Hollandia Dairy CUP Modification

Technical Appendices

Appendix F2

Hydrology/Hydraulics Study

HYDROLOGY / HYDRAULICS STUDY
(PRELIMINARY STUDY)

FOR THE:
PRELIMINARY GRADING PLAN FOR
HOLLANDIA DAIRY REDEVELOPMENT
APN 218-180-48
622 E Mission Road
San Marcos, CA 92069

PREPARED FOR:
HOLLANDIA FARMS, INC.
622 E MISSION ROAD
SAN MARCOS, CA 92069
TEL: (760) 744-3222

PREPARED BY:
EXCEL ENGINEERING
440 State Place
Escondido, CA 92029
Tel: (760) 745-8118
Project No: 08-067

DATE PREPARED:
March 27, 2019

REVISION DATE(S):
February 19, 2019

TABLE OF CONTENTS

1.0 PROJECT DESCRIPTION

1.1 Project Purpose

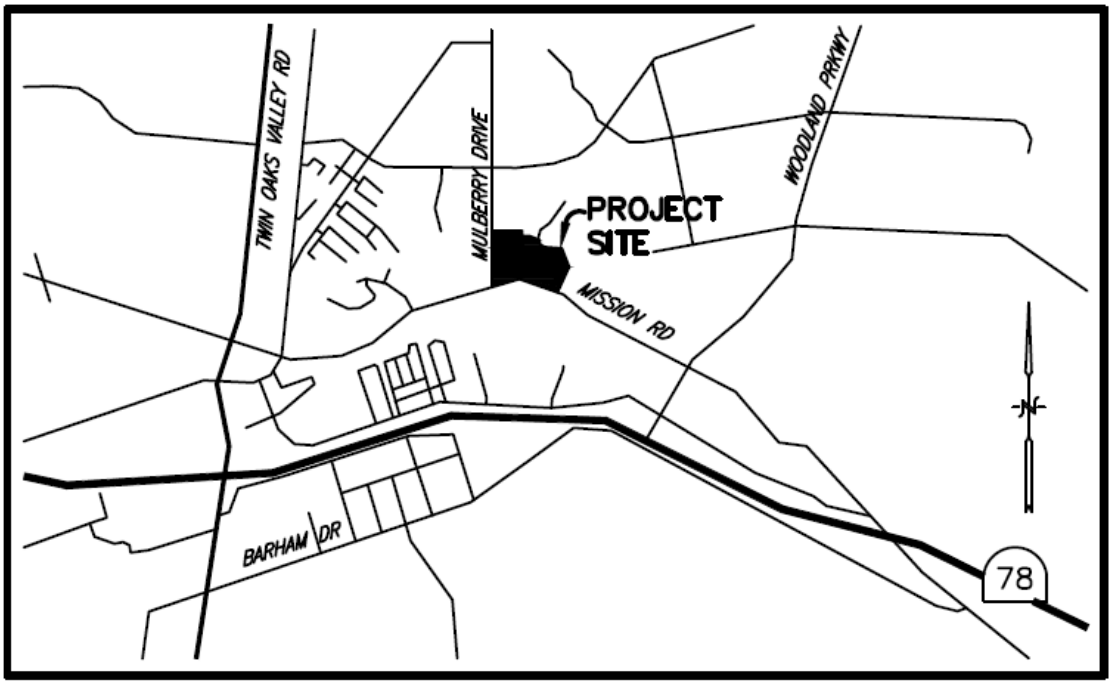
The purpose of this project is to modernize existing dairy production facilities located internal to the parcel located on Mission Road in the City of San Marcos. Three buildings will be removed and replaced and storm drain facilities constructed to ensure compliance with current storm water regulations. Cover will be provided over onsite cleaning areas with additional parking provided along the easterly boundary of the project.

1.2 Project Proposed Drainage Facilities

The proposed drainage improvements for the site include drainage two pipe storage fields to detain runoff. The pipe storage fields will each discharge to Modular Wetland System (MWS) where it will be treated and sent to the existing Point-Of-Compliance (POC). Additionally, 1 Bio-filtration planter will be constructed to treat roof storm runoff. The flows will be discharged to an existing underground pipe storm drain network where it will be connect to the same POC as the pipe storage.

Calculations for the drainage facilities can be found in the following report and attachments.

2.0 VICINTIY MAP



VICINITY MAP

NOT TO SCALE

3.1 DESCRIPITON OF WATERSHED

3.2 Pre-Development Topography

The project is located within a 14.54 acre parcel that is a previously graded and developed site for dairy production. The parcel has several site-specific drainage basins that convey storm runoff to the public facilities within the right-of-way. The drainage basin this project impacts is on the western portion of the parcel, along Mulberry Dr and E Mission Road. The drainage basin is approximately 7.2 acres and generally drains from the northeast to the southwest. Several inlets are located throughout the drainage basin that convey flows to a storm drain inlet along Mulberry Dr. This storm drain is the point of compliance (POC) for this project.

Please see Attachment 2 for the Pre-Development Topographic Map.

3.3 Post-Development Topography

Most of the existing topography will remain the same in the post-developed conditions. The area east of the northern detention pipe system will be maintained. The asphalt will be changed but the water will go to the same place. The project does propose to direct runoff produced by the easterly constructed building into a proposed underground storm drain network and convey the flows to a pipe storage field, which ultimately conveys the flow to the POC. The westerly constructed buildings will collect runoff and convey flows in a separate proposed underground pipe network and storage field, which ultimately outlets flow to the POC. A portion of the southerly roof on the newly constructed western building will convey the roof runoff to a bio-filtration planter that will treat the runoff and convey the flows to the POC.

Of note, the project has a portion of sidewalk and planter strip, 2,263 sqft, which produces surface flows that cannot be treated by an underground system. The flows will overland flow to an existing storm runoff treatment facility where it will be treated as it was in the existing condition. In order to ensure the project is treating the appropriate amount of runoff, a portion of undisturbed driveway, 5,532 sqft, will be treated in the proposed system to the west. The treatment of the driveway is more than twice the sidewalk & planter and has a higher pollutant loading. Thus, making the proposed treated area larger and more efficient than required.

Please see Attachment 2 for the Post-Development Topographic Map

3.3 Hydrologic Unit Contribution

The project lays within the San Marcos Hydraulic Area of the Carlsbad Hydrologic Unit (904.52).

4.0 METHODOLOGY

4.1 Design Standards

The 2003 San Diego County Hydrology Manual and 2014 The 2014 San Diego County Hydraulic Design Manual are used as guidance to design the drainage facilities within this project. For this study, the County Hydrology Manual will be referred to as the Hydrology Manual and the County Hydraulic Design Manual will be referred to as the Hydraulic manual.

4.2 Hydrology Software

Surface topography and material are analyzed to determine the runoff produced by the proposed development. The values are then entered into the "Rational Hydrology Method, San Diego County (2003 Manual)" module of the CIVILCADD/CIVIL DESIGN Engineering software version 7.9 to determine the amount of runoff produced. The software is also used to develop the hydrographs to assist in determining ponding capacity of each proposed pond and inlet.

5.0 CALCULATIONS

5.1 Determine the Watershed that affects the project

To determine if the proposed design will have a negative impact to downstream facilities, the analysis ensures the contributing areas to each POC remain approximately identical in pre & post development conditions and the resulting post-development runoff flows remain at or below the pre-development flows.

See Attachment 2 for the topographic maps.

5.2 Calculate Runoff Coefficient

Per Web Soil Survey from the USDA, the project site was found to lay within Hydraulic Soil Group "D".

To determine the runoff coefficient "C" for the pre-development conditions, Table 3-1 of the Hydrology Manual was utilized. With a project land use type of General Industrial the C-value for this project will be 0.87.

5.3 Calculate Manning Roughness Coefficient

Per Hydraulic Manual Design Manual Appendix A, the average Manning Roughness Coefficient for smooth finish asphalt pavement is 0.013 and for landscaped areas is 0.035. These values will be used for this study.

5.4 Calculate Storm Flows using the Modified Rational Method

100 year peak flow runoff for Pre- & Post-development are calculated in accordance with the Hydrology Manual and utilizing the CivilD software. A single POC is identified to assist in comparison of the pre- & post-development conditions. POC-1 is located at the western edge of the project along Mulberry Road.

Pre-developed flows are routed using topography obtained by aerial and precise topographic surveying. The flows are routed to POC as described above.

Post-development onsite flows resulting from rooftops and driveway are directed to one of two pipe storage fields or a biofiltration planter. The drainage facilities then outfall to POC-1. Due to the elongated flow path caused by the proposed storm drain system, the runoff produced by the post-development conditions is less than the pre-developed conditions. The reduction of runoff due to detention is therefore ignored in this report.

See Attachment 2 for Pre- & Post-Development Basin Delineation.

SUMMARY OF THE PEAK 100-YEAR STORM R U N O F F

POC	Pre−development	Post−development	Runoff reduction
	(cfs)	(cfs)	(cfs)
POC−1	47.402	46.196	1.206

See Attachment 3 for Pre-development calculations.
See Attachment 4 for Post-development calculations.

5.5 Detention Facility Calculations

Two pipe storage fields are proposed to satisfy water quality requirements. The storage fields provide detention to treat the water quality volume and bypass the system after the volume requirement of the SWQMP is met. Since the peak flow of the post-developed conditions are less than the pre-developed conditions, the reduction of flows is not analyzed.

A biofiltration planter is also proposed for this project but no detention is performed within the planter. The planter covers runoff above the water quality design level out of the planter and to the P6C.

See Attachment 4 for CivilD calculation

5.6 Inlet Sizing

Three inlets are analyzed as part of the private storm drain system. All inlets are sized with a 50% clogging factor.

The inlet to the northeast of the project (Node 3) is proposed to accept existing overland flows and convey them to the same existing storm drain network the current flow to. The inlet is sized to accept the 100-µear design storm

A proposed water quality inlet (WQ inlet-28) is designed along the westerly edge of the project to convey overland flow to the underground storage pipe field. The inlet is sized to take 1.5 times the design flow rate required to accept the 85th percentile storm, which is the same flow rate the Modular Wetlands treats the runoff at.

The existing inlet along the westerly boundary (Node 28.1) that accepts existing overland overflow is analyzed to ensure that the overflow from the water quality inlet during the 100-µear storm.

See Attachment 5 for Inlet calculations.

6.0 OTHER STUDIES

6.1 Storm Water Quality Management Plan

Storm water quality management plan (SWQMP) sheets are submitted as a standalone report for this study.

6.2 Hydromodification Analysis

Hydromodification Analysis has been included in the storm water quality management plan (SWQMP) report as Attachment 2.

7.0 CONCLUSION

This study and resulting data indicate that the project will not increase the 100-year peak runoff at the project POCs. It can therefore be concluded that erosive behavior of the site runoff will not be increased by development of this project. Further, the study shows a slight decrease in runoff produced by the development which indicates potential flooding downstream would be decrease as well. It can be determined that no negative impact on the existing downstream storm drain facilities or adjacent and downstream properties will occur.

The project is not located downstream of any levee or dam and is not at significant risk of loss, injury or death from a failure of a levee or dam.
The proposed project does not place housing within a 100-year flood hazard area as mapped by FEMA Panel 0794G. See Attachment 2 for Flood mapping.

8.0 REFERENCES

County of San Diego, Department of Public Works, Flood Control Section, June2003 San Diego County Hydrology Manual

County of San Diego, Department of Public Works, Flood Control Section, September 2014 San Diego County Hydraulic Design Manual

9.0 DECLARATION OF RESPONSIBLE CHARGE

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

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

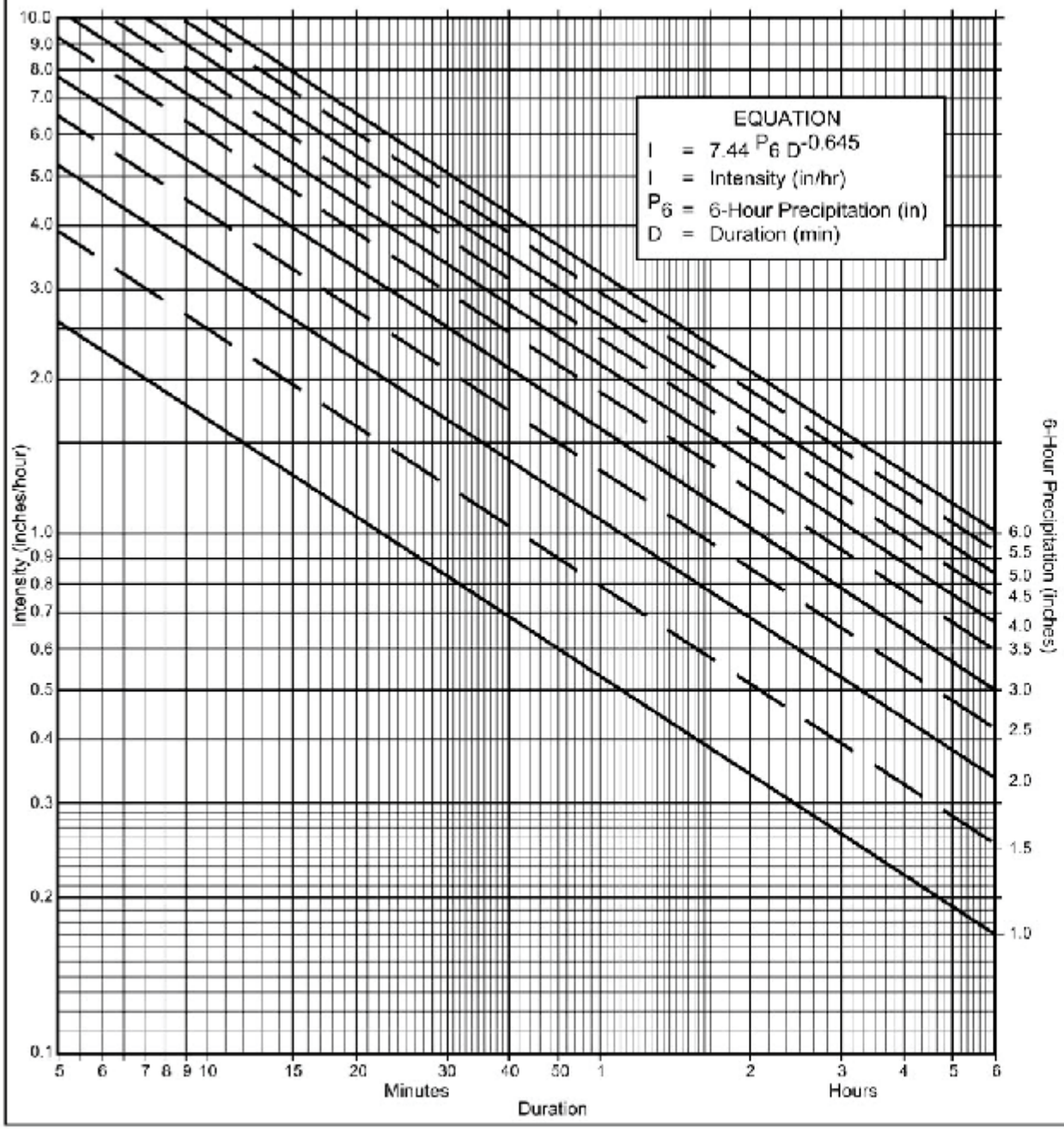
ENGINEER OF WORK
Excel Engineering
440 State Place
Escondido, CA 92029
Tel – (760)745-8118
Fax – (760)745-1890

Project Number: 08-067

_____ _____

Robert D. Dentino, RCE 45629 Date
Registration Expire: December 31, 2020

ATTACHMENT 1



Directions for Application:

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

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

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

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

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

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 3.1 in., P_{24} = 5.5, $\frac{P_6}{P_{24}}$ = 56.4 %(2)

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

(d) t_x = _____ min.

(e) I = _____ in./hr.

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

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

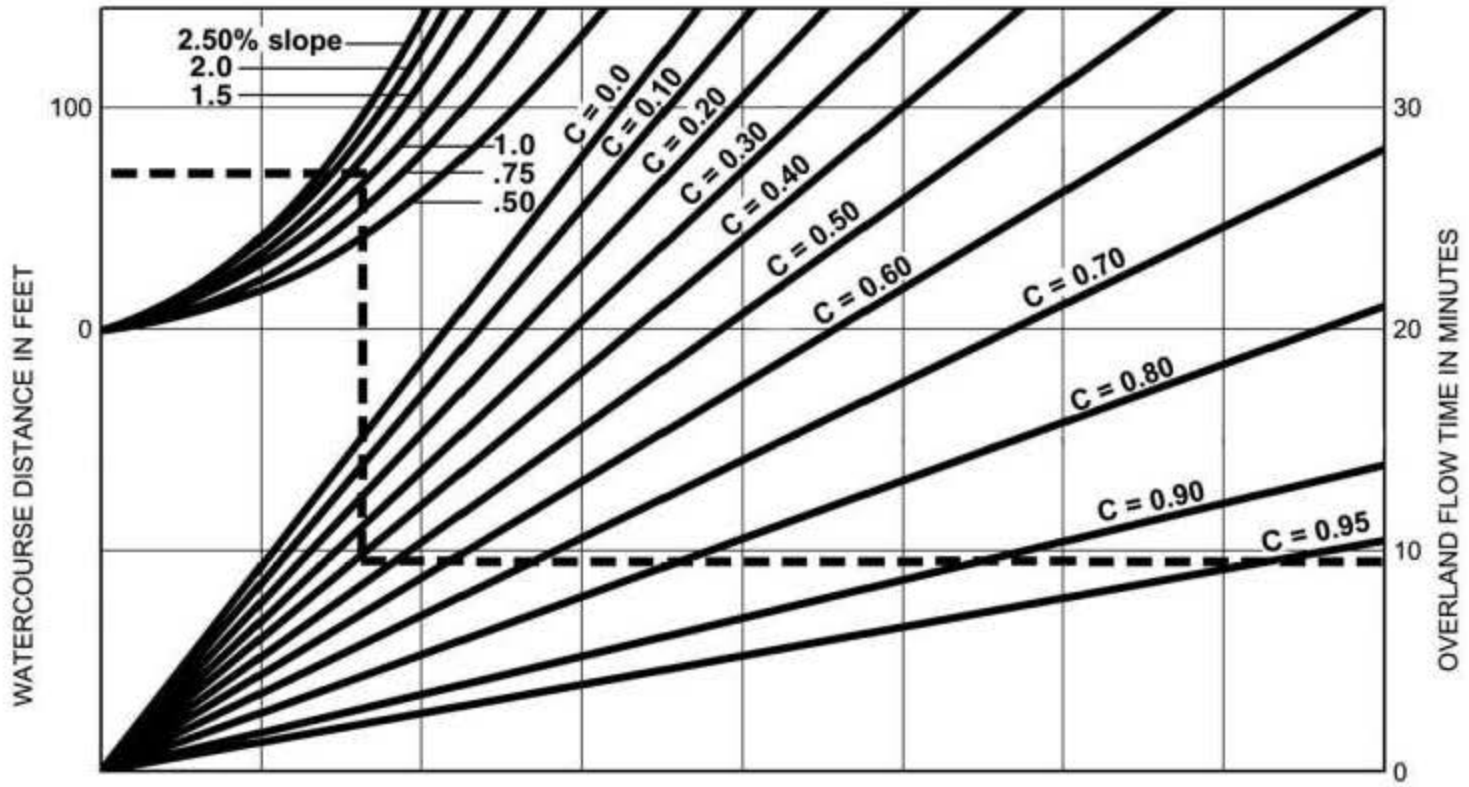
Intensity-Duration Design Chart - Template

FIGURE 3-1

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

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

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



EXAMPLE:

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

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

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

Rational Formula - Overland Time of Flow Nomograph

3-3

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

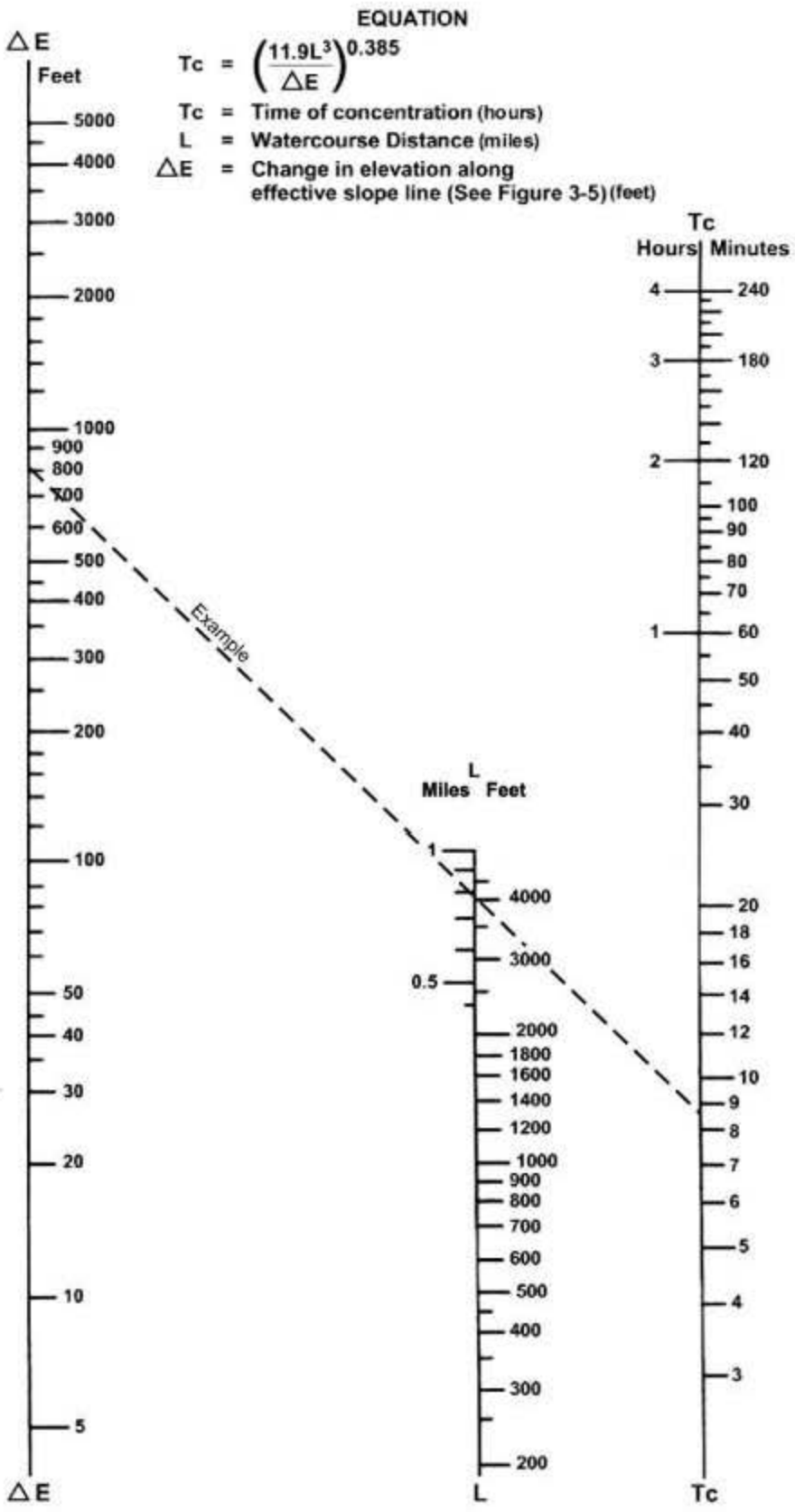
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved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

