

PRELIMINARY HYDROLOGY / HYDRAULICS STUDY

FOR THE:

ASCEND TOWNHOMES

APN 223-341-17

Melrose Drive and Diamond Street, San Marcos, CA 92078

PREPARED FOR:

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Project No: 19-089

DATE PREPARED:

03/11/2026

REVISION DATE(S):

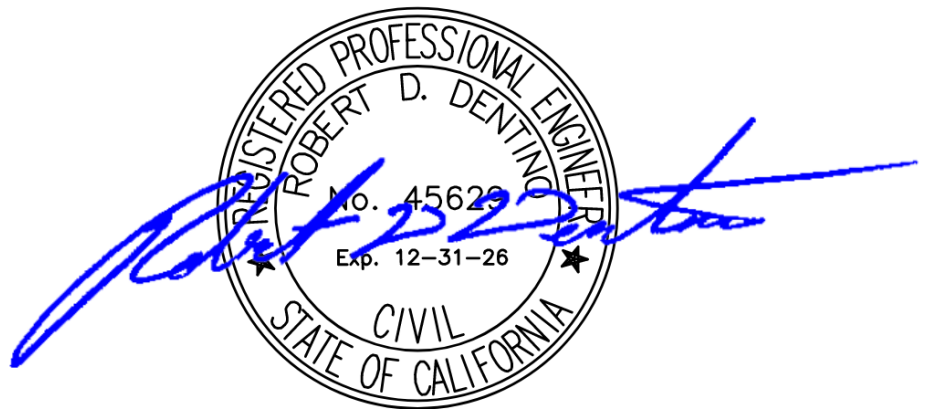


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1.0 PROJECT DESCRIPTION

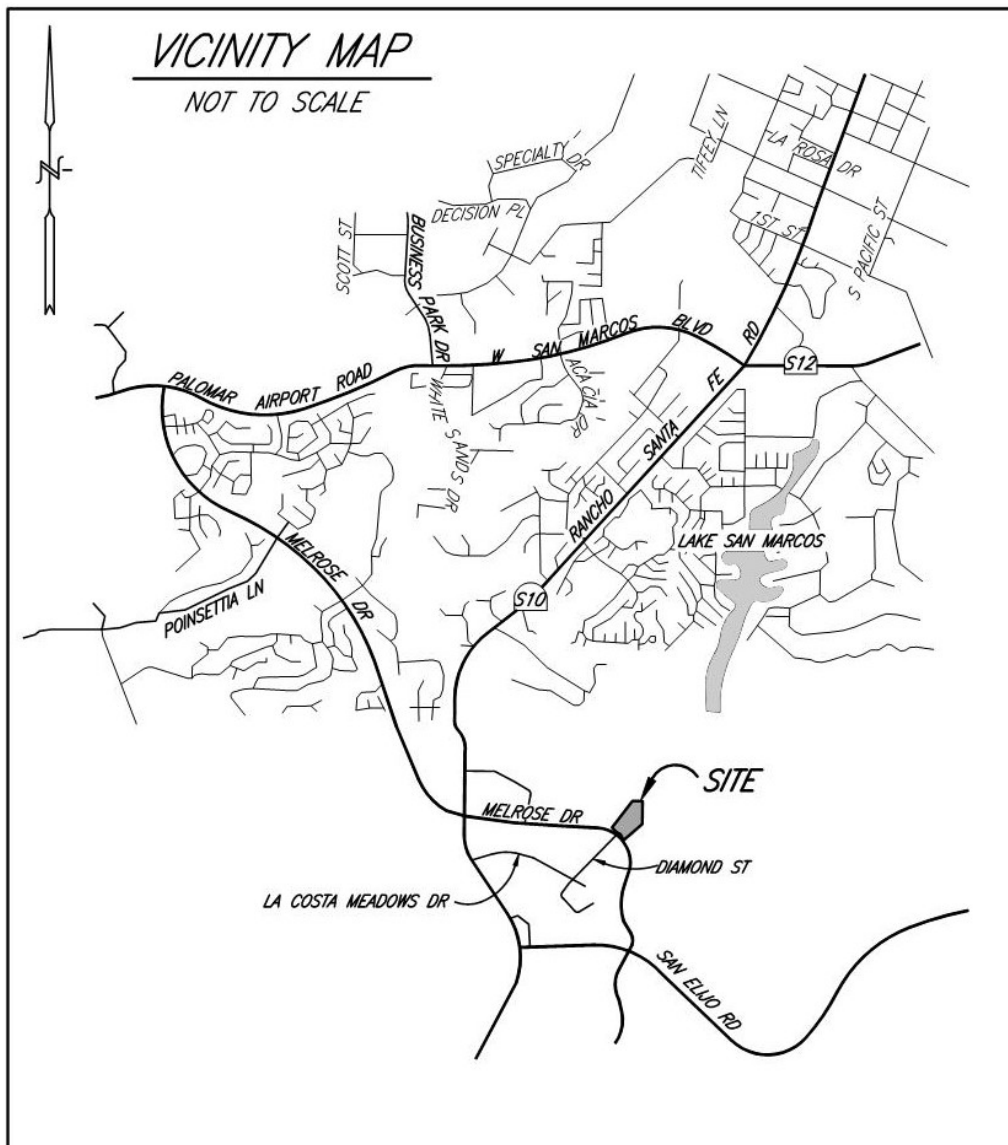
1.1 Purpose of Study

The purpose of this study is to support the development of a new High Density Residential project (from the previously conditioned and approved industrial project – GP22-00018) for a proposed townhome/residential design, consisting of typical building pads, driveways, hardscape, amenities, utility and drainage infrastructure, etc. To ensure proposed facilities are sized appropriately for the residential project this report shows calculations and justifications for the impacts due to typical development activities for that type of project.

1.2 Project Description

The project proposes approximately 14-acre pad to be used for residential, high density use. Improvements consist primarily of hardscape, sidewalks, driveways, buildings, and landscaping amenities as well as retaining walls and slope grading, and drainage infrastructure to allow offsite flows to bypass around the site.

2.0 VICINITY MAP



3.0 DESCRIPTION OF WATERSHED

3.1 Pre-Development Topography

The property is currently mostly undeveloped hillsides, except for a portion of residential street atop of the most northerly hillside which all drain south into a natural valley at the bottom of the hills. The valley continues draining south into an existing Type-F inlet where it enters the public storm drain system via a 48" RCP in Melrose Drive.

There is a small natural ridge that develops in the lower western portion of the property that splits a small portion of the hillside flows west towards an existing access road with adjacent browditches collecting this flow into an existing 30" pipe in the access road.

Along the Melrose Drive Right of Way there is a 30' - 50' high cut slope that drains into a browditch adjacent to the sidewalk on Melrose Drive. The browditch drains south along Melrose Dr. till it reaches the D-25 where it discharges into Melrose Drive.

The Pre-Developed Drainage Map can be found as Attachment 2.2 in this report

3.2 Post-Development Topography

The rough grading project for the industrial pad (previously approved as City of San Marcos GP22-00018) proposed to fill in a portion of the existing valley to create a large pad that sloped 2.0% towards 2 different desiltation basins while maintaining the natural split of the existing ridge. All offsite flows generally remained undisturbed until they reached the northern edge of the pad where they either entered a 48" pipe or a browditch that drains directly into the existing Type-F box. The upstream watershed and how it flows to the proposed pad for this High Density Residential project remains largely unchanged as was previously approved – with that 48" pipe and edge-condition browditches intercepting the off-site flows.

What was the Point of Compliance POC-1 location for the previously approved industrial pad stays the same with the off-site runoff running through the 48" pipe through the site, down the easterly main driveway, and connecting to the existing underground storm drain that crosses Melrose Drive. Along the way, the north, northeast, east, and south central/east portion of the residential pad area (largely mimicking the area previously delineated by the split of the existing ridge) received water quality treatment in surface basins and then connects to either the 48" pipe running through the site or at the POC-1 location itself. Additionally, off-site runoff that is intercepted by the brow ditch along the east side of the property continues to be picked up by the Type-F box at that southeast corner near Melrose Drive and connects to POC-1.

A portion of cut slope along Melrose Dr. is now redirected to POC-1, due to the proposed driveway. The remaining undisturbed cut slope drains as it did in the pre-development condition.

An on-site water quality basin and a proposed Modular Wetland System combined with underground storage collects all onsite flows from the residential pad that flow to POC-2 in the pre-development condition and discharges them into the existing browditch along the access road.

A third Point of Compliance, POC-3 is created by the proposal to install a fire lane at the southwest corner of the site. This road is steep and cuts into the portion of the cut slope that previously had been left alone in the GP22-00018 study. This POC-3 proposes treatment and storage by way of a biofiltration swale.

The project proposes all necessary improvements to support the drainage and mitigation needs of a typical high density townhome project, building off of the infrastructure shown by the rough grading permit, GP22-00018.

The Post-Developed Drainage Map can be found as Attachment 2.3 in this report.

3.3 Hydrologic Unit Contribution

The project is in the Batiquitos Hydrologic Sub Area of the Lower San Marcos Creek Hydrologic Area of the Carlsbad Hydrologic Unit (904.51).

4.0 METHODOLOGY

This report is prepared in accordance with the 2003 San Diego County Hydrology Manual. Based on the overall tributary study area, calculations utilize Rational Method.

4.1 Drainage system overview

All offsite flows are captured either by a brow-ditch or a 48" pipe that routes the flow to their respective POC. All on-site drainage is routed by way of sheet flow, initially, to more defined flowpaths (curbs and gutter, ribbon gutters, or brow ditches) directly into water quality treatment systems (surface biofiltration basins or modular wetland systems) or collected into storm drain inlets and routed through storm drain piping to those basins. From there, peak flow attenuation will occur (as well as water quality treatment) and the resultant flows will pipe via private storm drain conveyance pipes to the POCs.

4.2 Hydrology Software

The "Rational Hydrology Method, San Diego County Flood Division (2003 Hydrology Manual)" module of the CIVILCADD/CIVIL DESIGN Engineering software version 6.5 is used in this study.

4.3 Hydraulics Software

Hydraflow Storm Sewers 2015 will be used to analyze pipes, brow ditches, etc., during the Final Engineering for this project once additional detailing is required to support construction drawings. Runoff calculated from the rational method for conservative peak flows at each individual pipe and ditch will be entered into this software to design and size the storm drain systems.

5.0 CALCULATIONS

5.1 Determination of Watershed

The watershed is shown as Attachment 2.2 (predeveloped) and 2.3 (postdeveloped) of this report and was developed by reviewing topographic surveys performed for the entire upstream and downstream area. The upstream watershed is extensive and that is reflected in both the predeveloped and postdeveloped maps.

5.2 Calculate Runoff Coefficient

In accordance with the County's Hydrology Manual, the runoff coefficient "C" was determined from Table 3-1 and USDA Web Soil Survey. From Table 3-1 Undisturbed Natural Terrain was selected for the Predeveloped condition as the entirety of the project site watershed is undeveloped hills and natural vegetation. From the Web Soil Survey, soil type D was selected.

C-Factors for the proposed project within the project area is based on High Density Residential C-Factors provided in Table 3-1 and Soil Type D.

5.3 Calculate Manning Roughness Coefficient

The manning's coefficient used for calculations are as follows.

PVC pipe: $n=0.013$

Concrete pipe: $n=0.015$

Brow ditch: $n=0.016$

Overland channel flows: $n= 0.040$

5.4 Calculate Storm Flows using the Modified Rational Method

Peak runoff for the 6-hour 100-year storm was calculated by the modified rational method using CivilD software in accordance with the County's hydrology manual. Three points of compliance were examined. The results are tabulated below.

POC-1	NODE #	Area (Acres)	Tc (MIN)	Runoff (CFS)
Pre-development	108	112.98	21.67	123.83
Post-development (Un-mitigated)	111	111.83	20.81	137.27

POC-2	NODE #	Area (Acres)	Tc (MIN)	Runoff (CFS)
Pre-development	404	7.78	7.7	15.75
Post-development (Un-mitigated)	409	8.42	9.60	18.68

POC-3	NODE #	Area (Acres)	Tc (MIN)	Runoff (CFS)
Pre-development	902	0.17	5.00	0.46
Post-development (Un-mitigated)	903	0.82	5.08	4.91

Table 5.4-1. Peak 100-year runoff un-mitigated

POC-1, POC-2, and POC-3 require peak flow mitigation. See Section 5.6 for detention analysis and results. CivilD data and output files can be found in Attachment 3 of this report.

5.5 Design / Analyze Proposed Storm Drain Facilities

Hydraflow Storm Sewer Extension for Autodesk Autocad Civil 3D 2015, version 10.4, (Storm Sewer), will be used to size the proposed storm drain piping, brow ditches, inlets, etc. That analysis will be performed during final engineering once all piping and detailing is known – to support construction drawings and infrastructure installation.

5.6 Design / Analyze Proposed Detention Basins

As shown in the Hydrology analysis in Section 5.4, all three POCs will require detention of peak flows to release at predeveloped rates.

The detention methods used for POC-1 include two biofiltration basins (BMP-2 and BMP-6) and two underground detention pipe systems. The first detention pipe is the proposed 48” pipe that picks up offsite runoff at node 108 and conveys it to node 109 at a cleanout box. This pipe will detain offsite flows only and will be hydraulically separated from onsite runoff. The cleanout box will have a weir plate in it with two orifices to control the rate of flow leaving the box. The second underground storage pipe system is located just south of the BMP-2 basin under the proposed drive isle. This storage system is used to detain onsite runoff in conjunction with the biofiltration basin. The detained onsite runoff leaves the basin and storage pipes and confluent with the offsite flows in the 48” storm drain pipe running south down the drive isle.

The onsite runoff contributing to POC-2 is detained in one proposed biofiltration basin (BMP-3). The detained water will leave BMP-3 at the overflow structure at node 406 and pipe to the south to where it will discharge to the browditch along the west property line and confluence with offsite flows.

The detention methods used for POC-3 include a biofiltration swale running north to south along the west side of the proposed fire lane. This swale will include check dams with orifices to control the flow rate of runoff.

A summary of the peak flow runoff rates after detention is included in Table 5.6-1 below. For detention calculations please see Attachment 3.4.

POC-1	NODE #	Area (Acres)	Tc (MIN)	Runoff (CFS)
Pre-development	108	112.98	21.67	123.83
Post-development (Mitigated)	111	111.83	30.83	122.58

POC-2	NODE #	Area (Acres)	Tc (MIN)	Runoff (CFS)
Pre-development	404	7.78	7.7	15.75
Post-development (Mitigated)	409	8.42	7.75	13.73

POC-3	NODE #	Area (Acres)	Tc (MIN)	Runoff (CFS)
Pre-development	902	0.17	5.00	0.46
Post-development (Mitigated)	903	0.82	18.08	0.46

Table 5.6-1. Peak 100-year runoff mitigated

The section below explains the use of a modified runoff coefficient in the mitigated calculations.

CALCULATION AFTER THE DETENTION STRUCTURE

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

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

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

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

Tc_{in} = Is equal to the Time of Concentration flowing into the basin before detention

Tc_{out} = Is equal to the Time of Concentration exiting the basin after detention

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

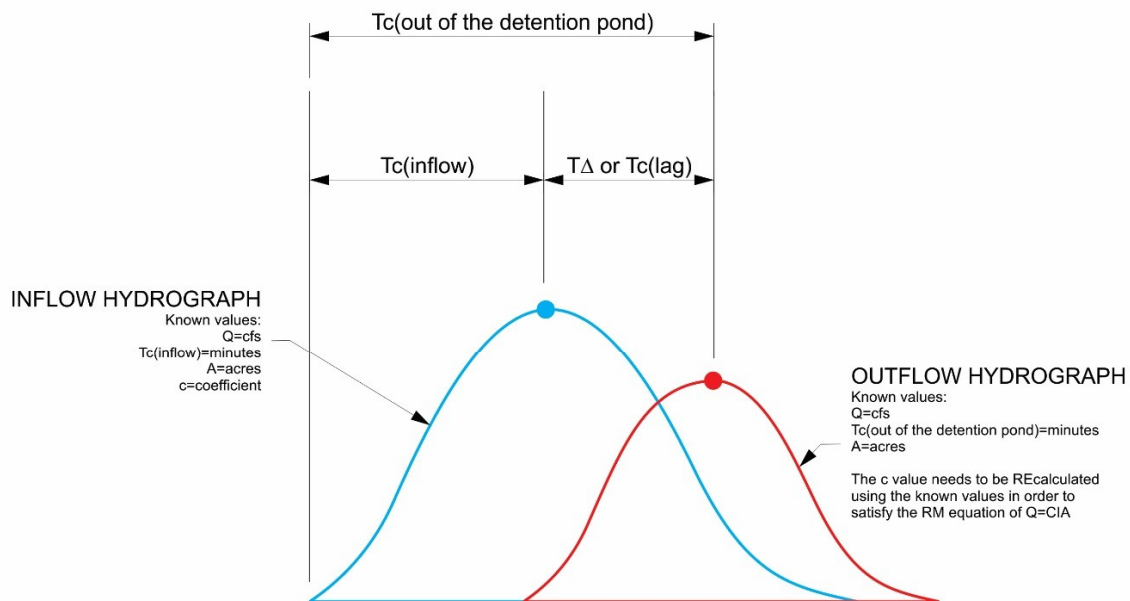
C_{inflow} = The runoff coefficient going into the basin for detention

C_{out} = The runoff coefficient recalculated considering the water stored in pond for detention

One method is to keep the value of c_{inflow} and solve for the $I=$ intensity & Tc_{out} (outflow). In this interpretation, we will get a Tc that will not match the value of the Tc_{out} (out of the detention structure) of the outflow hydrograph that was calculated using the detention pond.

The T_c Using this method shows a disruption on the oneness & continuity of the outflow hydrograph & the formula $Q=CIA$.

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



**GRAPHICAL DIAGRAM OF THE HYDROGRAPH
COMING OUT OF THE DETENTION POND**

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

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

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

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

The following equations are used in this stage: $Q = CIA$ $I = 7.44P_6D^{-0.645}$

Where:

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

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

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

$T_{c(inflow)} + T\Delta$ (minutes)

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

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

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

$C_{(outflow)}$ = runoff coefficient (unitless), value to be solved

100 Year

CALCULATIONS For Basin Sizing			
LINE	ITEM	AT THE OUTFLOW OF DETENTION NODE	REMARKS
1	P6 inch	2.9	KNOWN VALUE
2	TC (inflow) mins		KNOWN VALUE
3	TC (lag) mins		FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins		LINE 2+3
5	I inches/hour		FROM THE INTENSITY FORMULA
6	Q(outflow)		KNOWN VALUE
7	A (inflow=outflow)		KNOWN VALUE
8	c(inflow)		KNOWN VALUE FROM THE CONTRIBUTING BASIN(S)
9	c(outflow)		CALCULATED FROM $C=Q/IA$

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

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

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

5.7 Design / Analyze Proposed Desiltation Basins

The Desiltation basins that will be placed on site during the development of the High Density Residential pad will be designed, at final engineering, per The California Stormwater BMP Handbook bulletin SE-2 (Sediment Basin) using option 1 for the design basis. At this point, the erosion control plan is not fully developed, but will be developed during the final engineering stage when more coordination is completed with the selected General Contractor, grading contractor, etc., and more information is known as to how the precise graded pad will be staged, phased, etc. When the desiltation basins are sized, they will be sized per the following criteria:

$$A_s = 1.2Q_{10}/V_s.$$

Where:

A_s = Minimum surface area for trapping soil particles of a certain size

V_s = Settling Velocity of the design particle size chosen = 0.037 mm

The particle size of 0.037mm was chosen based on the soils report sieve analysis for the boring T2-3 (which will be in an area of cut) only had 1.4% of the sample passing a #200 sieve (0.074mm). Also, all import material will be specified to be free of any fines passing a #400 sieve (0.037mm).

$$V_s = 2.81d^2 = 2.81 \cdot .020^2 = .001124 \text{ ft/sec}$$

Q_{10} = Flow from the area from a 10 year storm

The flow for the 10 year storm was found by utilizing the Rational Method using the P_6 of a 10 year rainfall event per County of San Diego Rainfall Isopleth maps. (See attachment 2)

P_6 =2.0 inches

Hydraflow Hydrographs Extension for Autodesk Autocad Civil 3D 2019, Version 2020, will be used to size the desiltation basins outlet structures and verify basins will fully drain in less than 96hrs.

6.0 CONCLUSION

This study currently shows that the project, without mitigation, will increase 100-year peak runoff downstream of the project. Therefore, multiple detention methods will be utilized onsite including biofiltration basins/swales and underground storage pipes for each POC. As summarized in Table 5.6-1 and shown in the calculations provided in Attachment 3.4, the post-developed peak runoff flows have been mitigated to at or below the predeveloped rates. It can therefore be concluded that this project will result in no negative impact on the existing downstream storm drain facilities or adjacent and downstream properties.

Because the project is not located within or discharges to navigable waters, water of the United States, or federal jurisdictional wetlands, as defined by the Clean Water Act, no 401/404 permit is required.

In conclusion, the project has met the City of San Marcos minimum requirements for the peak flow control.

7.0 REFERENCES

County of San Diego Hydrology Manual, June 2003
San Diego County Hydraulic Design Manual, September 2014

8.0 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 City of San Marcos 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
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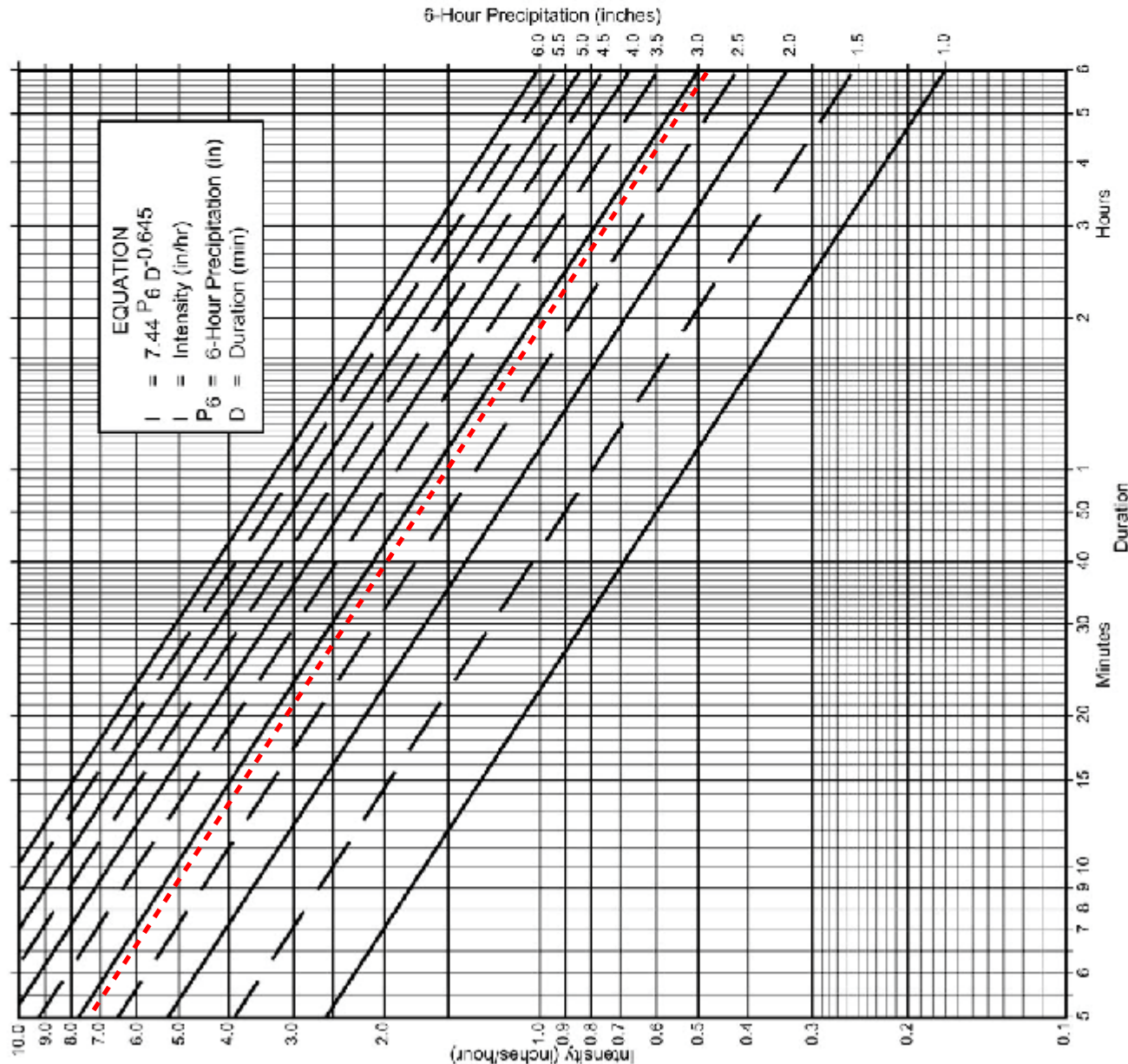


Robert D. Dentino, RCE 45629
Registration Expire: December 31, 2026

03/12/2026

Date

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 applicable 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:

- Selected frequency 100 year
- $P_6 = 2.9$ in., $P_{24} = 5.25$ in. $\frac{P_6}{P_{24}} = 55.2\%$
- Adjusted $P_6^{(2)} = 2.9$ in.
- $t_x =$ min.
- $I =$ in./hr.

