	----	----	0.651	----	----	----	----	0.684
4.00	14.60	534.56	61.35	0.035	----	----	3.830	----	----	----	----	3.865
4.17	39.24 <<	534.97	61.35	0.039	----	----	13.67	----	----	----	----	13.71
4.33	7.300	535.00 <<	61.35	0.039	----	----	14.65	----	----	----	----	14.69 <<
4.50	4.900	534.98	61.35	0.039	----	----	14.15	----	----	----	----	14.18
4.67	3.800	534.81	61.35	0.037	----	----	9.509	----	----	----	----	9.547
4.83	3.200	534.71	61.35	0.036	----	----	6.911	----	----	----	----	6.948
5.00	2.800	534.63	61.35	0.036	----	----	5.363	----	----	----	----	5.398
5.17	2.500	534.58	61.35	0.035	----	----	4.332	----	----	----	----	4.367
5.33	2.300	534.55	61.35	0.035	----	----	3.651	----	----	----	----	3.686
5.50	2.100	534.52	61.35	0.034	----	----	3.137	----	----	----	----	3.171
5.67	1.900	534.50	61.35	0.034	----	----	2.743	----	----	----	----	2.778
5.83	1.800	534.48	61.35	0.034	----	----	2.473	----	----	----	----	2.507
6.00	1.700	534.46	61.35	0.034	----	----	2.252	----	----	----	----	2.286
6.17	0.000	534.44	61.35	0.034	----	----	1.833	----	----	----	----	1.867
6.33	0.000	534.40	61.35	0.033	----	----	1.293	----	----	----	----	1.327
6.50	0.000	534.37	61.35	0.033	----	----	1.010	----	----	----	----	1.043
6.67	0.000	534.35	61.35	0.033	----	----	0.787	----	----	----	----	0.820
6.83	0.000	534.33	61.35	0.033	----	----	0.612	----	----	----	----	0.644
7.00	0.000	534.32	61.35	0.032	----	----	0.474	----	----	----	----	0.507
7.17	0.000	534.31	61.35	0.032	----	----	0.366	----	----	----	----	0.398
7.33	0.000	534.30	61.35	0.032	----	----	0.281	----	----	----	----	0.313
7.50	0.000	534.30	61.35	0.032	----	----	0.241	----	----	----	----	0.273
7.67	0.000	534.29	61.35	0.032	----	----	0.226	----	----	----	----	0.258
7.83	0.000	534.28	61.35	0.032	----	----	0.212	----	----	----	----	0.244
8.00	0.000	534.28	61.35	0.032	----	----	0.198	----	----	----	----	0.230
8.17	0.000	534.27	61.35	0.032	----	----	0.185	----	----	----	----	0.217
8.33	0.000	534.27	61.35	0.032	----	----	0.173	----	----	----	----	0.205
8.50	0.000	534.26	61.35	0.032	----	----	0.162	----	----	----	----	0.194
8.67	0.000	534.26	61.35	0.032	----	----	0.151	----	----	----	----	0.183
8.83	0.000	534.26	61.35	0.032	----	----	0.141	----	----	----	----	0.173
9.00	0.000	534.25	61.35	0.032	----	----	0.132	----	----	----	----	0.163
9.17	0.000	534.25	61.35	0.032	----	----	0.123	----	----	----	----	0.154