Table 3-2

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

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

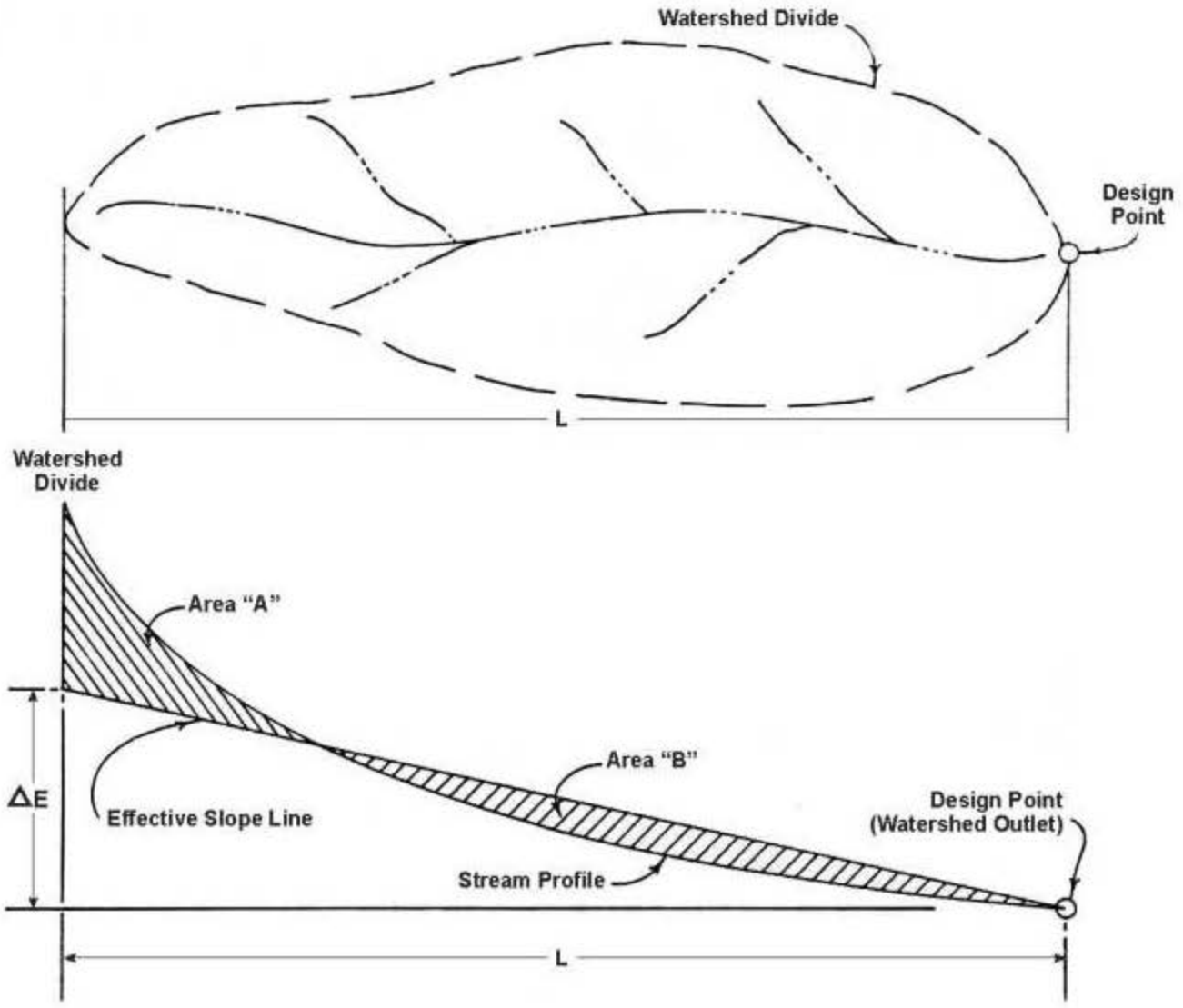
*See Table 3-1 for more detailed description



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

FIGURE 3-4

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

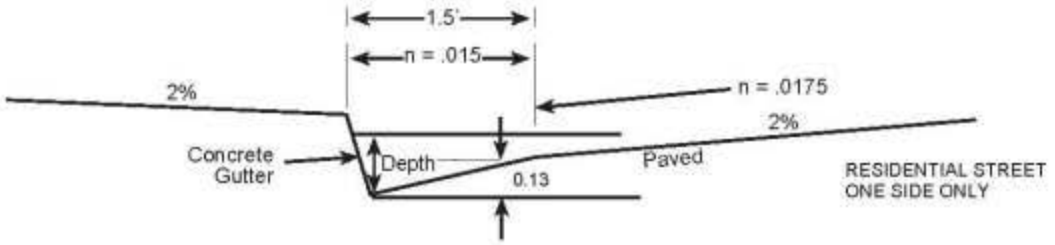


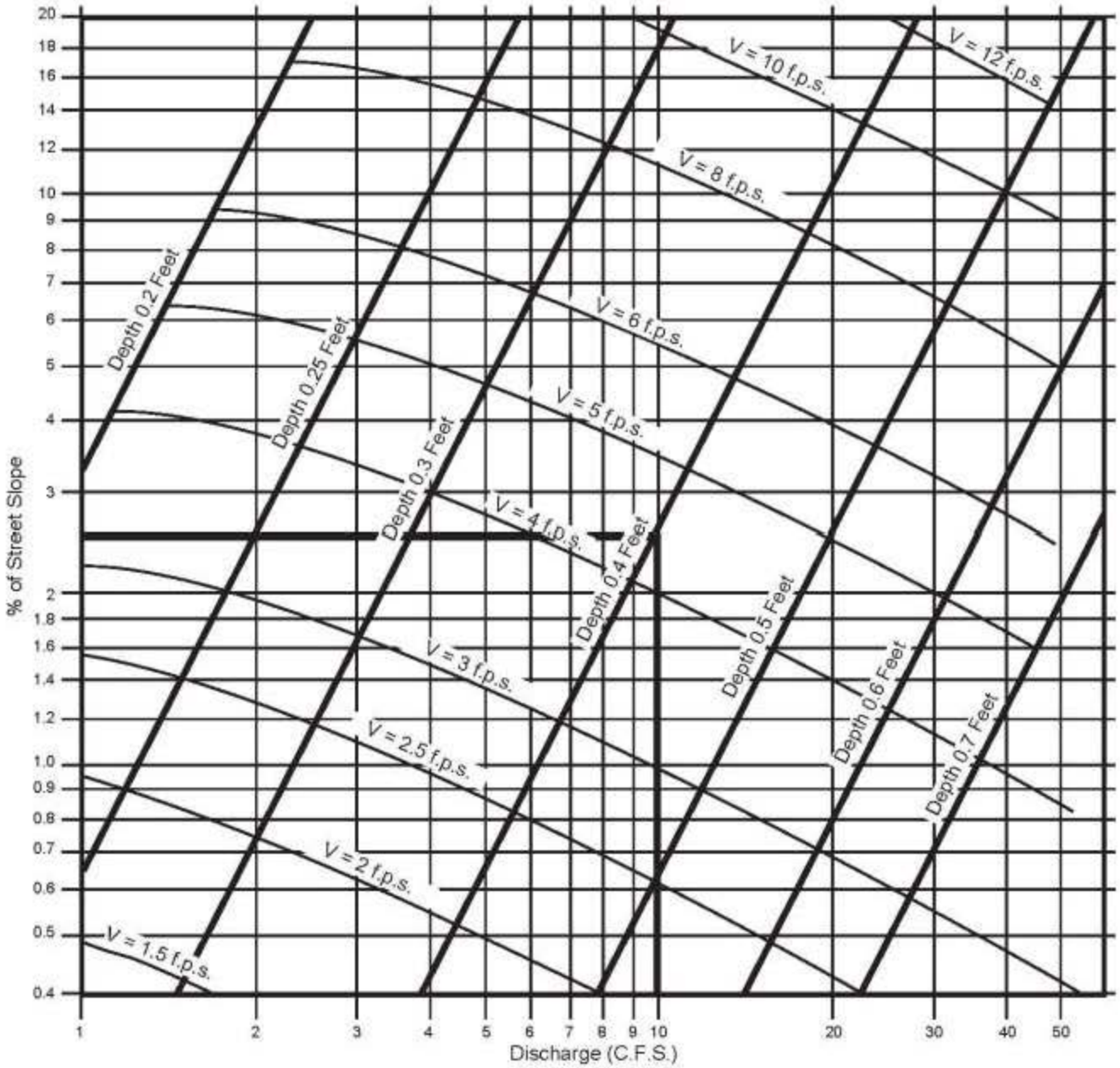
SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE

Computation of Effective Slope for Natural Watersheds

3-5





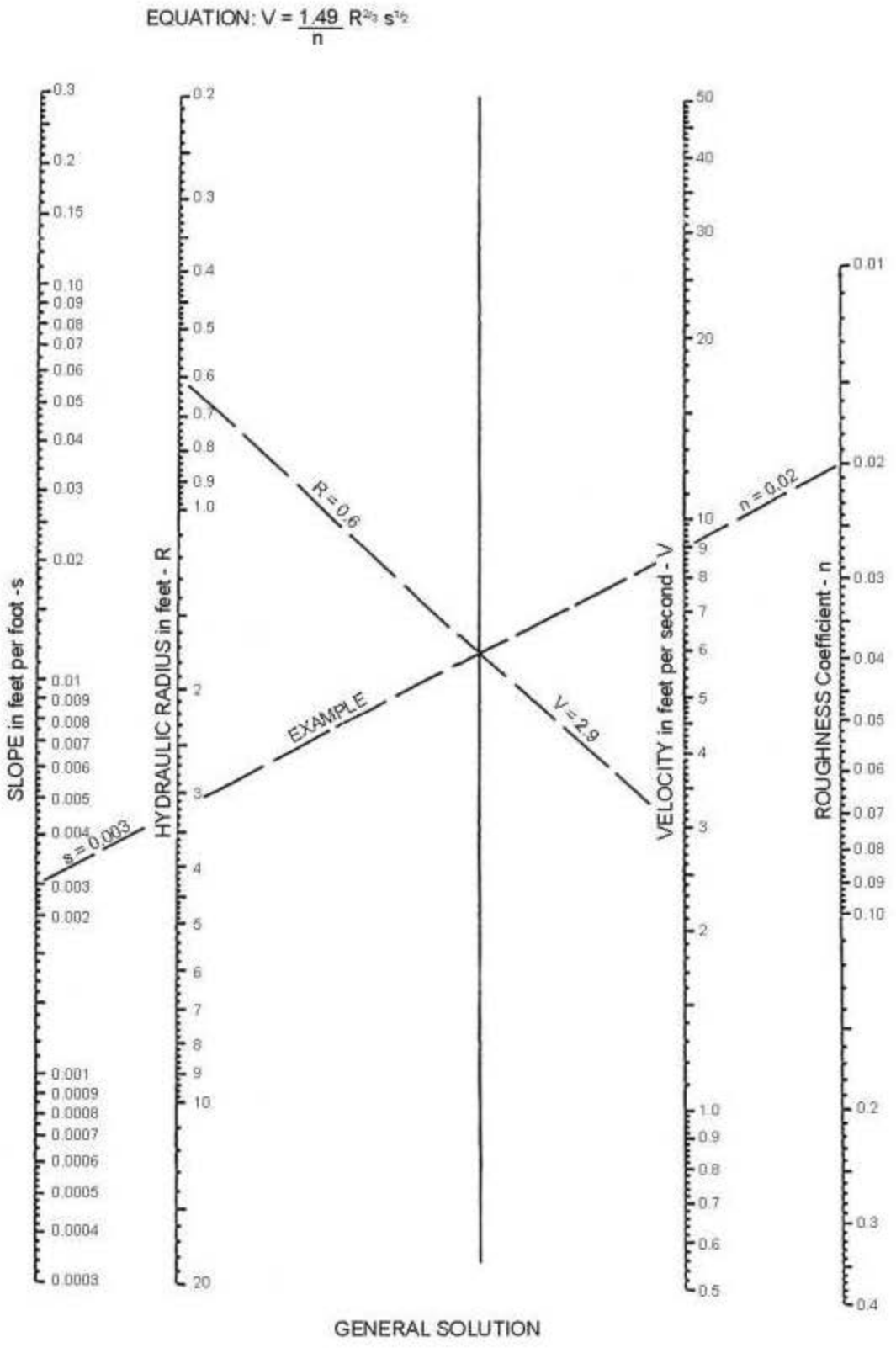
EXAMPLE:
Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

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

FIGURE

Gutter and Roadway Discharge - Velocity Chart

3-6



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

FIGURE 3-7

Manning's Equation Nomograph

ATTACHMENT 2

HYDROLOGY MAP
PRE-DEVELOPMENT
HOLLANDIA DAIRY REDEVELOPMENT

ENGINEER OF WORK

By: _____ Date: Feb 13, 2020

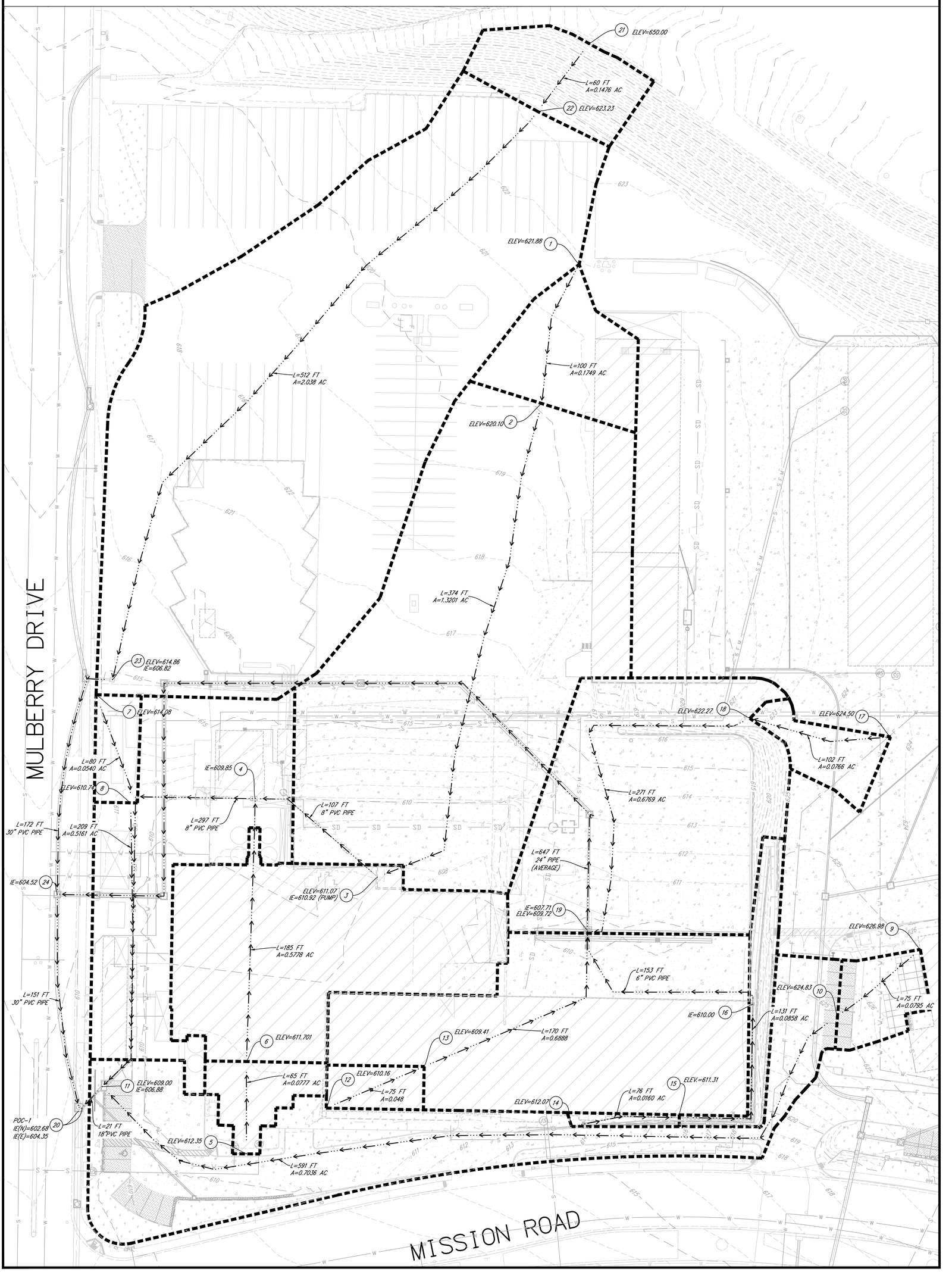
Name: ROBERT D. DENTINO

R.C.E.: 45629 exp: 12-31-18

REGISTERED PROFESSIONAL ENGINEER
ROBERT D. DENTINO
No. 45629
Exp.12-31-18
CIVIL
STATE OF CALIFORNIA

SCALE 1"=30'

0 30 60 90 120



13 ELEV=650
L=60 FT
A=0.1476 AC
14 ELEV=623.23
1 ELEV=621.88
L=100 FT
A=0.1991 AC
2 ELEV=620.10
L=189 FT
A=0.6429 AC
L=324 FT
30" PVC PIPE
33 IE=609.54
L=99 FT
18" PVC PIPE
34 IE=609.00
L=531 FT
A=1.672 AC
L=192 FT
30" EXIST.
PVC PIPE
MULBERRY DRIVE
32 IE=610.04
L=200 FT
12" PVC PIPE
32 IE=610.04
L=101 FT
A=0.339 AC
31 ELEV.=612.79
3 ELEV=616.83
IE=607.20
36 ELEV.=617.41
18 ELEV=614.86
18 IE=606.63
20 ELEV=614.93
L=446 FT
24" PVC PIPE
L=20 FT
18" PVC PIPE
17.1 IE=611.05
L=209 FT
AREA=0.054AC
12 IE=606.97
10 ELEV=622.27
9 ELEV=624.50
L=95 FT
A=0.0827 AC
37 ELEV.=613.76
L=53 FT
12" PVC PIPE
L=102 FT
A=0.526 AC
L=164 FT
AREA=0.044AC
L=102 FT
A=0.0766 AC
21 ELEV=611.32
L=92 FT
12" PVC PIPE
38 IE=611.31
30 ELEV.=613.80
L=271 FT
A=0.6656 AC
17 IE=612.7
L=155 FT
30" PIPE
L=88 FT
A=0.489 AC
L=201 FT
24" PIPE
19 IE=604.52
L=212 FT
A=0.3875 AC
16 ELEV=615.18
11 IE=607.71
ELEV=609.72
26 ELEV=626.98
L=149 FT
30" PIPE
22 ELEV=608.95
L=60FT
A=0.0408 AC
L=60 FT
A=0.0318
15 ELEV=615.78
L=141 FT
6" PVC PIPE
27 ELEV=624.83
L=75 FT
A=0.0795 AC
23 ELEV=608.35
IE=610.00
8
L=141 FT
A=0.0858 AC
L=171FT
A=0.7115 AC
L=106FT
A=0.2809 AC
28 WQ INLET
ELEV=609.39
IE=607.13
5 ELEV=609.41
4 ELEV=610.16
L=75 FT
A= 0.0480 AC
L=22FT
28.1 ELEV=609.00
IE=606.00
6 ELEV=612.16
L=76 FT
A=0.0160 AC
7 ELEV.=611.40
POC-1
IE(N)=602.68
IE(E)=604.35
29
L=21 FT
18"PVC PIPE
24 ELEV=607.30
L=591 FT
A=0.6573 AC
L=81 FT
12" PVC PIPE
L=101 FT
12" PVC PIPE
25 ELEV=606.49
MISSION ROAD

LEGEND

NAME	SYMBOL
NODE NUMBER & ELEVATION	(xx) XXX.XX
EXISTING MAJOR CONTOUR (SURVEYED)	
EXISTING MAJOR CONTOUR (SanGIS)	
PROPOSED MAJOR CONTOUR	
ROUTING FLOW PATH	
BASIN DELINEATION	
SUB AREA DELINEATION	

SCALE: 1"=30'

0 30 60 90 120

HOLLANDIA DEVELOPMENT
POST-DEVELOPMENT HYDROLOGIC MAP

C:\08\08067\gp\10\Storm\tm\HYD\CIVIL\Post Dev Hydrology Map.dwg 2/14/2020 12:37 PM ORIGINAL PLOT SIZE: ----

Map Scale: 1:1,040 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 13, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 3, 2014—Nov 22, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
HrC	Huerhuero loam, 2 to 9 percent slopes	D	2.3	100.0%
Totals for Area of Interest			**2.3**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

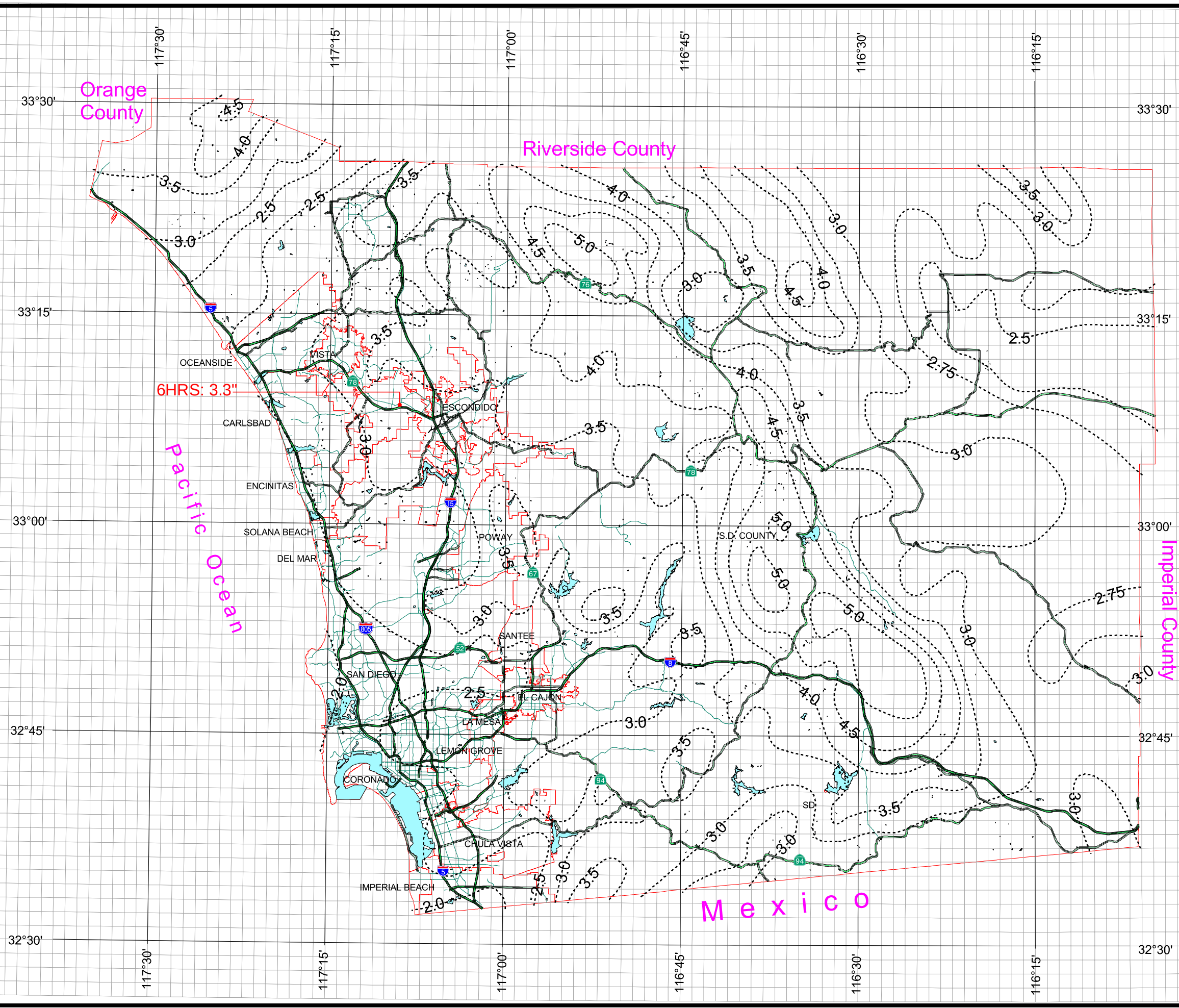
Component Percent Cutoff: None Specified