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

P6 Duration	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
5	2.63	3.85	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	4.55	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	1.85	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	0.65	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

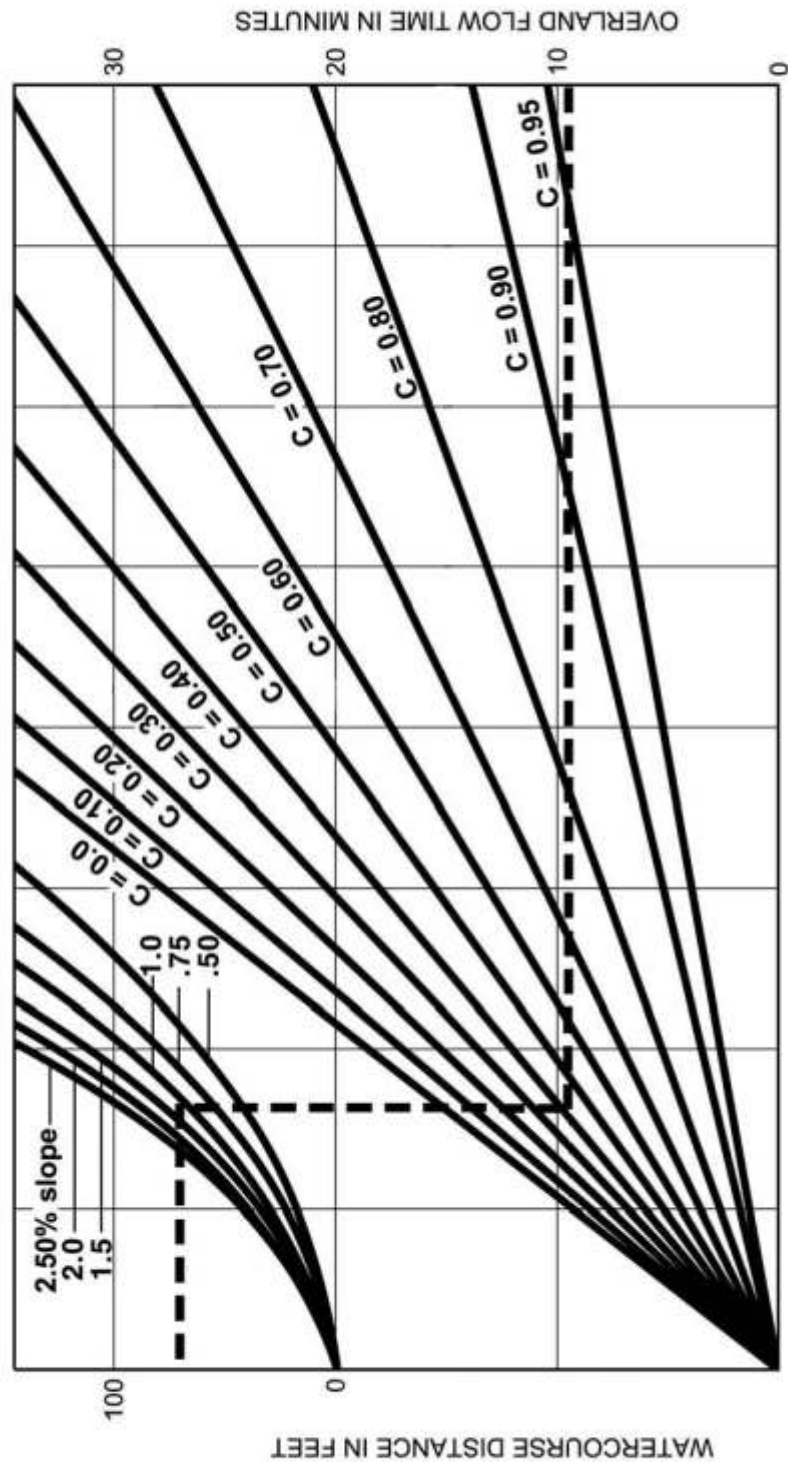
**Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS**

Land Use		Runoff Coefficient "C"				
NRCS Elements	County Elements	% IMPER.	Soil Type			
			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

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

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

Rational Formula - Overland Time of Flow Nomograph

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.

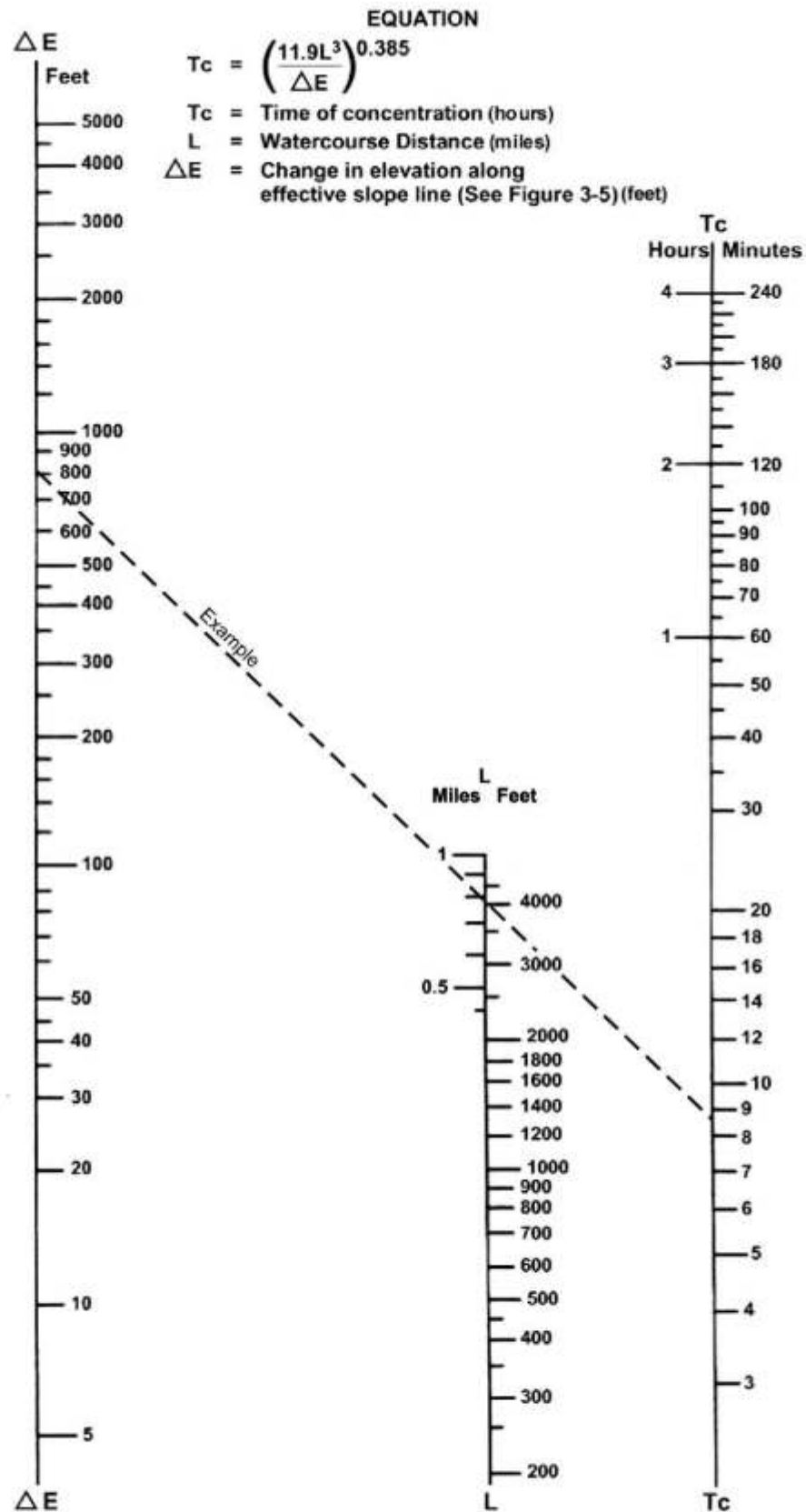
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved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

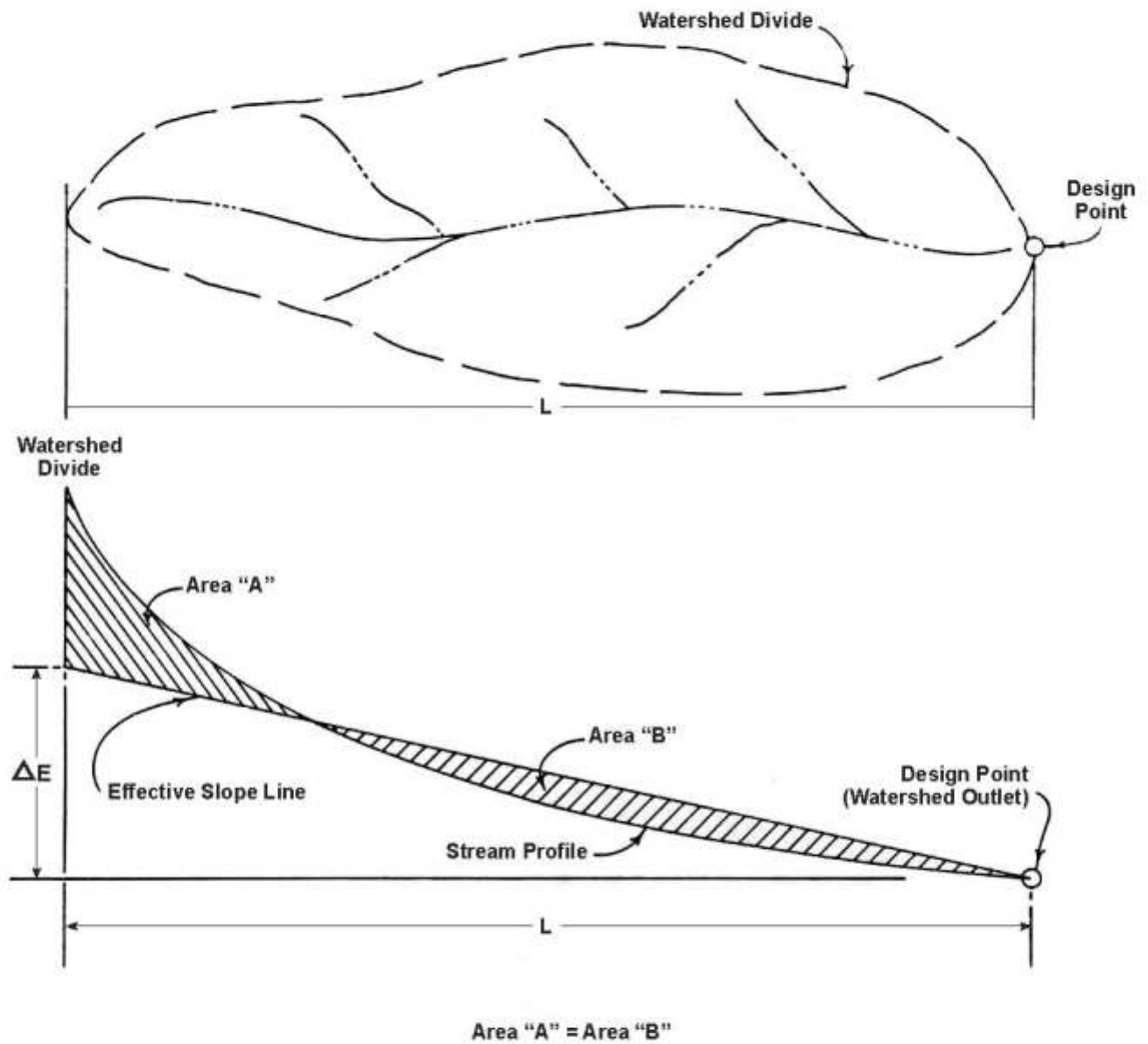


SOURCE: California Division of Highways (1941) and Kirpich (1940)

Nomograph for Determination of
Time of Concentration (T_c) or Travel Time (T_t) for Natural Watersheds

FIGURE

3-4

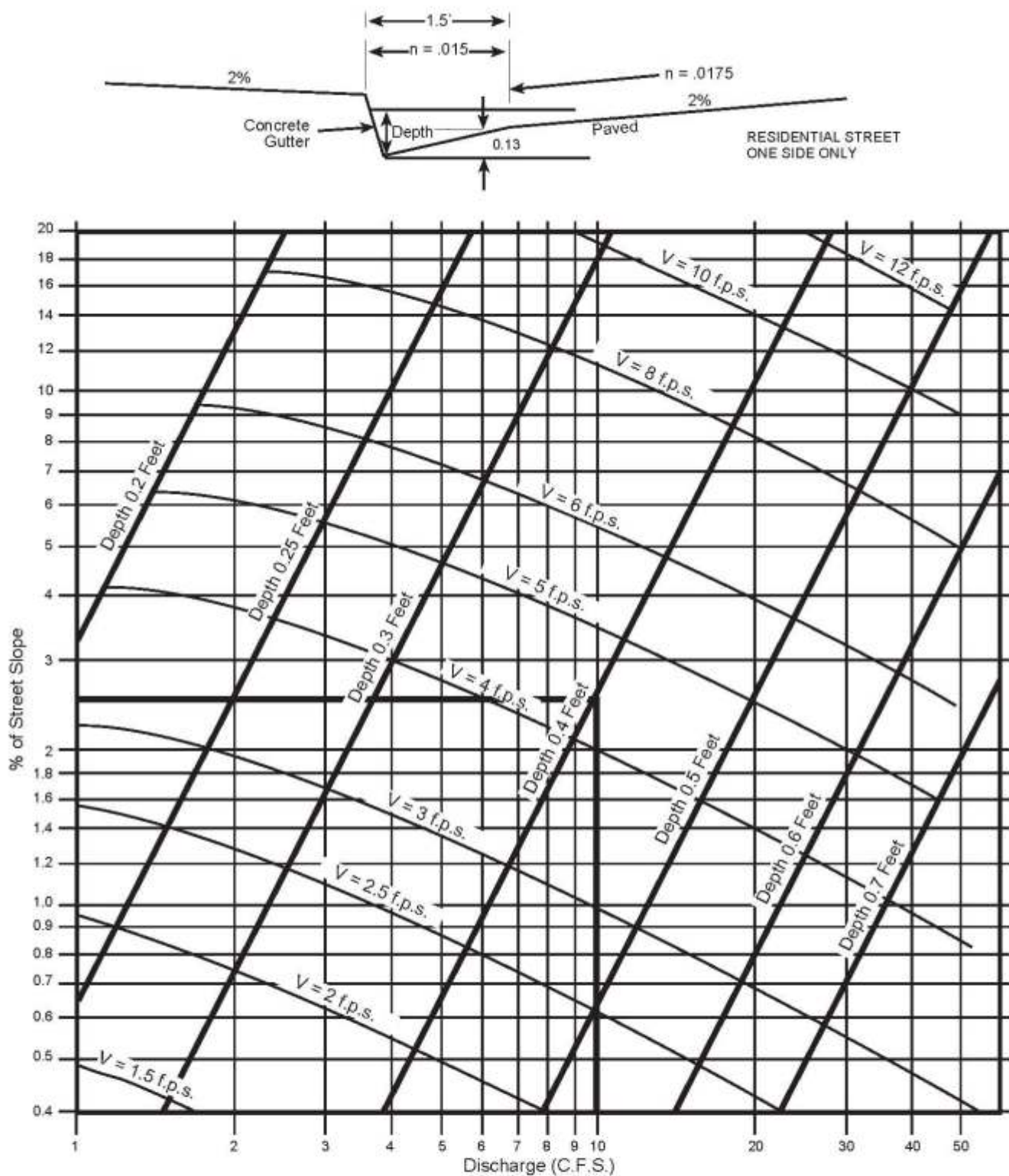


SOURCE: California Division of Highways (1941) and Kirpich (1940)

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.

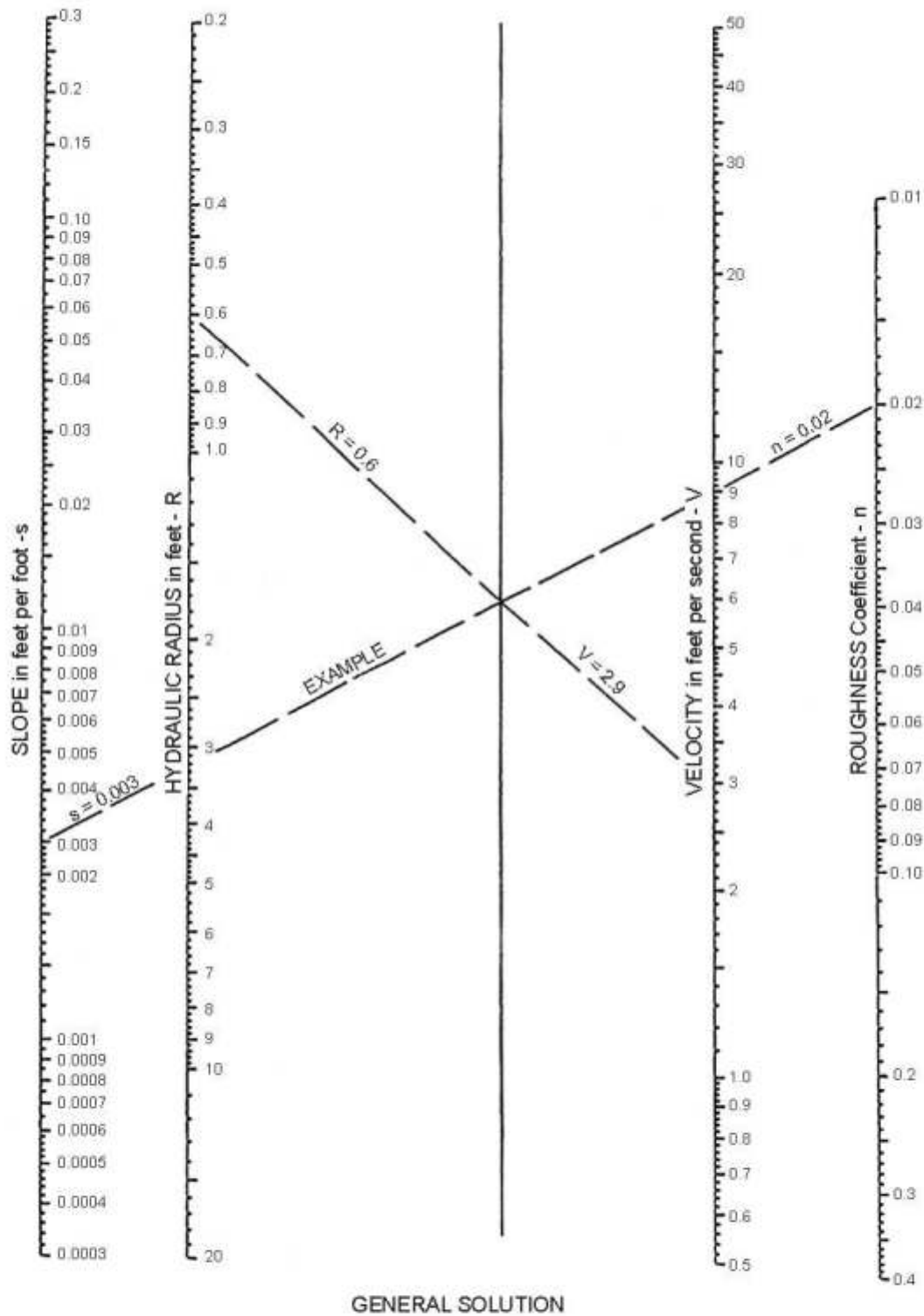
SOURCE: San Diego County Department of Special District Services Design Manual

Gutter and Roadway Discharge - Velocity Chart

FIGURE

3-6

$$\text{EQUATION: } V = \frac{1.49}{n} R^{2/3} s^{1/2}$$



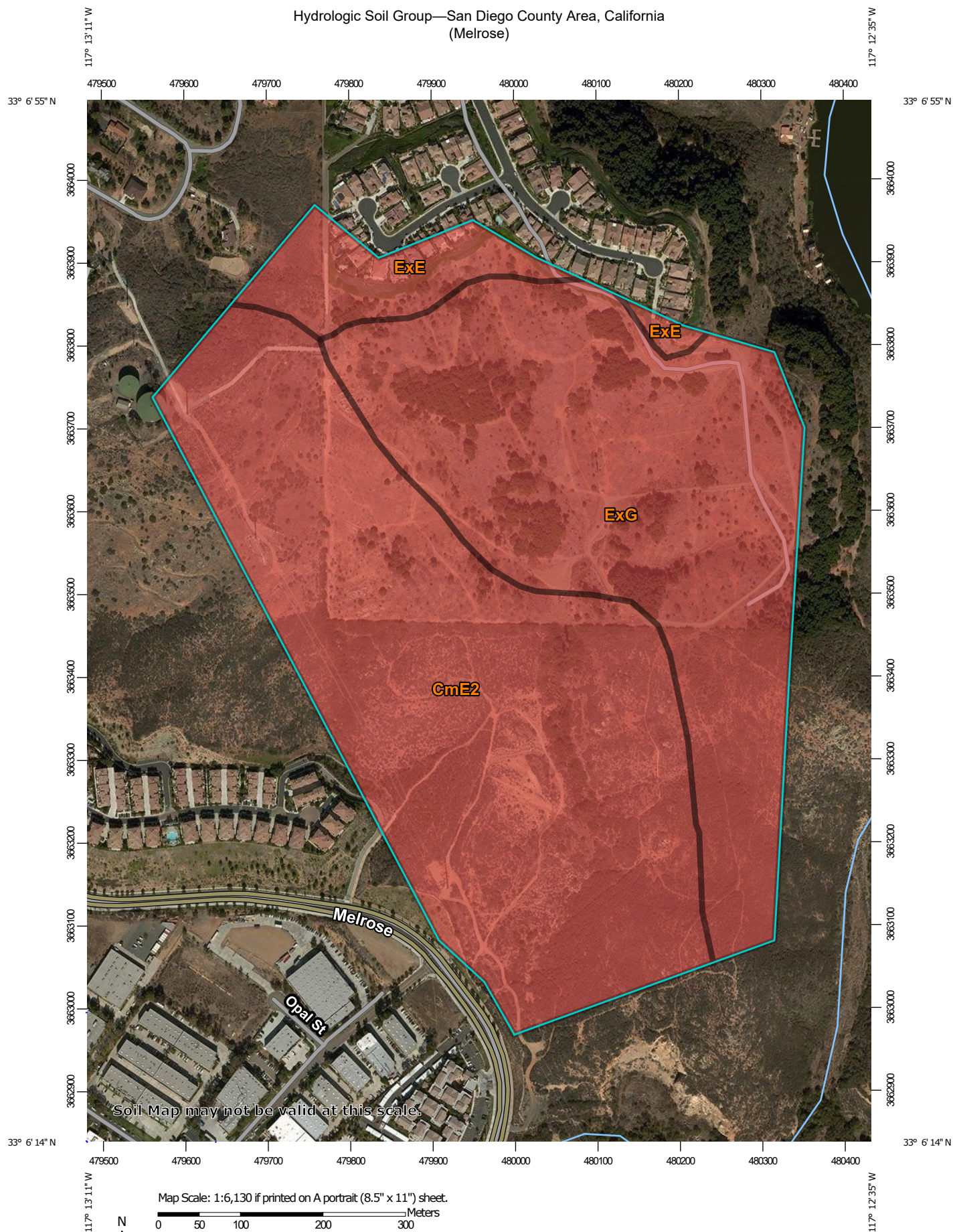
SOURCE: USDOT, FHWA, HDS-3 (1961)

Manning's Equation Nomograph

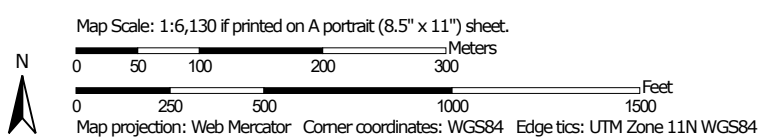
FIGURE

3-7

Hydrologic Soil Group—San Diego County Area, California (Melrose)



Soil Map may not be valid at this scale.