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.23

Sunday, May 9, 2021

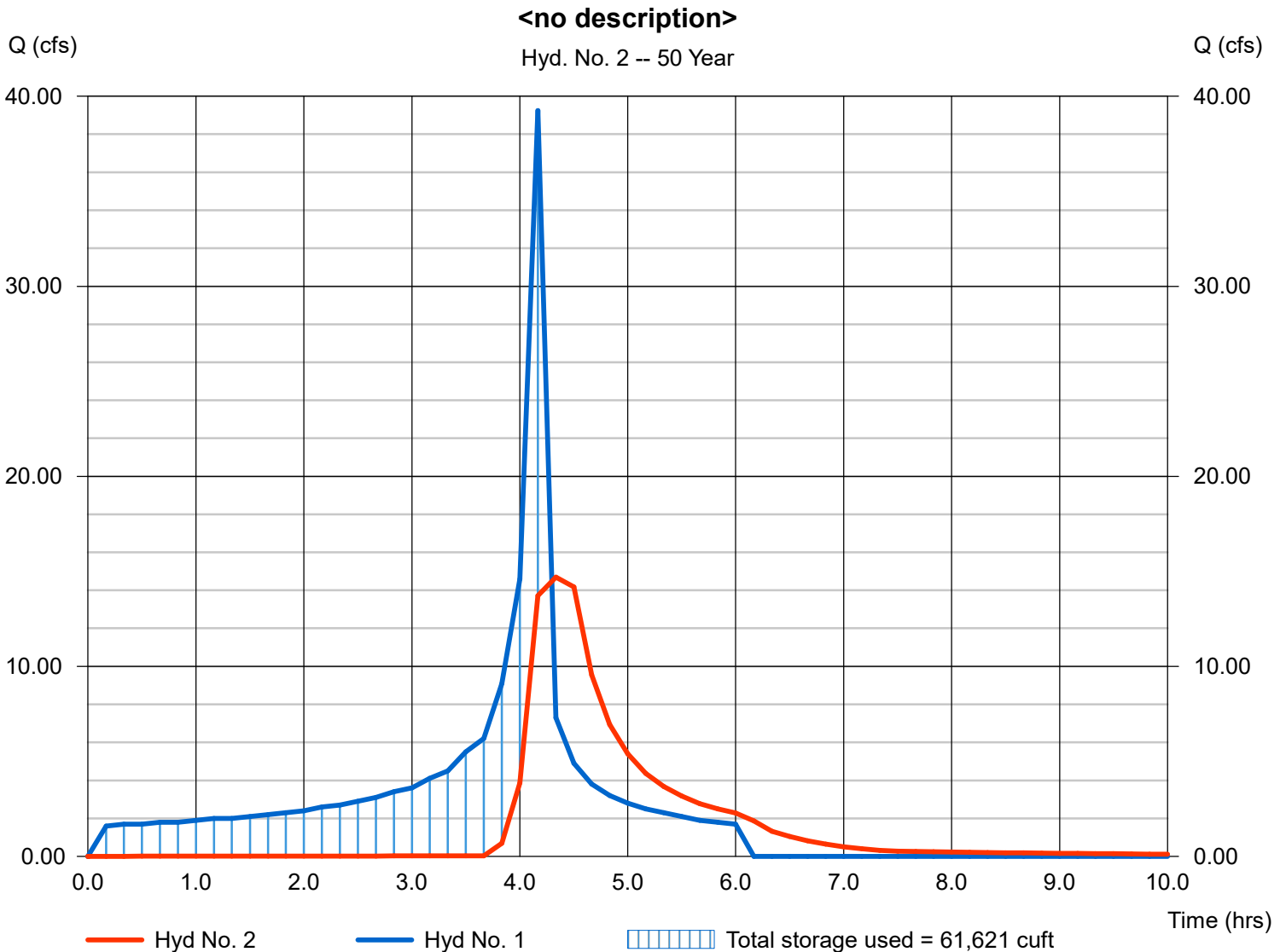
Hyd. No. 2

<no description>

Hydrograph type = Reservoir
 Storm frequency = 50 yrs
 Time interval = 10 min
 Inflow hyd. No. = 1 - <no description>
 Reservoir name = <New Pond>

Peak discharge = 14.69 cfs
 Time to peak = 4.33 hrs
 Hyd. volume = 92,564 cuft
 Max. Elevation = 535.25 ft
 Max. Storage = 61,621 cuft

Storage Indication method used.