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)



DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

24HRS: 5.7"

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
POWAY
S.D. COUNTY
DEL MAR
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
SD
CHULA VISTA
IMPERIAL BEACH

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'

33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
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N W E S

3 0 3 Miles

ATTACHMENT 3

```
               San Diego County Rational Hydrology Program

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

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 02/13/20
--------------------------------------------------------------------------
08-067 Hollandia Redevelopment - (100-year)
Pre POC-1
100 Year Storm Event
File Name: 08067Pre.rd3
--------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

--------------------------------------------------------------------------


Program License Serial Number 6332

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

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.300
24 hour precipitation(inches) =  5.700
P6/P24 =    57.9%
San Diego hydrology manual 'C' values used

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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                       ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  621.880(Ft.)
Lowest elevation =  620.100(Ft.)
Elevation difference =    1.780(Ft.) Slope =  1.780 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.78 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.86 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  70.000^.5)/(   1.780^(1/3)]=   2.86
Calculated TC of    2.858 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      1.324(CFS)
Total initial stream area =        0.175(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
__________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      6.278(CFS)
Depth of flow =   0.123(Ft.), Average velocity =   2.767(Ft/s)
       ******* Irregular Channel Data ***********
--------------------------------------------------------------------
```

```
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             75.00              0.00
       3            150.00              0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      6.278(CFS)
  '     '       flow top width =     36.895(Ft.)
  '     '    velocity=    2.767(Ft/s)
  '     '       area =      2.269(Sq.Ft)
  '     '       Froude number =     1.966

Upstream point elevation =   620.100(Ft.)
Downstream point elevation =   611.070(Ft.)
Flow length =   374.000(Ft.)
Travel time  =    2.25 min.
Time of concentration =    5.11 min.
Depth of flow =   0.123(Ft.)
Average velocity =   2.767(Ft/s)
Total irregular channel flow =     6.278(CFS)
Irregular channel normal depth above invert elev. =   0.123(Ft.)
Average velocity of channel(s) =   2.767(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.573(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.573(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      1.301
Subarea runoff =      9.826(CFS) for      1.320(Ac.)
Total runoff =     11.150(CFS)        Total area =       1.495(Ac.)
Depth of flow =   0.153(Ft.), Average velocity =   3.194(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   610.920(Ft.)
Downstream point/station elevation =   609.850(Ft.)
Pipe length  =   107.00(Ft.) Slope =   0.0100  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.150(CFS)
Given pipe size =      8.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
   113.760(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     91.065(Ft.)
 Minor friction loss =     23.765(Ft.)       K-factor =   1.50
Pipe flow velocity =     31.94(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     5.17 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.495(Ac.)
Runoff from this stream =     11.150(CFS)
Time of concentration =    5.17 min.
Rainfall intensity =     8.513(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        6.000
**** 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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =   65.000(Ft.)
Highest elevation =  612.350(Ft.)
Lowest elevation =  611.701(Ft.)
Elevation difference =    0.649(Ft.) Slope =  0.998 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.21 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  60.000^.5)/(   0.998^(1/3)]=   3.21
Calculated TC of    3.209 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.590(CFS)
Total initial stream area =        0.078(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        4.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.776(CFS)
Depth of flow =   0.124(Ft.), Average velocity =   1.795(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             50.00              0.00
       3            100.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      2.776(CFS)
  '     '       flow top width =     24.875(Ft.)
  '     '    velocity=    1.795(Ft/s)
  '     '       area =      1.547(Sq.Ft)
  '     '       Froude number =     1.268

Upstream point elevation =   611.701(Ft.)
Downstream point elevation =   609.850(Ft.)
Flow length =   185.000(Ft.)
Travel time  =    1.72 min.
Time of concentration =    4.93 min.
Depth of flow =   0.124(Ft.)
Average velocity =   1.795(Ft/s)
Total irregular channel flow =     2.776(CFS)
Irregular channel normal depth above invert elev. =   0.124(Ft.)
Average velocity of channel(s) =   1.795(Ft/s)
 Adding area flow to channel
Calculated TC of    4.927 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.571
Subarea runoff =      4.372(CFS) for      0.578(Ac.)
Total runoff =      4.962(CFS)       Total area =       0.656(Ac.)
Depth of flow =   0.155(Ft.), Average velocity =   2.075(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.656(Ac.)
Runoff from this stream =      4.962(CFS)
Time of concentration =    4.93 min.
Rainfall intensity =     8.695(In/Hr)
Summary of stream data:

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


1       11.150      5.17              8.513
2        4.962      4.93              8.695
Qmax(1) =
          1.000 *    1.000 *    11.150) +
          0.979 *    1.000 *     4.962) + =      16.008
Qmax(2) =
          1.000 *    0.954 *    11.150) +
          1.000 *    1.000 *     4.962) + =      15.595

Total of 2 streams to confluence:
Flow rates before confluence point:
      11.150       4.962
Maximum flow rates at confluence using above data:
       16.008       15.595
Area of streams before confluence:
        1.495        0.656
Results of confluence:
Total flow rate =     16.008(CFS)
Time of concentration =     5.167 min.
Effective stream area after confluence =      2.151(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station       11.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   609.850(Ft.)
Downstream point/station elevation =   606.880(Ft.)
Pipe length  =   297.00(Ft.) Slope =   0.0100  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.008(CFS)
Given pipe size =      8.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
   567.059(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =    521.042(Ft.)
 Minor friction loss =     48.987(Ft.)       K-factor =   1.50
Pipe flow velocity =     45.86(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     5.27 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      2.151(Ac.)
Runoff from this stream =     16.008(CFS)
Time of concentration =    5.27 min.
Rainfall intensity =     8.400(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        8.000
**** 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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =   80.000(Ft.)
Highest elevation =  614.080(Ft.)
Lowest elevation =  610.740(Ft.)
Elevation difference =    3.340(Ft.) Slope =  4.175 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   4.17 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.44 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  90.000^.5)/(   4.175^(1/3)]=   2.44
Calculated TC of    2.439 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.408(CFS)
Total initial stream area =        0.054(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station       11.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      2.360(CFS)
Depth of flow =   0.157(Ft.), Average velocity =   1.913(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      2.360(CFS)
  '     '       flow top width =     15.709(Ft.)
  '     '    velocity=    1.913(Ft/s)
  '     '       area =      1.234(Sq.Ft)
  '     '       Froude number =     1.203

Upstream point elevation =   610.740(Ft.)
Downstream point elevation =   609.000(Ft.)
Flow length =   209.000(Ft.)
Travel time  =    1.82 min.
Time of concentration =    4.26 min.
Depth of flow =   0.157(Ft.)
Average velocity =   1.913(Ft/s)
Total irregular channel flow =     2.360(CFS)
Irregular channel normal depth above invert elev. =   0.157(Ft.)
Average velocity of channel(s) =   1.913(Ft/s)
```

```
 Adding area flow to channel
Calculated TC of    4.260 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.496
Subarea runoff =      3.903(CFS) for      0.516(Ac.)
Total runoff =      4.312(CFS)        Total area =       0.570(Ac.)
Depth of flow =   0.197(Ft.), Average velocity =   2.224(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.570(Ac.)
Runoff from this stream =      4.312(CFS)
Time of concentration =    4.26 min.
Rainfall intensity =     8.695(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** 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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =   75.000(Ft.)
Highest elevation =  626.980(Ft.)
Lowest elevation =  624.830(Ft.)
Elevation difference =    2.150(Ft.) Slope =  2.867 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   2.87 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.61 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  80.000^.5)/(   2.867^(1/3)]=   2.61
Calculated TC of    2.607 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.605(CFS)
Total initial stream area =        0.080(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       11.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.185(CFS)
Depth of flow =   0.171(Ft.), Average velocity =   3.632(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
```

```
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             15.00              0.00
       3             30.00              0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      3.185(CFS)
  '     '       flow top width =     10.258(Ft.)
  '     '    velocity=    3.632(Ft/s)
  '     '       area =      0.877(Sq.Ft)
  '     '       Froude number =     2.189

Upstream point elevation =   624.830(Ft.)
Downstream point elevation =   609.000(Ft.)
Flow length =   590.000(Ft.)
Travel time  =    2.71 min.
Time of concentration =    5.31 min.
Depth of flow =   0.171(Ft.)
Average velocity =   3.632(Ft/s)
Total irregular channel flow =     3.185(CFS)
Irregular channel normal depth above invert elev. =   0.171(Ft.)
Average velocity of channel(s) =   3.632(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.360(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.360(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.682
Subarea runoff =      5.097(CFS) for      0.704(Ac.)
Total runoff =      5.702(CFS)        Total area =       0.784(Ac.)
Depth of flow =   0.213(Ft.), Average velocity =   4.201(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      0.784(Ac.)
Runoff from this stream =      5.702(CFS)
Time of concentration =    5.31 min.
Rainfall intensity =     8.360(In/Hr)
Summary of stream data:

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


1       16.008      5.27               8.400
2        4.312      4.26               8.695
3        5.702      5.31               8.360
Qmax(1) =
          1.000 *    1.000 *    16.008) +
          0.966 *    1.000 *     4.312) +
          1.000 *    0.993 *     5.702) + =      25.833
Qmax(2) =
          1.000 *    0.808 *    16.008) +
          1.000 *    1.000 *     4.312) +
          1.000 *    0.802 *     5.702) + =      21.813
Qmax(3) =
          0.995 *    1.000 *    16.008) +
          0.961 *    1.000 *     4.312) +
          1.000 *    1.000 *     5.702) + =      25.779
```

```
Total of 3 streams to confluence:
Flow rates before confluence point:
      16.008       4.312       5.702
Maximum flow rates at confluence using above data:
       25.833       21.813       25.779
Area of streams before confluence:
        2.151        0.570        0.784
Results of confluence:
Total flow rate =     25.833(CFS)
Time of concentration =     5.275 min.
Effective stream area after confluence =      3.505(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       20.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   606.880(Ft.)
Downstream point/station elevation =   604.350(Ft.)
Pipe length  =    21.00(Ft.) Slope =   0.1205  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    25.833(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    25.833(CFS)
Normal flow depth in pipe =   11.19(In.)
Flow top width inside pipe =   17.46(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.38(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     5.29 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       20.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      3.505(Ac.)
Runoff from this stream =     25.833(CFS)
Time of concentration =    5.29 min.
Rainfall intensity =     8.384(In/Hr)
Program is now starting with Main Stream No. 2

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** 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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =   75.000(Ft.)
Highest elevation =  610.160(Ft.)
Lowest elevation =  609.410(Ft.)
Elevation difference =    0.750(Ft.) Slope =  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.21 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  60.000^.5)/(   1.000^(1/3)]=   3.21
Calculated TC of    3.207 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.363(CFS)
```

```
Total initial stream area =        0.048(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       19.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.969(CFS)
Depth of flow =   0.139(Ft.), Average velocity =   1.929(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             40.00              0.00
       3             80.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      2.969(CFS)
  '     '       flow top width =     22.191(Ft.)
  '     '    velocity=    1.929(Ft/s)
  '     '       area =      1.539(Sq.Ft)
  '     '       Froude number =     1.291

Upstream point elevation =   609.410(Ft.)
Downstream point elevation =   607.710(Ft.)
Flow length =   170.000(Ft.)
Travel time  =    1.47 min.
Time of concentration =    4.68 min.
Depth of flow =   0.139(Ft.)
Average velocity =   1.929(Ft/s)
Total irregular channel flow =     2.969(CFS)
Irregular channel normal depth above invert elev. =   0.139(Ft.)
Average velocity of channel(s) =   1.929(Ft/s)
 Adding area flow to channel
Calculated TC of    4.675 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.641
Subarea runoff =      5.212(CFS) for      0.689(Ac.)
Total runoff =      5.575(CFS)        Total area =       0.737(Ac.)
Depth of flow =   0.176(Ft.), Average velocity =   2.258(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       19.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.737(Ac.)
Runoff from this stream =      5.575(CFS)
Time of concentration =    4.68 min.
Rainfall intensity =     8.695(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       15.000
**** 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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =   76.000(Ft.)
Highest elevation =  612.070(Ft.)
Lowest elevation =  611.310(Ft.)
Elevation difference =    0.760(Ft.) Slope =  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.21 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  60.000^.5)/(   1.000^(1/3)]=   3.21
Calculated TC of    3.207 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.121(CFS)
Total initial stream area =        0.016(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.446(CFS)
Depth of flow =   0.190(Ft.), Average velocity =   0.883(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              7.00              0.00
       3             14.00              0.50
Manning's 'N' friction factor =   0.035
------------------------------------------------------------------------
Sub-Channel flow  =      0.446(CFS)
  '     '       flow top width =      5.321(Ft.)
  '     '    velocity=    0.883(Ft/s)
  '     '       area =      0.506(Sq.Ft)
  '     '       Froude number =     0.505

Upstream point elevation =   611.310(Ft.)
Downstream point elevation =   610.000(Ft.)
Flow length =   131.000(Ft.)
Travel time  =    2.47 min.
Time of concentration =    5.68 min.
Depth of flow =   0.190(Ft.)
Average velocity =   0.883(Ft/s)
Total irregular channel flow =     0.446(CFS)
Irregular channel normal depth above invert elev. =   0.190(Ft.)
Average velocity of channel(s) =   0.883(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.008(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.008(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.089
Subarea runoff =      0.590(CFS) for      0.086(Ac.)
Total runoff =      0.711(CFS)        Total area =       0.102(Ac.)
Depth of flow =   0.226(Ft.), Average velocity =   0.991(Ft/s)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       19.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   610.000(Ft.)
Downstream point/station elevation =   607.710(Ft.)
Pipe length  =   153.00(Ft.) Slope =   0.0150  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.711(CFS)
Given pipe size =      6.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     0.468(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      2.453(Ft.)
 Minor friction loss =      0.305(Ft.)       K-factor =   1.50
Critical depth could not be calculated.
Pipe flow velocity =      3.62(Ft/s)
Travel time through pipe =    0.70 min.
Time of concentration (TC) =     6.39 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       19.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.102(Ac.)
Runoff from this stream =      0.711(CFS)
Time of concentration =    6.39 min.
Rainfall intensity =     7.426(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       17.000 to Point/Station       18.000
**** 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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =  102.000(Ft.)
Highest elevation =  624.500(Ft.)
Lowest elevation =  622.270(Ft.)
Elevation difference =    2.230(Ft.) Slope =  2.186 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   2.19 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.67 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  70.000^.5)/(   2.186^(1/3)]=   2.67
Calculated TC of    2.669 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.582(CFS)
Total initial stream area =        0.077(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       18.000 to Point/Station       19.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.143(CFS)
Depth of flow =   0.082(Ft.), Average velocity =   2.924(Ft/s)
```

```
       ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             80.00              0.00
       3            160.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------------
Sub-Channel flow  =      3.143(CFS)
  '     '       flow top width =     26.229(Ft.)
  '     '    velocity=    2.924(Ft/s)
  '     '       area =      1.075(Sq.Ft)
  '     '       Froude number =     2.545

Upstream point elevation =   622.270(Ft.)
Downstream point elevation =   609.720(Ft.)
Flow length =   271.000(Ft.)
Travel time  =    1.54 min.
Time of concentration =    4.21 min.
Depth of flow =   0.082(Ft.)
Average velocity =   2.924(Ft/s)
Total irregular channel flow =     3.143(CFS)
Irregular channel normal depth above invert elev. =   0.082(Ft.)
Average velocity of channel(s) =   2.924(Ft/s)
 Adding area flow to channel
Calculated TC of    4.214 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.656
Subarea runoff =      5.121(CFS) for      0.677(Ac.)
Total runoff =      5.704(CFS)        Total area =       0.754(Ac.)
Depth of flow =   0.102(Ft.), Average velocity =   3.394(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       19.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      0.754(Ac.)
Runoff from this stream =      5.704(CFS)
Time of concentration =    4.21 min.
Rainfall intensity =     8.695(In/Hr)
Summary of stream data:

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


1        5.575      4.68              8.695
2        0.711      6.39              7.426
3        5.704      4.21              8.695
Qmax(1) =
          1.000 *    1.000 *     5.575) +
          1.000 *    0.732 *     0.711) +
          1.000 *    1.000 *     5.704) + =      11.799
Qmax(2) =
          0.854 *    1.000 *     5.575) +
          1.000 *    1.000 *     0.711) +
```

```
          0.854 *    1.000 *     5.704) + =      10.343
Qmax(3) =
          1.000 *    0.901 *     5.575) +
          1.000 *    0.660 *     0.711) +
          1.000 *    1.000 *     5.704) + =      11.197

Total of 3 streams to confluence:
Flow rates before confluence point:
       5.575       0.711       5.704
Maximum flow rates at confluence using above data:
       11.799       10.343       11.197
Area of streams before confluence:
        0.737        0.102        0.754
Results of confluence:
Total flow rate =     11.799(CFS)
Time of concentration =     4.675 min.
Effective stream area after confluence =      1.593(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   607.710(Ft.)
Downstream point/station elevation =   604.520(Ft.)
Pipe length  =   647.00(Ft.) Slope =   0.0049  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.799(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =    11.799(CFS)
Normal flow depth in pipe =   15.40(In.)
Flow top width inside pipe =   23.02(In.)
Critical Depth =   14.79(In.)
Pipe flow velocity =      5.54(Ft/s)
Travel time through pipe =    1.95 min.
Time of concentration (TC) =     6.62 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       24.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.593(Ac.)
Runoff from this stream =     11.799(CFS)
Time of concentration =    6.62 min.
Rainfall intensity =     7.253(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** 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                       ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =   60.000(Ft.)
Highest elevation =  650.000(Ft.)
Lowest elevation =  623.230(Ft.)
Elevation difference =   26.770(Ft.) Slope = 44.617 %
Top of Initial Area Slope adjusted by User to 44.600 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  44.60 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   1.17 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
```

```
TC = [1.8*(1.1-0.8700)*( 100.000^.5)/(  44.600^(1/3)]=   1.17
Calculated TC of    1.167 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      1.104(CFS)
Total initial stream area =        0.146(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      8.812(CFS)
Depth of flow =   0.135(Ft.), Average velocity =   2.422(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2            100.00              0.00
       3            200.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      8.813(CFS)
  '     '       flow top width =     53.957(Ft.)
  '     '    velocity=    2.422(Ft/s)
  '     '       area =      3.639(Sq.Ft)
  '     '       Froude number =     1.643

Upstream point elevation =   623.230(Ft.)
Downstream point elevation =   614.860(Ft.)
Flow length =   512.000(Ft.)
Travel time  =    3.52 min.
Time of concentration =    4.69 min.
Depth of flow =   0.135(Ft.)
Average velocity =   2.422(Ft/s)
Total irregular channel flow =     8.812(CFS)
Irregular channel normal depth above invert elev. =   0.135(Ft.)
Average velocity of channel(s) =   2.422(Ft/s)
 Adding area flow to channel
Calculated TC of    4.691 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      1.900
Subarea runoff =     15.416(CFS) for      2.038(Ac.)
Total runoff =     16.520(CFS)        Total area =       2.184(Ac.)
Depth of flow =   0.171(Ft.), Average velocity =   2.834(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   606.820(Ft.)
Downstream point/station elevation =   604.520(Ft.)
Pipe length  =   172.00(Ft.) Slope =   0.0134  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.520(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =    16.520(CFS)
Normal flow depth in pipe =   12.22(In.)
Flow top width inside pipe =   29.48(In.)
```

```
Critical Depth =   16.48(In.)
Pipe flow velocity =      8.80(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =     5.02 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       24.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.184(Ac.)
Runoff from this stream =     16.520(CFS)
Time of concentration =    5.02 min.
Rainfall intensity =     8.675(In/Hr)
Summary of stream data:

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


1       11.799      6.62               7.253
2       16.520      5.02               8.675
Qmax(1) =
          1.000 *    1.000 *    11.799) +
          0.836 *    1.000 *    16.520) + =      25.611
Qmax(2) =
          1.000 *    0.758 *    11.799) +
          1.000 *    1.000 *    16.520) + =      25.459

Total of 2 streams to confluence:
Flow rates before confluence point:
      11.799      16.520
Maximum flow rates at confluence using above data:
       25.611       25.459
Area of streams before confluence:
        1.593        2.184
Results of confluence:
Total flow rate =     25.611(CFS)
Time of concentration =     6.623 min.
Effective stream area after confluence =      3.777(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       20.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   604.520(Ft.)
Downstream point/station elevation =   602.680(Ft.)
Pipe length  =   151.00(Ft.) Slope =   0.0122  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    25.611(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =    25.611(CFS)
Normal flow depth in pipe =   16.15(In.)
Flow top width inside pipe =   29.91(In.)
Critical Depth =   20.70(In.)
Pipe flow velocity =      9.51(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =     6.89 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       20.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.777(Ac.)
Runoff from this stream =     25.611(CFS)
Time of concentration =    6.89 min.
Rainfall intensity =     7.072(In/Hr)
Summary of stream data:
```

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


1       25.833      5.29               8.384
2       25.611      6.89               7.072
Qmax(1) =
          1.000 *    1.000 *    25.833) +
          1.000 *    0.768 *    25.611) + =      45.505
Qmax(2) =
          0.844 *    1.000 *    25.833) +
          1.000 *    1.000 *    25.611) + =      47.402

Total of 2 main streams to confluence:
Flow rates before confluence point:
      25.833      25.611
Maximum flow rates at confluence using above data:
       45.505       47.402
Area of streams before confluence:
        3.505        3.777


Results of confluence:
Total flow rate =     47.402(CFS)
Time of concentration =     6.887 min.
Effective stream area after confluence  =      7.282(Ac.)
End of computations, total study area =           7.282 (Ac.)
```

ATTACHMENT 4