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 14, Sep 16, 2019

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
CmE2	Cieneba rocky coarse sandy loam, 9 to 30 percent slopes, eroded	D	67.9	52.5%
ExE	Exchequer rocky silt loam, 9 to 30 percent slopes	D	8.2	6.4%
ExG	Exchequer rocky silt loam, 30 to 70 percent slopes	D	53.2	41.2%
Totals for Area of Interest			129.3	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

Tie-break Rule: Higher

ATTACHMENT 2.1

County of San Diego Hydrology Manual



Rainfall Isophuvials

10 Year Rainfall Event - 6 Hours

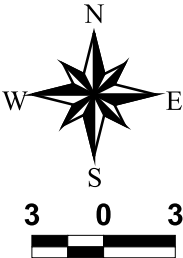
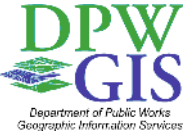
----- Isopluvial (inches)

10 yr Storm P6 = 2.0 inches

Pacific Ocean

Imperial County

Mexico



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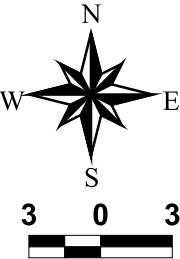
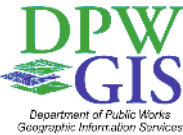
County of San Diego Hydrology Manual



Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

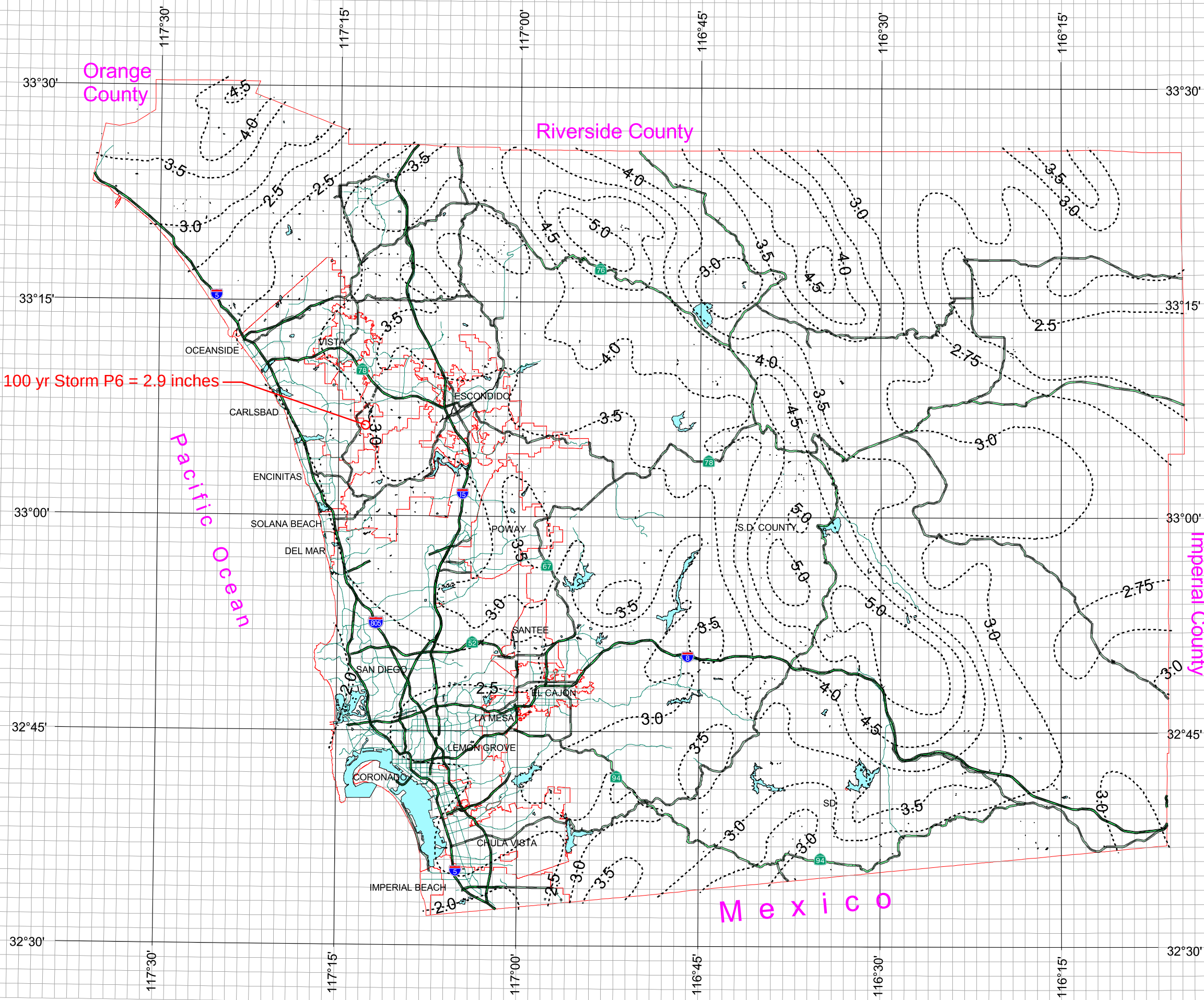
----- Isopluvial (inches)



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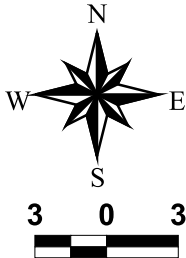
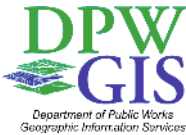
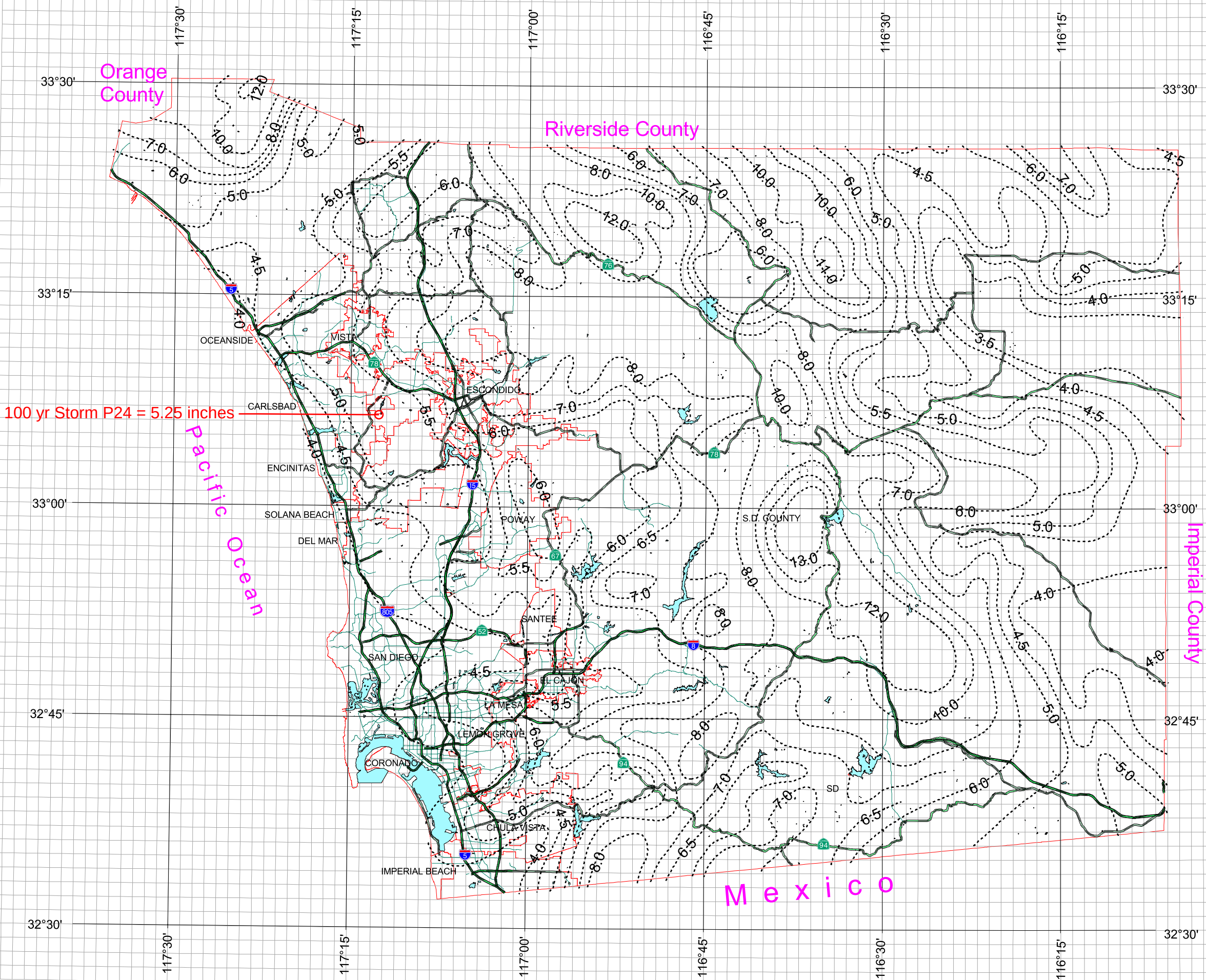
County of San Diego Hydrology Manual



Rainfall Isophuvials

100 Year Rainfall Event - 24 Hours

----- Isopluvial (inches)



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ATTACHMENT 2.2



LEGEND-ABBREVIATIONS:

INDICATES TRIBUTARY AREA BOUNDARY

FLOW LINE

L = 66 FT

Q100 = 15.749 CFS

Q100 = 6.72 FT/S

Q100 = 8.463 CFS

Q100 = 7.585 FT/S

Q100 = 15.749 CFS

Q100 = 6.72 FT/S

Q100 = 8.463 CFS

Q100 = 7.585 FT/S

ATTACHMENT 2.3

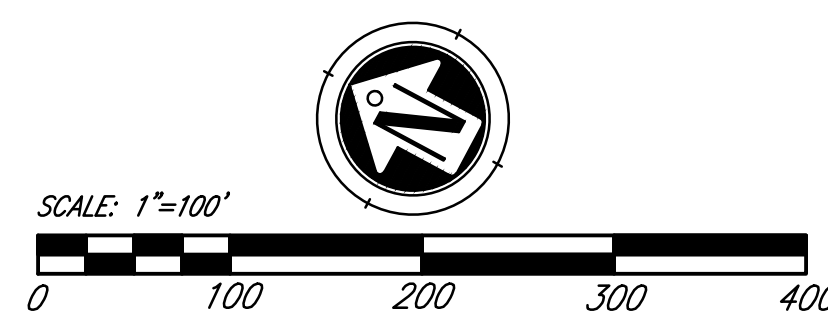
K:\251\2507\Engineering\2507\Storm-SSP\Map-Sub-1102.dwg 3/1/2008 5:08 PM GRSMAL PLOT SIZE: 11.00x17.00



POC 2 @ JUNCTION STRUCTURE
AREA = 6.4185 ACRES
0100 POST-DEV UNMITIGATED = 18.68 CFS
0100 PRE-DEV = 15.75 CFS
0100 POST-DEV MITIGATED = 13.73 CFS

POC 3 @ JUNCTION STRUCTURE
AREA = 0.8216 ACRES
0100 POST-DEV UNMITIGATED = 4.91 CFS
0100 PRE-DEV = 0.46 CFS
0100 POST-DEV MITIGATED = 0.46 CFS

POC 1 @ OUTLET OF RISER
AREA = 111.83 ACRES
0100 POST-DEV UNMITIGATED = 137.37 CFS
0100 PRE-DEV = 123.83 CFS
0100 POST-DEV MITIGATED = 122.38 CFS



LEGEND-ABBREVIATIONS:
- - - - - INDICATES TRIBUTARY AREA BOUNDARY
- - - - - FLOW LINE
L = 66 FT FLOW DISTANCE
① NODE NUMBER (REFERENCED IN COMPUTER PRINT OUT)
3.69 ACRES TOTAL AREA IN SUB TRIBUTARY AREA

ATTACHMENT 3.1


```

1
2 San Diego County Rational Hydrology Program
3
4 CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
5
6 Rational method hydrology program based on
7 San Diego County Flood Control Division 2003 hydrology manual
8 Rational Hydrology Study Date: 03/11/26
9
10 -----
11 PRE-DEVELOPMENT
12 POC-1
13 100 YR STORM
14
15 -----
16 ***** Hydrology Study Control Information *****
17 -----
18
19
20 Program License Serial Number 6332
21
22 -----
23 Rational hydrology study storm event year is 100.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 2.900
28 24 hour precipitation(inches) = 5.250
29 P6/P24 = 55.2%
30 San Diego hydrology manual 'C' values used
31
32
33 +-----+
34 Process from Point/Station 101.000 to Point/Station 102.000
35 **** INITIAL AREA EVALUATION ****
36
37 -----
38 Decimal fraction soil group A = 0.000
39 Decimal fraction soil group B = 0.000
40 Decimal fraction soil group C = 0.000
41 Decimal fraction soil group D = 1.000
42 [MEDIUM DENSITY RESIDENTIAL ]
43 (4.3 DU/A or Less )
44 Impervious value, Ai = 0.300
45 Sub-Area C Value = 0.520
46 Initial subarea total flow distance = 98.000 (Ft.)
47 Highest elevation = 776.000 (Ft.)
48 Lowest elevation = 775.500 (Ft.)
49 Elevation difference = 0.500 (Ft.) Slope = 0.510 %
50 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
51 The maximum overland flow distance is 50.00 (Ft)
52 for the top area slope value of 0.51 %, in a development type of
53 4.3 DU/A or Less
54 In Accordance With Figure 3-3
55 Initial Area Time of Concentration = 9.24 minutes
56 TC = [1.8*(1.1-C)*distance (Ft.)^.5]/(% slope^(1/3)]
57 TC = [1.8*(1.1-0.5200)*( 50.000^.5)/( 0.510^(1/3)]= 9.24
58 The initial area total distance of 98.00 (Ft.) entered leaves a
59 remaining distance of 48.00 (Ft.)
60 Using Figure 3-4, the travel time for this distance is 1.17 minutes
61 for a distance of 48.00 (Ft.) and a slope of 0.51 %
62 with an elevation difference of 0.24 (Ft.) from the end of the top area
63 Tt = [11.9*length (Mi)^3]/(elevation change (Ft.))^.385 *60 (min/hr)
64 = 1.174 Minutes
65 Tt=[(11.9*0.0091^3)/( 0.24)]^.385= 1.17
66 Total initial area Ti = 9.24 minutes from Figure 3-3 formula plus
67 1.17 minutes from the Figure 3-4 formula = 10.41 minutes
68 Rainfall intensity (I) = 4.760 (In/Hr) for a 100.0 year storm
69 Effective runoff coefficient used for area (Q=KCIA) is C = 0.520
70 Subarea runoff = 0.673 (CFS)

```

```

70 Total initial stream area = 0.272 (Ac.)
71
72
73 ++++++
74 Process from Point/Station 102.000 to Point/Station 103.000
75 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
76
77 -----
78 Estimated mean flow rate at midpoint of channel = 7.957 (CFS)
79 Depth of flow = 0.247 (Ft.), Average velocity = 5.183 (Ft/s)
80 ***** Irregular Channel Data *****
81 -----
82 Information entered for subchannel number 1 :
83 Point number 'X' coordinate 'Y' coordinate
84 1 0.00 0.50
85 2 25.00 0.00
86 3 25.10 0.50
87 4 30.00 0.51
88 Manning's 'N' friction factor = 0.013
89 -----
90 Sub-Channel flow = 7.957 (CFS)
91 ' ' flow top width = 12.415 (Ft.)
92 ' ' velocity = 5.184 (Ft/s)
93 ' ' area = 1.535 (Sq.Ft)
94 ' ' Froude number = 2.598
95
96 Upstream point elevation = 775.500 (Ft.)
97 Downstream point elevation = 748.000 (Ft.)
98 Flow length = 806.000 (Ft.)
99 Travel time = 2.59 min.
100 Time of concentration = 13.01 min.
101 Depth of flow = 0.247 (Ft.)
102 Average velocity = 5.183 (Ft/s)
103 Total irregular channel flow = 7.957 (CFS)
104 Irregular channel normal depth above invert elev. = 0.247 (Ft.)
105 Average velocity of channel(s) = 5.183 (Ft/s)
106 Adding area flow to channel
107 Rainfall intensity (I) = 4.124 (In/Hr) for a 100.0 year storm
108 Decimal fraction soil group A = 0.000
109 Decimal fraction soil group B = 0.000
110 Decimal fraction soil group C = 0.000
111 Decimal fraction soil group D = 1.000
112 [MEDIUM DENSITY RESIDENTIAL ]
113 (4.3 DU/A or Less )
114 Impervious value, Ai = 0.300
115 Sub-Area C Value = 0.520
116 Rainfall intensity = 4.124 (In/Hr) for a 100.0 year storm
117 Effective runoff coefficient used for total area
118 (Q=KCIA) is C = 0.520 CA = 3.675
119 Subarea runoff = 14.485 (CFS) for 6.796 (Ac.)
120 Total runoff = 15.159 (CFS) Total area = 7.068 (Ac.)
121 Depth of flow = 0.315 (Ft.), Average velocity = 6.090 (Ft/s)
122
123 ++++++
124 Process from Point/Station 104.000 to Point/Station 104.000
125 **** SUBAREA FLOW ADDITION ****
126
127 -----
128 Rainfall intensity (I) = 4.124 (In/Hr) for a 100.0 year storm
129 Decimal fraction soil group A = 0.000
130 Decimal fraction soil group B = 0.000
131 Decimal fraction soil group C = 0.000
132 Decimal fraction soil group D = 1.000
133 [MEDIUM DENSITY RESIDENTIAL ]
134 (4.3 DU/A or Less )
135 Impervious value, Ai = 0.300
136 Sub-Area C Value = 0.520
137 Time of concentration = 13.01 min.
138 Rainfall intensity = 4.124 (In/Hr) for a 100.0 year storm
139 Effective runoff coefficient used for total area

```

```

139      (Q=KCIA) is C = 0.520   CA =      6.694
140      Subarea runoff =      12.452(CFS) for      5.806(Ac.)
141      Total runoff =      27.611(CFS)   Total area =      12.874(Ac.)
142
143
144      ++++++
145      Process from Point/Station      104.000 to Point/Station      105.000
146      **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
147
148      Upstream point/station elevation =      738.000(Ft.)
149      Downstream point/station elevation =      732.000(Ft.)
150      Pipe length =      305.00(Ft.) Slope =      0.0197   Manning's N = 0.013
151      No. of pipes = 1   Required pipe flow =      27.611(CFS)
152      Nearest computed pipe diameter =      24.00(In.)
153      Calculated individual pipe flow =      27.611(CFS)
154      Normal flow depth in pipe =      17.32(In.)
155      Flow top width inside pipe =      21.51(In.)
156      Critical Depth =      21.84(In.)
157      Pipe flow velocity =      11.38(Ft/s)
158      Travel time through pipe =      0.45 min.
159      Time of concentration (TC) =      13.45 min.
160
161
162      ++++++
163      Process from Point/Station      105.000 to Point/Station      106.000
164      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
165
166      Estimated mean flow rate at midpoint of channel =      31.525(CFS)
167      Depth of flow =      0.389(Ft.), Average velocity =      7.387(Ft/s)
168      ***** Irregular Channel Data *****
169
170      -----
171      Information entered for subchannel number 1 :
172      Point number      'X' coordinate      'Y' coordinate
173      1                  0.00                  18.00
174      2                  45.00                  0.00
175      3                  55.00                  0.00
176      4                  100.00                 18.00
177      Manning's 'N' friction factor =      0.040
178
179      -----
180      Sub-Channel flow =      31.525(CFS)
181      '      '      flow top width =      11.945(Ft.)
182      '      '      velocity=      7.387(Ft/s)
183      '      '      area =      4.267(Sq.Ft)
184      '      '      Froude number =      2.178
185
186      Upstream point elevation =      732.000(Ft.)
187      Downstream point elevation =      516.000(Ft.)
188      Flow length =      1362.000(Ft.)
189      Travel time =      3.07 min.
190      Time of concentration =      16.53 min.
191      Depth of flow =      0.389(Ft.)
192      Average velocity =      7.387(Ft/s)
193      Total irregular channel flow =      31.525(CFS)
194      Irregular channel normal depth above invert elev. =      0.389(Ft.)
195      Average velocity of channel(s) =      7.387(Ft/s)
196      Adding area flow to channel
197      Rainfall intensity (I) =      3.534(In/Hr) for a      100.0 year storm
198      Decimal fraction soil group A = 0.000
199      Decimal fraction soil group B = 0.000
200      Decimal fraction soil group C = 0.000
201      Decimal fraction soil group D = 1.000
202      [UNDISTURBED NATURAL TERRAIN      ]
203      (Permanent Open Space      )
204      Impervious value, Ai = 0.000
205      Sub-Area C Value = 0.350
206      Rainfall intensity =      3.534(In/Hr) for a      100.0 year storm
207      Effective runoff coefficient used for total area
208      (Q=KCIA) is C = 0.448   CA =      10.012
209      Subarea runoff =      7.771(CFS) for      9.478(Ac.)