APPENDIX A – TABLES AND CHARTS



**ENGINEERING
& DEVELOPMENT
department**



NOTICE

CITY OF SAN DIEGO • 1222 FIRST AVENUE, SAN DIEGO, CALIFORNIA 92101

DATE: August 7, 1987
TO: All Private Engineers
FROM: Subdivision Engineer
SUBJECT: DRAINAGE REQUIREMENTS FOR DEVELOPMENTS IN OTAY MESA

In order to minimize the effects of increased storm water runoff in Mexico, due to development of property in Otay Mesa, all property in Otay Mesa that is within the water shed that drains into Mexico, shall be developed with the following requirements:

1. Each property owner shall provide storm water detention facilities so that there will be no increase in the rate of runoff due to development of the property.
2. The detention facilities shall be designed so that the rate of runoff from the property will not be greater after development than it was before development for a 5 year, 10 year, 25 year and 50 year storm.
3. All drainage facilities crossing four-lane major or higher classification streets shall be designed for a Q100 (existing). Other facilities, except the major channel referred to in paragraph 5, may be designed for Q50 (existing).
4. The Drainage Design Manual shall be used as guidelines for design of drainage facilities and computing design discharges.
5. The City Engineer's Office, Flood Control Section, is preparing a preliminary plan for the main north-south channel from Otay Mesa Road near La Media to the Mexican Border. The preliminary design will include the design "Q" (Q100 existing), the invert grade, and the water surface elevation at the major road crossings.