```
               San Diego County Rational Hydrology Program

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

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
       Rational Hydrology Study        Date: 02/18/20
--------------------------------------------------------------------------
POST DEVELOPMENT
08067-HOLLANDIA
POC 1

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

--------------------------------------------------------------------------


Program License Serial Number 6332

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

Map data precipitation entered:
6 hour,  precipitation(inches) =  3.300
24 hour precipitation(inches) =  5.700
P6/P24 =    57.9%
San Diego hydrology manual 'C' values used

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  621.880(Ft.)
Lowest elevation =  620.100(Ft.)
Elevation difference =    1.780(Ft.) Slope =  1.780 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.78 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.86 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  70.000^.5)/(   1.780^(1/3)]=   2.86
Calculated TC of    2.858 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      1.513(CFS)
Total initial stream area =        0.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
____________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.945(CFS)
Depth of flow =   0.128(Ft.), Average velocity =   2.406(Ft/s)
```

```
       ******* Irregular Channel Data ***********
------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             50.00              0.00
       3            100.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------------
Sub-Channel flow  =      3.945(CFS)
  '     '       flow top width =     25.608(Ft.)
  '     '    velocity=    2.406(Ft/s)
  '     '       area =      1.639(Sq.Ft)
  '     '       Froude number =     1.676

Upstream point elevation =   620.100(Ft.)
Downstream point elevation =   616.830(Ft.)
Flow length =   189.000(Ft.)
Travel time  =    1.31 min.
Time of concentration =    4.17 min.
Depth of flow =   0.128(Ft.)
Average velocity =   2.406(Ft/s)
Total irregular channel flow =     3.945(CFS)
Irregular channel normal depth above invert elev. =   0.128(Ft.)
Average velocity of channel(s) =   2.406(Ft/s)
 Adding area flow to channel
Calculated TC of    4.167 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.733
Subarea runoff =      4.864(CFS) for      0.643(Ac.)
Total runoff =      6.377(CFS)        Total area =       0.843(Ac.)
Depth of flow =   0.153(Ft.), Average velocity =   2.713(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   607.200(Ft.)
Downstream point/station elevation =   606.970(Ft.)
Pipe length  =    20.00(Ft.) Slope =   0.0115  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.377(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     6.377(CFS)
Normal flow depth in pipe =    9.69(In.)
Flow top width inside pipe =   17.95(In.)
Critical Depth =   11.71(In.)
Pipe flow velocity =      6.57(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     4.22 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      0.843(Ac.)
Runoff from this stream =      6.377(CFS)
Time of concentration =    4.22 min.
```

```
Rainfall intensity =     8.695(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =   75.000(Ft.)
Highest elevation =  610.160(Ft.)
Lowest elevation =  609.410(Ft.)
Elevation difference =    0.750(Ft.) Slope =  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.21 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  60.000^.5)/(   1.000^(1/3)]=   3.21
Calculated TC of    3.207 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.363(CFS)
Total initial stream area =        0.048(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station       11.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.056(CFS)
Depth of flow =   0.140(Ft.), Average velocity =   1.939(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             40.00              0.00
       3             80.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      3.056(CFS)
  '     '       flow top width =     22.458(Ft.)
  '     '    velocity=    1.939(Ft/s)
  '     '       area =      1.576(Sq.Ft)
  '     '       Froude number =     1.290

Upstream point elevation =   609.410(Ft.)
Downstream point elevation =   607.710(Ft.)
Flow length =   171.000(Ft.)
Travel time  =    1.47 min.
Time of concentration =    4.68 min.
Depth of flow =   0.140(Ft.)
Average velocity =   1.939(Ft/s)
Total irregular channel flow =     3.056(CFS)
Irregular channel normal depth above invert elev. =   0.140(Ft.)
Average velocity of channel(s) =   1.939(Ft/s)
 Adding area flow to channel
Calculated TC of    4.677 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
```

```
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.661
Subarea runoff =      5.386(CFS) for      0.712(Ac.)
Total runoff =      5.749(CFS)        Total area =       0.760(Ac.)
Depth of flow =   0.178(Ft.), Average velocity =   2.271(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.760(Ac.)
Runoff from this stream =      5.749(CFS)
Time of concentration =    4.68 min.
Rainfall intensity =     8.695(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        7.000
**** 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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =   76.000(Ft.)
Highest elevation =  612.160(Ft.)
Lowest elevation =  611.400(Ft.)
Elevation difference =    0.760(Ft.) Slope =  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.21 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  60.000^.5)/(   1.000^(1/3)]=   3.21
Calculated TC of    3.207 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.121(CFS)
Total initial stream area =        0.016(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        8.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.446(CFS)
Depth of flow =   0.131(Ft.), Average velocity =   1.850(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              7.00              0.00
       3             14.00              0.50
```

```
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      0.446(CFS)
  '     '       flow top width =      3.675(Ft.)
  '     '    velocity=    1.850(Ft/s)
  '     '       area =      0.241(Sq.Ft)
  '     '       Froude number =     1.273

Upstream point elevation =   611.400(Ft.)
Downstream point elevation =   610.000(Ft.)
Flow length =   141.000(Ft.)
Travel time  =    1.27 min.
Time of concentration =    4.48 min.
Depth of flow =   0.131(Ft.)
Average velocity =   1.850(Ft/s)
Total irregular channel flow =     0.446(CFS)
Irregular channel normal depth above invert elev. =   0.131(Ft.)
Average velocity of channel(s) =   1.850(Ft/s)
 Adding area flow to channel
Calculated TC of    4.477 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.089
Subarea runoff =      0.651(CFS) for      0.086(Ac.)
Total runoff =      0.772(CFS)        Total area =       0.102(Ac.)
Depth of flow =   0.161(Ft.), Average velocity =   2.121(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station       11.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   610.000(Ft.)
Downstream point/station elevation =   607.710(Ft.)
Pipe length  =   141.00(Ft.) Slope =   0.0162  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.772(CFS)
Given pipe size =      6.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     0.735(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      2.665(Ft.)
 Minor friction loss =      0.360(Ft.)       K-factor =   1.50
Pipe flow velocity =      3.93(Ft/s)
Travel time through pipe =    0.60 min.
Time of concentration (TC) =     5.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.102(Ac.)
Runoff from this stream =      0.772(CFS)
Time of concentration =    5.08 min.
Rainfall intensity =     8.611(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** 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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =  102.000(Ft.)
Highest elevation =  624.500(Ft.)
Lowest elevation =  622.270(Ft.)
Elevation difference =    2.230(Ft.) Slope =  2.186 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   2.19 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.67 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  70.000^.5)/(   2.186^(1/3)]=   2.67
Calculated TC of    2.669 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.582(CFS)
Total initial stream area =        0.077(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       11.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.101(CFS)
Depth of flow =   0.082(Ft.), Average velocity =   2.914(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             80.00              0.00
       3            160.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      3.101(CFS)
  '     '       flow top width =     26.098(Ft.)
  '     '    velocity=    2.914(Ft/s)
  '     '       area =      1.064(Sq.Ft)
  '     '       Froude number =     2.543

Upstream point elevation =   622.270(Ft.)
Downstream point elevation =   609.720(Ft.)
Flow length =   271.000(Ft.)
Travel time  =    1.55 min.
Time of concentration =    4.22 min.
Depth of flow =   0.082(Ft.)
Average velocity =   2.914(Ft/s)
Total irregular channel flow =     3.101(CFS)
Irregular channel normal depth above invert elev. =   0.082(Ft.)
Average velocity of channel(s) =   2.914(Ft/s)
 Adding area flow to channel
Calculated TC of    4.219 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
```

```
Rainfall intensity =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.646
Subarea runoff =      5.038(CFS) for      0.666(Ac.)
Total runoff =      5.620(CFS)        Total area =       0.743(Ac.)
Depth of flow =   0.102(Ft.), Average velocity =   3.381(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      0.743(Ac.)
Runoff from this stream =      5.620(CFS)
Time of concentration =    4.22 min.
Rainfall intensity =     8.695(In/Hr)
Summary of stream data:

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


1        5.749      4.68               8.695
2        0.772      5.08               8.611
3        5.620      4.22               8.695
Qmax(1) =
          1.000 *    1.000 *     5.749) +
          1.000 *    0.921 *     0.772) +
          1.000 *    1.000 *     5.620) + =      12.080
Qmax(2) =
          0.990 *    1.000 *     5.749) +
          1.000 *    1.000 *     0.772) +
          0.990 *    1.000 *     5.620) + =      12.032
Qmax(3) =
          1.000 *    0.902 *     5.749) +
          1.000 *    0.831 *     0.772) +
          1.000 *    1.000 *     5.620) + =      11.448

Total of 3 streams to confluence:
Flow rates before confluence point:
       5.749       0.772       5.620
Maximum flow rates at confluence using above data:
       12.080       12.032       11.448
Area of streams before confluence:
        0.760        0.102        0.743
Results of confluence:
Total flow rate =     12.080(CFS)
Time of concentration =     4.677 min.
Effective stream area after confluence =      1.605(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   607.710(Ft.)
Downstream point/station elevation =   606.970(Ft.)
Pipe length  =   201.00(Ft.) Slope =   0.0037  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.080(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =    12.080(CFS)
Normal flow depth in pipe =   17.48(In.)
Flow top width inside pipe =   21.35(In.)
Critical Depth =   14.98(In.)
Pipe flow velocity =      4.93(Ft/s)
Travel time through pipe =    0.68 min.
Time of concentration (TC) =     5.36 min.


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

```
Process from Point/Station       12.000 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
--------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.605(Ac.)
Runoff from this stream =     12.080(CFS)
Time of concentration =    5.36 min.
Rainfall intensity =     8.317(In/Hr)
Summary of stream data:

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


1        6.377      4.22               8.695
2       12.080      5.36               8.317
Qmax(1) =
          1.000 *    1.000 *     6.377) +
          1.000 *    0.788 *    12.080) + =      15.890
Qmax(2) =
          0.957 *    1.000 *     6.377) +
          1.000 *    1.000 *    12.080) + =      18.180

Total of 2 main streams to confluence:
Flow rates before confluence point:
       6.377      12.080
Maximum flow rates at confluence using above data:
       15.890       18.180
Area of streams before confluence:
        0.843        1.605


Results of confluence:
Total flow rate =     18.180(CFS)
Time of concentration =     5.356 min.
Effective stream area after confluence  =      2.448(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       19.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
--------------------------------------------------------------------------------
Upstream point/station elevation =   606.970(Ft.)
Downstream point/station elevation =   604.520(Ft.)
Pipe length  =   446.00(Ft.) Slope =   0.0055  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.180(CFS)
Given pipe size =     24.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     1.209(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      2.879(Ft.)
 Minor friction loss =      0.780(Ft.)       K-factor =   1.50
Pipe flow velocity =      5.79(Ft/s)
Travel time through pipe =    1.28 min.
Time of concentration (TC) =     6.64 min.



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       19.000
**** CONFLUENCE OF MAIN STREAMS ****
--------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.448(Ac.)
Runoff from this stream =     18.180(CFS)
Time of concentration =    6.64 min.
Rainfall intensity =     7.240(In/Hr)
Program is now starting with Main Stream No. 2
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** 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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =   60.000(Ft.)
Highest elevation =  615.780(Ft.)
Lowest elevation =  615.180(Ft.)
Elevation difference =    0.600(Ft.) Slope =  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.21 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  60.000^.5)/(   1.000^(1/3)]=   3.21
Calculated TC of    3.207 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.242(CFS)
Total initial stream area =        0.032(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       17.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.092(CFS)
Depth of flow =   0.077(Ft.), Average velocity =   2.189(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             80.00              0.00
       3            160.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      2.092(CFS)
  '     '       flow top width =     24.730(Ft.)
  '     '    velocity=    2.189(Ft/s)
  '     '       area =      0.956(Sq.Ft)
  '     '       Froude number =     1.962

Upstream point elevation =   615.180(Ft.)
Downstream point elevation =   612.710(Ft.)
Flow length =    88.000(Ft.)
Travel time  =    0.67 min.
Time of concentration =    3.88 min.
Depth of flow =   0.077(Ft.)
Average velocity =   2.189(Ft/s)
Total irregular channel flow =     2.092(CFS)
Irregular channel normal depth above invert elev. =   0.077(Ft.)
Average velocity of channel(s) =   2.189(Ft/s)
 Adding area flow to channel
Calculated TC of    3.877 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
```

```
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.453
Subarea runoff =      3.699(CFS) for      0.489(Ac.)
Total runoff =      3.941(CFS)        Total area =       0.521(Ac.)
Depth of flow =   0.098(Ft.), Average velocity =   2.564(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       17.000 to Point/Station       17.100
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   612.710(Ft.)
Downstream point/station elevation =   611.050(Ft.)
Pipe length  =    92.00(Ft.) Slope =   0.0180  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.941(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     3.941(CFS)
Normal flow depth in pipe =    8.30(In.)
Flow top width inside pipe =   11.09(In.)
Critical Depth =   10.11(In.)
Pipe flow velocity =      6.80(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =     4.10 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.521(Ac.)
Runoff from this stream =      3.941(CFS)
Time of concentration =    4.10 min.
Rainfall intensity =     8.695(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       36.000 to Point/Station       37.000
**** 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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =  209.000(Ft.)
Highest elevation =  617.410(Ft.)
Lowest elevation =  613.760(Ft.)
Elevation difference =    3.650(Ft.) Slope =  1.746 %
Top of Initial Area Slope adjusted by User to  0.250 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.25 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.65 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  50.000^.5)/(   0.250^(1/3)]=   4.65
Calculated TC of    4.647 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
```

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Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.408(CFS)
Total initial stream area =        0.054(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       37.000 to Point/Station       38.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.545(CFS)
Depth of flow =   0.063(Ft.), Average velocity =   1.388(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             50.00              0.00
       3            100.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      0.545(CFS)
  '     '       flow top width =     12.528(Ft.)
  '     '    velocity=    1.388(Ft/s)
  '     '       area =      0.392(Sq.Ft)
  '     '       Froude number =     1.382

Upstream point elevation =   613.760(Ft.)
Downstream point elevation =   611.310(Ft.)
Flow length =   164.000(Ft.)
Travel time  =    1.97 min.
Time of concentration =    6.62 min.
Depth of flow =   0.063(Ft.)
Average velocity =   1.388(Ft/s)
Total irregular channel flow =     0.545(CFS)
Irregular channel normal depth above invert elev. =   0.063(Ft.)
Average velocity of channel(s) =   1.388(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      7.258(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      7.258(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.085
Subarea runoff =      0.210(CFS) for      0.044(Ac.)
Total runoff =      0.619(CFS)        Total area =       0.098(Ac.)
Depth of flow =   0.066(Ft.), Average velocity =   1.433(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       38.000 to Point/Station       17.100
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   611.310(Ft.)
Downstream point/station elevation =   611.050(Ft.)
Pipe length  =    53.00(Ft.) Slope =   0.0049  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.619(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     0.619(CFS)
Normal flow depth in pipe =    4.07(In.)
Flow top width inside pipe =   11.36(In.)
Critical Depth =    3.93(In.)
Pipe flow velocity =      2.64(Ft/s)
Travel time through pipe =    0.34 min.
Time of concentration (TC) =     6.95 min.

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Process from Point/Station       17.100 to Point/Station       17.100
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.098(Ac.)
Runoff from this stream =      0.619(CFS)
Time of concentration =    6.95 min.
Rainfall intensity =     7.030(In/Hr)
Summary of stream data:

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


1        3.941      4.10               8.695
2        0.619      6.95               7.030
Qmax(1) =
          1.000 *    1.000 *     3.941) +
          1.000 *    0.590 *     0.619) + =       4.306
Qmax(2) =
          0.809 *    1.000 *     3.941) +
          1.000 *    1.000 *     0.619) + =       3.805

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.941       0.619
Maximum flow rates at confluence using above data:
        4.306        3.805
Area of streams before confluence:
        0.521        0.098
Results of confluence:
Total flow rate =      4.306(CFS)
Time of concentration =     4.102 min.
Effective stream area after confluence =      0.619(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       17.100 to Point/Station       32.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
____________________________________________________________________________
Upstream point/station elevation =   611.050(Ft.)
Downstream point/station elevation =   610.040(Ft.)
Pipe length  =   200.00(Ft.) Slope =   0.0050  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.306(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =     4.306(CFS)
Normal flow depth in pipe =    7.79(In.)
Flow top width inside pipe =   26.31(In.)
Critical Depth =    8.18(In.)
Pipe flow velocity =      4.25(Ft/s)
Travel time through pipe =    0.78 min.
Time of concentration (TC) =     4.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.619(Ac.)
Runoff from this stream =      4.306(CFS)
Time of concentration =    4.89 min.
Rainfall intensity =     8.695(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** 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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =  102.000(Ft.)
Highest elevation =  613.800(Ft.)
Lowest elevation =  612.790(Ft.)
Elevation difference =    1.010(Ft.) Slope =  0.990 %
Top of Initial Area Slope adjusted by User to  0.250 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 50.00 (Ft)
for the top area slope value of   0.25 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   4.65 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  50.000^.5)/(   0.250^(1/3)]=   4.65
Calculated TC of    4.647 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      3.979(CFS)
Total initial stream area =        0.526(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       32.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      5.216(CFS)
Depth of flow =   0.122(Ft.), Average velocity =   2.922(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.25
       2             30.00              0.00
       3             60.00              0.25
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      5.216(CFS)
  '     '       flow top width =     29.271(Ft.)
  '     '    velocity=    2.922(Ft/s)
  '     '       area =      1.785(Sq.Ft)
  '     '       Froude number =     2.085

Upstream point elevation =   612.790(Ft.)
Downstream point elevation =   610.040(Ft.)
Flow length =   101.000(Ft.)
Travel time  =    0.58 min.
Time of concentration =    5.22 min.
Depth of flow =   0.122(Ft.)
Average velocity =   2.922(Ft/s)
Total irregular channel flow =     5.216(CFS)
Irregular channel normal depth above invert elev. =   0.122(Ft.)
Average velocity of channel(s) =   2.922(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.453(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.453(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.753
Subarea runoff =      2.383(CFS) for      0.339(Ac.)
Total runoff =      6.362(CFS)        Total area =       0.865(Ac.)
Depth of flow =   0.131(Ft.), Average velocity =   3.071(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.865(Ac.)
Runoff from this stream =      6.362(CFS)
Time of concentration =    5.22 min.
Rainfall intensity =     8.453(In/Hr)
Summary of stream data:

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


1        4.306      4.89               8.695
2        6.362      5.22               8.453
Qmax(1) =
          1.000 *    1.000 *     4.306) +
          1.000 *    0.935 *     6.362) + =      10.257
Qmax(2) =
          0.972 *    1.000 *     4.306) +
          1.000 *    1.000 *     6.362) + =      10.548

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.306       6.362
Maximum flow rates at confluence using above data:
       10.257       10.548
Area of streams before confluence:
        0.619        0.865
Results of confluence:
Total flow rate =     10.548(CFS)
Time of concentration =     5.223 min.
Effective stream area after confluence =      1.484(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       33.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   610.040(Ft.)
Downstream point/station elevation =   609.540(Ft.)
Pipe length  =   324.00(Ft.) Slope =   0.0015  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.548(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =    10.548(CFS)
Normal flow depth in pipe =   17.70(In.)
Flow top width inside pipe =   29.51(In.)
Critical Depth =   13.03(In.)
Pipe flow velocity =      3.50(Ft/s)
Travel time through pipe =    1.54 min.
Time of concentration (TC) =     6.77 min.


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```
Process from Point/Station       33.000 to Point/Station       34.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   609.540(Ft.)
Downstream point/station elevation =   609.000(Ft.)
Pipe length  =    99.00(Ft.) Slope =   0.0055  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.548(CFS)
Given pipe size =     18.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     1.288(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =      0.998(Ft.)
 Minor friction loss =      0.830(Ft.)       K-factor =   1.50
Pipe flow velocity =      5.97(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     7.04 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.000 to Point/Station       34.000
**** 6 HOUR HYDROGRAPH ****
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003