```



```

208 Total runoff =      35.382(CFS)  Total area =      22.352(Ac.)
209 Depth of flow =    0.416(Ft.), Average velocity =    7.699(Ft/s)
210
211
212 ++++++
213 Process from Point/Station      106.000 to Point/Station      106.000
214 **** CONFLUENCE OF MINOR STREAMS ****
215
216 -----
217 Along Main Stream number: 1 in normal stream number 1
218 Stream flow area =      22.352(Ac.)
219 Runoff from this stream =      35.382(CFS)
220 Time of concentration =    16.53 min.
221 Rainfall intensity =      3.534(In/Hr)
222
223 ++++++
224 Process from Point/Station      201.000 to Point/Station      202.000
225 **** INITIAL AREA EVALUATION ****
226
227 -----
228 Decimal fraction soil group A = 0.000
229 Decimal fraction soil group B = 0.000
230 Decimal fraction soil group C = 0.000
231 Decimal fraction soil group D = 1.000
232 [UNDISTURBED NATURAL TERRAIN          ]
233 (Permanent Open Space    )
234 Impervious value, Ai = 0.000
235 Sub-Area C Value = 0.350
236 Initial subarea total flow distance = 117.000(Ft.)
237 Highest elevation = 748.000(Ft.)
238 Lowest elevation = 716.000(Ft.)
239 Elevation difference = 32.000(Ft.) Slope = 27.350 %
240 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
241 The maximum overland flow distance is 100.00 (Ft)
242 for the top area slope value of 27.35 %, in a development type of
243 Permanent Open Space
244 In Accordance With Figure 3-3
245 Initial Area Time of Concentration = 4.48 minutes
246 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
247 TC = [1.8*(1.1-0.3500)*( 100.000^.5)/( 27.350^(1/3)]= 4.48
248 The initial area total distance of 117.00 (Ft.) entered leaves a
249 remaining distance of 17.00 (Ft.)
250 Using Figure 3-4, the travel time for this distance is 0.11 minutes
251 for a distance of 17.00 (Ft.) and a slope of 27.35 %
252 with an elevation difference of 4.65(Ft.) from the end of the top area
253 Tt = [11.9*length(Mi)^3]/(elevation change(Ft.))]^.385 *60(min/hr)
254 = 0.114 Minutes
255 Tt=[(11.9*0.0032^3)/( 4.65)]^.385= 0.11
256 Total initial area Ti = 4.48 minutes from Figure 3-3 formula plus
257 0.11 minutes from the Figure 3-4 formula = 4.59 minutes
258 Calculated TC of 4.595 minutes is less than 5 minutes,
259 resetting TC to 5.0 minutes for rainfall intensity calculations
260 Rainfall intensity (I) = 7.641(In/Hr) for a 100.0 year storm
261 Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
262 Subarea runoff = 0.251(CFS)
263 Total initial stream area = 0.094(Ac.)
264
265 ++++++
266 Process from Point/Station      202.000 to Point/Station      106.000
267 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
268
269 -----
270 Estimated mean flow rate at midpoint of channel = 8.354(CFS)
271 Depth of flow = 0.170(Ft.), Average velocity = 4.712(Ft/s)
272 ***** Irregular Channel Data *****
273 -----
274 Information entered for subchannel number 1 :
275 Point number      'X' coordinate      'Y' coordinate
276      1              0.00              18.00
277      2             45.00              0.00

```

```

277         3           55.00           0.00
278         4           100.00          18.00
279 Manning's 'N' friction factor = 0.040
280 -----
281 Sub-Channel flow = 8.355 (CFS)
282 ' ' flow top width = 10.850 (Ft.)
283 ' ' velocity = 4.712 (Ft/s)
284 ' ' area = 1.773 (Sq.Ft)
285 ' ' Froude number = 2.054
286
287 Upstream point elevation = 716.000 (Ft.)
288 Downstream point elevation = 516.000 (Ft.)
289 Flow length = 1102.000 (Ft.)
290 Travel time = 3.90 min.
291 Time of concentration = 8.49 min.
292 Depth of flow = 0.170 (Ft.)
293 Average velocity = 4.712 (Ft/s)
294 Total irregular channel flow = 8.354 (CFS)
295 Irregular channel normal depth above invert elev. = 0.170 (Ft.)
296 Average velocity of channel(s) = 4.712 (Ft/s)
297 Adding area flow to channel
298 Rainfall intensity (I) = 5.429 (In/Hr) for a 100.0 year storm
299 Decimal fraction soil group A = 0.000
300 Decimal fraction soil group B = 0.000
301 Decimal fraction soil group C = 0.000
302 Decimal fraction soil group D = 1.000
303 [UNDISTURBED NATURAL TERRAIN ]
304 (Permanent Open Space )
305 Impervious value, Ai = 0.000
306 Sub-Area C Value = 0.350
307 Rainfall intensity = 5.429 (In/Hr) for a 100.0 year storm
308 Effective runoff coefficient used for total area
309 (Q=KCIA) is C = 0.350 CA = 3.014
310 Subarea runoff = 16.113 (CFS) for 8.518 (Ac.)
311 Total runoff = 16.364 (CFS) Total area = 8.612 (Ac.)
312 Depth of flow = 0.254 (Ft.), Average velocity = 6.067 (Ft/s)
313
314
315 ++++++
316 Process from Point/Station 203.000 to Point/Station 203.000
317 **** SUBAREA FLOW ADDITION ****
318 -----
319 Rainfall intensity (I) = 5.429 (In/Hr) for a 100.0 year storm
320 Decimal fraction soil group A = 0.000
321 Decimal fraction soil group B = 0.000
322 Decimal fraction soil group C = 0.000
323 Decimal fraction soil group D = 1.000
324 [UNDISTURBED NATURAL TERRAIN ]
325 (Permanent Open Space )
326 Impervious value, Ai = 0.000
327 Sub-Area C Value = 0.350
328 Time of concentration = 8.49 min.
329 Rainfall intensity = 5.429 (In/Hr) for a 100.0 year storm
330 Effective runoff coefficient used for total area
331 (Q=KCIA) is C = 0.350 CA = 8.389
332 Subarea runoff = 29.179 (CFS) for 15.356 (Ac.)
333 Total runoff = 45.544 (CFS) Total area = 23.968 (Ac.)
334
335
336 ++++++
337 Process from Point/Station 106.000 to Point/Station 106.000
338 **** CONFLUENCE OF MINOR STREAMS ****
339 -----
340 Along Main Stream number: 1 in normal stream number 2
341 Stream flow area = 23.968 (Ac.)
342 Runoff from this stream = 45.544 (CFS)
343 Time of concentration = 8.49 min.
344 Rainfall intensity = 5.429 (In/Hr)
345 Summary of stream data:

```

```

346
347 Stream      Flow rate      TC      Rainfall Intensity
348   No.      (CFS)      (min)      (In/Hr)
349
350
351 1          35.382      16.53      3.534
352 2          45.544      8.49      5.429
353 Qmax(1) =
354     1.000 *      1.000 *      35.382) +
355     0.651 *      1.000 *      45.544) + =      65.028
356 Qmax(2) =
357     1.000 *      0.514 *      35.382) +
358     1.000 *      1.000 *      45.544) + =      63.728
359
360 Total of 2 streams to confluence:
361 Flow rates before confluence point:
362     35.382      45.544
363 Maximum flow rates at confluence using above data:
364     65.028      63.728
365 Area of streams before confluence:
366     22.352      23.968
367 Results of confluence:
368 Total flow rate =      65.028 (CFS)
369 Time of concentration =      16.525 min.
370 Effective stream area after confluence =      46.320 (Ac.)
371
372
373 ++++++
374 Process from Point/Station      106.000 to Point/Station      107.000
375 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
376
377 -----
378 Estimated mean flow rate at midpoint of channel =      65.078 (CFS)
379 Depth of flow =      0.837 (Ft.), Average velocity =      6.432 (Ft/s)
380 ***** Irregular Channel Data *****
381
382 -----
383 Information entered for subchannel number 1 :
384 Point number      'X' coordinate      'Y' coordinate
385 1          0.00      18.00
386 2          45.00      0.00
387 3          55.00      0.00
388 4          100.00      18.00
389 Manning's 'N' friction factor =      0.040
390
391 -----
392 Sub-Channel flow =      65.078 (CFS)
393 '      '      flow top width =      14.184 (Ft.)
394 '      '      velocity=      6.432 (Ft/s)
395 '      '      area =      10.118 (Sq.Ft)
396 '      '      Froude number =      1.342
397
398 Upstream point elevation =      516.000 (Ft.)
399 Downstream point elevation =      505.000 (Ft.)
400 Flow length =      227.000 (Ft.)
401 Travel time =      0.59 min.
402 Time of concentration =      17.11 min.
403 Depth of flow =      0.837 (Ft.)
404 Average velocity =      6.432 (Ft/s)
405 Total irregular channel flow =      65.078 (CFS)
406 Irregular channel normal depth above invert elev. =      0.837 (Ft.)
407 Average velocity of channel(s) =      6.432 (Ft/s)
408 Adding area flow to channel
409 Rainfall intensity (I) =      3.455 (In/Hr) for a      100.0 year storm
410 Decimal fraction soil group A = 0.000
411 Decimal fraction soil group B = 0.000
412 Decimal fraction soil group C = 0.000
413 Decimal fraction soil group D = 1.000
414 [UNDISTURBED NATURAL TERRAIN      ]
415 (Permanent Open Space      )
416 Impervious value, Ai = 0.000
417 Sub-Area C Value = 0.350

```



```

415 Rainfall intensity =      3.455(In/Hr) for a   100.0 year storm
416 Effective runoff coefficient used for total area
417 (Q=KCIA) is C = 0.396  CA =      18.834
418 Subarea runoff =      0.048(CFS) for      1.239(Ac.)
419 Total runoff =      65.075(CFS)  Total area =      47.559(Ac.)
420 Depth of flow =      0.837(Ft.), Average velocity =      6.432(Ft/s)
421
422
423 ++++++
424 Process from Point/Station      107.000 to Point/Station      107.000
425 **** CONFLUENCE OF MINOR STREAMS ****
426
427 -----
428 Along Main Stream number: 1 in normal stream number 1
429 Stream flow area =      47.559(Ac.)
430 Runoff from this stream =      65.075(CFS)
431 Time of concentration =      17.11 min.
432 Rainfall intensity =      3.455(In/Hr)
433
434 ++++++
435 Process from Point/Station      301.000 to Point/Station      302.000
436 **** INITIAL AREA EVALUATION ****
437
438 -----
439 Decimal fraction soil group A = 0.000
440 Decimal fraction soil group B = 0.000
441 Decimal fraction soil group C = 0.000
442 Decimal fraction soil group D = 1.000
443 [UNDISTURBED NATURAL TERRAIN          ]
444 (Permanent Open Space   )
445 Impervious value, Ai = 0.000
446 Sub-Area C Value = 0.350
447 Initial subarea total flow distance = 102.000(Ft.)
448 Highest elevation = 810.000(Ft.)
449 Lowest elevation = 808.000(Ft.)
450 Elevation difference = 2.000(Ft.) Slope = 1.961 %
451 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
452 The maximum overland flow distance is 85.00 (Ft)
453 for the top area slope value of 1.96 %, in a development type of
454 Permanent Open Space
455 In Accordance With Figure 3-3
456 Initial Area Time of Concentration = 9.94 minutes
457 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
458 TC = [1.8*(1.1-0.3500)*( 85.000^.5)/( 1.961^(1/3)]= 9.94
459 The initial area total distance of 102.00 (Ft.) entered leaves a
460 remaining distance of 17.00 (Ft.)
461 Using Figure 3-4, the travel time for this distance is 0.31 minutes
462 for a distance of 17.00 (Ft.) and a slope of 1.96 %
463 with an elevation difference of 0.33(Ft.) from the end of the top area
464 Tt = [11.9*length(Mi)^3]/(elevation change(Ft.))]^.385 *60(min/hr)
465 = 0.314 Minutes
466 Tt=[(11.9*0.0032^3)/( 0.33)]^.385= 0.31
467 Total initial area Ti = 9.94 minutes from Figure 3-3 formula plus
468 0.31 minutes from the Figure 3-4 formula = 10.26 minutes
469 Rainfall intensity (I) =      4.807(In/Hr) for a   100.0 year storm
470 Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
471 Subarea runoff =      0.119(CFS)
472 Total initial stream area =      0.071(Ac.)
473
474 ++++++
475 Process from Point/Station      302.000 to Point/Station      107.000
476 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
477
478 -----
479 Estimated mean flow rate at midpoint of channel =      12.804(CFS)
480 Depth of flow =      0.234(Ft.), Average velocity =      5.172(Ft/s)
481 ***** Irregular Channel Data *****
482 -----
483 Information entered for subchannel number 1 :
484 Point number      'X' coordinate      'Y' coordinate

```

```

484         1           0.00           18.00
485         2          45.00           0.00
486         3          55.00           0.00
487         4         100.00          18.00
488 Manning's 'N' friction factor = 0.040
489 -----
490 Sub-Channel flow = 12.804 (CFS)
491 ' ' flow top width = 11.169 (Ft.)
492 ' ' velocity = 5.172 (Ft/s)
493 ' ' area = 2.475 (Sq.Ft)
494 ' ' Froude number = 1.936
495
496 Upstream point elevation = 808.000 (Ft.)
497 Downstream point elevation = 505.000 (Ft.)
498 Flow length = 2074.000 (Ft.)
499 Travel time = 6.68 min.
500 Time of concentration = 16.94 min.
501 Depth of flow = 0.234 (Ft.)
502 Average velocity = 5.172 (Ft/s)
503 Total irregular channel flow = 12.804 (CFS)
504 Irregular channel normal depth above invert elev. = 0.234 (Ft.)
505 Average velocity of channel(s) = 5.172 (Ft/s)
506 Adding area flow to channel
507 Rainfall intensity (I) = 3.478 (In/Hr) for a 100.0 year storm
508 Decimal fraction soil group A = 0.000
509 Decimal fraction soil group B = 0.000
510 Decimal fraction soil group C = 0.000
511 Decimal fraction soil group D = 1.000
512 [UNDISTURBED NATURAL TERRAIN ]
513 (Permanent Open Space )
514 Impervious value, Ai = 0.000
515 Sub-Area C Value = 0.350
516 Rainfall intensity = 3.478 (In/Hr) for a 100.0 year storm
517 Effective runoff coefficient used for total area
518 (Q=KCIA) is C = 0.350 CA = 7.309
519 Subarea runoff = 25.300 (CFS) for 20.812 (Ac.)
520 Total runoff = 25.419 (CFS) Total area = 20.883 (Ac.)
521 Depth of flow = 0.351 (Ft.), Average velocity = 6.658 (Ft/s)
522
523
524 +-----+
525 Process from Point/Station 107.000 to Point/Station 107.000
526 **** CONFLUENCE OF MINOR STREAMS ****
527 -----
528 Along Main Stream number: 1 in normal stream number 2
529 Stream flow area = 20.883 (Ac.)
530 Runoff from this stream = 25.419 (CFS)
531 Time of concentration = 16.94 min.
532 Rainfall intensity = 3.478 (In/Hr)
533 Summary of stream data:
534
535 Stream Flow rate TC Rainfall Intensity
536 No. (CFS) (min) (In/Hr)
537
538
539 1 65.075 17.11 3.455
540 2 25.419 16.94 3.478
541 Qmax (1) =
542 1.000 * 1.000 * 65.075) +
543 0.993 * 1.000 * 25.419) + = 90.329
544 Qmax (2) =
545 1.000 * 0.990 * 65.075) +
546 1.000 * 1.000 * 25.419) + = 89.840
547
548 Total of 2 streams to confluence:
549 Flow rates before confluence point:
550 65.075 25.419
551 Maximum flow rates at confluence using above data:
552 90.329 89.840

```

```

553 Area of streams before confluence:
554     47.559     20.883
555 Results of confluence:
556 Total flow rate =     90.329 (CFS)
557 Time of concentration =     17.113 min.
558 Effective stream area after confluence =     68.442 (Ac.)
559
560
561 ++++++
562 Process from Point/Station     107.000 to Point/Station     107.500
563 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
564
565 -----
566 Estimated mean flow rate at midpoint of channel =     101.915 (CFS)
567 Depth of flow =     0.981 (Ft.), Average velocity =     8.343 (Ft/s)
568 ***** Irregular Channel Data *****
569 -----
570 Information entered for subchannel number 1 :
571 Point number      'X' coordinate      'Y' coordinate
572     1              0.00              18.00
573     2             45.00              0.00
574     3             55.00              0.00
575     4            100.00             18.00
576 Manning's 'N' friction factor =     0.040
577 -----
578 Sub-Channel flow =     101.915 (CFS)
579 '      '      flow top width =     14.905 (Ft.)
580 '      '      velocity =     8.343 (Ft/s)
581 '      '      area =     12.215 (Sq.Ft)
582 '      '      Froude number =     1.624
583
584 Upstream point elevation =     505.000 (Ft.)
585 Downstream point elevation =     454.000 (Ft.)
586 Flow length =     750.000 (Ft.)
587 Travel time =     1.50 min.
588 Time of concentration =     18.61 min.
589 Depth of flow =     0.981 (Ft.)
590 Average velocity =     8.343 (Ft/s)
591 Total irregular channel flow =     101.915 (CFS)
592 Irregular channel normal depth above invert elev. =     0.981 (Ft.)
593 Average velocity of channel(s) =     8.343 (Ft/s)
594 Adding area flow to channel
595 Rainfall intensity (I) =     3.273 (In/Hr) for a     100.0 year storm
596 Decimal fraction soil group A = 0.000
597 Decimal fraction soil group B = 0.000
598 Decimal fraction soil group C = 0.000
599 Decimal fraction soil group D = 1.000
600 [UNDISTURBED NATURAL TERRAIN ]
601 (Permanent Open Space )
602 Impervious value, Ai = 0.000
603 Sub-Area C Value = 0.350
604 Rainfall intensity =     3.273 (In/Hr) for a     100.0 year storm
605 Effective runoff coefficient used for total area
606 (Q=KCIA) is C = 0.374 CA =     34.654
607 Subarea runoff =     23.097 (CFS) for     24.316 (Ac.)
608 Total runoff =     113.426 (CFS) Total area =     92.758 (Ac.)
609 Depth of flow =     1.042 (Ft.), Average velocity =     8.634 (Ft/s)
610
611 ++++++
612 Process from Point/Station     107.500 to Point/Station     107.500
613 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
614
615 -----
616 Depth of flow =     0.716 (Ft.), Average velocity =     2.071 (Ft/s)
617 ***** Irregular Channel Data *****
618 -----
619 Information entered for subchannel number 1 :
620 Point number      'X' coordinate      'Y' coordinate
621     1              0.00              5.00
622     2             10.00              0.00

```



```

622         3           85.00           0.00
623         4           95.00           5.00
624 Manning's 'N' friction factor = 0.040
625 -----
626 Sub-Channel flow = 113.426 (CFS)
627 ' ' flow top width = 77.866 (Ft.)
628 ' ' velocity= 2.071 (Ft/s)
629 ' ' area = 54.759 (Sq.Ft)
630 ' ' Froude number = 0.435
631
632 Upstream point elevation = 454.000 (Ft.)
633 Downstream point elevation = 453.000 (Ft.)
634 Flow length = 200.000 (Ft.)
635 Travel time = 1.61 min.
636 Time of concentration = 20.22 min.
637 Depth of flow = 0.716 (Ft.)
638 Average velocity = 2.071 (Ft/s)
639 Total irregular channel flow = 113.426 (CFS)
640 Irregular channel normal depth above invert elev. = 0.716 (Ft.)
641 Average velocity of channel(s) = 2.071 (Ft/s)
642
643
644 ++++++
645 Process from Point/Station 107.500 to Point/Station 108.000
646 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
647 -----
648 Estimated mean flow rate at midpoint of channel = 118.508 (CFS)
649 Depth of flow = 1.214 (Ft.), Average velocity = 7.488 (Ft/s)
650 ***** Irregular Channel Data *****
651 -----
652 Information entered for subchannel number 1 :
653 Point number 'X' coordinate 'Y' coordinate
654 1 0.00 18.00
655 2 45.00 0.00
656 3 55.00 0.00
657 4 100.00 18.00
658 Manning's 'N' friction factor = 0.040
659 -----
660 Sub-Channel flow = 118.508 (CFS)
661 ' ' flow top width = 16.071 (Ft.)
662 ' ' velocity= 7.488 (Ft/s)
663 ' ' area = 15.827 (Sq.Ft)
664 ' ' Froude number = 1.330
665
666 Upstream point elevation = 453.000 (Ft.)
667 Downstream point elevation = 425.000 (Ft.)
668 Flow length = 650.000 (Ft.)
669 Travel time = 1.45 min.
670 Time of concentration = 21.67 min.
671 Depth of flow = 1.214 (Ft.)
672 Average velocity = 7.488 (Ft/s)
673 Total irregular channel flow = 118.508 (CFS)
674 Irregular channel normal depth above invert elev. = 1.214 (Ft.)
675 Average velocity of channel(s) = 7.488 (Ft/s)
676 Adding area flow to channel
677 Rainfall intensity (I) = 2.967 (In/Hr) for a 100.0 year storm
678 Decimal fraction soil group A = 0.000
679 Decimal fraction soil group B = 0.000
680 Decimal fraction soil group C = 0.000
681 Decimal fraction soil group D = 1.000
682 [UNDISTURBED NATURAL TERRAIN ]
683 (Permanent Open Space )
684 Impervious value, Ai = 0.000
685 Sub-Area C Value = 0.350
686 Rainfall intensity = 2.967 (In/Hr) for a 100.0 year storm
687 Effective runoff coefficient used for total area
688 (Q=KCIA) is C = 0.369 CA = 41.630
689 Subarea runoff = 10.105 (CFS) for 19.931 (Ac.)
690 Total runoff = 123.531 (CFS) Total area = 112.689 (Ac.)