C. R. LOCHHEAD
Subdivision Engineer

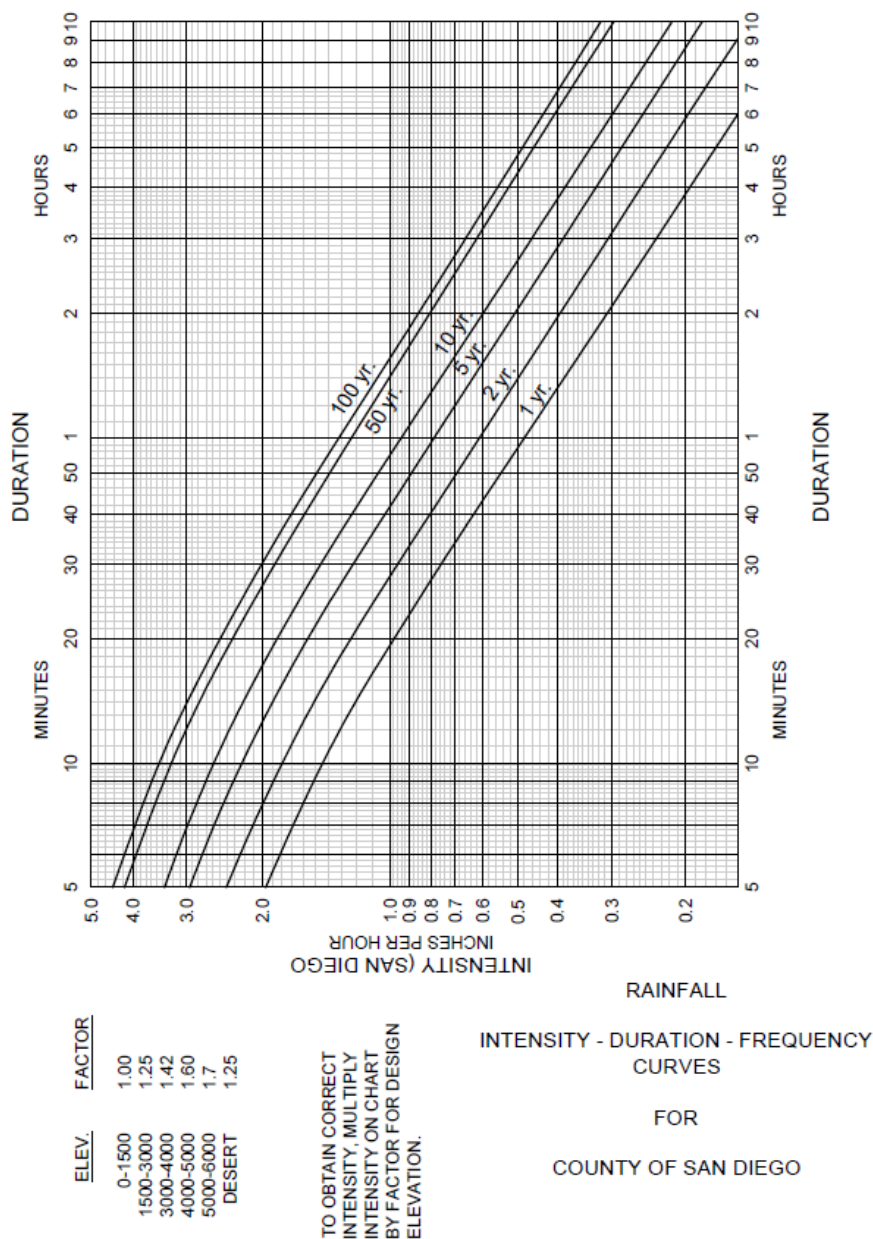


Figure A-1. Intensity-Duration-Frequency Design Chart

HANDBOOK OF HYDRAULICS

For the Solution of Hydraulic Engineering Problems

$$Q = \frac{K'}{n} d^3 s s'_{12}$$

D = depth of water d = diameter of channel

[illegible]

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C) Soil Type ⁽¹⁾
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than 1/2 acre)	0.45
Commercial ⁽²⁾	
80% Impervious	0.85
Industrial ⁽²⁾	
90% Impervious	0.95

Note:

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

⁽²⁾ Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

$$\begin{array}{rcl}
 \text{Actual imperviousness} & = & 50\% \\
 \text{Tabulated imperviousness} & = & 80\% \\
 \text{Revised C} & = & (50/80) \times 0.85 = 0.53
 \end{array}$$

The values in Table A-1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

A.1.3. Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the T_c for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_c calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).

Manning Roughness Coefficients

The Manning roughness coefficient (n) is used to represent flow resistance in open-channel hydraulic computations. This Appendix offers a compilation of Manning roughness coefficients that may be used in the hydraulic design and evaluation of drainage facilities.

These values serve only as a basic guide. The procedure for selecting appropriate values for Manning roughness coefficient, especially in natural channel systems, is subjective and requires judgment and skill that is primarily developed through experience. For work where very accurate determination of water surface profile is necessary, the design engineer should consult the governing Agency to obtain data regarding roughness coefficient values applicable to specific streams. The design engineer may also examine Flood Insurance Study data, or one of several references for more specific information on determining roughness coefficient.

Table C-1. Average Manning Roughness Coefficients for Pavement and Gutters ⁽¹⁾

Material	Manning Roughness Coefficient (n)
Concrete Gutter ⁽²⁾	0.015
Concrete Pavement Float Finish Broom Finish	0.014 0.016
Concrete Gutter with Asphalt Pavement Smooth Finish Rough Texture	0.013 0.015
Asphalt Pavement Smooth Finish Rough Texture	0.013 0.016

Based on FHWA HEC-22.

⁽¹⁾ Based on materials and workmanship required by standard specifications.

⁽²⁾ Increase roughness coefficient in gutters with mild slopes where sediment might accumulate by 0.020.

APPENDIX C: MANNING ROUGHNESS COEFFICIENTS

Table C-2. Average Manning Roughness Coefficients for Closed Conduits ⁽¹⁾

Conduit	Manning Roughness Coefficient (n)
Reinforced Concrete Pipe (RCP)	0.013
Corrugated Metal Pipe and Pipe Arch 2-3/8 x 1/2 inch Corrugations	0.024
Unlined	
Half Lined	
Full Flow	
d/D ≥ 0.60	
d/D < 0.60	
Fully Lined	
3x1 inch Corrugations	
6x2 inch Corrugations	
Spiral Rib Pipe	
Helically Wound Pipe	
18-inch	
24-inch	
30-inch	
36-inch	
42-inch	0.022
48-inch	0.023
Plastic Pipe (HPDE and PVC)	0.013
Smooth	
Corrugated	0.024
Vitrified Clay Pipe	0.014
Cast-Iron Pipe (Uncoated)	0.013
Steel Pipe	0.011
Brick	0.017
Cast-In-Place Concrete Pipe	0.017
Rough Wood Forms	
Smooth Wood or Steel Forms	0.014

⁽¹⁾ Based on materials and workmanship required by standard specifications.