Time of Concentration =   7.04
Basin Area =     3.93 Acres
6 Hour Rainfall =  3.300 Inches
Runoff Coefficient =  0.328
Peak Discharge =    10.55 CFS
     Time (Min)     Discharge (CFS)
       0              0.000
       7              0.256
       14              0.259
       21              0.266
       28              0.270
       35              0.277
       42              0.281
       49              0.290
       56              0.295
       63              0.304
       70              0.310
       77              0.321
       84              0.327
       91              0.340
       98              0.347
       105              0.362
       112              0.370
       119              0.387
       126              0.397
       133              0.419
       140              0.431
       147              0.457
       154              0.472
       161              0.506
       168              0.526
       175              0.572
       182              0.599
       189              0.664
       196              0.704
       203              0.807
       210              0.875
       217              1.070
       224              1.218
       231              1.789
       238              2.521
       245             10.548
       252              1.435
       259              0.960
```

266	0.751
273	0.629
280	0.548
287	0.489
294	0.443
301	0.408
308	0.378
315	0.354
322	0.333
329	0.315
336	0.299
343	0.286
350	0.273
357	0.262
364	0.252

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6 - H O U R S T O R M

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

Hydrograph in 1 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.6	5.3	7.9	10.5
0+ 0	0.0000	0.00	Q	|	|	|	|
0+ 1	0.0001	0.04	Q	|	|	|	|
0+ 2	0.0002	0.07	Q	|	|	|	|
0+ 3	0.0003	0.11	Q	|	|	|	|
0+ 4	0.0005	0.15	Q	|	|	|	|
0+ 5	0.0008	0.18	Q	|	|	|	|
0+ 6	0.0011	0.22	Q	|	|	|	|
0+ 7	0.0014	0.26	Q	|	|	|	|
0+ 8	0.0018	0.26	Q	|	|	|	|
0+ 9	0.0021	0.26	Q	|	|	|	|
0+10	0.0025	0.26	Q	|	|	|	|
0+11	0.0028	0.26	Q	|	|	|	|
0+12	0.0032	0.26	Q	|	|	|	|
0+13	0.0035	0.26	Q	|	|	|	|
0+14	0.0039	0.26	Q	|	|	|	|
0+15	0.0042	0.26	Q	|	|	|	|
0+16	0.0046	0.26	Q	|	|	|	|
0+17	0.0050	0.26	Q	|	|	|	|
0+18	0.0053	0.26	Q	|	|	|	|
0+19	0.0057	0.26	VQ	|	|	|	|
0+20	0.0061	0.26	VQ	|	|	|	|
0+21	0.0064	0.27	VQ	|	|	|	|
0+22	0.0068	0.27	VQ	|	|	|	|
0+23	0.0072	0.27	VQ	|	|	|	|
0+24	0.0075	0.27	VQ	|	|	|	|
0+25	0.0079	0.27	VQ	|	|	|	|
0+26	0.0083	0.27	VQ	|	|	|	|
0+27	0.0086	0.27	VQ	|	|	|	|
0+28	0.0090	0.27	VQ	|	|	|	|
0+29	0.0094	0.27	|Q	|	|	|	|
0+30	0.0098	0.27	|Q	|	|	|	|
0+31	0.0101	0.27	|Q	|	|	|	|
0+32	0.0105	0.27	|Q	|	|	|	|
0+33	0.0109	0.28	|Q	|	|	|	|
0+34	0.0113	0.28	|Q	|	|	|	|
0+35	0.0117	0.28	|Q	|	|	|	|
0+36	0.0120	0.28	|Q	|	|	|	|
0+37	0.0124	0.28	|Q	|	|	|	|
0+38	0.0128	0.28	|Q	|	|	|	|
0+39	0.0132	0.28	|Q	|	|	|	|
0+40	0.0136	0.28	|Q	|	|	|	|
0+41	0.0140	0.28	|Q	|	|	|	|
0+42	0.0143	0.28	|Q	|	|	|	|
0+43	0.0147	0.28	|Q	|	|	|	|
0+44	0.0151	0.28	|Q	|	|	|	|
0+45	0.0155	0.29	|Q	|	|	|	|

0+46	0.0159	0.29	|Q	|	|	|	|
0+47	0.0163	0.29	|Q	|	|	|	|
0+48	0.0167	0.29	|Q	|	|	|	|
0+49	0.0171	0.29	|Q	|	|	|	|
0+50	0.0175	0.29	|Q	|	|	|	|
0+51	0.0179	0.29	|Q	|	|	|	|
0+52	0.0183	0.29	|Q	|	|	|	|
0+53	0.0187	0.29	|QV	|	|	|	|
0+54	0.0191	0.29	|QV	|	|	|	|
0+55	0.0195	0.29	|QV	|	|	|	|
0+56	0.0199	0.29	|QV	|	|	|	|
0+57	0.0203	0.30	|QV	|	|	|	|
0+58	0.0207	0.30	|QV	|	|	|	|
0+59	0.0212	0.30	|QV	|	|	|	|
1+ 0	0.0216	0.30	|QV	|	|	|	|
1+ 1	0.0220	0.30	|QV	|	|	|	|
1+ 2	0.0224	0.30	|QV	|	|	|	|
1+ 3	0.0228	0.30	|QV	|	|	|	|
1+ 4	0.0232	0.31	|QV	|	|	|	|
1+ 5	0.0237	0.31	|QV	|	|	|	|
1+ 6	0.0241	0.31	|QV	|	|	|	|
1+ 7	0.0245	0.31	|QV	|	|	|	|
1+ 8	0.0249	0.31	|QV	|	|	|	|
1+ 9	0.0254	0.31	|QV	|	|	|	|
1+10	0.0258	0.31	|QV	|	|	|	|
1+11	0.0262	0.31	|QV	|	|	|	|
1+12	0.0267	0.31	|QV	|	|	|	|
1+13	0.0271	0.31	|QV	|	|	|	|
1+14	0.0275	0.32	|QV	|	|	|	|
1+15	0.0280	0.32	|Q V	|	|	|	|
1+16	0.0284	0.32	|Q V	|	|	|	|
1+17	0.0288	0.32	|Q V	|	|	|	|
1+18	0.0293	0.32	|Q V	|	|	|	|
1+19	0.0297	0.32	|Q V	|	|	|	|
1+20	0.0302	0.32	|Q V	|	|	|	|
1+21	0.0306	0.32	|Q V	|	|	|	|
1+22	0.0311	0.33	|Q V	|	|	|	|
1+23	0.0315	0.33	|Q V	|	|	|	|
1+24	0.0320	0.33	|Q V	|	|	|	|
1+25	0.0324	0.33	|Q V	|	|	|	|
1+26	0.0329	0.33	|Q V	|	|	|	|
1+27	0.0333	0.33	|Q V	|	|	|	|
1+28	0.0338	0.33	|Q V	|	|	|	|
1+29	0.0343	0.34	|Q V	|	|	|	|
1+30	0.0347	0.34	|Q V	|	|	|	|
1+31	0.0352	0.34	|Q V	|	|	|	|
1+32	0.0357	0.34	|Q V	|	|	|	|
1+33	0.0361	0.34	|Q V	|	|	|	|
1+34	0.0366	0.34	|Q V	|	|	|	|
1+35	0.0371	0.34	|Q V	|	|	|	|
1+36	0.0375	0.34	|Q V	|	|	|	|
1+37	0.0380	0.35	|Q V	|	|	|	|
1+38	0.0385	0.35	|Q V	|	|	|	|
1+39	0.0390	0.35	|Q V	|	|	|	|
1+40	0.0395	0.35	|Q V	|	|	|	|
1+41	0.0400	0.35	|Q V	|	|	|	|
1+42	0.0404	0.36	|Q V	|	|	|	|
1+43	0.0409	0.36	|Q V	|	|	|	|
1+44	0.0414	0.36	|Q V	|	|	|	|
1+45	0.0419	0.36	|Q V	|	|	|	|
1+46	0.0424	0.36	|Q V	|	|	|	|
1+47	0.0429	0.36	|Q V	|	|	|	|
1+48	0.0434	0.37	|Q V	|	|	|	|
1+49	0.0439	0.37	|Q V	|	|	|	|
1+50	0.0444	0.37	|Q V	|	|	|	|
1+51	0.0449	0.37	|Q V	|	|	|	|
1+52	0.0455	0.37	|Q V	|	|	|	|
1+53	0.0460	0.37	|Q V	|	|	|	|
1+54	0.0465	0.37	|Q V	|	|	|	|
1+55	0.0470	0.38	|Q V	|	|	|	|

1+56	0.0475	0.38	Q V			
1+57	0.0481	0.38	Q V			
1+58	0.0486	0.38	Q V			
1+59	0.0491	0.39	Q V			
2+ 0	0.0497	0.39	Q V			
2+ 1	0.0502	0.39	Q V			
2+ 2	0.0507	0.39	Q V			
2+ 3	0.0513	0.39	Q V			
2+ 4	0.0518	0.39	Q V			
2+ 5	0.0524	0.40	Q V			
2+ 6	0.0529	0.40	Q V			
2+ 7	0.0535	0.40	Q V			
2+ 8	0.0540	0.40	Q V			
2+ 9	0.0546	0.41	Q V			
2+10	0.0551	0.41	Q V			
2+11	0.0557	0.41	Q V			
2+12	0.0563	0.42	Q V			
2+13	0.0569	0.42	Q V			
2+14	0.0574	0.42	Q V			
2+15	0.0580	0.42	Q V			
2+16	0.0586	0.42	Q V			
2+17	0.0592	0.43	Q V			
2+18	0.0598	0.43	Q V			
2+19	0.0604	0.43	Q V			
2+20	0.0610	0.43	Q V			
2+21	0.0616	0.43	Q V			
2+22	0.0622	0.44	Q V			
2+23	0.0628	0.44	Q V			
2+24	0.0634	0.45	Q V			
2+25	0.0640	0.45	Q V			
2+26	0.0646	0.45	Q V			
2+27	0.0653	0.46	Q V			
2+28	0.0659	0.46	Q V			
2+29	0.0665	0.46	Q V			
2+30	0.0672	0.46	Q V			
2+31	0.0678	0.47	Q V			
2+32	0.0684	0.47	Q V			
2+33	0.0691	0.47	Q V			
2+34	0.0697	0.47	Q V			
2+35	0.0704	0.48	Q V			
2+36	0.0711	0.48	Q V			
2+37	0.0717	0.49	Q V			
2+38	0.0724	0.49	Q V			
2+39	0.0731	0.50	Q V			
2+40	0.0738	0.50	Q V			
2+41	0.0745	0.51	Q V			
2+42	0.0752	0.51	Q V			
2+43	0.0759	0.51	Q V			
2+44	0.0766	0.51	Q V			
2+45	0.0773	0.52	Q V			
2+46	0.0780	0.52	Q V			
2+47	0.0788	0.52	Q V			
2+48	0.0795	0.53	Q V			
2+49	0.0802	0.53	Q V			
2+50	0.0810	0.54	Q V			
2+51	0.0817	0.55	Q V			
2+52	0.0825	0.55	Q V			
2+53	0.0832	0.56	Q V			
2+54	0.0840	0.57	Q V			
2+55	0.0848	0.57	Q V			
2+56	0.0856	0.58	Q V			
2+57	0.0864	0.58	Q V			
2+58	0.0872	0.58	Q V			
2+59	0.0880	0.59	Q V			
3+ 0	0.0888	0.59	Q V			
3+ 1	0.0896	0.59	Q V			
3+ 2	0.0905	0.60	Q V			
3+ 3	0.0913	0.61	Q V			
3+ 4	0.0922	0.62	Q V			
3+ 5	0.0930	0.63	Q V			

3+ 6	0.0939	0.64	Q V | | |
3+ 7	0.0948	0.65	Q V | | |
3+ 8	0.0957	0.65	Q V | | |
3+ 9	0.0966	0.66	Q V | | |
3+10	0.0975	0.67	Q V | | |
3+11	0.0984	0.68	Q V | | |
3+12	0.0994	0.68	Q V | | |
3+13	0.1003	0.69	Q V | | |
3+14	0.1013	0.69	Q |V | | |
3+15	0.1023	0.70	Q |V | | |
3+16	0.1032	0.70	Q |V | | |
3+17	0.1042	0.72	Q |V | | |
3+18	0.1052	0.73	Q |V | | |
3+19	0.1063	0.75	Q |V | | |
3+20	0.1073	0.76	Q |V | | |
3+21	0.1084	0.78	Q |V | | |
3+22	0.1095	0.79	Q |V | | |
3+23	0.1106	0.81	Q | V | | |
3+24	0.1117	0.82	Q | V | | |
3+25	0.1128	0.83	Q | V | | |
3+26	0.1140	0.84	Q | V | | |
3+27	0.1152	0.85	Q | V | | |
3+28	0.1163	0.86	Q | V | | |
3+29	0.1175	0.87	Q | V | | |
3+30	0.1187	0.88	Q | V | | |
3+31	0.1200	0.90	Q | V | | |
3+32	0.1213	0.93	Q | V | | |
3+33	0.1226	0.96	Q | V | | |
3+34	0.1239	0.99	Q | V | | |
3+35	0.1253	1.01	Q | V | | |
3+36	0.1268	1.04	Q | V | | |
3+37	0.1282	1.07	Q | V | | |
3+38	0.1297	1.09	Q | V | | |
3+39	0.1313	1.11	Q | V | | |
3+40	0.1328	1.13	Q | V | | |
3+41	0.1344	1.15	Q | V | | |
3+42	0.1361	1.18	Q | V | | |
3+43	0.1377	1.20	Q | V | | |
3+44	0.1394	1.22	Q | V | | |
3+45	0.1412	1.30	Q | V | | |
3+46	0.1431	1.38	Q | V | | |
3+47	0.1451	1.46	Q | V | | |
3+48	0.1472	1.54	Q | V | | |
3+49	0.1495	1.63	Q | V | | |
3+50	0.1518	1.71	Q | V | | |
3+51	0.1543	1.79	Q | V | | |
3+52	0.1569	1.89	Q | V | | |
3+53	0.1596	2.00	Q | V | | |
3+54	0.1625	2.10	Q | V | | |
3+55	0.1656	2.21	Q | V | | |
3+56	0.1688	2.31	Q | V | | |
3+57	0.1721	2.42	Q| V | | |
3+58	0.1756	2.52	Q| V| | |
3+59	0.1806	3.67	| Q V| | |
4+ 0	0.1872	4.81	| Q V | |
4+ 1	0.1954	5.96	| |VQ | |
4+ 2	0.2052	7.11	| | V Q | |
4+ 3	0.2166	8.25	| | V |Q |
4+ 4	0.2296	9.40	| | V | Q |
4+ 5	0.2441	10.55	| | V | | Q
4+ 6	0.2568	9.25	| | V | Q |
4+ 7	0.2678	7.94	| | VQ | |
4+ 8	0.2769	6.64	| | Q V | |
4+ 9	0.2843	5.34	| | Q V | |
4+10	0.2898	4.04	| Q | |V |
4+11	0.2936	2.74	| Q | |V |
4+12	0.2956	1.43	| Q | | V |
4+13	0.2975	1.37	| Q | | V |
4+14	0.2993	1.30	| Q | | V |
4+15	0.3009	1.23	| Q | | V |

4+16	0.3026	1.16	Q			V
4+17	0.3041	1.10	Q			V
4+18	0.3055	1.03	Q			V
4+19	0.3068	0.96	Q			V
4+20	0.3081	0.93	Q			V
4+21	0.3093	0.90	Q			V
4+22	0.3105	0.87	Q			V
4+23	0.3117	0.84	Q			V
4+24	0.3128	0.81	Q			V
4+25	0.3139	0.78	Q			V
4+26	0.3149	0.75	Q			V
4+27	0.3159	0.73	Q			V
4+28	0.3169	0.72	Q			V
4+29	0.3179	0.70	Q			V
4+30	0.3188	0.68	Q			V
4+31	0.3197	0.66	Q			V
4+32	0.3206	0.65	Q			V
4+33	0.3215	0.63	Q			V
4+34	0.3223	0.62	Q			V
4+35	0.3232	0.61	Q			V
4+36	0.3240	0.59	Q			V
4+37	0.3248	0.58	Q			V
4+38	0.3256	0.57	Q			V
4+39	0.3263	0.56	Q			V
4+40	0.3271	0.55	Q			V
4+41	0.3278	0.54	Q			V
4+42	0.3286	0.53	Q			V
4+43	0.3293	0.52	Q			V
4+44	0.3300	0.51	Q			V
4+45	0.3307	0.51	Q			V
4+46	0.3314	0.50	Q			V
4+47	0.3320	0.49	Q			V
4+48	0.3327	0.48	Q			V
4+49	0.3334	0.48	Q			V
4+50	0.3340	0.47	Q			V
4+51	0.3347	0.46	Q			V
4+52	0.3353	0.46	Q			V
4+53	0.3359	0.45	Q			V
4+54	0.3365	0.44	Q			V
4+55	0.3371	0.44	Q			V
4+56	0.3377	0.43	Q			V
4+57	0.3383	0.43	Q			V
4+58	0.3389	0.42	Q			V
4+59	0.3395	0.42	Q			V
5+ 0	0.3400	0.41	Q			V
5+ 1	0.3406	0.41	Q			V
5+ 2	0.3411	0.40	Q			V
5+ 3	0.3417	0.40	Q			V
5+ 4	0.3422	0.40	Q			V
5+ 5	0.3428	0.39	Q			V
5+ 6	0.3433	0.39	Q			V
5+ 7	0.3438	0.38	Q			V
5+ 8	0.3444	0.38	Q			V
5+ 9	0.3449	0.37	Q			V
5+10	0.3454	0.37	Q			V
5+11	0.3459	0.37	Q			V
5+12	0.3464	0.36	Q			V
5+13	0.3469	0.36	Q			V
5+14	0.3474	0.36	Q			V
5+15	0.3479	0.35	Q			V
5+16	0.3484	0.35	Q			V
5+17	0.3488	0.35	Q			V
5+18	0.3493	0.34	Q			V
5+19	0.3498	0.34	Q			V
5+20	0.3502	0.34	Q			V
5+21	0.3507	0.34	Q			V
5+22	0.3512	0.33	Q			V
5+23	0.3516	0.33	Q			V
5+24	0.3521	0.33	Q			V
5+25	0.3525	0.33	Q			V

5+26	0.3530	0.32	|Q	|	|	|	V |
5+27	0.3534	0.32	|Q	|	|	|	V |
5+28	0.3538	0.32	|Q	|	|	|	V |
5+29	0.3543	0.32	|Q	|	|	|	V |
5+30	0.3547	0.31	|Q	|	|	|	V |
5+31	0.3551	0.31	|Q	|	|	|	V |
5+32	0.3556	0.31	|Q	|	|	|	V |
5+33	0.3560	0.31	|Q	|	|	|	V |
5+34	0.3564	0.30	|Q	|	|	|	V |
5+35	0.3568	0.30	|Q	|	|	|	V |
5+36	0.3572	0.30	|Q	|	|	|	V |
5+37	0.3576	0.30	|Q	|	|	|	V |
5+38	0.3580	0.30	|Q	|	|	|	V |
5+39	0.3585	0.29	|Q	|	|	|	V |
5+40	0.3589	0.29	|Q	|	|	|	V|
5+41	0.3593	0.29	|Q	|	|	|	V|
5+42	0.3596	0.29	|Q	|	|	|	V|
5+43	0.3600	0.29	|Q	|	|	|	V|
5+44	0.3604	0.28	|Q	|	|	|	V|
5+45	0.3608	0.28	|Q	|	|	|	V|
5+46	0.3612	0.28	|Q	|	|	|	V|
5+47	0.3616	0.28	|Q	|	|	|	V|
5+48	0.3620	0.28	|Q	|	|	|	V|
5+49	0.3624	0.28	|Q	|	|	|	V|
5+50	0.3627	0.27	|Q	|	|	|	V|
5+51	0.3631	0.27	|Q	|	|	|	V|
5+52	0.3635	0.27	|Q	|	|	|	V|
5+53	0.3638	0.27	|Q	|	|	|	V|
5+54	0.3642	0.27	|Q	|	|	|	V|
5+55	0.3646	0.27	|Q	|	|	|	V|
5+56	0.3649	0.26	|Q	|	|	|	V|
5+57	0.3653	0.26	Q	|	|	|	V|
5+58	0.3657	0.26	Q	|	|	|	V|
5+59	0.3660	0.26	Q	|	|	|	V|
6+ 0	0.3664	0.26	Q	|	|	|	V|
6+ 1	0.3667	0.26	Q	|	|	|	V|
6+ 2	0.3671	0.26	Q	|	|	|	V|
6+ 3	0.3674	0.25	Q	|	|	|	V|
6+ 4	0.3678	0.25	Q	|	|	|	V

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.000 to Point/Station       18.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   609.000(Ft.)
Downstream point/station elevation =   606.630(Ft.)
Pipe length  =   192.00(Ft.) Slope =   0.0123  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.548(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =    10.548(CFS)
Normal flow depth in pipe =    9.82(In.)
Flow top width inside pipe =   28.15(In.)
Critical Depth =   13.03(In.)
Pipe flow velocity =      7.55(Ft/s)
Travel time through pipe =    0.42 min.
Time of concentration (TC) =     7.47 min.


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Process from Point/Station       18.000 to Point/Station       18.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.484(Ac.)
Runoff from this stream =     10.548(CFS)
Time of concentration =    7.47 min.
Rainfall intensity =     6.713(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** 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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =   60.000(Ft.)
Highest elevation =  650.000(Ft.)
Lowest elevation =  623.230(Ft.)
Elevation difference =   26.770(Ft.) Slope = 44.617 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of  44.62 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   1.17 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*( 100.000^.5)/(  44.620^(1/3)]=   1.17
Calculated TC of    1.167 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      1.120(CFS)
Total initial stream area =        0.148(Ac.)
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Process from Point/Station       14.000 to Point/Station       18.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      7.443(CFS)
Depth of flow =   0.154(Ft.), Average velocity =   2.602(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             60.00              0.00
       3            120.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------------------
Sub-Channel flow  =      7.443(CFS)
  '     '       flow top width =     37.056(Ft.)
  '     '    velocity=    2.602(Ft/s)
  '     '       area =      2.861(Sq.Ft)
  '     '       Froude number =     1.650

Upstream point elevation =   623.230(Ft.)
Downstream point elevation =   614.860(Ft.)
Flow length =   531.000(Ft.)
Travel time  =    3.40 min.
Time of concentration =    4.57 min.
Depth of flow =   0.154(Ft.)
Average velocity =   2.602(Ft/s)
Total irregular channel flow =     7.443(CFS)
Irregular channel normal depth above invert elev. =   0.154(Ft.)
Average velocity of channel(s) =   2.602(Ft/s)
 Adding area flow to channel
Calculated TC of    4.569 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      1.583
Subarea runoff =     12.648(CFS) for      1.672(Ac.)
Total runoff =     13.767(CFS)        Total area =       1.820(Ac.)
Depth of flow =   0.194(Ft.), Average velocity =   3.034(Ft/s)


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Process from Point/Station       18.000 to Point/Station       18.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.820(Ac.)
Runoff from this stream =     13.767(CFS)
Time of concentration =    4.57 min.
Rainfall intensity =     8.695(In/Hr)
Summary of stream data:

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


1       10.548      7.47              6.713
2       13.767      4.57              8.695
Qmax(1) =
```

```
          1.000 *    1.000 *    10.548) +
          0.772 *    1.000 *    13.767) + =      21.178
Qmax(2) =
          1.000 *    0.612 *    10.548) +
          1.000 *    1.000 *    13.767) + =      20.222

Total of 2 streams to confluence:
Flow rates before confluence point:
      10.548      13.767
Maximum flow rates at confluence using above data:
       21.178       20.222
Area of streams before confluence:
        1.484        1.820
Results of confluence:
Total flow rate =     21.178(CFS)
Time of concentration =     7.466 min.
Effective stream area after confluence =      3.304(Ac.)

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Process from Point/Station       18.000 to Point/Station       19.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   606.630(Ft.)
Downstream point/station elevation =   604.520(Ft.)
Pipe length  =   155.00(Ft.) Slope =   0.0136  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.178(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =    21.178(CFS)
Normal flow depth in pipe =   13.97(In.)
Flow top width inside pipe =   29.93(In.)
Critical Depth =   18.77(In.)
Pipe flow velocity =      9.45(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     7.74 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       19.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.304(Ac.)
Runoff from this stream =     21.178(CFS)
Time of concentration =    7.74 min.
Rainfall intensity =     6.559(In/Hr)
Summary of stream data:

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


1       18.180      6.64               7.240
2       21.178      7.74               6.559
Qmax(1) =
          1.000 *    1.000 *    18.180) +
          1.000 *    0.858 *    21.178) + =      36.352
Qmax(2) =
          0.906 *    1.000 *    18.180) +
          1.000 *    1.000 *    21.178) + =      37.649

Total of 2 main streams to confluence:
Flow rates before confluence point:
      18.180      21.178
Maximum flow rates at confluence using above data:
       36.352       37.649
Area of streams before confluence:
        2.448        3.304


Results of confluence:
```

```
Total flow rate =     37.649(CFS)
Time of concentration =     7.739 min.
Effective stream area after confluence  =      5.752(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       29.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   604.520(Ft.)
Downstream point/station elevation =   602.680(Ft.)
Pipe length  =   149.00(Ft.) Slope =   0.0123  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    37.649(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =    37.649(CFS)
Normal flow depth in pipe =   20.79(In.)
Flow top width inside pipe =   27.68(In.)
Critical Depth =   24.91(In.)
Pipe flow velocity =     10.37(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =     7.98 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       29.000 to Point/Station       29.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      5.752(Ac.)
Runoff from this stream =     37.649(CFS)
Time of concentration =    7.98 min.
Rainfall intensity =     6.432(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
**** 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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =   95.000(Ft.)
Highest elevation =  614.930(Ft.)
Lowest elevation =  611.320(Ft.)
Elevation difference =    3.610(Ft.) Slope =  3.800 %
Top of Initial Area Slope adjusted by User to  5.470 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   5.47 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.23 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  90.000^.5)/(   5.470^(1/3)]=   2.23
Calculated TC of    2.229 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.628(CFS)
Total initial stream area =        0.083(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       28.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
```

```
Estimated mean flow rate at midpoint of channel =      2.095(CFS)
Depth of flow =   0.148(Ft.), Average velocity =   1.920(Ft/s)
       ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             25.00              0.00
       3             50.00              0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      2.095(CFS)
  '     '       flow top width =     14.774(Ft.)
  '     '    velocity=    1.920(Ft/s)
  '     '       area =      1.091(Sq.Ft)
  '     '       Froude number =     1.245

Upstream point elevation =   611.320(Ft.)
Downstream point elevation =   609.390(Ft.)
Flow length =   212.000(Ft.)
Travel time  =    1.84 min.
Time of concentration =    4.07 min.
Depth of flow =   0.148(Ft.)
Average velocity =   1.920(Ft/s)
Total irregular channel flow =     2.095(CFS)
Irregular channel normal depth above invert elev. =   0.148(Ft.)
Average velocity of channel(s) =   1.920(Ft/s)
 Adding area flow to channel
Calculated TC of    4.069 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.410
Subarea runoff =      2.935(CFS) for      0.388(Ac.)
Total runoff =      3.563(CFS)        Total area =       0.471(Ac.)
Depth of flow =   0.180(Ft.), Average velocity =   2.192(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       28.000
**** 6 HOUR HYDROGRAPH ****
________________________________________________________________________
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003


Time of Concentration =   4.07
Basin Area =     6.22 Acres
6 Hour Rainfall =  3.300 Inches
Runoff Coefficient =  0.066
Peak Discharge =     3.56 CFS
     Time (Min)     Discharge (CFS)
       0              0.000
       4              0.080
       8              0.081
       12              0.082
       16              0.083
       20              0.084
       24              0.085
       28              0.086
       32              0.087
```