```

691 Depth of flow = 1.243 (Ft.), Average velocity = 7.585 (Ft/s)
692
693
694 ++++++
695 Process from Point/Station 501.000 to Point/Station 108.000
696 **** SUBAREA FLOW ADDITION ****
697
698 Rainfall intensity (I) = 2.967 (In/Hr) for a 100.0 year storm
699 Decimal fraction soil group A = 0.000
700 Decimal fraction soil group B = 0.000
701 Decimal fraction soil group C = 0.000
702 Decimal fraction soil group D = 1.000
703 [UNDISTURBED NATURAL TERRAIN]
704 (Permanent Open Space)
705 Impervious value, Ai = 0.000
706 Sub-Area C Value = 0.350
707 Time of concentration = 21.67 min.
708 Rainfall intensity = 2.967 (In/Hr) for a 100.0 year storm
709 Effective runoff coefficient used for total area
710 (Q=KCIA) is C = 0.369 CA = 41.731
711 Subarea runoff = 0.299 (CFS) for 0.288 (Ac.)
712 Total runoff = 123.830 (CFS) Total area = 112.977 (Ac.)
713 End of computations, total study area = 112.977 (Ac.)
714
715
716

San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 02/26/20

PRE-DEVELOPMENT
POC-2
100 YR STORM

***** 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) = 2.900
24 hour precipitation(inches) = 5.250
P6/P24 = 55.2%
San Diego hydrology manual 'C' values used

Process from Point/Station 401.000 to Point/Station 402.000
**** 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
[UNDISTURBED NATURAL TERRAIN]
(Permanent Open Space)
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance = 82.000 (Ft.)
Highest elevation = 598.000 (Ft.)
Lowest elevation = 586.000 (Ft.)
Elevation difference = 12.000 (Ft.) Slope = 14.634 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 14.63 %, in a development type of
Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration = 5.52 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance (Ft.)}^{.5} / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.3500) * (100.000^{.5}) / (14.634^{(1/3)})] = 5.52$
Rainfall intensity (I) = 7.169 (In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff = 0.276 (CFS)
Total initial stream area = 0.110 (Ac.)

Process from Point/Station 402.000 to Point/Station 404.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 6.296 (CFS)
Depth of flow = 0.202 (Ft.), Average velocity = 5.382 (Ft/s)
***** Irregular Channel Data *****


```

70 -----
71 Information entered for subchannel number 1 :
72 Point number      'X' coordinate      'Y' coordinate
73      1              0.00              5.00
74      2             20.00              0.00
75      3             25.00              0.00
76      4             45.00              5.00
77 Manning's 'N' friction factor =    0.040
78 -----
79 Sub-Channel flow =    6.296 (CFS)
80 '      ' flow top width =    6.612 (Ft.)
81 '      ' velocity =    5.382 (Ft/s)
82 '      ' area =    1.170 (Sq.Ft)
83 '      ' Froude number =    2.255
84
85 Upstream point elevation =    586.000 (Ft.)
86 Downstream point elevation =    436.000 (Ft.)
87 Flow length =    703.000 (Ft.)
88 Travel time =    2.18 min.
89 Time of concentration =    7.70 min.
90 Depth of flow =    0.202 (Ft.)
91 Average velocity =    5.382 (Ft/s)
92 Total irregular channel flow =    6.296 (CFS)
93 Irregular channel normal depth above invert elev. =    0.202 (Ft.)
94 Average velocity of channel(s) =    5.382 (Ft/s)
95 Adding area flow to channel
96 Rainfall intensity (I) =    5.785 (In/Hr) for a    100.0 year storm
97 Decimal fraction soil group A = 0.000
98 Decimal fraction soil group B = 0.000
99 Decimal fraction soil group C = 0.000
100 Decimal fraction soil group D = 1.000
101 [UNDISTURBED NATURAL TERRAIN
102 (Permanent Open Space )
103 Impervious value, Ai = 0.000
104 Sub-Area C Value = 0.350
105 Rainfall intensity =    5.785 (In/Hr) for a    100.0 year storm
106 Effective runoff coefficient used for total area
107 (Q=KCIA) is C = 0.350 CA =    2.119
108 Subarea runoff =    11.980 (CFS) for    5.943 (Ac.)
109 Total runoff =    12.256 (CFS) Total area =    6.053 (Ac.)
110 Depth of flow =    0.295 (Ft.), Average velocity =    6.724 (Ft/s)
111
112
113 +-----+
114 Process from Point/Station    403.000 to Point/Station    403.000
115 **** SUBAREA FLOW ADDITION ****
116
117 -----
118 Rainfall intensity (I) =    5.785 (In/Hr) for a    100.0 year storm
119 Decimal fraction soil group A = 0.000
120 Decimal fraction soil group B = 0.000
121 Decimal fraction soil group C = 0.000
122 Decimal fraction soil group D = 1.000
123 [UNDISTURBED NATURAL TERRAIN
124 (Permanent Open Space )
125 Impervious value, Ai = 0.000
126 Sub-Area C Value = 0.350
127 Time of concentration =    7.70 min.
128 Rainfall intensity =    5.785 (In/Hr) for a    100.0 year storm
129 Effective runoff coefficient used for total area
130 (Q=KCIA) is C = 0.350 CA =    2.722
131 Subarea runoff =    3.493 (CFS) for    1.725 (Ac.)
132 Total runoff =    15.749 (CFS) Total area =    7.778 (Ac.)
133 End of computations, total study area =    7.778 (Ac.)
134
135

```

```

1
2 San Diego County Rational Hydrology Program
3
4 CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
5
6 Rational method hydrology program based on
7 San Diego County Flood Control Division 2003 hydrology manual
8 Rational Hydrology Study Date: 02/27/25
9 -----
10 PRE-DEVELOPMENT
11 POC-3
12 100 YR STORM
13 19089predevpoc3.out
14 -----
15 ***** Hydrology Study Control Information *****
16 -----
17
18
19
20 Program License Serial Number 6332
21 -----
22
23 Rational hydrology study storm event year is 100.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 2.900
28 24 hour precipitation(inches) = 5.250
29 P6/P24 = 55.2%
30 San Diego hydrology manual 'C' values used
31
32
33 +-----+
34 Process from Point/Station 901.000 to Point/Station 902.000
35 **** INITIAL AREA EVALUATION ****
36 -----
37 Decimal fraction soil group A = 0.000
38 Decimal fraction soil group B = 0.000
39 Decimal fraction soil group C = 0.000
40 Decimal fraction soil group D = 1.000
41 [UNDISTURBED NATURAL TERRAIN ]
42 (Permanent Open Space )
43 Impervious value, Ai = 0.000
44 Sub-Area C Value = 0.350
45 Initial subarea total flow distance = 106.000 (Ft.)
46 Highest elevation = 472.000 (Ft.)
47 Lowest elevation = 421.000 (Ft.)
48 Elevation difference = 51.000 (Ft.) Slope = 48.113 %
49 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50 The maximum overland flow distance is 100.00 (Ft)
51 for the top area slope value of 48.11 %, in a development type of
52 Permanent Open Space
53 In Accordance With Figure 3-3
54 Initial Area Time of Concentration = 3.71 minutes
55  $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5} / (% slope^{(1/3)})]$ 
56  $TC = [1.8 * (1.1 - 0.3500) * (100.000^{.5}) / (48.113^{(1/3)})] = 3.71$ 
57 The initial area total distance of 106.00 (Ft.) entered leaves a
58 remaining distance of 6.00 (Ft.)
59 Using Figure 3-4, the travel time for this distance is 0.04 minutes
60 for a distance of 6.00 (Ft.) and a slope of 48.11 %
61 with an elevation difference of 2.89 (Ft.) from the end of the top area
62  $Tt = [11.9 * length(Mi)^3 / (elevation change(Ft.))]^{.385} * 60 (min/hr)$ 
63 = 0.041 Minutes
64  $Tt = [(11.9 * 0.0011^3) / (2.89)]^{.385} = 0.04$ 
65 Total initial area Ti = 3.71 minutes from Figure 3-3 formula plus
66 0.04 minutes from the Figure 3-4 formula = 3.75 minutes
67 Calculated TC of 3.753 minutes is less than 5 minutes,
68 resetting TC to 5.0 minutes for rainfall intensity calculations
69 Rainfall intensity (I) = 7.641 (In/Hr) for a 100.0 year storm

```

70 Effective runoff coefficient used for area (Q=KCIA) is $C = 0.350$
71 Subarea runoff = 0.463 (CFS)
72 Total initial stream area = 0.173 (Ac.)
73 End of computations, total study area = 0.173 (Ac.)
74
75
76

ATTACHMENT 3.2

```

1
2      San Diego County Rational Hydrology Program
3
4      CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
5
6      Rational method hydrology program based on
7      San Diego County Flood Control Division 2003 hydrology manual
8      Rational Hydrology Study      Date: 03/11/26
9      -----
10     POST-DEVELOPMENT
11     POC-1 UN-MITIGATED
12     100-YR
13     UPDATED 9-8-25
14     -----
15     ***** Hydrology Study Control Information *****
16     -----
17
18
19
20     Program License Serial Number 6332
21
22     -----
23     Rational hydrology study storm event year is 100.0
24     English (in-lb) input data Units used
25
26     Map data precipitation entered:
27     6 hour, precipitation(inches) = 2.900
28     24 hour precipitation(inches) = 5.250
29     P6/P24 = 55.2%
30     San Diego hydrology manual 'C' values used
31
32
33     +-----+
34     Process from Point/Station 101.000 to Point/Station 102.000
35     **** INITIAL AREA EVALUATION ****
36     -----
37     Decimal fraction soil group A = 0.000
38     Decimal fraction soil group B = 0.000
39     Decimal fraction soil group C = 0.000
40     Decimal fraction soil group D = 1.000
41     [MEDIUM DENSITY RESIDENTIAL
42     (4.3 DU/A or Less )
43     Impervious value, Ai = 0.300
44     Sub-Area C Value = 0.520
45     Initial subarea total flow distance = 98.000 (Ft.)
46     Highest elevation = 776.000 (Ft.)
47     Lowest elevation = 775.500 (Ft.)
48     Elevation difference = 0.500 (Ft.) Slope = 0.510 %
49     INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50     The maximum overland flow distance is 50.00 (Ft)
51     for the top area slope value of 0.51 %, in a development type of
52     4.3 DU/A or Less
53     In Accordance With Figure 3-3
54     Initial Area Time of Concentration = 9.24 minutes
55     TC = [1.8*(1.1-C)*distance (Ft.)^.5]/(% slope^(1/3)]
56     TC = [1.8*(1.1-0.5200)*( 50.000^.5)/( 0.510^(1/3)]= 9.24
57     The initial area total distance of 98.00 (Ft.) entered leaves a
58     remaining distance of 48.00 (Ft.)
59     Using Figure 3-4, the travel time for this distance is 1.17 minutes
60     for a distance of 48.00 (Ft.) and a slope of 0.51 %
61     with an elevation difference of 0.24 (Ft.) from the end of the top area
62     Tt = [11.9*length (Mi)^3]/(elevation change (Ft.))]^.385 *60 (min/hr)
63     = 1.174 Minutes
64     Tt=[(11.9*0.0091^3)/( 0.24)]^.385= 1.17
65     Total initial area Ti = 9.24 minutes from Figure 3-3 formula plus
66     1.17 minutes from the Figure 3-4 formula = 10.41 minutes
67     Rainfall intensity (I) = 4.760 (In/Hr) for a 100.0 year storm
68     Effective runoff coefficient used for area (Q=KCIA) is C = 0.520
69     Subarea runoff = 0.673 (CFS)

```

```

70 Total initial stream area = 0.272 (Ac.)
71
72
73 ++++++
74 Process from Point/Station 102.000 to Point/Station 103.000
75 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
76
77 -----
78 Estimated mean flow rate at midpoint of channel = 7.957 (CFS)
79 Depth of flow = 0.247 (Ft.), Average velocity = 5.183 (Ft/s)
80 ***** Irregular Channel Data *****
81 -----
82 Information entered for subchannel number 1 :
83 Point number 'X' coordinate 'Y' coordinate
84 1 0.00 0.50
85 2 25.00 0.00
86 3 25.10 0.50
87 4 30.00 0.51
88 Manning's 'N' friction factor = 0.013
89 -----
90 Sub-Channel flow = 7.957 (CFS)
91 ' ' flow top width = 12.415 (Ft.)
92 ' ' velocity = 5.184 (Ft/s)
93 ' ' area = 1.535 (Sq.Ft)
94 ' ' Froude number = 2.598
95
96 Upstream point elevation = 775.500 (Ft.)
97 Downstream point elevation = 748.000 (Ft.)
98 Flow length = 806.000 (Ft.)
99 Travel time = 2.59 min.
100 Time of concentration = 13.01 min.
101 Depth of flow = 0.247 (Ft.)
102 Average velocity = 5.183 (Ft/s)
103 Total irregular channel flow = 7.957 (CFS)
104 Irregular channel normal depth above invert elev. = 0.247 (Ft.)
105 Average velocity of channel(s) = 5.183 (Ft/s)
106 Adding area flow to channel
107 Rainfall intensity (I) = 4.124 (In/Hr) for a 100.0 year storm
108 Decimal fraction soil group A = 0.000
109 Decimal fraction soil group B = 0.000
110 Decimal fraction soil group C = 0.000
111 Decimal fraction soil group D = 1.000
112 [MEDIUM DENSITY RESIDENTIAL ]
113 (4.3 DU/A or Less )
114 Impervious value, Ai = 0.300
115 Sub-Area C Value = 0.520
116 Rainfall intensity = 4.124 (In/Hr) for a 100.0 year storm
117 Effective runoff coefficient used for total area
118 (Q=KCIA) is C = 0.520 CA = 3.675
119 Subarea runoff = 14.485 (CFS) for 6.796 (Ac.)
120 Total runoff = 15.159 (CFS) Total area = 7.068 (Ac.)
121 Depth of flow = 0.315 (Ft.), Average velocity = 6.090 (Ft/s)
122
123 ++++++
124 Process from Point/Station 104.000 to Point/Station 104.000
125 **** SUBAREA FLOW ADDITION ****
126
127 -----
128 Rainfall intensity (I) = 4.124 (In/Hr) for a 100.0 year storm
129 Decimal fraction soil group A = 0.000
130 Decimal fraction soil group B = 0.000
131 Decimal fraction soil group C = 0.000
132 Decimal fraction soil group D = 1.000
133 [MEDIUM DENSITY RESIDENTIAL ]
134 (4.3 DU/A or Less )
135 Impervious value, Ai = 0.300
136 Sub-Area C Value = 0.520
137 Time of concentration = 13.01 min.
138 Rainfall intensity = 4.124 (In/Hr) for a 100.0 year storm
139 Effective runoff coefficient used for total area

```



```

139      (Q=KCIA) is C = 0.520  CA = 6.694
140      Subarea runoff = 12.452(CFS) for 5.806(Ac.)
141      Total runoff = 27.611(CFS) Total area = 12.874(Ac.)
142
143
144      ++++++
145      Process from Point/Station 104.000 to Point/Station 105.000
146      **** PIPEFLOW TRAVEL TIME (User specified size) ****
147
148      Upstream point/station elevation = 738.000(Ft.)
149      Downstream point/station elevation = 732.000(Ft.)
150      Pipe length = 305.00(Ft.) Slope = 0.0197 Manning's N = 0.013
151      No. of pipes = 1 Required pipe flow = 27.611(CFS)
152      Given pipe size = 24.00(In.)
153      Calculated individual pipe flow = 27.611(CFS)
154      Normal flow depth in pipe = 17.32(In.)
155      Flow top width inside pipe = 21.51(In.)
156      Critical Depth = 21.84(In.)
157      Pipe flow velocity = 11.38(Ft/s)
158      Travel time through pipe = 0.45 min.
159      Time of concentration (TC) = 13.45 min.
160
161
162      ++++++
163      Process from Point/Station 105.000 to Point/Station 106.000
164      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
165
166      Estimated mean flow rate at midpoint of channel = 31.525(CFS)
167      Depth of flow = 0.389(Ft.), Average velocity = 7.387(Ft/s)
168      ***** Irregular Channel Data *****
169
170      -----
171      Information entered for subchannel number 1 :
172      Point number 'X' coordinate 'Y' coordinate
173      1 0.00 18.00
174      2 45.00 0.00
175      3 55.00 0.00
176      4 100.00 18.00
177      Manning's 'N' friction factor = 0.040
178
179      -----
180      Sub-Channel flow = 31.525(CFS)
181      ' ' flow top width = 11.945(Ft.)
182      ' ' velocity = 7.387(Ft/s)
183      ' ' area = 4.267(Sq.Ft)
184      ' ' Froude number = 2.178
185
186      Upstream point elevation = 732.000(Ft.)
187      Downstream point elevation = 516.000(Ft.)
188      Flow length = 1362.000(Ft.)
189      Travel time = 3.07 min.
190      Time of concentration = 16.53 min.
191      Depth of flow = 0.389(Ft.)
192      Average velocity = 7.387(Ft/s)
193      Total irregular channel flow = 31.525(CFS)
194      Irregular channel normal depth above invert elev. = 0.389(Ft.)
195      Average velocity of channel(s) = 7.387(Ft/s)
196      Adding area flow to channel
197      Rainfall intensity (I) = 3.534(In/Hr) for a 100.0 year storm
198      Decimal fraction soil group A = 0.000
199      Decimal fraction soil group B = 0.000
200      Decimal fraction soil group C = 0.000
201      Decimal fraction soil group D = 1.000
202      [UNDISTURBED NATURAL TERRAIN ]
203      (Permanent Open Space )
204      Impervious value, Ai = 0.000
205      Sub-Area C Value = 0.350
206      Rainfall intensity = 3.534(In/Hr) for a 100.0 year storm
207      Effective runoff coefficient used for total area
208      (Q=KCIA) is C = 0.448 CA = 10.012
209      Subarea runoff = 7.771(CFS) for 9.478(Ac.)

```

```

208 Total runoff =      35.382(CFS)  Total area =      22.352(Ac.)
209 Depth of flow =    0.416(Ft.), Average velocity =    7.699(Ft/s)
210
211
212 ++++++
213 Process from Point/Station      106.000 to Point/Station      106.000
214 **** CONFLUENCE OF MINOR STREAMS ****
215
216 -----
217 Along Main Stream number: 1 in normal stream number 1
218 Stream flow area =      22.352(Ac.)
219 Runoff from this stream =      35.382(CFS)
220 Time of concentration =    16.53 min.
221 Rainfall intensity =      3.534(In/Hr)
222
223 ++++++
224 Process from Point/Station      201.000 to Point/Station      202.000
225 **** INITIAL AREA EVALUATION ****
226
227 -----
228 Decimal fraction soil group A = 0.000
229 Decimal fraction soil group B = 0.000
230 Decimal fraction soil group C = 0.000
231 Decimal fraction soil group D = 1.000
232 [UNDISTURBED NATURAL TERRAIN          ]
233 (Permanent Open Space    )
234 Impervious value, Ai = 0.000
235 Sub-Area C Value = 0.350
236 Initial subarea total flow distance = 117.000(Ft.)
237 Highest elevation = 748.000(Ft.)
238 Lowest elevation = 716.000(Ft.)
239 Elevation difference = 32.000(Ft.) Slope = 27.350 %
240 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
241 The maximum overland flow distance is 100.00 (Ft)
242 for the top area slope value of 27.35 %, in a development type of
243 Permanent Open Space
244 In Accordance With Figure 3-3
245 Initial Area Time of Concentration = 4.48 minutes
246 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
247 TC = [1.8*(1.1-0.3500)*( 100.000^.5)/( 27.350^(1/3)]= 4.48
248 The initial area total distance of 117.00 (Ft.) entered leaves a
249 remaining distance of 17.00 (Ft.)
250 Using Figure 3-4, the travel time for this distance is 0.11 minutes
251 for a distance of 17.00 (Ft.) and a slope of 27.35 %
252 with an elevation difference of 4.65(Ft.) from the end of the top area
253 Tt = [11.9*length(Mi)^3]/(elevation change(Ft.))]^.385 *60(min/hr)
254 = 0.114 Minutes
255 Tt=[(11.9*0.0032^3)/( 4.65)]^.385= 0.11
256 Total initial area Ti = 4.48 minutes from Figure 3-3 formula plus
257 0.11 minutes from the Figure 3-4 formula = 4.59 minutes
258 Calculated TC of 4.595 minutes is less than 5 minutes,
259 resetting TC to 5.0 minutes for rainfall intensity calculations
260 Rainfall intensity (I) = 7.641(In/Hr) for a 100.0 year storm
261 Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
262 Subarea runoff = 0.251(CFS)
263 Total initial stream area = 0.094(Ac.)
264
265 ++++++
266 Process from Point/Station      202.000 to Point/Station      106.000
267 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
268
269 -----
270 Estimated mean flow rate at midpoint of channel = 8.354(CFS)
271 Depth of flow = 0.170(Ft.), Average velocity = 4.712(Ft/s)
272 ***** Irregular Channel Data *****
273 -----
274 Information entered for subchannel number 1 :
275 Point number      'X' coordinate      'Y' coordinate
276      1              0.00              18.00
277      2             45.00              0.00

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```

277      3      55.00      0.00
278      4      100.00      18.00
279 Manning's 'N' friction factor = 0.040
280 -----
281 Sub-Channel flow = 8.355 (CFS)
282 ' ' flow top width = 10.850 (Ft.)
283 ' ' velocity = 4.712 (Ft/s)
284 ' ' area = 1.773 (Sq.Ft)
285 ' ' Froude number = 2.054
286
287 Upstream point elevation = 716.000 (Ft.)
288 Downstream point elevation = 516.000 (Ft.)
289 Flow length = 1102.000 (Ft.)
290 Travel time = 3.90 min.
291 Time of concentration = 8.49 min.
292 Depth of flow = 0.170 (Ft.)
293 Average velocity = 4.712 (Ft/s)
294 Total irregular channel flow = 8.354 (CFS)
295 Irregular channel normal depth above invert elev. = 0.170 (Ft.)
296 Average velocity of channel(s) = 4.712 (Ft/s)
297 Adding area flow to channel
298 Rainfall intensity (I) = 5.429 (In/Hr) for a 100.0 year storm
299 Decimal fraction soil group A = 0.000
300 Decimal fraction soil group B = 0.000
301 Decimal fraction soil group C = 0.000
302 Decimal fraction soil group D = 1.000
303 [UNDISTURBED NATURAL TERRAIN ]
304 (Permanent Open Space )
305 Impervious value, Ai = 0.000
306 Sub-Area C Value = 0.350
307 Rainfall intensity = 5.429 (In/Hr) for a 100.0 year storm
308 Effective runoff coefficient used for total area
309 (Q=KCIA) is C = 0.350 CA = 3.014
310 Subarea runoff = 16.113 (CFS) for 8.518 (Ac.)
311 Total runoff = 16.364 (CFS) Total area = 8.612 (Ac.)
312 Depth of flow = 0.254 (Ft.), Average velocity = 6.067 (Ft/s)
313
314
315 ++++++
316 Process from Point/Station 203.000 to Point/Station 203.000
317 **** SUBAREA FLOW ADDITION ****
318 -----
319 Rainfall intensity (I) = 5.429 (In/Hr) for a 100.0 year storm
320 Decimal fraction soil group A = 0.000
321 Decimal fraction soil group B = 0.000
322 Decimal fraction soil group C = 0.000
323 Decimal fraction soil group D = 1.000
324 [UNDISTURBED NATURAL TERRAIN ]
325 (Permanent Open Space )
326 Impervious value, Ai = 0.000
327 Sub-Area C Value = 0.350
328 Time of concentration = 8.49 min.
329 Rainfall intensity = 5.429 (In/Hr) for a 100.0 year storm
330 Effective runoff coefficient used for total area
331 (Q=KCIA) is C = 0.350 CA = 8.389
332 Subarea runoff = 29.179 (CFS) for 15.356 (Ac.)
333 Total runoff = 45.544 (CFS) Total area = 23.968 (Ac.)
334
335
336 ++++++
337 Process from Point/Station 106.000 to Point/Station 106.000
338 **** CONFLUENCE OF MINOR STREAMS ****
339 -----
340 Along Main Stream number: 1 in normal stream number 2
341 Stream flow area = 23.968 (Ac.)
342 Runoff from this stream = 45.544 (CFS)
343 Time of concentration = 8.49 min.
344 Rainfall intensity = 5.429 (In/Hr)
345 Summary of stream data:

```



```

346
347 Stream      Flow rate      TC      Rainfall Intensity
348   No.      (CFS)      (min)      (In/Hr)
349
350
351 1          35.382      16.53      3.534
352 2          45.544      8.49      5.429
353 Qmax(1) =
354     1.000 *      1.000 *      35.382) +
355     0.651 *      1.000 *      45.544) + =      65.028
356 Qmax(2) =
357     1.000 *      0.514 *      35.382) +
358     1.000 *      1.000 *      45.544) + =      63.728
359
360 Total of 2 streams to confluence:
361 Flow rates before confluence point:
362     35.382      45.544
363 Maximum flow rates at confluence using above data:
364     65.028      63.728
365 Area of streams before confluence:
366     22.352      23.968
367 Results of confluence:
368 Total flow rate =      65.028 (CFS)
369 Time of concentration =      16.525 min.
370 Effective stream area after confluence =      46.320 (Ac.)
371
372
373 ++++++
374 Process from Point/Station      106.000 to Point/Station      107.000
375 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
376
377 -----
378 Estimated mean flow rate at midpoint of channel =      65.078 (CFS)
379 Depth of flow =      0.837 (Ft.), Average velocity =      6.432 (Ft/s)
380 ***** Irregular Channel Data *****
381
382 -----
383 Information entered for subchannel number 1 :
384 Point number      'X' coordinate      'Y' coordinate
385 1          0.00      18.00
386 2          45.00      0.00
387 3          55.00      0.00
388 4          100.00      18.00
389 Manning's 'N' friction factor =      0.040
390
391 -----
392 Sub-Channel flow =      65.078 (CFS)
393 '      '      flow top width =      14.184 (Ft.)
394 '      '      velocity=      6.432 (Ft/s)
395 '      '      area =      10.118 (Sq.Ft)
396 '      '      Froude number =      1.342
397
398 Upstream point elevation =      516.000 (Ft.)
399 Downstream point elevation =      505.000 (Ft.)
400 Flow length =      227.000 (Ft.)
401 Travel time =      0.59 min.
402 Time of concentration =      17.11 min.
403 Depth of flow =      0.837 (Ft.)
404 Average velocity =      6.432 (Ft/s)
405 Total irregular channel flow =      65.078 (CFS)
406 Irregular channel normal depth above invert elev. =      0.837 (Ft.)
407 Average velocity of channel(s) =      6.432 (Ft/s)
408 Adding area flow to channel
409 Rainfall intensity (I) =      3.455 (In/Hr) for a      100.0 year storm
410 Decimal fraction soil group A = 0.000
411 Decimal fraction soil group B = 0.000
412 Decimal fraction soil group C = 0.000
413 Decimal fraction soil group D = 1.000
414 [UNDISTURBED NATURAL TERRAIN      ]
415 (Permanent Open Space      )
416 Impervious value, Ai = 0.000
417 Sub-Area C Value = 0.350

```

```

415 Rainfall intensity =      3.455(In/Hr) for a   100.0 year storm
416 Effective runoff coefficient used for total area
417 (Q=KCIA) is C = 0.396  CA =      18.834
418 Subarea runoff =      0.048(CFS) for      1.239(Ac.)
419 Total runoff =      65.075(CFS)  Total area =      47.559(Ac.)
420 Depth of flow =      0.837(Ft.), Average velocity =      6.432(Ft/s)
421
422
423 ++++++
424 Process from Point/Station      107.000 to Point/Station      107.000
425 **** CONFLUENCE OF MINOR STREAMS ****
426
427 -----
428 Along Main Stream number: 1 in normal stream number 1
429 Stream flow area =      47.559(Ac.)
430 Runoff from this stream =      65.075(CFS)
431 Time of concentration =      17.11 min.
432 Rainfall intensity =      3.455(In/Hr)
433
434 ++++++
435 Process from Point/Station      301.000 to Point/Station      302.000
436 **** INITIAL AREA EVALUATION ****
437
438 -----
439 Decimal fraction soil group A = 0.000
440 Decimal fraction soil group B = 0.000
441 Decimal fraction soil group C = 0.000
442 Decimal fraction soil group D = 1.000
443 [UNDISTURBED NATURAL TERRAIN          ]
444 (Permanent Open Space   )
445 Impervious value, Ai = 0.000
446 Sub-Area C Value = 0.350
447 Initial subarea total flow distance = 102.000(Ft.)
448 Highest elevation = 810.000(Ft.)
449 Lowest elevation = 808.000(Ft.)
450 Elevation difference = 2.000(Ft.) Slope = 1.961 %
451 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
452 The maximum overland flow distance is 85.00 (Ft)
453 for the top area slope value of 1.96 %, in a development type of
454 Permanent Open Space
455 In Accordance With Figure 3-3
456 Initial Area Time of Concentration = 9.94 minutes
457 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
458 TC = [1.8*(1.1-0.3500)*( 85.000^.5)/( 1.961^(1/3)]= 9.94
459 The initial area total distance of 102.00 (Ft.) entered leaves a
460 remaining distance of 17.00 (Ft.)
461 Using Figure 3-4, the travel time for this distance is 0.31 minutes
462 for a distance of 17.00 (Ft.) and a slope of 1.96 %
463 with an elevation difference of 0.33(Ft.) from the end of the top area
464 Tt = [11.9*length(Mi)^3]/(elevation change(Ft.))]^.385 *60(min/hr)
465 = 0.314 Minutes
466 Tt=[(11.9*0.0032^3)/( 0.33)]^.385= 0.31
467 Total initial area Ti = 9.94 minutes from Figure 3-3 formula plus
468 0.31 minutes from the Figure 3-4 formula = 10.26 minutes
469 Rainfall intensity (I) =      4.807(In/Hr) for a   100.0 year storm
470 Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
471 Subarea runoff =      0.119(CFS)
472 Total initial stream area =      0.071(Ac.)
473
474 ++++++
475 Process from Point/Station      302.000 to Point/Station      107.000
476 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
477
478 -----
479 Estimated mean flow rate at midpoint of channel =      12.804(CFS)
480 Depth of flow =      0.234(Ft.), Average velocity =      5.172(Ft/s)
481 ***** Irregular Channel Data *****
482 -----
483 Information entered for subchannel number 1 :
484 Point number      'X' coordinate      'Y' coordinate