APPENDIX C: MANNING ROUGHNESS COEFFICIENTS

Table C-3. Average Manning Roughness Coefficients for Small Open Channels Conveying Less than 50 cfs⁽¹⁾

Lining Type	Design Flow Depth		
	0 – 0.5 ft	0.5 – 2.0 ft	> 2.0 ft
Concrete (Poured)	0.015	0.013	0.013
Air Blown Concrete	0.023	0.019	0.016
Grouted Riprap	0.040	0.030	0.028
Stone Masonry	0.042	0.032	0.030
Soil Cement	0.025	0.022	0.020
Bare Soil	0.023	0.020	0.020
Rock Cut	0.045	0.035	0.025
Rock Riprap	Based on Rock Size (See Chapter 7, Section 7.6.17)		

⁽¹⁾ Based on materials and workmanship required by standard specifications.

Table C-4. Average Manning Roughness Coefficients for Larger Open Channels

Channel	Manning Roughness Coefficient(n)
Unlined Channels Clay Loam Sand	0.023 0.020
Lined Channels Grass Lined (well maintained) Grass Lined (not maintained)	0.035 0.045
Wetland-Bottom Channels (New Channel)	0.023
Wetland-Bottom Channels (Mature Channel)	See Table A-5
Riprap-Lined Channels	See Chapter 7, Section 7.6.17
Concrete (Poured)	0.014
Air Blown Mortar (Gunite or Shotcrete) ⁽¹⁾	0.016
Asphaltic Concrete or Bituminous Plant Mix	0.018

⁽¹⁾ For air blown concrete, use n=0.012 (if troweled) and n=0.025 if purposely roughened.

Note: For channels with revetments or multiple lining types, use composite Manning roughness coefficient based on component lining materials.

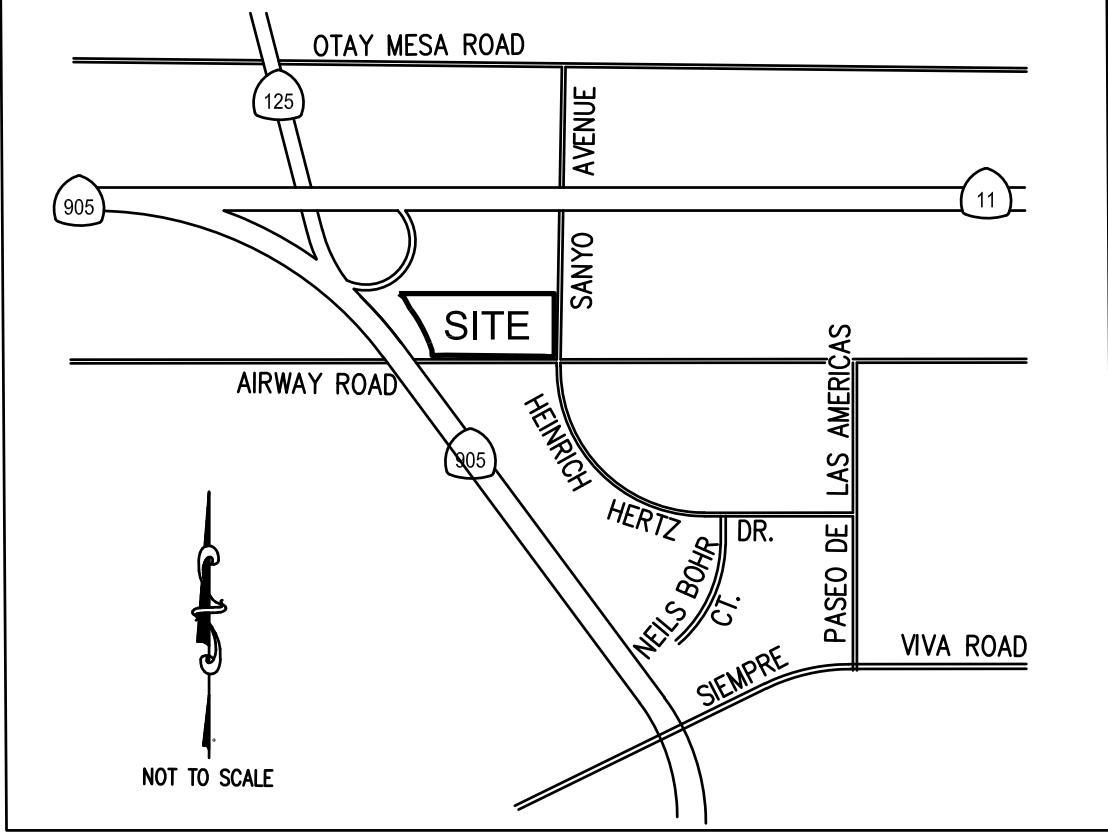
APPENDIX C: MANNING ROUGHNESS COEFFICIENTS