36	0.088
40	0.089
44	0.091
48	0.091
52	0.093
56	0.094
60	0.096
64	0.097
68	0.098
72	0.099
76	0.101
80	0.102
84	0.105
88	0.106
92	0.108
96	0.110
100	0.112
104	0.114
108	0.116
112	0.118
116	0.121
120	0.123
124	0.126
128	0.128
132	0.132
136	0.134
140	0.139
144	0.141
148	0.146
152	0.149
156	0.155
160	0.158
164	0.165
168	0.168
172	0.176
176	0.181
180	0.191
184	0.196
188	0.208
192	0.215
196	0.231
200	0.240
204	0.260
208	0.273
212	0.302
216	0.321
220	0.368
224	0.399
228	0.487
232	0.555
236	0.815
240	1.148
244	3.563
248	0.653
252	0.437
256	0.342
260	0.287
264	0.249
268	0.222
272	0.202
276	0.186
280	0.172
284	0.161
288	0.152
292	0.144
296	0.136
300	0.130
304	0.124
308	0.119
312	0.115

316	0.111
320	0.107
324	0.104
328	0.100
332	0.097
336	0.095
340	0.092
344	0.090
348	0.088
352	0.085
356	0.084
360	0.082
364	0.080

++

6 - H O U R S T O R M

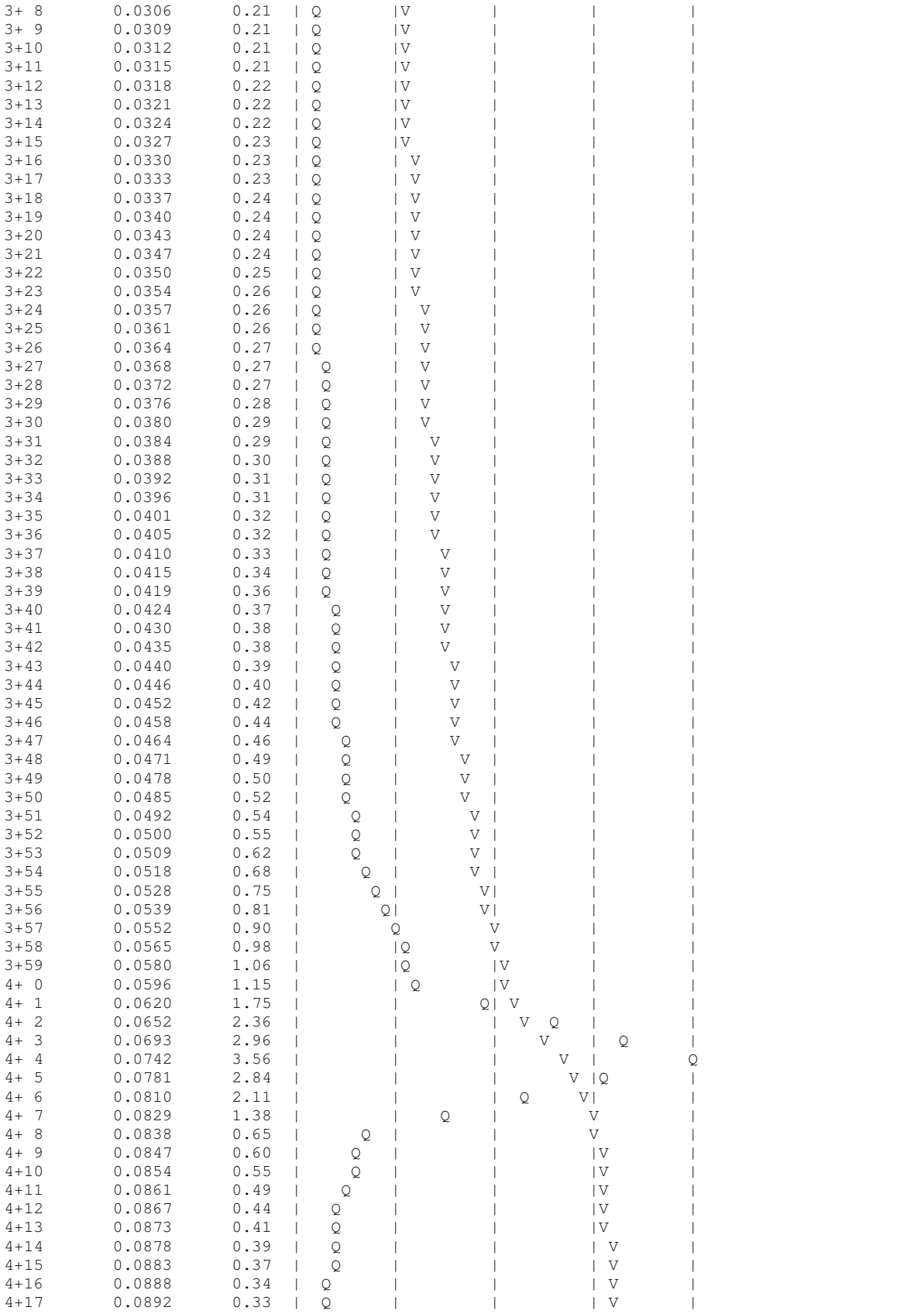
R u n o f f H y d r o g r a p h

Hydrograph in 1 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	0.9	1.8	2.7	3.6
0+ 0	0.0000	0.00	Q				
0+ 1	0.0000	0.02	Q				
0+ 2	0.0001	0.04	Q				
0+ 3	0.0002	0.06	Q				
0+ 4	0.0003	0.08	Q				
0+ 5	0.0004	0.08	Q				
0+ 6	0.0005	0.08	Q				
0+ 7	0.0006	0.08	Q				
0+ 8	0.0007	0.08	Q				
0+ 9	0.0008	0.08	Q				
0+10	0.0009	0.08	Q				
0+11	0.0011	0.08	Q				
0+12	0.0012	0.08	Q				
0+13	0.0013	0.08	Q				
0+14	0.0014	0.08	Q				
0+15	0.0015	0.08	Q				
0+16	0.0016	0.08	Q				
0+17	0.0017	0.08	Q				
0+18	0.0019	0.08	Q				
0+19	0.0020	0.08	Q				
0+20	0.0021	0.08	Q				
0+21	0.0022	0.08	Q				
0+22	0.0023	0.08	Q				
0+23	0.0024	0.08	Q				
0+24	0.0026	0.08	Q				
0+25	0.0027	0.09	Q				
0+26	0.0028	0.09	QV				
0+27	0.0029	0.09	QV				
0+28	0.0030	0.09	QV				
0+29	0.0031	0.09	QV				
0+30	0.0033	0.09	QV				
0+31	0.0034	0.09	QV				
0+32	0.0035	0.09	QV				
0+33	0.0036	0.09	QV				
0+34	0.0037	0.09	QV				
0+35	0.0039	0.09	QV				
0+36	0.0040	0.09	QV				
0+37	0.0041	0.09	QV				
0+38	0.0042	0.09	QV				
0+39	0.0044	0.09	QV				
0+40	0.0045	0.09	QV				
0+41	0.0046	0.09	|Q				
0+42	0.0047	0.09	|Q				
0+43	0.0048	0.09	|Q				
0+44	0.0050	0.09	|Q				
0+45	0.0051	0.09	|Q				
0+46	0.0052	0.09	|Q				
0+47	0.0053	0.09	|Q				

0+48	0.0055	0.09	|QV	|	|	|	|
0+49	0.0056	0.09	|QV	|	|	|	|
0+50	0.0057	0.09	|QV	|	|	|	|
0+51	0.0059	0.09	|QV	|	|	|	|
0+52	0.0060	0.09	|QV	|	|	|	|
0+53	0.0061	0.09	|QV	|	|	|	|
0+54	0.0062	0.09	|QV	|	|	|	|
0+55	0.0064	0.09	|QV	|	|	|	|
0+56	0.0065	0.09	|QV	|	|	|	|
0+57	0.0066	0.09	|QV	|	|	|	|
0+58	0.0068	0.09	|QV	|	|	|	|
0+59	0.0069	0.10	|QV	|	|	|	|
1+ 0	0.0070	0.10	|QV	|	|	|	|
1+ 1	0.0072	0.10	|QV	|	|	|	|
1+ 2	0.0073	0.10	|QV	|	|	|	|
1+ 3	0.0074	0.10	|QV	|	|	|	|
1+ 4	0.0076	0.10	|QV	|	|	|	|
1+ 5	0.0077	0.10	|QV	|	|	|	|
1+ 6	0.0078	0.10	|QV	|	|	|	|
1+ 7	0.0080	0.10	|QV	|	|	|	|
1+ 8	0.0081	0.10	|QV	|	|	|	|
1+ 9	0.0082	0.10	|Q V	|	|	|	|
1+10	0.0084	0.10	|Q V	|	|	|	|
1+11	0.0085	0.10	|Q V	|	|	|	|
1+12	0.0086	0.10	|Q V	|	|	|	|
1+13	0.0088	0.10	|Q V	|	|	|	|
1+14	0.0089	0.10	|Q V	|	|	|	|
1+15	0.0091	0.10	|Q V	|	|	|	|
1+16	0.0092	0.10	|Q V	|	|	|	|
1+17	0.0093	0.10	|Q V	|	|	|	|
1+18	0.0095	0.10	|Q V	|	|	|	|
1+19	0.0096	0.10	|Q V	|	|	|	|
1+20	0.0098	0.10	|Q V	|	|	|	|
1+21	0.0099	0.10	|Q V	|	|	|	|
1+22	0.0100	0.10	|Q V	|	|	|	|
1+23	0.0102	0.10	|Q V	|	|	|	|
1+24	0.0103	0.10	|Q V	|	|	|	|
1+25	0.0105	0.10	|Q V	|	|	|	|
1+26	0.0106	0.11	|Q V	|	|	|	|
1+27	0.0108	0.11	|Q V	|	|	|	|
1+28	0.0109	0.11	|Q V	|	|	|	|
1+29	0.0111	0.11	|Q V	|	|	|	|
1+30	0.0112	0.11	|Q V	|	|	|	|
1+31	0.0113	0.11	|Q V	|	|	|	|
1+32	0.0115	0.11	|Q V	|	|	|	|
1+33	0.0116	0.11	|Q V	|	|	|	|
1+34	0.0118	0.11	|Q V	|	|	|	|
1+35	0.0119	0.11	|Q V	|	|	|	|
1+36	0.0121	0.11	|Q V	|	|	|	|
1+37	0.0123	0.11	|Q V	|	|	|	|
1+38	0.0124	0.11	|Q V	|	|	|	|
1+39	0.0126	0.11	|Q V	|	|	|	|
1+40	0.0127	0.11	|Q V	|	|	|	|
1+41	0.0129	0.11	|Q V	|	|	|	|
1+42	0.0130	0.11	|Q V	|	|	|	|
1+43	0.0132	0.11	|Q V	|	|	|	|
1+44	0.0133	0.11	|Q V	|	|	|	|
1+45	0.0135	0.11	|Q V	|	|	|	|
1+46	0.0136	0.11	|Q V	|	|	|	|
1+47	0.0138	0.12	|Q V	|	|	|	|
1+48	0.0140	0.12	|Q V	|	|	|	|
1+49	0.0141	0.12	|Q V	|	|	|	|
1+50	0.0143	0.12	|Q V	|	|	|	|
1+51	0.0145	0.12	|Q V	|	|	|	|
1+52	0.0146	0.12	|Q V	|	|	|	|
1+53	0.0148	0.12	|Q V	|	|	|	|
1+54	0.0149	0.12	|Q V	|	|	|	|
1+55	0.0151	0.12	|Q V	|	|	|	|
1+56	0.0153	0.12	|Q V	|	|	|	|
1+57	0.0154	0.12	|Q V	|	|	|	|

1+58	0.0156	0.12	Q V			
1+59	0.0158	0.12	Q V			
2+ 0	0.0159	0.12	Q V			
2+ 1	0.0161	0.12	Q V			
2+ 2	0.0163	0.12	Q V			
2+ 3	0.0165	0.13	Q V			
2+ 4	0.0166	0.13	Q V			
2+ 5	0.0168	0.13	Q V			
2+ 6	0.0170	0.13	Q V			
2+ 7	0.0172	0.13	Q V			
2+ 8	0.0173	0.13	Q V			
2+ 9	0.0175	0.13	Q V			
2+10	0.0177	0.13	Q V			
2+11	0.0179	0.13	Q V			
2+12	0.0181	0.13	Q V			
2+13	0.0182	0.13	Q V			
2+14	0.0184	0.13	Q V			
2+15	0.0186	0.13	Q V			
2+16	0.0188	0.13	Q V			
2+17	0.0190	0.14	Q V			
2+18	0.0192	0.14	Q V			
2+19	0.0194	0.14	Q V			
2+20	0.0195	0.14	Q V			
2+21	0.0197	0.14	Q V			
2+22	0.0199	0.14	Q V			
2+23	0.0201	0.14	Q V			
2+24	0.0203	0.14	Q V			
2+25	0.0205	0.14	Q V			
2+26	0.0207	0.14	Q V			
2+27	0.0209	0.14	Q V			
2+28	0.0211	0.15	Q V			
2+29	0.0213	0.15	Q V			
2+30	0.0215	0.15	Q V			
2+31	0.0217	0.15	Q V			
2+32	0.0219	0.15	Q V			
2+33	0.0221	0.15	Q V			
2+34	0.0223	0.15	Q V			
2+35	0.0226	0.15	Q V			
2+36	0.0228	0.15	Q V			
2+37	0.0230	0.16	Q V			
2+38	0.0232	0.16	Q V			
2+39	0.0234	0.16	Q V			
2+40	0.0236	0.16	Q V			
2+41	0.0239	0.16	Q V			
2+42	0.0241	0.16	Q V			
2+43	0.0243	0.16	Q V			
2+44	0.0245	0.16	Q V			
2+45	0.0248	0.17	Q V			
2+46	0.0250	0.17	Q V			
2+47	0.0252	0.17	Q V			
2+48	0.0254	0.17	Q V			
2+49	0.0257	0.17	Q V			
2+50	0.0259	0.17	Q V			
2+51	0.0262	0.17	Q V			
2+52	0.0264	0.18	Q V			
2+53	0.0266	0.18	Q V			
2+54	0.0269	0.18	Q V			
2+55	0.0271	0.18	Q V			
2+56	0.0274	0.18	Q V			
2+57	0.0276	0.18	Q V			
2+58	0.0279	0.19	Q V			
2+59	0.0282	0.19	Q V			
3+ 0	0.0284	0.19	Q V			
3+ 1	0.0287	0.19	Q V			
3+ 2	0.0289	0.19	Q V			
3+ 3	0.0292	0.19	Q V			
3+ 4	0.0295	0.20	Q V			
3+ 5	0.0298	0.20	Q V			
3+ 6	0.0300	0.20	Q V			
3+ 7	0.0303	0.21	Q V			