```

```

484         1           0.00           18.00
485         2          45.00           0.00
486         3          55.00           0.00
487         4         100.00          18.00
488 Manning's 'N' friction factor = 0.040
489 -----
490 Sub-Channel flow = 12.804 (CFS)
491 ' ' flow top width = 11.169 (Ft.)
492 ' ' velocity = 5.172 (Ft/s)
493 ' ' area = 2.475 (Sq.Ft)
494 ' ' Froude number = 1.936
495
496 Upstream point elevation = 808.000 (Ft.)
497 Downstream point elevation = 505.000 (Ft.)
498 Flow length = 2074.000 (Ft.)
499 Travel time = 6.68 min.
500 Time of concentration = 16.94 min.
501 Depth of flow = 0.234 (Ft.)
502 Average velocity = 5.172 (Ft/s)
503 Total irregular channel flow = 12.804 (CFS)
504 Irregular channel normal depth above invert elev. = 0.234 (Ft.)
505 Average velocity of channel(s) = 5.172 (Ft/s)
506 Adding area flow to channel
507 Rainfall intensity (I) = 3.478 (In/Hr) for a 100.0 year storm
508 Decimal fraction soil group A = 0.000
509 Decimal fraction soil group B = 0.000
510 Decimal fraction soil group C = 0.000
511 Decimal fraction soil group D = 1.000
512 [UNDISTURBED NATURAL TERRAIN ]
513 (Permanent Open Space )
514 Impervious value, Ai = 0.000
515 Sub-Area C Value = 0.350
516 Rainfall intensity = 3.478 (In/Hr) for a 100.0 year storm
517 Effective runoff coefficient used for total area
518 (Q=KCIA) is C = 0.350 CA = 7.309
519 Subarea runoff = 25.300 (CFS) for 20.812 (Ac.)
520 Total runoff = 25.419 (CFS) Total area = 20.883 (Ac.)
521 Depth of flow = 0.351 (Ft.), Average velocity = 6.658 (Ft/s)
522
523
524 ++++++
525 Process from Point/Station 107.000 to Point/Station 107.000
526 **** CONFLUENCE OF MINOR STREAMS ****
527 -----
528 Along Main Stream number: 1 in normal stream number 2
529 Stream flow area = 20.883 (Ac.)
530 Runoff from this stream = 25.419 (CFS)
531 Time of concentration = 16.94 min.
532 Rainfall intensity = 3.478 (In/Hr)
533 Summary of stream data:
534
535 Stream Flow rate TC Rainfall Intensity
536 No. (CFS) (min) (In/Hr)
537
538
539 1 65.075 17.11 3.455
540 2 25.419 16.94 3.478
541 Qmax (1) =
542 1.000 * 1.000 * 65.075) +
543 0.993 * 1.000 * 25.419) + = 90.329
544 Qmax (2) =
545 1.000 * 0.990 * 65.075) +
546 1.000 * 1.000 * 25.419) + = 89.840
547
548 Total of 2 streams to confluence:
549 Flow rates before confluence point:
550 65.075 25.419
551 Maximum flow rates at confluence using above data:
552 90.329 89.840

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553 Area of streams before confluence:
554     47.559     20.883
555 Results of confluence:
556 Total flow rate =     90.329 (CFS)
557 Time of concentration =     17.113 min.
558 Effective stream area after confluence =     68.442 (Ac.)
559
560
561 ++++++
562 Process from Point/Station     107.000 to Point/Station     108.000
563 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
564
565 -----
566 Estimated mean flow rate at midpoint of channel =     99.333 (CFS)
567 Depth of flow =     1.049 (Ft.), Average velocity =     7.504 (Ft/s)
568     ***** Irregular Channel Data *****
569 -----
570 Information entered for subchannel number 1 :
571 Point number      'X' coordinate      'Y' coordinate
572     1              0.00              18.00
573     2              45.00              0.00
574     3              55.00              0.00
575     4             100.00             18.00
576 Manning's 'N' friction factor =     0.040
577 -----
578 Sub-Channel flow =     99.333 (CFS)
579 '      '      flow top width =     15.244 (Ft.)
580 '      '      velocity =     7.504 (Ft/s)
581 '      '      area =     13.237 (Sq.Ft)
582 '      '      Froude number =     1.419
583
584 Upstream point elevation =     505.000 (Ft.)
585 Downstream point elevation =     454.000 (Ft.)
586 Flow length =     1000.000 (Ft.)
587 Travel time =     2.22 min.
588 Time of concentration =     19.33 min.
589 Depth of flow =     1.049 (Ft.)
590 Average velocity =     7.504 (Ft/s)
591 Total irregular channel flow =     99.333 (CFS)
592 Irregular channel normal depth above invert elev. =     1.049 (Ft.)
593 Average velocity of channel(s) =     7.504 (Ft/s)
594 Adding area flow to channel
595 Rainfall intensity (I) =     3.194 (In/Hr) for a     100.0 year storm
596 Decimal fraction soil group A = 0.000
597 Decimal fraction soil group B = 0.000
598 Decimal fraction soil group C = 0.000
599 Decimal fraction soil group D = 1.000
600 [UNDISTURBED NATURAL TERRAIN ]
601 (Permanent Open Space )
602 Impervious value, Ai = 0.000
603 Sub-Area C Value = 0.350
604 Rainfall intensity =     3.194 (In/Hr) for a     100.0 year storm
605 Effective runoff coefficient used for total area
606 (Q=KCIA) is C = 0.374 CA =     33.893
607 Subarea runoff =     17.912 (CFS) for     22.141 (Ac.)
608 Total runoff =     108.241 (CFS) Total area =     90.583 (Ac.)
609 Depth of flow =     1.101 (Ft.), Average velocity =     7.712 (Ft/s)
610
611 ++++++
612 Process from Point/Station     108.000 to Point/Station     109.000
613 **** PIPEFLOW TRAVEL TIME (User specified size) ****
614
615 -----
616 Upstream point/station elevation =     451.970 (Ft.)
617 Downstream point/station elevation =     449.740 (Ft.)
618 Pipe length =     447.00 (Ft.) Slope =     0.0050 Manning's N = 0.015
619 No. of pipes = 1 Required pipe flow =     108.241 (CFS)
620 Given pipe size =     48.00 (In.)
621 NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is

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622         2.876(Ft.)  at the headworks or inlet of the pipe(s)
623     Pipe friction loss =      3.378(Ft.)
624     Minor friction loss =      1.728(Ft.)  K-factor =      1.50
625     Pipe flow velocity =      8.61(Ft/s)
626     Travel time through pipe =      0.86 min.
627     Time of concentration (TC) =      20.20 min.
628
629
630     ++++++
631     Process from Point/Station      109.000 to Point/Station      109.000
632     **** 6 HOUR HYDROGRAPH ****
633
634     ++++++
635     Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003
636
637
638     Time of Concentration =      20.20
639     Basin Area =      90.58 Acres
640     6 Hour Rainfall =      2.900 Inches
641     Runoff Coefficient =      0.374
642     Peak Discharge =      108.24 CFS
643         Time (Min)      Discharge (CFS)
644             0              0.000
645             20             5.935
646             40             6.165
647             60             6.701
648             80             7.017
649             100            7.783
650             120            8.254
651             140            9.461
652             160           10.258
653             180           12.538
654             200           14.281
655             220           20.970
656             240           29.546
657             260          108.241
658             280           16.819
659             300           11.253
660             320            8.805
661             340            7.375
662             360            6.419
663             380            5.726
664     ++++++
665             6 - H O U R      S T O R M
666             R u n o f f      H y d r o g r a p h
667
668             -----
669             Hydrograph in      1      Minute intervals ((CFS))
670
671             -----
672     Time(h+m)  Volume Ac.Ft  Q(CFS)  0      27.1      54.1      81.2      108.2
673     0+ 0      0.0000      0.00  Q
674     0+ 1      0.0004      0.30  Q
675     0+ 2      0.0012      0.59  Q
676     0+ 3      0.0025      0.89  Q
677     0+ 4      0.0041      1.19  Q
678     0+ 5      0.0061      1.48  Q
679     0+ 6      0.0086      1.78  Q
680     0+ 7      0.0114      2.08  Q
681     0+ 8      0.0147      2.37  Q
682     0+ 9      0.0184      2.67  Q
683     0+10      0.0225      2.97  VQ
684     0+11      0.0270      3.26  VQ
685     0+12      0.0319      3.56  VQ
686     0+13      0.0372      3.86  VQ
687     0+14      0.0429      4.15  VQ
688     0+15      0.0491      4.45  VQ
689     0+16      0.0556      4.75  VQ
690     0+17      0.0625      5.05  VQ

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691	0+18	0.0699	5.34	VQ				
692	0+19	0.0777	5.64	V Q				
693	0+20	0.0858	5.94	V Q				
694	0+21	0.0940	5.95	V Q				
695	0+22	0.1022	5.96	V Q				
696	0+23	0.1105	5.97	V Q				
697	0+24	0.1187	5.98	V Q				
698	0+25	0.1270	5.99	V Q				
699	0+26	0.1352	6.00	V Q				
700	0+27	0.1435	6.02	V Q				
701	0+28	0.1518	6.03	V Q				
702	0+29	0.1601	6.04	V Q				
703	0+30	0.1685	6.05	V Q				
704	0+31	0.1768	6.06	V Q				
705	0+32	0.1852	6.07	V Q				
706	0+33	0.1936	6.08	V Q				
707	0+34	0.2020	6.10	V Q				
708	0+35	0.2104	6.11	VQ				
709	0+36	0.2188	6.12	VQ				
710	0+37	0.2272	6.13	VQ				
711	0+38	0.2357	6.14	VQ				
712	0+39	0.2442	6.15	VQ				
713	0+40	0.2527	6.17	VQ				
714	0+41	0.2612	6.19	VQ				
715	0+42	0.2698	6.22	VQ				
716	0+43	0.2784	6.25	VQ				
717	0+44	0.2870	6.27	VQ				
718	0+45	0.2957	6.30	VQ				
719	0+46	0.3044	6.33	VQ				
720	0+47	0.3131	6.35	VQ				
721	0+48	0.3219	6.38	VQ				
722	0+49	0.3308	6.41	VQ				
723	0+50	0.3396	6.43	VQ				
724	0+51	0.3485	6.46	VQ				
725	0+52	0.3575	6.49	VQ				
726	0+53	0.3664	6.51	VQ				
727	0+54	0.3754	6.54	VQ				
728	0+55	0.3845	6.57	VQ				
729	0+56	0.3936	6.59	VQ				
730	0+57	0.4027	6.62	VQ				
731	0+58	0.4118	6.65	VQ				
732	0+59	0.4210	6.67	Q				
733	1+ 0	0.4303	6.70	Q				
734	1+ 1	0.4395	6.72	Q				
735	1+ 2	0.4488	6.73	Q				
736	1+ 3	0.4581	6.75	Q				
737	1+ 4	0.4674	6.76	Q				
738	1+ 5	0.4767	6.78	Q				
739	1+ 6	0.4861	6.80	Q				
740	1+ 7	0.4955	6.81	Q				
741	1+ 8	0.5049	6.83	Q				
742	1+ 9	0.5143	6.84	Q				
743	1+10	0.5238	6.86	Q				
744	1+11	0.5332	6.88	Q				
745	1+12	0.5427	6.89	Q				
746	1+13	0.5522	6.91	Q				
747	1+14	0.5618	6.92	Q				
748	1+15	0.5713	6.94	Q				
749	1+16	0.5809	6.95	Q				
750	1+17	0.5905	6.97	Q				
751	1+18	0.6001	6.99	Q				
752	1+19	0.6098	7.00	Q				
753	1+20	0.6194	7.02	Q				
754	1+21	0.6292	7.06	QV				
755	1+22	0.6389	7.09	QV				
756	1+23	0.6488	7.13	QV				
757	1+24	0.6586	7.17	QV				
758	1+25	0.6686	7.21	QV				
759	1+26	0.6785	7.25	QV				

760	1+27	0.6886	7.29	QV				
761	1+28	0.6987	7.32	QV				
762	1+29	0.7088	7.36	QV				
763	1+30	0.7190	7.40	QV				
764	1+31	0.7292	7.44	QV				
765	1+32	0.7395	7.48	QV				
766	1+33	0.7499	7.51	QV				
767	1+34	0.7603	7.55	QV				
768	1+35	0.7708	7.59	QV				
769	1+36	0.7813	7.63	QV				
770	1+37	0.7918	7.67	QV				
771	1+38	0.8024	7.71	QV				
772	1+39	0.8131	7.74	QV				
773	1+40	0.8238	7.78	QV				
774	1+41	0.8346	7.81	Q V				
775	1+42	0.8454	7.83	Q V				
776	1+43	0.8562	7.85	Q V				
777	1+44	0.8670	7.88	Q V				
778	1+45	0.8779	7.90	Q V				
779	1+46	0.8888	7.92	Q V				
780	1+47	0.8998	7.95	Q V				
781	1+48	0.9108	7.97	Q V				
782	1+49	0.9218	7.99	Q V				
783	1+50	0.9328	8.02	Q V				
784	1+51	0.9439	8.04	Q V				
785	1+52	0.9550	8.07	Q V				
786	1+53	0.9661	8.09	Q V				
787	1+54	0.9773	8.11	Q V				
788	1+55	0.9885	8.14	QV				
789	1+56	0.9998	8.16	QV				
790	1+57	1.0110	8.18	QV				
791	1+58	1.0223	8.21	QV				
792	1+59	1.0337	8.23	QV				
793	2+ 0	1.0450	8.25	Q V				
794	2+ 1	1.0565	8.31	Q V				
795	2+ 2	1.0680	8.37	Q V				
796	2+ 3	1.0796	8.43	Q V				
797	2+ 4	1.0913	8.50	Q V				
798	2+ 5	1.1031	8.56	Q V				
799	2+ 6	1.1150	8.62	Q V				
800	2+ 7	1.1269	8.68	Q V				
801	2+ 8	1.1390	8.74	Q V				
802	2+ 9	1.1511	8.80	Q V				
803	2+10	1.1633	8.86	Q V				
804	2+11	1.1756	8.92	Q V				
805	2+12	1.1879	8.98	Q V				
806	2+13	1.2004	9.04	Q V				
807	2+14	1.2129	9.10	Q V				
808	2+15	1.2255	9.16	Q V				
809	2+16	1.2382	9.22	Q V				
810	2+17	1.2510	9.28	Q V				
811	2+18	1.2639	9.34	Q V				
812	2+19	1.2768	9.40	Q V				
813	2+20	1.2899	9.46	Q V				
814	2+21	1.3030	9.50	Q V				
815	2+22	1.3161	9.54	Q V				
816	2+23	1.3293	9.58	Q V				
817	2+24	1.3425	9.62	Q V				
818	2+25	1.3559	9.66	Q V				
819	2+26	1.3692	9.70	Q V				
820	2+27	1.3826	9.74	Q V				
821	2+28	1.3961	9.78	Q V				
822	2+29	1.4096	9.82	Q V				
823	2+30	1.4232	9.86	Q V				
824	2+31	1.4368	9.90	Q V				
825	2+32	1.4505	9.94	Q V				
826	2+33	1.4643	9.98	Q V				
827	2+34	1.4781	10.02	Q V				
828	2+35	1.4919	10.06	Q V				

829	2+36	1.5058	10.10	Q	V				
830	2+37	1.5198	10.14	Q	V				
831	2+38	1.5338	10.18	Q	V				
832	2+39	1.5479	10.22	Q	V				
833	2+40	1.5620	10.26	Q	V				
834	2+41	1.5763	10.37	Q	V				
835	2+42	1.5908	10.49	Q	V				
836	2+43	1.6054	10.60	Q	V				
837	2+44	1.6201	10.71	Q	V				
838	2+45	1.6350	10.83	Q	V				
839	2+46	1.6501	10.94	Q	V				
840	2+47	1.6653	11.06	Q	V				
841	2+48	1.6807	11.17	Q	V				
842	2+49	1.6963	11.28	Q	V				
843	2+50	1.7120	11.40	Q	V				
844	2+51	1.7278	11.51	Q	V				
845	2+52	1.7438	11.63	Q	V				
846	2+53	1.7600	11.74	Q	V				
847	2+54	1.7763	11.85	Q	V				
848	2+55	1.7928	11.97	Q	V				
849	2+56	1.8095	12.08	Q	V				
850	2+57	1.8263	12.20	Q	V				
851	2+58	1.8432	12.31	Q	V				
852	2+59	1.8603	12.42	Q	V				
853	3+ 0	1.8776	12.54	Q	V				
854	3+ 1	1.8950	12.63	Q	V				
855	3+ 2	1.9125	12.71	Q	V				
856	3+ 3	1.9301	12.80	Q	V				
857	3+ 4	1.9479	12.89	Q	V				
858	3+ 5	1.9658	12.97	Q	V				
859	3+ 6	1.9837	13.06	Q	V				
860	3+ 7	2.0019	13.15	Q	V				
861	3+ 8	2.0201	13.24	Q	V				
862	3+ 9	2.0384	13.32	Q	V				
863	3+10	2.0569	13.41	Q	V				
864	3+11	2.0755	13.50	Q	V				
865	3+12	2.0942	13.58	Q	V				
866	3+13	2.1130	13.67	Q	V				
867	3+14	2.1320	13.76	Q	V				
868	3+15	2.1511	13.85	Q	V				
869	3+16	2.1703	13.93	Q	V				
870	3+17	2.1896	14.02	Q	V				
871	3+18	2.2090	14.11	Q	V				
872	3+19	2.2286	14.19	Q	V				
873	3+20	2.2482	14.28	Q	V				
874	3+21	2.2684	14.62	Q	V				
875	3+22	2.2889	14.95	Q	V				
876	3+23	2.3100	15.28	Q	V				
877	3+24	2.3315	15.62	Q	V				
878	3+25	2.3535	15.95	Q	V				
879	3+26	2.3759	16.29	Q	V				
880	3+27	2.3988	16.62	Q	V				
881	3+28	2.4222	16.96	Q	V				
882	3+29	2.4460	17.29	Q	V				
883	3+30	2.4703	17.63	Q	V				
884	3+31	2.4950	17.96	Q	V				
885	3+32	2.5202	18.29	Q	V				
886	3+33	2.5459	18.63	Q	V				
887	3+34	2.5720	18.96	Q	V				
888	3+35	2.5986	19.30	Q	V				
889	3+36	2.6256	19.63	Q	V				
890	3+37	2.6531	19.97	Q	V				
891	3+38	2.6811	20.30	Q	V				
892	3+39	2.7095	20.64	Q	V				
893	3+40	2.7384	20.97	Q	V				
894	3+41	2.7679	21.40	Q	V				
895	3+42	2.7979	21.83	Q	V				
896	3+43	2.8286	22.26	Q	V				
897	3+44	2.8598	22.68	Q	V				

898	3+45	2.8917	23.11	Q	V				
899	3+46	2.9241	23.54	Q	V				
900	3+47	2.9571	23.97	Q	V				
901	3+48	2.9907	24.40	Q	V				
902	3+49	3.0249	24.83	Q	V				
903	3+50	3.0597	25.26	Q	V				
904	3+51	3.0951	25.69	Q	V				
905	3+52	3.1311	26.12	Q	V				
906	3+53	3.1676	26.54	Q	V				
907	3+54	3.2048	26.97	Q	V				
908	3+55	3.2425	27.40	Q	V				
909	3+56	3.2808	27.83	Q	V				
910	3+57	3.3198	28.26	Q	V				
911	3+58	3.3593	28.69	Q	V				
912	3+59	3.3994	29.12	Q	V				
913	4+ 0	3.4401	29.55	Q	V				
914	4+ 1	3.4862	33.48		Q	V			
915	4+ 2	3.5377	37.42		Q	V			
916	4+ 3	3.5947	41.35			Q	V		
917	4+ 4	3.6571	45.28				Q	V	
918	4+ 5	3.7249	49.22					V	Q
919	4+ 6	3.7981	53.15					V	Q
920	4+ 7	3.8767	57.09					V	Q
921	4+ 8	3.9608	61.02					V	Q
922	4+ 9	4.0503	64.96					V	Q
923	4+10	4.1451	68.89					V	Q
924	4+11	4.2455	72.83					V	Q
925	4+12	4.3512	76.76					V	Q
926	4+13	4.4623	80.70					V	Q
927	4+14	4.5789	84.63					V	Q
928	4+15	4.7009	88.57					V	Q
929	4+16	4.8283	92.50					V	Q
930	4+17	4.9612	96.44					V	Q
931	4+18	5.0994	100.37					V	Q
932	4+19	5.2431	104.31					V	Q
933	4+20	5.3922	108.24					V	Q
934	4+21	5.5350	103.67					V	Q
935	4+22	5.6715	99.10					V	Q
936	4+23	5.8017	94.53					V	Q
937	4+24	5.9256	89.96					V	Q
938	4+25	6.0432	85.39					V	Q
939	4+26	6.1545	80.81					V	Q
940	4+27	6.2595	76.24					V	Q
941	4+28	6.3583	71.67					V	Q
942	4+29	6.4507	67.10					V	Q
943	4+30	6.5368	62.53					V	Q
944	4+31	6.6166	57.96					V	Q
945	4+32	6.6902	53.39					V	Q
946	4+33	6.7574	48.82					V	Q
947	4+34	6.8184	44.25					V	Q
948	4+35	6.8730	39.67					V	Q
949	4+36	6.9214	35.10					V	Q
950	4+37	6.9634	30.53					V	Q
951	4+38	6.9992	25.96					V	Q
952	4+39	7.0286	21.39					V	Q
953	4+40	7.0518	16.82					V	Q
954	4+41	7.0746	16.54					V	Q
955	4+42	7.0970	16.26					V	Q
956	4+43	7.1190	15.98					V	Q
957	4+44	7.1406	15.71					V	Q
958	4+45	7.1619	15.43					V	Q
959	4+46	7.1828	15.15					V	Q
960	4+47	7.2032	14.87					V	Q
961	4+48	7.2233	14.59					V	Q
962	4+49	7.2431	14.31					V	Q
963	4+50	7.2624	14.04					V	Q
964	4+51	7.2813	13.76					V	Q
965	4+52	7.2999	13.48					V	Q
966	4+53	7.3181	13.20					V	Q

967	4+54	7.3359	12.92	Q			V
968	4+55	7.3533	12.64	Q			V
969	4+56	7.3703	12.37	Q			V
970	4+57	7.3870	12.09	Q			V
971	4+58	7.4033	11.81	Q			V
972	4+59	7.4191	11.53	Q			V
973	5+ 0	7.4346	11.25	Q			V
974	5+ 1	7.4500	11.13	Q			V
975	5+ 2	7.4651	11.01	Q			V
976	5+ 3	7.4801	10.89	Q			V
977	5+ 4	7.4950	10.76	Q			V
978	5+ 5	7.5096	10.64	Q			V
979	5+ 6	7.5241	10.52	Q			V
980	5+ 7	7.5384	10.40	Q			V
981	5+ 8	7.5526	10.27	Q			V
982	5+ 9	7.5666	10.15	Q			V
983	5+10	7.5804	10.03	Q			V
984	5+11	7.5940	9.91	Q			V
985	5+12	7.6075	9.78	Q			V
986	5+13	7.6208	9.66	Q			V
987	5+14	7.6339	9.54	Q			V
988	5+15	7.6469	9.42	Q			V
989	5+16	7.6597	9.29	Q			V
990	5+17	7.6723	9.17	Q			V
991	5+18	7.6848	9.05	Q			V
992	5+19	7.6971	8.93	Q			V
993	5+20	7.7092	8.80	Q			V
994	5+21	7.7213	8.73	Q			V
995	5+22	7.7332	8.66	Q			V
996	5+23	7.7450	8.59	Q			V
997	5+24	7.7568	8.52	Q			V
998	5+25	7.7684	8.45	Q			V
999	5+26	7.7799	8.38	Q			V
1000	5+27	7.7914	8.30	Q			V
1001	5+28	7.8027	8.23	Q			V
1002	5+29	7.8140	8.16	Q			V
1003	5+30	7.8251	8.09	Q			V
1004	5+31	7.8361	8.02	Q			V
1005	5+32	7.8471	7.95	Q			V
1006	5+33	7.8579	7.88	Q			V
1007	5+34	7.8687	7.80	Q			V
1008	5+35	7.8793	7.73	Q			V
1009	5+36	7.8899	7.66	Q			V
1010	5+37	7.9003	7.59	Q			V
1011	5+38	7.9107	7.52	Q			V
1012	5+39	7.9210	7.45	Q			V
1013	5+40	7.9311	7.37	Q			V
1014	5+41	7.9412	7.33	Q			V
1015	5+42	7.9512	7.28	Q			V
1016	5+43	7.9612	7.23	Q			V
1017	5+44	7.9711	7.18	Q			V
1018	5+45	7.9809	7.14	Q			V
1019	5+46	7.9907	7.09	Q			V
1020	5+47	8.0004	7.04	Q			V
1021	5+48	8.0100	6.99	Q			V
1022	5+49	8.0196	6.94	Q			V
1023	5+50	8.0291	6.90	Q			V
1024	5+51	8.0385	6.85	Q			V
1025	5+52	8.0479	6.80	Q			V
1026	5+53	8.0572	6.75	Q			V
1027	5+54	8.0664	6.71	Q			V
1028	5+55	8.0756	6.66	Q			V
1029	5+56	8.0847	6.61	Q			V
1030	5+57	8.0937	6.56	Q			V
1031	5+58	8.1027	6.51	Q			V
1032	5+59	8.1116	6.47	Q			V
1033	6+ 0	8.1205	6.42	Q			V
1034	6+ 1	8.1292	6.38	Q			V
1035	6+ 2	8.1380	6.35	Q			V

1036	6+ 3	8.1467	6.31	Q				V
1037	6+ 4	8.1553	6.28	Q				V
1038	6+ 5	8.1639	6.25	Q				V
1039	6+ 6	8.1725	6.21	Q				V
1040	6+ 7	8.1810	6.18	Q				V
1041	6+ 8	8.1895	6.14	Q				V
1042	6+ 9	8.1979	6.11	Q				V
1043	6+10	8.2062	6.07	Q				V
1044	6+11	8.2146	6.04	Q				V
1045	6+12	8.2228	6.00	Q				V
1046	6+13	8.2310	5.97	Q				V
1047	6+14	8.2392	5.93	Q				V
1048	6+15	8.2473	5.90	Q				V
1049	6+16	8.2554	5.86	Q				V
1050	6+17	8.2635	5.83	Q				V
1051	6+18	8.2714	5.80	Q				V
1052	6+19	8.2794	5.76	Q				V
1053	6+20	8.2873	5.73	Q				V

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1061 *****
1062 Process from Point/Station 109.000 to Point/Station 109.000
1063 **** CONFLUENCE OF MINOR STREAMS ****
1064

1065 Along Main Stream number: 1 in normal stream number 1
1066 Stream flow area = 90.583(Ac.)
1067 Runoff from this stream = 108.241(CFS)
1068 Time of concentration = 20.20 min.
1069 Rainfall intensity = 3.105(In/Hr)
1070

1071 *****
1072 Process from Point/Station 501.000 to Point/Station 502.000
1073 **** INITIAL AREA EVALUATION ****
1074
1075

1076 Decimal fraction soil group A = 0.000
1077 Decimal fraction soil group B = 0.000
1078 Decimal fraction soil group C = 0.000
1079 Decimal fraction soil group D = 1.000
1080 [MEDIUM DENSITY RESIDENTIAL]
1081 (14.5 DU/A or Less)

1082 Impervious value, Ai = 0.500
1083 Sub-Area C Value = 0.630
1084 Initial subarea total flow distance = 84.000(Ft.)
1085 Highest elevation = 480.000(Ft.)
1086 Lowest elevation = 478.320(Ft.)
1087 Elevation difference = 1.680(Ft.) Slope = 2.000 %
1088 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
1089 The maximum overland flow distance is 80.00 (Ft)
1090 for the top area slope value of 2.00 %, in a development type of
1091 14.5 DU/A or Less

1092 In Accordance With Figure 3-3
1093 Initial Area Time of Concentration = 6.01 minutes
1094 $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5} / (% slope^{(1/3)})]$
1095 $TC = [1.8 * (1.1 - 0.6300) * (80.000^{.5}) / (2.000^{(1/3)})] = 6.01$
1096 The initial area total distance of 84.00 (Ft.) entered leaves a
1097 remaining distance of 4.00 (Ft.)
1098 Using Figure 3-4, the travel time for this distance is 0.10 minutes
1099 for a distance of 4.00 (Ft.) and a slope of 2.00 %
1100 with an elevation difference of 0.08(Ft.) from the end of the top area
1101 $Tt = [11.9 * length(Mi)^3 / (elevation change(Ft.))]^{.385} * 60(min/hr)$
1102 = 0.102 Minutes
1103 $Tt = [(11.9 * 0.0008^3) / (0.08)]^{.385} = 0.10$
1104 Total initial area Ti = 6.01 minutes from Figure 3-3 formula plus

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1105      0.10 minutes from the Figure 3-4 formula = 6.11 minutes
1106 Rainfall intensity (I) = 6.715(In/Hr) for a 100.0 year storm
1107 Effective runoff coefficient used for area (Q=KCIA) is C = 0.630
1108 Subarea runoff = 0.334(CFS)
1109 Total initial stream area = 0.079(Ac.)
1110
1111
1112 ++++++
1113 Process from Point/Station 502.000 to Point/Station 109.000
1114 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
1115
1116 -----
1117 Estimated mean flow rate at midpoint of channel = 11.532(CFS)
1118 Depth of flow = 0.471(Ft.), Average velocity = 3.288(Ft/s)
1119 ***** Irregular Channel Data *****
1120 -----
1121 Information entered for subchannel number 1 :
1122 Point number 'X' coordinate 'Y' coordinate
1123 1 0.00 1.08
1124 2 0.50 1.08
1125 3 0.50 0.58
1126 4 23.00 0.13
1127 5 24.50 0.00
1128 6 24.50 0.50
1129 7 25.00 0.50
1130
1131 Manning's 'N' friction factor = 0.016
1132 -----
1133 Sub-Channel flow = 11.532(CFS)
1134 ' ' flow top width = 18.527(Ft.)
1135 ' ' velocity= 3.288(Ft/s)
1136 ' ' area = 3.507(Sq.Ft)
1137 ' ' Froude number = 1.332
1138
1139 Upstream point elevation = 478.320(Ft.)
1140 Downstream point elevation = 466.500(Ft.)
1141 Flow length = 991.000(Ft.)
1142 Travel time = 5.02 min.
1143 Time of concentration = 11.13 min.
1144 Depth of flow = 0.471(Ft.)
1145 Average velocity = 3.288(Ft/s)
1146 Total irregular channel flow = 11.532(CFS)
1147 Irregular channel normal depth above invert elev. = 0.471(Ft.)
1148 Average velocity of channel(s) = 3.288(Ft/s)
1149 Adding area flow to channel
1150 Rainfall intensity (I) = 4.560(In/Hr) for a 100.0 year storm
1151 Decimal fraction soil group A = 0.000
1152 Decimal fraction soil group B = 0.000
1153 Decimal fraction soil group C = 0.000
1154 Decimal fraction soil group D = 1.000
1155 [MEDIUM DENSITY RESIDENTIAL ]
1156 (14.5 DU/A or Less )