Table C-5. Average Manning Roughness Coefficients for Natural Channels

Channel	Manning Roughness Coefficient (n)
Minor Streams (Surface Width at Flood Stage < 100 ft)	
Fairly Regular Section	
(A) Some Grass and Weeds, Little or No Brush	0.030
(B) Dense Growth of Weeds, Depth of Flow Materially Greater than Weed Height	0.040
(C) Some Weeds, Light Brush on Banks	0.040
(D) Some Weeds, Heavy Brush on Banks	0.060
(E) For Trees within Channel with Branches Submerged at High Stage, Increase all above values by:	0.015
Irregular Section, with Pools, Slight Channel Meander	0.015
Channels (A) through (E) above, Increase all Values by:	0.015
Mountain Streams; No Vegetation in Channel, Banks Usually Steep, Trees and Brush along Banks Submerged at High Stage	0.050
(A) Bottom, Gravel, Cobbles and Few Boulders	0.060
(B) Bottom, Cobbles with Large Boulders	
Flood Plains (Adjacent to Natural Streams)	
Pasture, No Brush	
(A) Short Grass	0.030
(B) High Grass	0.040
Cultivated Areas	
(A) No Crop	0.040
(B) Mature Row Crops	0.040
(C) Mature Field Crops	0.050
Heavy Weeds, Scattered Brush	0.050
Light Brush and Trees	0.060
Medium-to-Dense Brush	0.090
Dense Willows	0.170
Cleared Land with Tree Stumps, 100-150 per Acre	0.060
Heavy Stand of Timber, Little Undergrowth	
(A) Flood Depth below Branches	0.110
(B) Flood Depth Reaches Branches	0.140