3+ 8	0.0306	0.21	
3+ 9	0.0309	0.21	
3+10	0.0312	0.21	
3+11	0.0315	0.21	
3+12	0.0318	0.22	
3+13	0.0321	0.22	
3+14	0.0324	0.22	
3+15	0.0327	0.23	
3+16	0.0330	0.23	
3+17	0.0333	0.23	
3+18	0.0337	0.24	
3+19	0.0340	0.24	
3+20	0.0343	0.24	
3+21	0.0347	0.24	
3+22	0.0350	0.25	
3+23	0.0354	0.26	
3+24	0.0357	0.26	
3+25	0.0361	0.26	
3+26	0.0364	0.27	
3+27	0.0368	0.27	
3+28	0.0372	0.27	
3+29	0.0376	0.28	
3+30	0.0380	0.29	
3+31	0.0384	0.29	
3+32	0.0388	0.30	
3+33	0.0392	0.31	
3+34	0.0396	0.31	
3+35	0.0401	0.32	
3+36	0.0405	0.32	
3+37	0.0410	0.33	
3+38	0.0415	0.34	
3+39	0.0419	0.36	
3+40	0.0424	0.37	
3+41	0.0430	0.38	
3+42	0.0435	0.38	
3+43	0.0440	0.39	
3+44	0.0446	0.40	
3+45	0.0452	0.42	
3+46	0.0458	0.44	
3+47	0.0464	0.46	
3+48	0.0471	0.49	
3+49	0.0478	0.50	
3+50	0.0485	0.52	
3+51	0.0492	0.54	
3+52	0.0500	0.55	
3+53	0.0509	0.62	
3+54	0.0518	0.68	
3+55	0.0528	0.75	
3+56	0.0539	0.81	
3+57	0.0552	0.90	
3+58	0.0565	0.98	
3+59	0.0580	1.06	
4+ 0	0.0596	1.15	
4+ 1	0.0620	1.75	
4+ 2	0.0652	2.36	
4+ 3	0.0693	2.96	
4+ 4	0.0742	3.56	
4+ 5	0.0781	2.84	
4+ 6	0.0810	2.11	
4+ 7	0.0829	1.38	
4+ 8	0.0838	0.65	
4+ 9	0.0847	0.60	
4+10	0.0854	0.55	
4+11	0.0861	0.49	
4+12	0.0867	0.44	
4+13	0.0873	0.41	
4+14	0.0878	0.39	
4+15	0.0883	0.37	
4+16	0.0888	0.34	
4+17	0.0892	0.33	

```
4+18       0.0897      0.31  |  Q       |          |          | V        |
4+19       0.0901      0.30  |  Q       |          |          | V        |
4+20       0.0905      0.29  |  Q       |          |          |  V       |
4+21       0.0908      0.28  |  Q       |          |          |  V       |
4+22       0.0912      0.27  |  Q       |          |          |  V       |
4+23       0.0916      0.26  | Q        |          |          |  V       |
4+24       0.0919      0.25  | Q        |          |          |  V       |
4+25       0.0923      0.24  | Q        |          |          |  V       |
4+26       0.0926      0.24  | Q        |          |          |  V       |
4+27       0.0929      0.23  | Q        |          |          |   V      |
4+28       0.0932      0.22  | Q        |          |          |   V      |
4+29       0.0935      0.22  | Q        |          |          |   V      |
4+30       0.0938      0.21  | Q        |          |          |   V      |
4+31       0.0941      0.21  | Q        |          |          |   V      |
4+32       0.0944      0.20  | Q        |          |          |   V      |
4+33       0.0946      0.20  | Q        |          |          |   V      |
4+34       0.0949      0.19  | Q        |          |          |   V      |
4+35       0.0952      0.19  | Q        |          |          |   V      |
4+36       0.0954      0.19  | Q        |          |          |   V      |
4+37       0.0957      0.18  | Q        |          |          |    V     |
4+38       0.0959      0.18  | Q        |          |          |    V     |
4+39       0.0961      0.18  |Q         |          |          |    V     |
4+40       0.0964      0.17  |Q         |          |          |    V     |
4+41       0.0966      0.17  |Q         |          |          |    V     |
4+42       0.0968      0.17  |Q         |          |          |    V     |
4+43       0.0971      0.16  |Q         |          |          |    V     |
4+44       0.0973      0.16  |Q         |          |          |    V     |
4+45       0.0975      0.16  |Q         |          |          |    V     |
4+46       0.0977      0.16  |Q         |          |          |    V     |
4+47       0.0979      0.15  |Q         |          |          |    V     |
4+48       0.0982      0.15  |Q         |          |          |    V     |
4+49       0.0984      0.15  |Q         |          |          |     V    |
4+50       0.0986      0.15  |Q         |          |          |     V    |
4+51       0.0988      0.15  |Q         |          |          |     V    |
4+52       0.0990      0.14  |Q         |          |          |     V    |
4+53       0.0992      0.14  |Q         |          |          |     V    |
4+54       0.0993      0.14  |Q         |          |          |     V    |
4+55       0.0995      0.14  |Q         |          |          |     V    |
4+56       0.0997      0.14  |Q         |          |          |     V    |
4+57       0.0999      0.13  |Q         |          |          |     V    |
4+58       0.1001      0.13  |Q         |          |          |     V    |
4+59       0.1003      0.13  |Q         |          |          |     V    |
5+ 0       0.1005      0.13  |Q         |          |          |     V    |
5+ 1       0.1006      0.13  |Q         |          |          |     V    |
5+ 2       0.1008      0.13  |Q         |          |          |     V    |
5+ 3       0.1010      0.13  |Q         |          |          |     V    |
5+ 4       0.1012      0.12  |Q         |          |          |      V   |
5+ 5       0.1013      0.12  |Q         |          |          |      V   |
5+ 6       0.1015      0.12  |Q         |          |          |      V   |
5+ 7       0.1017      0.12  |Q         |          |          |      V   |
5+ 8       0.1018      0.12  |Q         |          |          |      V   |
5+ 9       0.1020      0.12  |Q         |          |          |      V   |
5+10       0.1021      0.12  |Q         |          |          |      V   |
5+11       0.1023      0.12  |Q         |          |          |      V   |
5+12       0.1025      0.11  |Q         |          |          |      V   |
5+13       0.1026      0.11  |Q         |          |          |      V   |
5+14       0.1028      0.11  |Q         |          |          |      V   |
5+15       0.1029      0.11  |Q         |          |          |      V   |
5+16       0.1031      0.11  |Q         |          |          |      V   |
5+17       0.1032      0.11  |Q         |          |          |      V   |
5+18       0.1034      0.11  |Q         |          |          |      V   |
5+19       0.1035      0.11  |Q         |          |          |      V   |
5+20       0.1037      0.11  |Q         |          |          |      V   |
5+21       0.1038      0.11  |Q         |          |          |       V  |
5+22       0.1040      0.11  |Q         |          |          |       V  |
5+23       0.1041      0.10  |Q         |          |          |       V  |
5+24       0.1043      0.10  |Q         |          |          |       V  |
5+25       0.1044      0.10  |Q         |          |          |       V  |
5+26       0.1045      0.10  |Q         |          |          |       V  |
5+27       0.1047      0.10  |Q         |          |          |       V  |
```

```
    5+28       0.1048      0.10  |Q        |         |         |       V |
    5+29       0.1050      0.10  |Q        |         |         |       V |
    5+30       0.1051      0.10  |Q        |         |         |       V |
    5+31       0.1052      0.10  |Q        |         |         |       V |
    5+32       0.1054      0.10  |Q        |         |         |       V |
    5+33       0.1055      0.10  |Q        |         |         |       V |
    5+34       0.1056      0.10  |Q        |         |         |       V |
    5+35       0.1058      0.10  |Q        |         |         |       V |
    5+36       0.1059      0.09  |Q        |         |         |       V |
    5+37       0.1060      0.09  |Q        |         |         |       V |
    5+38       0.1061      0.09  |Q        |         |         |       V |
    5+39       0.1063      0.09  |Q        |         |         |       V |
    5+40       0.1064      0.09  |Q        |         |         |       V |
    5+41       0.1065      0.09  |Q        |         |         |        V|
    5+42       0.1067      0.09  |Q        |         |         |        V|
    5+43       0.1068      0.09  |Q        |         |         |        V|
    5+44       0.1069      0.09  |Q        |         |         |        V|
    5+45       0.1070      0.09  |Q        |         |         |        V|
    5+46       0.1071      0.09  Q         |         |         |        V|
    5+47       0.1073      0.09  Q         |         |         |        V|
    5+48       0.1074      0.09  Q         |         |         |        V|
    5+49       0.1075      0.09  Q         |         |         |        V|
    5+50       0.1076      0.09  Q         |         |         |        V|
    5+51       0.1077      0.09  Q         |         |         |        V|
    5+52       0.1079      0.09  Q         |         |         |        V|
    5+53       0.1080      0.08  Q         |         |         |        V|
    5+54       0.1081      0.08  Q         |         |         |        V|
    5+55       0.1082      0.08  Q         |         |         |        V|
    5+56       0.1083      0.08  Q         |         |         |        V|
    5+57       0.1084      0.08  Q         |         |         |        V|
    5+58       0.1086      0.08  Q         |         |         |        V|
    5+59       0.1087      0.08  Q         |         |         |        V|
    6+ 0       0.1088      0.08  Q         |         |         |        V|
    6+ 1       0.1089      0.08  Q         |         |         |        V|
    6+ 2       0.1090      0.08  Q         |         |         |        V|
    6+ 3       0.1091      0.08  Q         |         |         |        V|
    6+ 4       0.1092      0.08  Q         |         |         |         V
---------------------------------------------------------------------------
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       28.100
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
____________________________________________________________________________
Depth of flow =   0.173(Ft.), Average velocity =   2.976(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.25
       2             10.00              0.00
       3             20.00              0.25
Manning's 'N' friction factor =   0.013
----------------------------------------------------------------
Sub-Channel flow  =      3.563(CFS)
  '     '       flow top width =     13.840(Ft.)
  '     '    velocity=    2.976(Ft/s)
  '     '       area =      1.197(Sq.Ft)
  '     '       Froude number =     1.783

Upstream point elevation =   609.390(Ft.)
Downstream point elevation =   609.000(Ft.)
Flow length =    22.000(Ft.)
Travel time  =    0.12 min.
Time of concentration =    4.19 min.
Depth of flow =   0.173(Ft.)
```

```
Average velocity =   2.976(Ft/s)
Total irregular channel flow =     3.563(CFS)
Irregular channel normal depth above invert elev. =   0.173(Ft.)
Average velocity of channel(s) =   2.976(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.100 to Point/Station       28.100
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.471(Ac.)
Runoff from this stream =      3.563(CFS)
Time of concentration =    4.19 min.
Rainfall intensity =     8.695(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** 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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =   60.000(Ft.)
Highest elevation =  608.950(Ft.)
Lowest elevation =  608.350(Ft.)
Elevation difference =    0.600(Ft.) Slope =  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.21 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  60.000^.5)/(   1.000^(1/3)]=   3.21
Calculated TC of    3.207 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.310(CFS)
Total initial stream area =        0.041(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.373(CFS)
Depth of flow =   0.052(Ft.), Average velocity =   1.003(Ft/s)
       ******* Irregular Channel Data **********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.10
       2             50.00              0.00
       3            100.00              0.10
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      1.373(CFS)
  '     '       flow top width =     52.332(Ft.)
  '     '    velocity=    1.003(Ft/s)
  '     '       area =      1.369(Sq.Ft)
  '     '       Froude number =     1.092

Upstream point elevation =   608.350(Ft.)
Downstream point elevation =   607.300(Ft.)
Flow length =   106.000(Ft.)
```

```
Travel time  =    1.76 min.
Time of concentration =    4.97 min.
Depth of flow =   0.052(Ft.)
Average velocity =   1.003(Ft/s)
Total irregular channel flow =     1.373(CFS)
Irregular channel normal depth above invert elev. =   0.052(Ft.)
Average velocity of channel(s) =   1.003(Ft/s)
 Adding area flow to channel
Calculated TC of    4.969 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.280
Subarea runoff =      2.126(CFS) for      0.281(Ac.)
Total runoff =      2.436(CFS)        Total area =       0.322(Ac.)
Depth of flow =   0.065(Ft.), Average velocity =   1.157(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   607.300(Ft.)
Downstream point/station elevation =   606.490(Ft.)
Pipe length  =    81.00(Ft.) Slope =   0.0100  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.436(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     2.436(CFS)
Normal flow depth in pipe =    7.28(In.)
Flow top width inside pipe =   11.72(In.)
Critical Depth =    8.02(In.)
Pipe flow velocity =      4.88(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     5.25 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       28.100
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   606.490(Ft.)
Downstream point/station elevation =   606.000(Ft.)
Pipe length  =   101.00(Ft.) Slope =   0.0049  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.436(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     2.436(CFS)
Normal flow depth in pipe =    9.63(In.)
Flow top width inside pipe =    9.55(In.)
Critical Depth =    8.02(In.)
Pipe flow velocity =      3.60(Ft/s)
Travel time through pipe =    0.47 min.
Time of concentration (TC) =     5.71 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.100 to Point/Station       28.100
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.322(Ac.)
Runoff from this stream =      2.436(CFS)
Time of concentration =    5.71 min.
Rainfall intensity =     7.979(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       27.000
**** 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                        ]
(General Industrial       )
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Initial subarea total flow distance  =   75.000(Ft.)
Highest elevation =  626.980(Ft.)
Lowest elevation =  624.830(Ft.)
Elevation difference =    2.150(Ft.) Slope =  2.867 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   2.87 %, in a development type of
 General Industrial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.61 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8700)*(  80.000^.5)/(   2.870^(1/3)]=   2.61
Calculated TC of    2.606 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      8.695(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff =      0.605(CFS)
Total initial stream area =        0.080(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       27.000 to Point/Station       28.100
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      3.001(CFS)
Depth of flow =   0.167(Ft.), Average velocity =   3.576(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             15.00              0.00
       3             30.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      3.001(CFS)
  '     '       flow top width =     10.035(Ft.)
  '     '    velocity=    3.576(Ft/s)
  '     '       area =      0.839(Sq.Ft)
  '     '       Froude number =     2.179

Upstream point elevation =   624.830(Ft.)
Downstream point elevation =   609.000(Ft.)
Flow length =   591.000(Ft.)
Travel time  =    2.75 min.
Time of concentration =    5.36 min.
Depth of flow =   0.167(Ft.)
Average velocity =   3.576(Ft/s)
Total irregular channel flow =     3.001(CFS)
Irregular channel normal depth above invert elev. =   0.167(Ft.)
Average velocity of channel(s) =   3.576(Ft/s)
 Adding area flow to channel
Rainfall intensity (I) =      8.313(In/Hr) for a   100.0 year storm
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                        ]
(General Industrial       )
```

```
Impervious value, Ai = 0.950
Sub-Area C Value = 0.870
Rainfall intensity =      8.313(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.870  CA =      0.641
Subarea runoff =      4.725(CFS) for      0.657(Ac.)
Total runoff =      5.330(CFS)        Total area =       0.737(Ac.)
Depth of flow =   0.207(Ft.), Average velocity =   4.128(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.100 to Point/Station       28.100
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      0.737(Ac.)
Runoff from this stream =      5.330(CFS)
Time of concentration =    5.36 min.
Rainfall intensity =     8.313(In/Hr)
Summary of stream data:

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


1        3.563      4.19               8.695
2        2.436      5.71               7.979
3        5.330      5.36               8.313
Qmax(1) =
           1.000 *    1.000 *     3.563) +
           1.000 *    0.734 *     2.436) +
           1.000 *    0.782 *     5.330) + =       9.520
Qmax(2) =
           0.918 *    1.000 *     3.563) +
           1.000 *    1.000 *     2.436) +
           0.960 *    1.000 *     5.330) + =      10.821
Qmax(3) =
           0.956 *    1.000 *     3.563) +
           1.000 *    0.938 *     2.436) +
           1.000 *    1.000 *     5.330) + =      11.022

Total of 3 streams to confluence:
Flow rates before confluence point:
       3.563       2.436       5.330
Maximum flow rates at confluence using above data:
        9.520       10.821       11.022
Area of streams before confluence:
        0.471        0.322        0.737
Results of confluence:
Total flow rate =     11.022(CFS)
Time of concentration =     5.360 min.
Effective stream area after confluence =      1.530(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.100 to Point/Station       29.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   606.880(Ft.)
Downstream point/station elevation =   604.350(Ft.)
Pipe length  =    21.00(Ft.) Slope =   0.1205  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.022(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    11.022(CFS)
Normal flow depth in pipe =    6.79(In.)
Flow top width inside pipe =   17.45(In.)
Critical Depth =   15.26(In.)
Pipe flow velocity =     18.07(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     5.38 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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```
Process from Point/Station       29.000 to Point/Station       29.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.530(Ac.)
Runoff from this stream =     11.022(CFS)
Time of concentration =    5.38 min.
Rainfall intensity =     8.294(In/Hr)
Summary of stream data:

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


1       37.649      7.98               6.432
2       11.022      5.38               8.294
Qmax(1) =
           1.000 *    1.000 *    37.649) +
           0.775 *    1.000 *    11.022) + =      46.196
Qmax(2) =
           1.000 *    0.674 *    37.649) +
           1.000 *    1.000 *    11.022) + =      36.405

Total of 2 main streams to confluence:
Flow rates before confluence point:
      37.649      11.022
Maximum flow rates at confluence using above data:
       46.196       36.405
Area of streams before confluence:
        5.752        1.530


Results of confluence:
Total flow rate =     46.196(CFS)
Time of concentration =     7.979 min.
Effective stream area after confluence  =      7.282(Ac.)
End of computations, total study area =           7.282 (Ac.)
```

ATTACHMENT 5

Inlet Report

NODE 28.1 EXISTING INLET

Drop Grate Inlet

Location	= Sag
Curb Length (ft)	= -0-
Throat Height (in)	= -0-
Grate Area (sqft)	= 4.24
Grate Width (ft)	= 1.73
Grate Length (ft)	= 2.45

Gutter

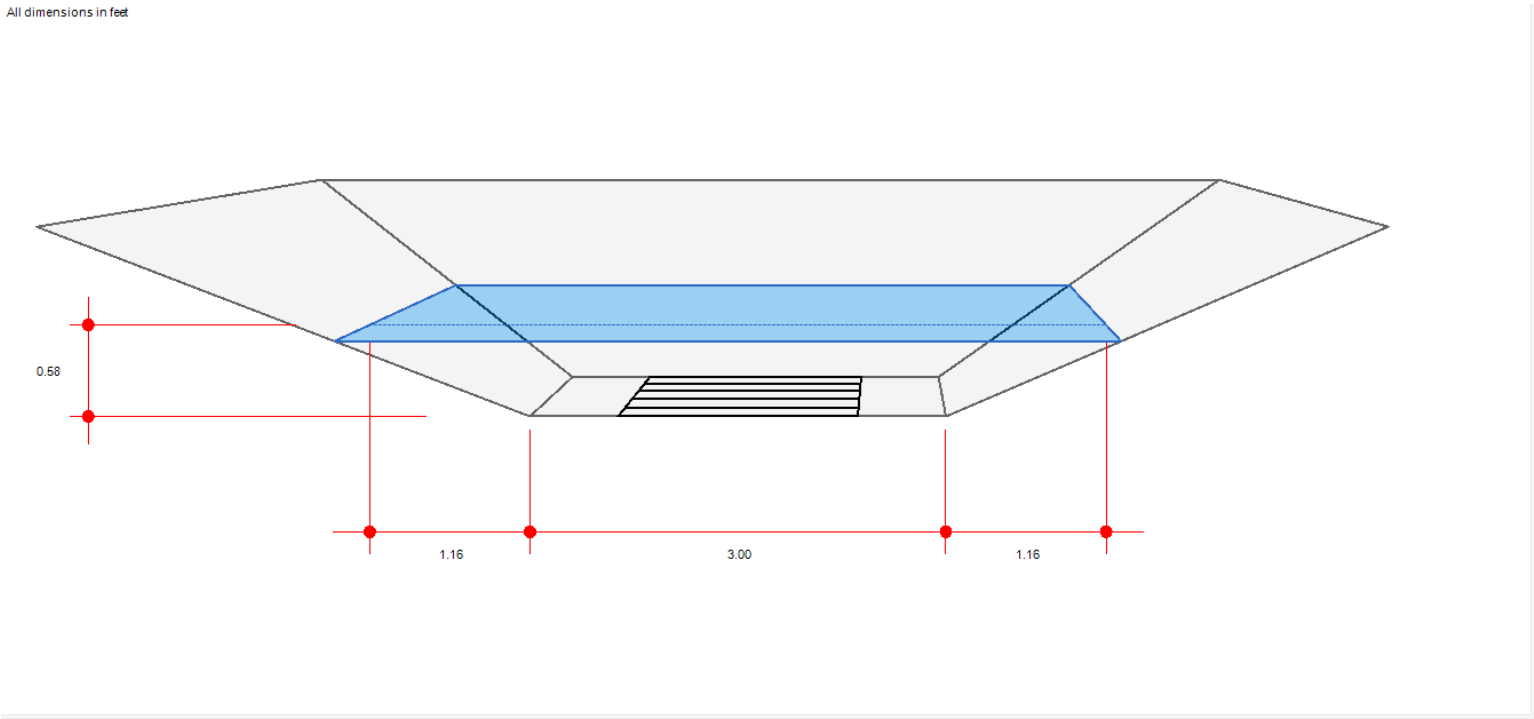
Slope, Sw (ft/ft)	= 0.500
Slope, Sx (ft/ft)	= 0.500
Local Depr (in)	= -0-
Gutter Width (ft)	= 3.00
Gutter Slope (%)	= -0-
Gutter n-value	= -0-

Calculations

Compute by:	Known Q
Q (cfs)	= 11.02

Highlighted

Q Total (cfs)	= 11.02
Q Capt (cfs)	= 11.02
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 6.93
Efficiency (%)	= 100
Gutter Spread (ft)	= 5.31
Gutter Vel (ft/s)	= -0-
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-



Inlet Report

Node 3 - Grated Inlet

Drop Grate Inlet

Location	= Sag
Curb Length (ft)	= -0-
Throat Height (in)	= -0-
Grate Area (sqft)	= 1.00
Grate Width (ft)	= 1.73
Grate Length (ft)	= 1.73

Gutter

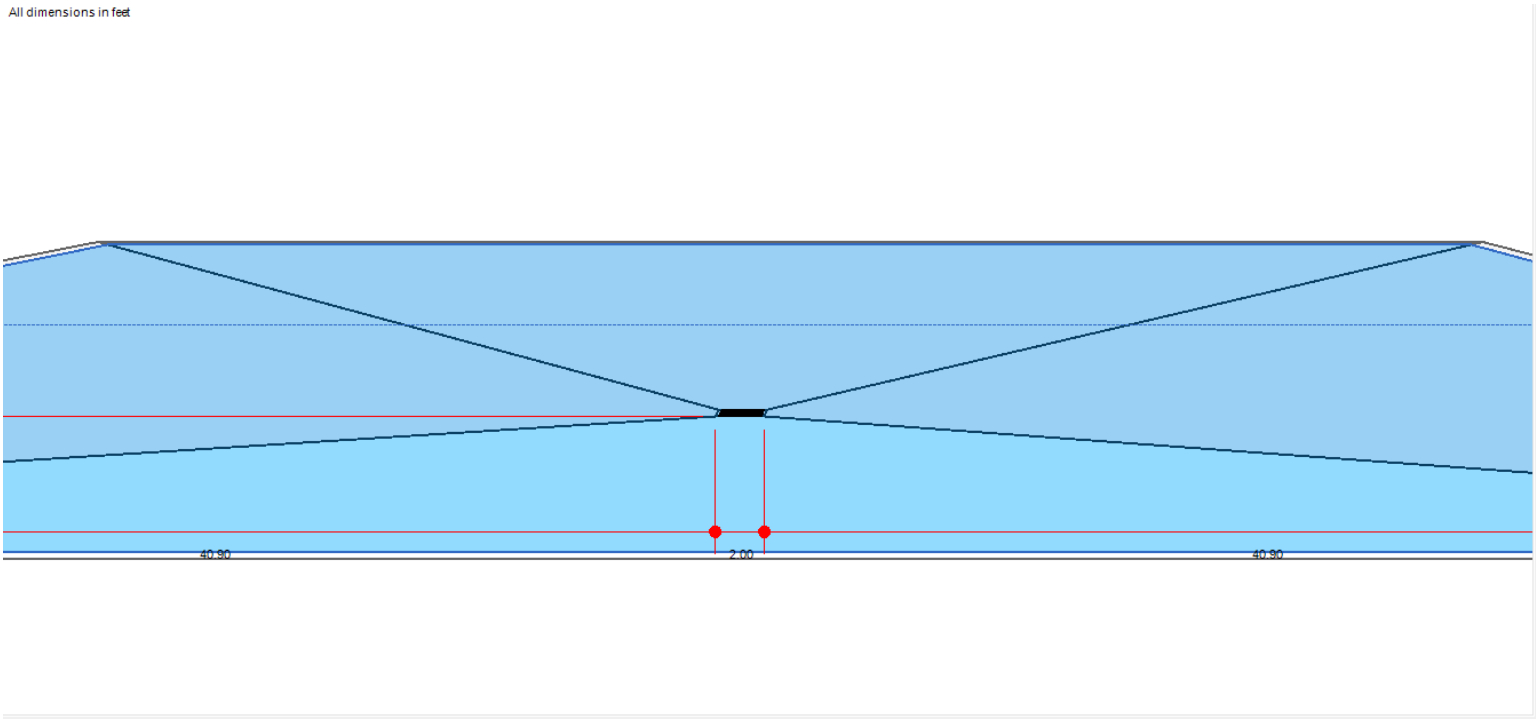
Slope, Sw (ft/ft)	= 0.020
Slope, Sx (ft/ft)	= 0.020
Local Depr (in)	= -0-
Gutter Width (ft)	= 2.00
Gutter Slope (%)	= -0-
Gutter n-value	= -0-

Calculations

Compute by:	Known Q
Q (cfs)	= 4.86

Highlighted

Q Total (cfs)	= 4.86
Q Capt (cfs)	= 4.86
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 9.82
Efficiency (%)	= 100
Gutter Spread (ft)	= 83.80
Gutter Vel (ft/s)	= -0-
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-



Inlet Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Feb 19 2020

Node 28 - Proposed Inlet

Drop Grate Inlet

Location	= Sag
Curb Length (ft)	= -0-
Throat Height (in)	= -0-
Grate Area (sqft)	= 1.00
Grate Width (ft)	= 1.41
Grate Length (ft)	= 1.41

Gutter

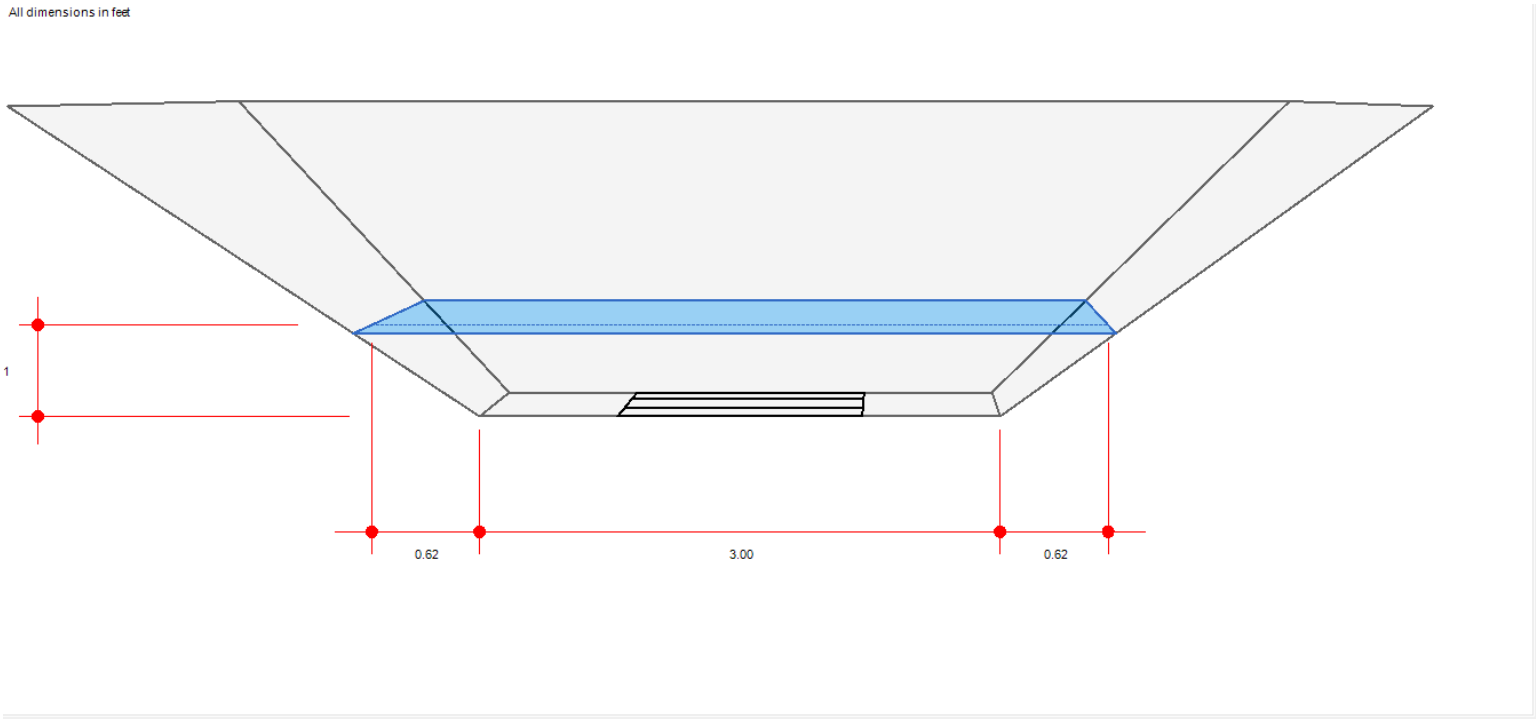
Slope, Sw (ft/ft)	= 0.500
Slope, Sx (ft/ft)	= 0.500
Local Depr (in)	= -0-
Gutter Width (ft)	= 3.00
Gutter Slope (%)	= -0-
Gutter n-value	= -0-

Calculations

Compute by:	Known Q
Q (cfs)	= 2.94

Highlighted

Q Total (cfs)	= 2.94
Q Capt (cfs)	= 2.94
Q Bypass (cfs)	= -0-
Depth at Inlet (in)	= 3.73
Efficiency (%)	= 100
Gutter Spread (ft)	= 4.24
Gutter Vel (ft/s)	= -0-
Bypass Spread (ft)	= -0-
Bypass Depth (in)	= -0-



EXITING STORM DRAIN HYDROGRAPHS

PROPOSED FINISHED SURFACE OVER STORM DRAIN

EXISTING GROUND LINE OVER STORM DRAIN

PROPOSED FINISHED SURFACE OVER STORM DRAIN

VERIFY HORIZONTAL & VERTICAL LOCATION OF SEWER PRIOR TO CONSTRUCTION.

EX. 48" S.D. SEE DRAWING #2893

4+80.41 ST. CL. 0+00.00 LINE F-2 TYPE B-1 C.I. L = 8' TOP = 612.27

9+11.35 ST. CL. = 0+00.00 LINE F-1 TOP = 619.43

0+11.23 LINE F-1 TOP = 619.63 FL OPENING = 618.51

610 590 600

4.00 LF ~ 48" RCP 2000-D @ 1.50% Qmax = 47.3 CFS Vmax = 3.8 FPS Qcap = 125 CFS

299.55 LF ~ 30" RCP 2000-D @ 0.82% INSTALL WATER TIGHT JOINTS Qmax = 44.8 CFS Vmax = 9.7 FPS Qcap = 49 CFS

193.02 LF ~ 30" RCP 2000-D @ 0.93% INSTALL WATER TIGHT JOINTS Qmax = 24.5 CFS Vmax = 5.0 FPS Qcap = 39 CFS

243.21 LF ~ 24" RCP 2000-D @ 1.00% INSTALL WATER TIGHT JOINTS Qmax = 19.3 CFS Vmax = 6.1 FPS Qcap = 18.8 CFS

QCAP = 18.8 CFS
POST HYDROGRAPH Q100= 7.7226 CFS
POST Q100 > Q CAP

8.00 LF 18" RCP @ 18.75% Qmax = 1.7 CFS Vmax = 8.6 FPS Qcap = 37.1 CFS

PRIVATE STORM DRAIN LINE 'F-1'

STORM DRAIN LINE 'F'

VERIFY I.E. OF 48" RCP PRIOR TO INSTALLING PROP. 18" RCP

EXIST. TELCO CONDUIT

110.59 LF ~ 18" RCP 2000-D @ 0.50% Qmax = 6.2 CFS Vmax = 4.7 FPS

5.25 LF ~ 18" RCP 2000-D @ 1.14%

STORM DRAIN LINE 'F-4'

JOIN EX. 15" CMP

18.44 LF 24" RCP ~2000-D @ 7.16% Qmax = 6.2 CFS Vmax = 8.7 FPS Qcap = 14.9 CFS

QCAP = 14.9 CFS
POST HYDROGRAPH Q100= 8.177 CFS
POST Q100 > Q CAP

PRIVATE STORM DRAIN LINE 'F-3'

18.00 LF 12" CSP SLOTTED DRAIN @ 1.00%

10.00 LF 12" CSP SLOTTED DRAIN @ 1.50%

NOTE: CONTRACTOR TO FIELD VERIFY PRIOR TO INSTALLING ANY STORM DRAIN PIPE OR BOXES

14.00 LF ~ 18" RCP USE WATER TIGHT JOINTS @ 4.00% Qmax = 19.6 CFS Vmax = 11.1 FPS Qcap = 24 CFS

PRIVATE STORM DRAIN LINE 'F-2'

PROFILE SCALE: HORIZ: 1"=40' VERT: 1"=8'

SCALE: 1"=40'

0 20 40 80

STORM DRAIN DATA				
NO.	BEARING/DELTA	RADIUS	LENGTH	REMARKS
(1)	N01°03'57"E	----	4.00'	48" RCP ~ 2000-D
(2)	D=18°43'34"	350.00'	114.39'	30" RCP ~ 2000-D *
	N00°55'33"E	----	74.82'	*
(4)	D=18°03'48"	350.00'	110.34'	*
(5)	D=31°35'54"	350.00'	193.02'	30" RCP ~ 2000-D *
(6)	D=18°03'48"	350.00'	110.34'	24" RCP ~ 2000-D *
(7)	N00°55'33"E	----	88.09'	*
(8)	D=57°00'48"	45.00'	44.78'	24" RCP ~ 2000-D *
(9)	N50°23'20"W	----	8.00'	18" RCP *
(10)	N76°15'25"E	----	14.00'	18" RCP *
(11)	N45°39'27"E	----	18.44'	24" RCP ~ 2000-D
(12)	N00°55'33"E	----	110.57'	18" RCP ~ 2000-D
(13)	N89°04'27"W	----	5.25'	18" RCP ~ 2000-D
(14)	N00°55'33"E	----	18.00'	12" CMP SLOTTED DRAIN
(15)	N00°55'33"E	----	10.00'	12" CMP SLOTTED DRAIN

* INSTALL WATER TIGHT JOINTS

CURB DATA				
NO.	BEARING/DELTA	RADIUS	LENGTH	REMARKS
1	D=77°25'07"	4.00'	5.40'	0" TO 4" CURB
2	D=88°02'41"	4.00'	6.15'	0" TO 4" CURB
3	N00°33'59"E	----	8.98'	4" CURB

NOTE
CONTRACTOR TO VERIFY LOCATION OF EXISTING FACILITIES BEFORE BEGINNING WORK AND PROTECT DURING CONSTRUCTION.

MISSION ROAD

1+56.23 15' TYPE 'B-1' C.I. W/FOSSIL FILTER

1+56.23 15' TYPE A4CO PER D-9

EXIST. 48" RCP PER DWG 2893

EXIST. 3" TRAFFIC SIGNAL CONDUIT

EXIST. TELCO

APPROXIMATE LOCATION OF EXIST. UNDERGROUND ELECTRIC

EXISTING 48" STORM DRAIN PER DRAWING #2893

MULBERRY DRIVE

EXISTING 8" V.C.P.

EXISTING 2" H.P. GAS

EXISTING 6" A.C.P.

220-210-31 220-210-32 220-210-33 220-210-34

218-180-33 218-180-44

EXIST. TYPE B INLET

1+74.71 (ST CL STA) LINE F-1 CONNECT TO EX. 48" RCP W/ CONC. COLLAR PER D-62

1+80.71 (ST CL STA) LINE F-3

0+00.00 LINE F-3 TYPE A-5 CO PER RSD D-9

0+24.41 LINE F-3 TYPE G C.B. (TRIPLE) PER RSD D-9 W/ FOSSIL FILTER

REMOVE EXIST. 15" CMP

CONNECT EX. 15" CMP TO 6" INLET

EXIST. SEWER LATERAL AND MONITOR MANHOLE ADJUST TO GRADE

2+95.07 EC SD ST CL STA

3+68.89 BC SD ST CL STA

DIP 4" ELECTRIC CONDUIT UNDER STORM DRAIN

4+80.41 ST CL STA 0+00.00 LINE F-2 TYPE B-1 C.I. PER RSD D-7 W/ FOSSIL FILTER

0+17.23 TYPE G C.B. PER RSD D-7 SEE DETAIL 'A' W/ FOSSIL FILTER L = 0'

SEE DETAIL "B12" ON SHEET 2 FOR RELOCATION OF F.H. AND WATER LATERAL

6+75.00 ST CL STA TYPE B-1 C.I. PER RSD D-2 W/ FOSSIL FILTER L = 15'

7+85.52 EC SD ST CL STA

8+23.62 BC SD ST CL STA

9+11.35 ST CL = 0+00.00 LINE F-1 TYPE A-4 CO PER RSD D-9

0+11.23 LINE F-1 W/FOSSIL FILTER PER RSD D-7

TYPE A-3 CO PER RSD D-9

SECTION A-A
15' TYPE B-1 C.I. @ STA. 1+56.23

NOTE: VERIFY ELEV. OF 48" PIPE PRIOR TO INSTALLATION OF 18" PIPE.

609.38 T.C.

17" 10"

EXIST. 5" TELCO DUCT TOP ELEV VARIES 605.03 TO 605.38

BOT. ELEV VARIES 604.55 TO 604.76

TOP 5" SIGNAL CONDUIT 606.47

602.12 FL 602.06 FL 601.86 FL

4+80.41 ST CL STA 0+00.00 LINE F-2

SIDEWALK R/W SAW CUT & REMOVE EXIST. AC PAVEMENT

RELOCATE EXIST. FENCE TO 5' B/O R/W

CONSTRUCT AC DIKE ON EXIST. AC PAVEMENT

EXISTING CONCRETE GUTTER

0+17.23 TYPE G C.B.

DETAIL 'A'
NO SCALE

STORM DRAIN LINE 'F'

JOB NO. 160078.01.000 DATE OF PREPARATION: 3-02

The Keith Companies TKC engineers and consultants
277 Rancheros Drive
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San Marcos, CA 92069
P: (760) 891-3200
F: (760) 891-3201
www.keithco.com

INSPECTED AND RECOMMENDED FOR ACCEPTANCE

PUBLIC WORKS INSPECTOR DATE

AS-BUILT CERTIFICATE

DANIEL A. LEE DATE 4-19-07

DANIEL A. LEE P.E. No. 38396

3/31/09 EXPIRES STANTEC CONSULTING

AS-BUILT

VWD AS-BUILT

DANIEL A. LEE R.C.E. 38396 EXP. 3/31/09 DATE 4-19-07

VWD Drawing No.

SAN MARCOS FIRE DEPARTMENT

By: ____ Date: ____

VALLECITOS WATER DISTRICT

By: PRESTON H. LEWIS, P.E. R.C.E. 45927 EXP. 12/06 Date:

ENGINEER OF WORK

By: ____ Date: ____
Name: GEORGE L. BENTON
R.C.E. 14594 Exp.: 3-31-05

CITY APPROVED CHANGES

No.	Description	App'd By	Date
3	CHANGE A-1 C.I. TO B-1 C.I. AT STA 1+64.00, REALIGN 18" PIPE		
2	RELOCATED B-1 INLET AND A-4 CO FROM STA 1+56.23		
1	DUE TO CONFLICT WITH SEWER LAT. RELOC. F.H. & CONDUIT		
A	AS-BUILT		

RECOMMENDED FOR APPROVAL

By: SASSAN HAGHGOO, PRINCIPAL ENGINEER Date
R.C.E. 42201 Exp.: 03-31-06

APPROVED FOR CONSTRUCTION

By: EUGENIA AGUILAR FRANCO, CITY ENGINEER Date
R.C.E. 38149 Exp.: 03-31-05

BENCH MARK

Description SURVEY CONTROL STATION 1053
Location AT THE INTERSECTION OF BORDEN ROAD AND MULBERRY DRIVE
Record From RECORD OF SURVEY MAP NO. 13928
Elev. 635.631 Datum: M.S.L.

CITY OF SAN MARCOS ENGINEERING DIVISION

IMPROVEMENT PLANS FOR: MISSION HILLS CHURCH CUP 01-482
STORM DRAIN LINE F, F-1 & F-2

Drawing No. IP-4557

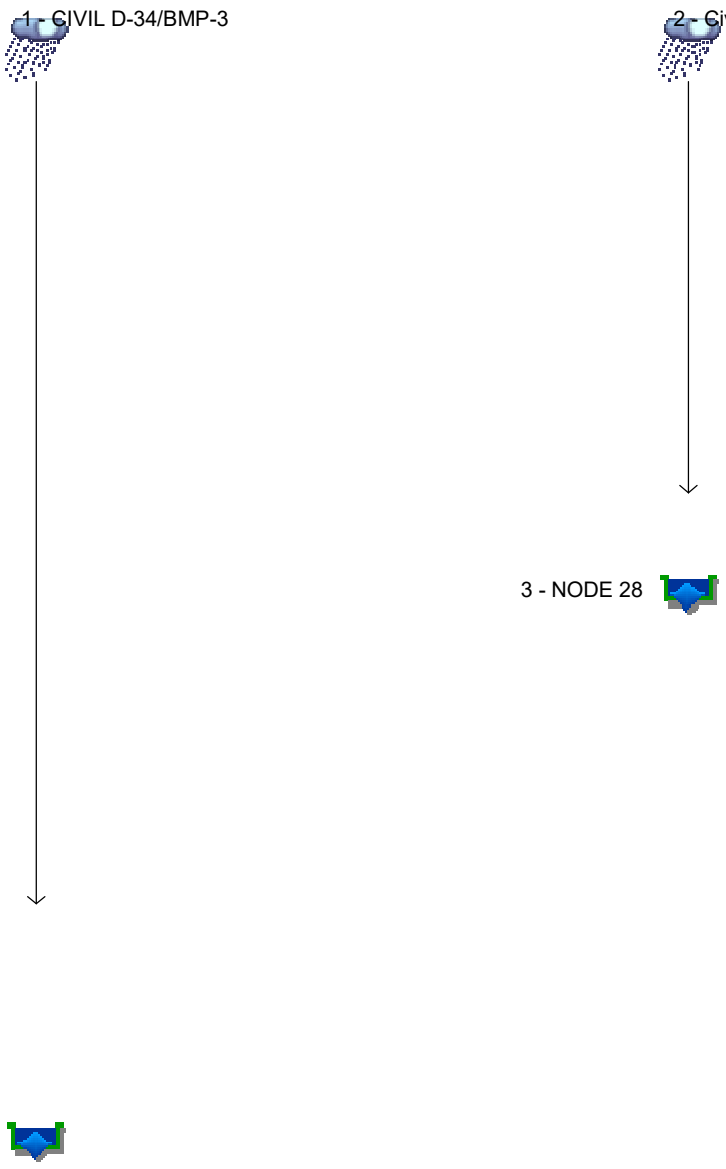
Sheet 11 of 23

VWD 02-046

O:\160078.00\Dwg\As-Built\ 11-sd-F-mod.dwg 04/18/07 11:26

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020



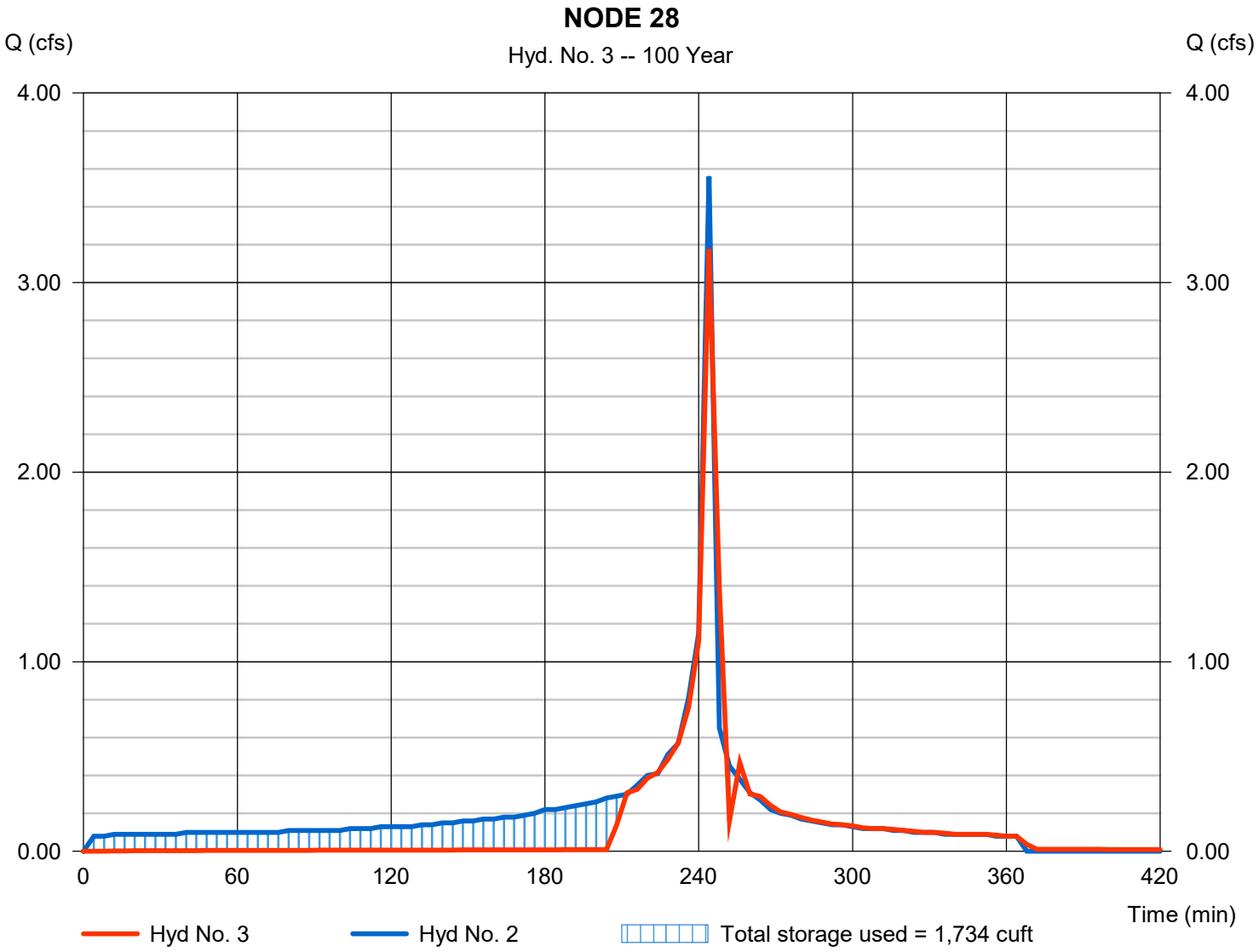
Hydrograph Report

Hyd. No. 3

NODE 28

Hydrograph type	= Reservoir	Peak discharge	= 3.177 cfs
Storm frequency	= 100 yrs	Time to peak	= 244 min
Time interval	= 4 min	Hyd. volume	= 4,882 cuft
Inflow hyd. No.	= 2 - Civil d-28/BMP-2	Max. Elevation	= 609.76 ft
Reservoir name	= BMP-2B (DETENTION PIPE SYSTEM)	Max. Storage	= 1,734 cuft

Storage Indication method used.



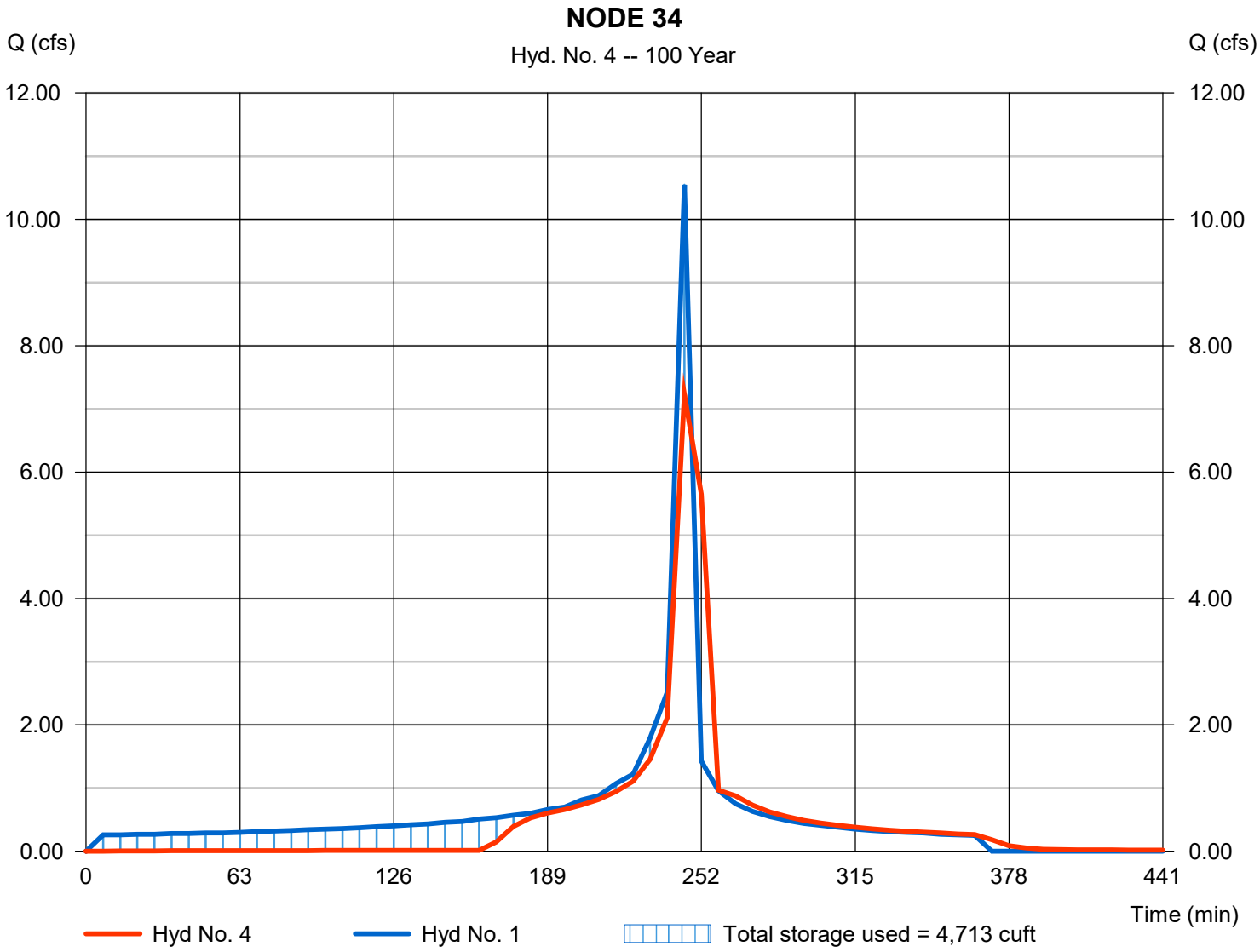
Hydrograph Report

Hyd. No. 4

NODE 34

Hydrograph type	=	Reservoir	Peak discharge	=	7.226 cfs
Storm frequency	=	100 yrs	Time to peak	=	245 min
Time interval	=	7 min	Hyd. volume	=	16,056 cuft
Inflow hyd. No.	=	1 - CIVIL D-34/BMP-3	Max. Elevation	=	612.54 ft
Reservoir name	=	BMP-3B2 (DETENTION PIPE SYSTEM)	Max. Storage	=	4,713 cuft

Storage Indication method used.



END OF REPORT