APPENDIX B – DRAINAGE EXHIBIT

EXISTING HYDROLOGY MAP FOR SANYO LOGISTICS CENTER



VICINITY MAP
NOT TO SCALE

LEGEND

FEATURE

NODE NUMBER

HYDROLOGIC AREA

SUBAREA BOUNDARY

DIRECTION OF FLOW

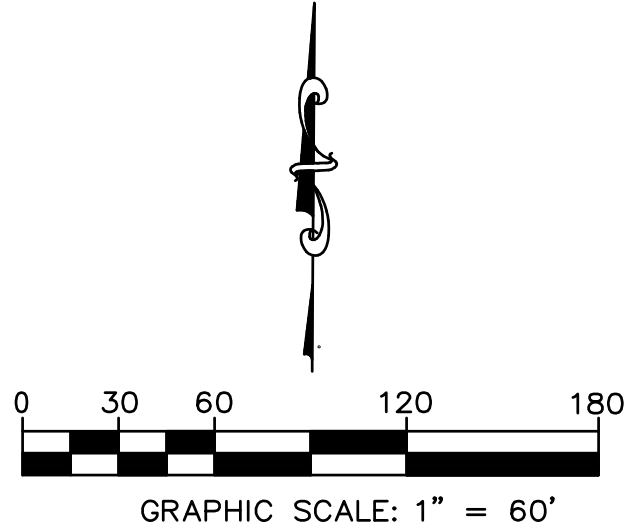
POINT OF COMPLIANCE

SYMBOL

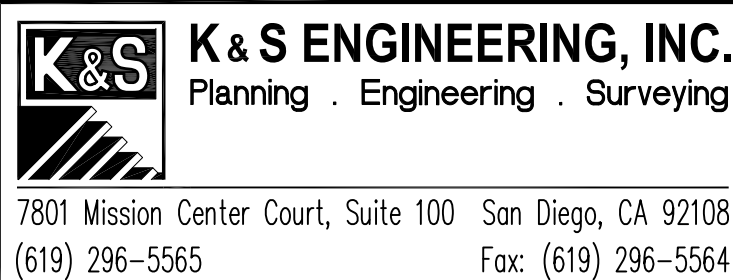
①

1.90AC

1



IF PLAN SIZE IS LESS THAN 24"x36", THIS IS A REDUCED COPY. SCALE PLAN ACCORDINGLY.



(FOR CONTINUATION SEE ABOVE)

(FOR CONTINUATION SEE BELOW)

CITY OF SAN DIEGO	DRAWING NO.
EXISTING HYDROLOGY PLAN FOR:	H1
SANYO LOGISTICS CENTER	SHEET 1 OF 2



FEATURE

NODE NUMBER

HYDROLOGIC AREA

SUBAREA BOUNDARY

DIRECTION OF FLOW

POINT OF COMPLIANCE

ROOF DRAIN

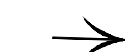
STREET RUNOFF

BYPASS STORM DRAIN PIPE

SYMBOL

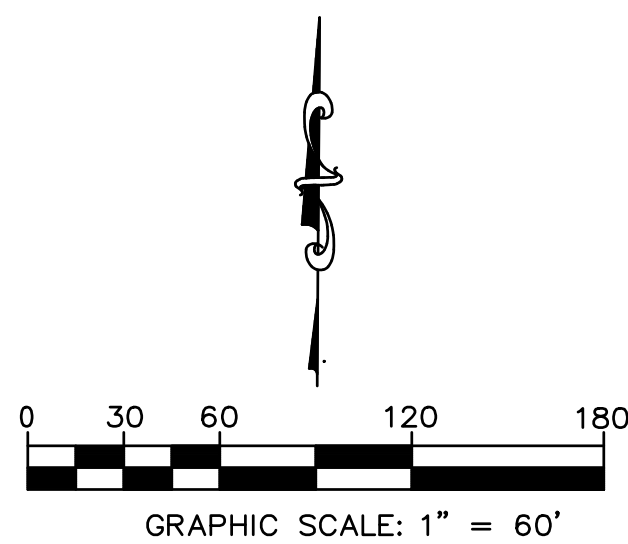
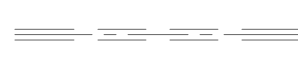
①

1.90AC

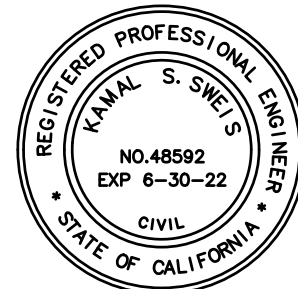
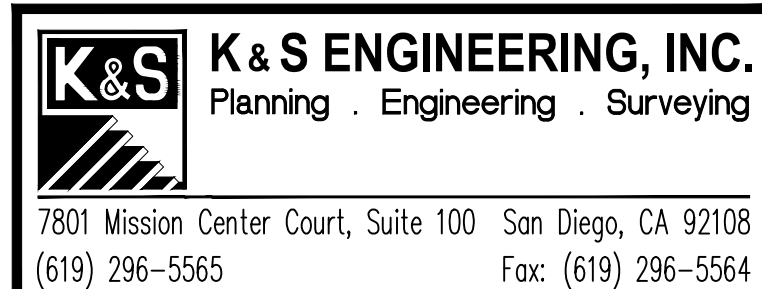


1

RD



IF PLAN SIZE IS LESS THAN 24"x36", THIS IS A REDUCED COPY. SCALE PLAN ACCORDINGLY.



SANYO LOGISTICS CENTER

H2

SHEET 2 OF 2