1157 Impervious value, Ai = 0.500
1158 Sub-Area C Value = 0.630
1159 Rainfall intensity = 4.560(In/Hr) for a 100.0 year storm
1160 Effective runoff coefficient used for total area
1161 (Q=KCIA) is C = 0.630 CA = 4.971
1162 Subarea runoff = 22.330(CFS) for 7.811(Ac.)
1163 Total runoff = 22.665(CFS) Total area = 7.890(Ac.)
1164 Depth of flow = 0.580(Ft.), Average velocity = 3.861(Ft/s)
1165
1166 ++++++
1167 Process from Point/Station 109.000 to Point/Station 109.000
1168 **** 6 HOUR HYDROGRAPH ****
1169
1170 ++++++
1171 Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003
1172
1173 Time of Concentration = 11.13

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1174 Basin Area =      98.47 Acres
1175 6 Hour Rainfall =   2.900 Inches
1176 Runoff Coefficient =  0.050
1177 Peak Discharge =    22.66 CFS
1178      Time (Min)      Discharge (CFS)
1179          0              0.000
1180          11              0.859
1181          22              0.876
1182          33              0.914
1183          44              0.934
1184          55              0.979
1185          66              1.004
1186          77              1.058
1187          88              1.088
1188          99              1.156
1189         110              1.194
1190         121              1.280
1191         132              1.330
1192         143              1.445
1193         154              1.513
1194         165              1.678
1195         176              1.780
1196         187              2.040
1197         198              2.212
1198         209              2.704
1199         220              3.080
1200         231              4.522
1201         242              6.372
1202         253             22.665
1203         264              3.627
1204         275              2.427
1205         286              1.899
1206         297              1.591
1207         308              1.384
1208         319              1.235
1209         330              1.121
1210         341              1.030
1211         352              0.956
1212         363              0.894

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+++++

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1213
1214      6 - H O U R      S T O R M
1215      R u n o f f      H y d r o g r a p h

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1216      Hydrograph in   1   Minute intervals ((CFS))

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Time (h+m)	Volume	Ac.Ft	Q(CFS)	0	5.7	11.3	17.0	22.7
1220								
1221								
1222	0+ 0	0.0000	0.00	Q				
1223	0+ 1	0.0001	0.08	Q				
1224	0+ 2	0.0003	0.16	Q				
1225	0+ 3	0.0006	0.23	Q				
1226	0+ 4	0.0011	0.31	Q				
1227	0+ 5	0.0016	0.39	Q				
1228	0+ 6	0.0023	0.47	Q				
1229	0+ 7	0.0030	0.55	Q				
1230	0+ 8	0.0039	0.62	VQ				
1231	0+ 9	0.0048	0.70	VQ				
1232	0+10	0.0059	0.78	VQ				
1233	0+11	0.0071	0.86	VQ				
1234	0+12	0.0083	0.86	VQ				
1235	0+13	0.0095	0.86	VQ				
1236	0+14	0.0107	0.86	VQ				
1237	0+15	0.0118	0.86	VQ				
1238	0+16	0.0130	0.87	VQ				
1239	0+17	0.0142	0.87	VQ				
1240	0+18	0.0154	0.87	VQ				
1241	0+19	0.0166	0.87	VQ				
1242	0+20	0.0178	0.87	VQ				

1243	0+21	0.0190	0.87	VQ
1244	0+22	0.0202	0.88	VQ
1245	0+23	0.0215	0.88	VQ
1246	0+24	0.0227	0.88	VQ
1247	0+25	0.0239	0.89	VQ
1248	0+26	0.0251	0.89	VQ
1249	0+27	0.0264	0.89	VQ
1250	0+28	0.0276	0.90	VQ
1251	0+29	0.0288	0.90	VQ
1252	0+30	0.0301	0.90	Q
1253	0+31	0.0313	0.91	Q
1254	0+32	0.0326	0.91	Q
1255	0+33	0.0338	0.91	Q
1256	0+34	0.0351	0.92	Q
1257	0+35	0.0364	0.92	Q
1258	0+36	0.0376	0.92	Q
1259	0+37	0.0389	0.92	Q
1260	0+38	0.0402	0.92	Q
1261	0+39	0.0414	0.93	Q
1262	0+40	0.0427	0.93	Q
1263	0+41	0.0440	0.93	Q
1264	0+42	0.0453	0.93	Q
1265	0+43	0.0466	0.93	Q
1266	0+44	0.0479	0.93	Q
1267	0+45	0.0491	0.94	Q
1268	0+46	0.0504	0.94	Q
1269	0+47	0.0517	0.95	Q
1270	0+48	0.0531	0.95	Q
1271	0+49	0.0544	0.95	Q
1272	0+50	0.0557	0.96	Q
1273	0+51	0.0570	0.96	Q
1274	0+52	0.0584	0.97	Q
1275	0+53	0.0597	0.97	QV
1276	0+54	0.0610	0.98	QV
1277	0+55	0.0624	0.98	QV
1278	0+56	0.0637	0.98	QV
1279	0+57	0.0651	0.98	QV
1280	0+58	0.0664	0.99	QV
1281	0+59	0.0678	0.99	QV
1282	1+ 0	0.0692	0.99	QV
1283	1+ 1	0.0705	0.99	QV
1284	1+ 2	0.0719	1.00	QV
1285	1+ 3	0.0733	1.00	QV
1286	1+ 4	0.0747	1.00	QV
1287	1+ 5	0.0760	1.00	QV
1288	1+ 6	0.0774	1.00	QV
1289	1+ 7	0.0788	1.01	QV
1290	1+ 8	0.0802	1.01	QV
1291	1+ 9	0.0816	1.02	QV
1292	1+10	0.0830	1.02	QV
1293	1+11	0.0844	1.03	QV
1294	1+12	0.0859	1.03	QV
1295	1+13	0.0873	1.04	QV
1296	1+14	0.0887	1.04	QV
1297	1+15	0.0902	1.05	Q V
1298	1+16	0.0916	1.05	Q V
1299	1+17	0.0931	1.06	Q V
1300	1+18	0.0945	1.06	Q V
1301	1+19	0.0960	1.06	Q V
1302	1+20	0.0975	1.07	Q V
1303	1+21	0.0990	1.07	Q V
1304	1+22	0.1004	1.07	Q V
1305	1+23	0.1019	1.07	Q V
1306	1+24	0.1034	1.08	Q V
1307	1+25	0.1049	1.08	Q V
1308	1+26	0.1064	1.08	Q V
1309	1+27	0.1079	1.09	Q V
1310	1+28	0.1094	1.09	Q V
1311	1+29	0.1109	1.09	Q V

1312	1+30	0.1124	1.10	Q V				
1313	1+31	0.1139	1.11	Q V				
1314	1+32	0.1155	1.11	Q V				
1315	1+33	0.1170	1.12	Q V				
1316	1+34	0.1185	1.13	Q V				
1317	1+35	0.1201	1.13	Q V				
1318	1+36	0.1217	1.14	Q V				
1319	1+37	0.1232	1.14	Q V				
1320	1+38	0.1248	1.15	Q V				
1321	1+39	0.1264	1.16	Q V				
1322	1+40	0.1280	1.16	Q V				
1323	1+41	0.1296	1.16	Q V				
1324	1+42	0.1312	1.17	Q V				
1325	1+43	0.1328	1.17	Q V				
1326	1+44	0.1344	1.17	Q V				
1327	1+45	0.1361	1.18	Q V				
1328	1+46	0.1377	1.18	Q V				
1329	1+47	0.1393	1.18	Q V				
1330	1+48	0.1410	1.19	Q V				
1331	1+49	0.1426	1.19	Q V				
1332	1+50	0.1442	1.19	Q V				
1333	1+51	0.1459	1.20	Q V				
1334	1+52	0.1476	1.21	Q V				
1335	1+53	0.1492	1.22	Q V				
1336	1+54	0.1509	1.23	Q V				
1337	1+55	0.1526	1.23	Q V				
1338	1+56	0.1543	1.24	Q V				
1339	1+57	0.1561	1.25	Q V				
1340	1+58	0.1578	1.26	Q V				
1341	1+59	0.1595	1.26	Q V				
1342	2+ 0	0.1613	1.27	Q V				
1343	2+ 1	0.1630	1.28	Q V				
1344	2+ 2	0.1648	1.28	Q V				
1345	2+ 3	0.1666	1.29	Q V				
1346	2+ 4	0.1684	1.29	Q V				
1347	2+ 5	0.1702	1.30	Q V				
1348	2+ 6	0.1720	1.30	Q V				
1349	2+ 7	0.1738	1.31	Q V				
1350	2+ 8	0.1756	1.31	Q V				
1351	2+ 9	0.1774	1.32	Q V				
1352	2+10	0.1792	1.32	Q V				
1353	2+11	0.1810	1.33	Q V				
1354	2+12	0.1828	1.33	Q V				
1355	2+13	0.1847	1.34	Q V				
1356	2+14	0.1866	1.35	Q V				
1357	2+15	0.1884	1.36	Q V				
1358	2+16	0.1903	1.37	Q V				
1359	2+17	0.1922	1.38	Q V				
1360	2+18	0.1941	1.39	Q V				
1361	2+19	0.1961	1.40	Q V				
1362	2+20	0.1980	1.41	Q V				
1363	2+21	0.2000	1.42	Q V				
1364	2+22	0.2020	1.43	Q V				
1365	2+23	0.2039	1.45	Q V				
1366	2+24	0.2059	1.45	Q V				
1367	2+25	0.2080	1.46	Q V				
1368	2+26	0.2100	1.46	Q V				
1369	2+27	0.2120	1.47	Q V				
1370	2+28	0.2140	1.48	Q V				
1371	2+29	0.2161	1.48	Q V				
1372	2+30	0.2181	1.49	Q V				
1373	2+31	0.2202	1.49	Q V				
1374	2+32	0.2222	1.50	Q V				
1375	2+33	0.2243	1.51	Q V				
1376	2+34	0.2264	1.51	Q V				
1377	2+35	0.2285	1.53	Q V				
1378	2+36	0.2306	1.54	Q V				
1379	2+37	0.2328	1.56	Q V				
1380	2+38	0.2350	1.57	Q V				

1381	2+39	0.2371	1.59	Q	V				
1382	2+40	0.2393	1.60	Q	V				
1383	2+41	0.2416	1.62	Q	V				
1384	2+42	0.2438	1.63	Q	V				
1385	2+43	0.2461	1.65	Q	V				
1386	2+44	0.2484	1.66	Q	V				
1387	2+45	0.2507	1.68	Q	V				
1388	2+46	0.2530	1.69	Q	V				
1389	2+47	0.2554	1.70	Q	V				
1390	2+48	0.2577	1.71	Q	V				
1391	2+49	0.2601	1.72	Q	V				
1392	2+50	0.2625	1.72	Q	V				
1393	2+51	0.2648	1.73	Q	V				
1394	2+52	0.2672	1.74	Q	V				
1395	2+53	0.2697	1.75	Q	V				
1396	2+54	0.2721	1.76	Q	V				
1397	2+55	0.2745	1.77	Q	V				
1398	2+56	0.2770	1.78	Q	V				
1399	2+57	0.2795	1.80	Q	V				
1400	2+58	0.2820	1.83	Q	V				
1401	2+59	0.2845	1.85	Q	V				
1402	3+ 0	0.2871	1.87	Q	V				
1403	3+ 1	0.2897	1.90	Q	V				
1404	3+ 2	0.2924	1.92	Q	V				
1405	3+ 3	0.2950	1.95	Q	V				
1406	3+ 4	0.2978	1.97	Q	V				
1407	3+ 5	0.3005	1.99	Q	V				
1408	3+ 6	0.3033	2.02	Q	V				
1409	3+ 7	0.3061	2.04	Q	V				
1410	3+ 8	0.3089	2.06	Q	V				
1411	3+ 9	0.3118	2.07	Q	V				
1412	3+10	0.3147	2.09	Q	V				
1413	3+11	0.3176	2.10	Q	V				
1414	3+12	0.3205	2.12	Q	V				
1415	3+13	0.3234	2.13	Q	V				
1416	3+14	0.3264	2.15	Q	V				
1417	3+15	0.3294	2.17	Q	V				
1418	3+16	0.3324	2.18	Q	V				
1419	3+17	0.3354	2.20	Q	V				
1420	3+18	0.3384	2.21	Q	V				
1421	3+19	0.3415	2.26	Q	V				
1422	3+20	0.3447	2.30	Q	V				
1423	3+21	0.3479	2.35	Q	V				
1424	3+22	0.3512	2.39	Q	V				
1425	3+23	0.3546	2.44	Q	V				
1426	3+24	0.3580	2.48	Q	V				
1427	3+25	0.3615	2.53	Q	V				
1428	3+26	0.3650	2.57	Q	V				
1429	3+27	0.3686	2.61	Q	V				
1430	3+28	0.3723	2.66	Q	V				
1431	3+29	0.3760	2.70	Q	V				
1432	3+30	0.3798	2.74	Q	V				
1433	3+31	0.3836	2.77	Q	V				
1434	3+32	0.3875	2.81	Q	V				
1435	3+33	0.3914	2.84	Q	V				
1436	3+34	0.3953	2.87	Q	V				
1437	3+35	0.3994	2.91	Q	V				
1438	3+36	0.4034	2.94	Q	V				
1439	3+37	0.4075	2.98	Q	V				
1440	3+38	0.4117	3.01	Q	V				
1441	3+39	0.4159	3.05	Q	V				
1442	3+40	0.4201	3.08	Q	V				
1443	3+41	0.4245	3.21	Q	V				
1444	3+42	0.4291	3.34	Q	V				
1445	3+43	0.4339	3.47	Q	V				
1446	3+44	0.4389	3.60	Q	V				
1447	3+45	0.4440	3.74	Q	V				
1448	3+46	0.4493	3.87	Q	V				
1449	3+47	0.4548	4.00	Q	V				

1450	3+48	0.4605	4.13	Q	V			
1451	3+49	0.4664	4.26	Q	V			
1452	3+50	0.4725	4.39	Q	V			
1453	3+51	0.4787	4.52	Q	V			
1454	3+52	0.4851	4.69	Q	V			
1455	3+53	0.4918	4.86	Q	V			
1456	3+54	0.4988	5.03	Q	V			
1457	3+55	0.5059	5.19	Q	V			
1458	3+56	0.5133	5.36	Q	V			
1459	3+57	0.5209	5.53	Q	V			
1460	3+58	0.5288	5.70	Q	V			
1461	3+59	0.5369	5.87	Q	V			
1462	4+ 0	0.5452	6.04	Q	V			
1463	4+ 1	0.5537	6.20	Q	V			
1464	4+ 2	0.5625	6.37	Q	V			
1465	4+ 3	0.5733	7.85		V	Q		
1466	4+ 4	0.5862	9.33		V	Q		
1467	4+ 5	0.6011	10.82		V	Q		
1468	4+ 6	0.6180	12.30		V	Q		
1469	4+ 7	0.6370	13.78		V	Q		
1470	4+ 8	0.6580	15.26		V	Q		
1471	4+ 9	0.6810	16.74		V	Q		
1472	4+10	0.7061	18.22		V	Q		
1473	4+11	0.7333	19.70		V	Q		
1474	4+12	0.7625	21.18		V	Q		
1475	4+13	0.7937	22.66		V	Q		
1476	4+14	0.8225	20.93		V	Q		
1477	4+15	0.8490	19.20		V	Q		
1478	4+16	0.8730	17.47		V	Q		
1479	4+17	0.8947	15.74		V	Q		
1480	4+18	0.9140	14.01		V	Q		
1481	4+19	0.9309	12.28		V	Q		
1482	4+20	0.9455	10.55		V	Q		
1483	4+21	0.9576	8.82		V	Q		
1484	4+22	0.9674	7.09		V	Q		
1485	4+23	0.9748	5.36		V	Q		
1486	4+24	0.9798	3.63	Q	V			
1487	4+25	0.9846	3.52	Q	V			
1488	4+26	0.9893	3.41	Q	V			
1489	4+27	0.9938	3.30	Q	V			
1490	4+28	0.9982	3.19	Q	V			
1491	4+29	1.0025	3.08	Q	V			
1492	4+30	1.0066	2.97	Q	V			
1493	4+31	1.0105	2.86	Q	V			
1494	4+32	1.0143	2.75	Q	V			
1495	4+33	1.0180	2.65	Q	V			
1496	4+34	1.0214	2.54	Q	V			
1497	4+35	1.0248	2.43	Q	V			
1498	4+36	1.0281	2.38	Q	V			
1499	4+37	1.0313	2.33	Q	V			
1500	4+38	1.0344	2.28	Q	V			
1501	4+39	1.0375	2.23	Q	V			
1502	4+40	1.0405	2.19	Q	V			
1503	4+41	1.0435	2.14	Q	V			
1504	4+42	1.0463	2.09	Q	V			
1505	4+43	1.0492	2.04	Q	V			
1506	4+44	1.0519	1.99	Q	V			
1507	4+45	1.0546	1.95	Q	V			
1508	4+46	1.0572	1.90	Q	V			
1509	4+47	1.0598	1.87	Q	V			
1510	4+48	1.0623	1.84	Q	V			
1511	4+49	1.0648	1.81	Q	V			
1512	4+50	1.0673	1.79	Q	V			
1513	4+51	1.0697	1.76	Q	V			
1514	4+52	1.0721	1.73	Q	V			
1515	4+53	1.0744	1.70	Q	V			
1516	4+54	1.0767	1.67	Q	V			
1517	4+55	1.0790	1.65	Q	V			
1518	4+56	1.0812	1.62	Q	V			

1519	4+57	1.0834	1.59	Q				V
1520	4+58	1.0856	1.57	Q				V
1521	4+59	1.0877	1.55	Q				V
1522	5+ 0	1.0898	1.53	Q				V
1523	5+ 1	1.0919	1.52	Q				V
1524	5+ 2	1.0940	1.50	Q				V
1525	5+ 3	1.0960	1.48	Q				V
1526	5+ 4	1.0980	1.46	Q				V
1527	5+ 5	1.1000	1.44	Q				V
1528	5+ 6	1.1020	1.42	Q				V
1529	5+ 7	1.1039	1.40	Q				V
1530	5+ 8	1.1058	1.38	Q				V
1531	5+ 9	1.1077	1.37	Q				V
1532	5+10	1.1096	1.36	Q				V
1533	5+11	1.1114	1.34	Q				V
1534	5+12	1.1133	1.33	Q				V
1535	5+13	1.1151	1.32	Q				V
1536	5+14	1.1169	1.30	Q				V
1537	5+15	1.1186	1.29	Q				V
1538	5+16	1.1204	1.28	Q				V
1539	5+17	1.1221	1.26	Q				V
1540	5+18	1.1239	1.25	Q				V
1541	5+19	1.1256	1.23	Q				V
1542	5+20	1.1272	1.22	Q				V
1543	5+21	1.1289	1.21	Q				V
1544	5+22	1.1306	1.20	Q				V
1545	5+23	1.1322	1.19	Q				V
1546	5+24	1.1338	1.18	Q				V
1547	5+25	1.1355	1.17	Q				V
1548	5+26	1.1371	1.16	Q				V
1549	5+27	1.1386	1.15	Q				V
1550	5+28	1.1402	1.14	Q				V
1551	5+29	1.1418	1.13	Q				V
1552	5+30	1.1433	1.12	Q				V
1553	5+31	1.1449	1.11	Q				V
1554	5+32	1.1464	1.10	Q				V
1555	5+33	1.1479	1.10	Q				V
1556	5+34	1.1494	1.09	Q				V
1557	5+35	1.1509	1.08	Q				V
1558	5+36	1.1523	1.07	Q				V
1559	5+37	1.1538	1.06	Q				V
1560	5+38	1.1553	1.05	Q				V
1561	5+39	1.1567	1.05	Q				V
1562	5+40	1.1581	1.04	Q				V
1563	5+41	1.1596	1.03	Q				V
1564	5+42	1.1610	1.02	Q				V
1565	5+43	1.1624	1.02	Q				V
1566	5+44	1.1638	1.01	Q				V
1567	5+45	1.1651	1.00	Q				V
1568	5+46	1.1665	1.00	Q				V
1569	5+47	1.1679	0.99	Q				V
1570	5+48	1.1692	0.98	Q				V
1571	5+49	1.1706	0.98	Q				V
1572	5+50	1.1719	0.97	Q				V
1573	5+51	1.1732	0.96	Q				V
1574	5+52	1.1746	0.96	Q				V
1575	5+53	1.1759	0.95	Q				V
1576	5+54	1.1772	0.95	Q				V
1577	5+55	1.1785	0.94	Q				V
1578	5+56	1.1797	0.93	Q				V
1579	5+57	1.1810	0.93	Q				V
1580	5+58	1.1823	0.92	Q				V
1581	5+59	1.1836	0.92	Q				V

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*****
Process from Point/Station      109.000 to Point/Station      109.000
**** CONFLUENCE OF MINOR STREAMS ****
*****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =          7.890 (Ac.)
Runoff from this stream =      22.665 (CFS)
Time of concentration =       11.13 min.
Rainfall intensity =          4.560 (In/Hr)
Summary of stream data:

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

1         108.241      20.20      3.105
2          22.665      11.13      4.560
Qmax (1) =
1.000 *    1.000 *    108.241) +
0.681 *    1.000 *    22.665) + =      123.674
Qmax (2) =
1.000 *    0.551 *    108.241) +
1.000 *    1.000 *    22.665) + =      82.317

Total of 2 streams to confluence:
Flow rates before confluence point:
108.241      22.665
Maximum flow rates at confluence using above data:
123.674      82.317
Area of streams before confluence:
90.583      7.890
Results of confluence:
Total flow rate =      123.674 (CFS)
Time of concentration =      20.199 min.
Effective stream area after confluence =      98.473 (Ac.)

*****
Process from Point/Station      109.000 to Point/Station      110.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
*****

Upstream point/station elevation =  449.740 (Ft.)
Downstream point/station elevation =  438.470 (Ft.)
Pipe length =  483.00 (Ft.) Slope =  0.0233 Manning's N = 0.015
No. of pipes = 1 Required pipe flow =  123.674 (CFS)
Given pipe size =  48.00 (In.)
Calculated individual pipe flow =  123.674 (CFS)
Normal flow depth in pipe =  28.20 (In.)
Flow top width inside pipe =  47.26 (In.)
Critical Depth =  40.09 (In.)
Pipe flow velocity =  16.11 (Ft/s)
Travel time through pipe =  0.50 min.
Time of concentration (TC) =  20.70 min.

*****
Process from Point/Station      701.000 to Point/Station      110.000
**** SUBAREA FLOW ADDITION ****
*****

Rainfall intensity (I) =  3.056 (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
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1657 [MEDIUM DENSITY RESIDENTIAL ]
1658 (14.5 DU/A or Less )
1659 Impervious value, Ai = 0.500
1660 Sub-Area C Value = 0.630
1661 The area added to the existing stream causes a
1662 a lower flow rate of Q = 120.625(CFS)
1663 therefore the upstream flow rate of Q = 123.674(CFS) is being used
1664 Time of concentration = 20.70 min.
1665 Rainfall intensity = 3.056(In/Hr) for a 100.0 year storm
1666 Effective runoff coefficient used for total area
1667 (Q=KCIA) is C = 0.397 CA = 39.469
1668 Subarea runoff = 0.000(CFS) for 0.961(Ac.)
1669 Total runoff = 123.674(CFS) Total area = 99.434(Ac.)
1670
1671
1672 ++++++
1673 Process from Point/Station 702.000 to Point/Station 110.000
1674 **** SUBAREA FLOW ADDITION ****
1675
1676 Rainfall intensity (I) = 3.056(In/Hr) for a 100.0 year storm
1677 Decimal fraction soil group A = 0.000
1678 Decimal fraction soil group B = 0.000
1679 Decimal fraction soil group C = 0.000
1680 Decimal fraction soil group D = 1.000
1681 [UNDISTURBED NATURAL TERRAIN ]
1682 (Permanent Open Space )
1683 Impervious value, Ai = 0.000
1684 Sub-Area C Value = 0.350
1685 The area added to the existing stream causes a
1686 a lower flow rate of Q = 121.531(CFS)
1687 therefore the upstream flow rate of Q = 123.674(CFS) is being used
1688 Time of concentration = 20.70 min.
1689 Rainfall intensity = 3.056(In/Hr) for a 100.0 year storm
1690 Effective runoff coefficient used for total area
1691 (Q=KCIA) is C = 0.397 CA = 39.765
1692 Subarea runoff = 0.000(CFS) for 0.847(Ac.)
1693 Total runoff = 123.674(CFS) Total area = 100.281(Ac.)
1694
1695
1696 ++++++
1697 Process from Point/Station 110.000 to Point/Station 111.000
1698 **** PIPEFLOW TRAVEL TIME (User specified size) ****
1699
1700 Upstream point/station elevation = 438.470(Ft.)
1701 Downstream point/station elevation = 407.700(Ft.)
1702 Pipe length = 212.00(Ft.) Slope = 0.1451 Manning's N = 0.015
1703 No. of pipes = 1 Required pipe flow = 123.674(CFS)
1704 Given pipe size = 48.00(In.)
1705 Calculated individual pipe flow = 123.674(CFS)
1706 Normal flow depth in pipe = 16.73(In.)
1707 Flow top width inside pipe = 45.75(In.)
1708 Critical Depth = 40.09(In.)
1709 Pipe flow velocity = 31.75(Ft/s)
1710 Travel time through pipe = 0.11 min.
1711 Time of concentration (TC) = 20.81 min.
1712
1713
1714 ++++++
1715 Process from Point/Station 111.000 to Point/Station 111.000
1716 **** CONFLUENCE OF MAIN STREAMS ****
1717
1718 The following data inside Main Stream is listed:
1719 In Main Stream number: 1
1720 Stream flow area = 100.281(Ac.)
1721 Runoff from this stream = 123.674(CFS)
1722 Time of concentration = 20.81 min.
1723 Rainfall intensity = 3.046(In/Hr)
1724 Program is now starting with Main Stream No. 2
1725

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1726
1727 ++++++
1728 Process from Point/Station      601.000 to Point/Station      602.000
1729 **** INITIAL AREA EVALUATION ****
1730
1731 Decimal fraction soil group A = 0.000
1732 Decimal fraction soil group B = 0.000
1733 Decimal fraction soil group C = 0.000
1734 Decimal fraction soil group D = 1.000
1735 [HIGH DENSITY RESIDENTIAL          ]
1736 (24.0 DU/A or Less          )
1737 Impervious value, Ai = 0.650
1738 Sub-Area C Value = 0.710
1739 Initial subarea total flow distance = 65.000 (Ft.)
1740 Highest elevation = 469.500 (Ft.)
1741 Lowest elevation = 468.850 (Ft.)
1742 Elevation difference = 0.650 (Ft.) Slope = 1.000 %
1743 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
1744 The maximum overland flow distance is 65.00 (Ft)
1745 for the top area slope value of 1.00 %, in a development type of
1746 24.0 DU/A or Less
1747 In Accordance With Figure 3-3
1748 Initial Area Time of Concentration = 5.66 minutes
1749 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
1750 TC = [1.8*(1.1-0.7100)*( 65.000^.5)/( 1.000^(1/3)]= 5.66
1751 Rainfall intensity (I) = 7.054 (In/Hr) for a 100.0 year storm
1752 Effective runoff coefficient used for area (Q=KCIA) is C = 0.710
1753 Subarea runoff = 0.270 (CFS)
1754 Total initial stream area = 0.054 (Ac.)
1755
1756
1757 ++++++
1758 Process from Point/Station      602.000 to Point/Station      603.000
1759 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
1760
1761 Estimated mean flow rate at midpoint of channel = 1.563 (CFS)
1762 Depth of flow = 0.213 (Ft.), Average velocity = 3.940 (Ft/s)
1763 ***** Irregular Channel Data *****
1764
1765 Information entered for subchannel number 1 :
1766 Point number      'X' coordinate      'Y' coordinate
1767      1              0.00              0.50
1768      2              0.50              0.50
1769      3              0.50              0.00
1770      4              2.00              0.13
1771      5              28.50             0.66
1772      6              28.50             1.16
1773      7              29.00             1.16
1774 Manning's 'N' friction factor = 0.016
1775
1776 Sub-Channel flow = 1.563 (CFS)
1777 ' ' flow top width = 5.671 (Ft.)
1778 ' ' velocity= 3.940 (Ft/s)
1779 ' ' area = 0.397 (Sq.Ft)
1780 ' ' Froude number = 2.626
1781
1782 Upstream point elevation = 468.850 (Ft.)
1783 Downstream point elevation = 435.000 (Ft.)
1784 Flow length = 515.000 (Ft.)
1785 Travel time = 2.18 min.
1786 Time of concentration = 7.84 min.
1787 Depth of flow = 0.213 (Ft.)
1788 Average velocity = 3.940 (Ft/s)
1789 Total irregular channel flow = 1.563 (CFS)
1790 Irregular channel normal depth above invert elev. = 0.213 (Ft.)
1791 Average velocity of channel(s) = 3.940 (Ft/s)
1792 Adding area flow to channel
1793 Rainfall intensity (I) = 5.718 (In/Hr) for a 100.0 year storm
1794 Decimal fraction soil group A = 0.000

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1795 Decimal fraction soil group B = 0.000
1796 Decimal fraction soil group C = 0.000
1797 Decimal fraction soil group D = 1.000
1798 [HIGH DENSITY RESIDENTIAL
1799 (24.0 DU/A or Less )
1800 Impervious value, Ai = 0.650
1801 Sub-Area C Value = 0.710
1802 Rainfall intensity = 5.718(In/Hr) for a 100.0 year storm
1803 Effective runoff coefficient used for total area
1804 (Q=KCIA) is C = 0.710 CA = 0.484
1805 Subarea runoff = 2.498(CFS) for 0.628(Ac.)
1806 Total runoff = 2.769(CFS) Total area = 0.682(Ac.)
1807 Depth of flow = 0.248(Ft.), Average velocity = 4.465(Ft/s)
1808
1809
1810 *****
1811 Process from Point/Station 603.000 to Point/Station 111.000
1812 **** PIPEFLOW TRAVEL TIME (User specified size) ****
1813
1814 Upstream point/station elevation = 427.840(Ft.)
1815 Downstream point/station elevation = 414.000(Ft.)
1816 Pipe length = 48.00(Ft.) Slope = 0.2883 Manning's N = 0.015
1817 No. of pipes = 1 Required pipe flow = 2.769(CFS)
1818 Given pipe size = 18.00(In.)
1819 Calculated individual pipe flow = 2.769(CFS)
1820 Normal flow depth in pipe = 2.91(In.)
1821 Flow top width inside pipe = 13.25(In.)
1822 Critical Depth = 7.58(In.)
1823 Pipe flow velocity = 14.96(Ft/s)
1824 Travel time through pipe = 0.05 min.
1825 Time of concentration (TC) = 7.89 min.
1826
1827
1828 *****
1829 Process from Point/Station 703.000 to Point/Station 111.000
1830 **** SUBAREA FLOW ADDITION ****
1831
1832 Rainfall intensity (I) = 5.693(In/Hr) for a 100.0 year storm
1833 Decimal fraction soil group A = 0.000
1834 Decimal fraction soil group B = 0.000
1835 Decimal fraction soil group C = 0.000
1836 Decimal fraction soil group D = 1.000
1837 [UNDISTURBED NATURAL TERRAIN
1838 (Permanent Open Space )
1839 Impervious value, Ai = 0.000
1840 Sub-Area C Value = 0.350
1841 Time of concentration = 7.89 min.
1842 Rainfall intensity = 5.693(In/Hr) for a 100.0 year storm
1843 Effective runoff coefficient used for total area
1844 (Q=KCIA) is C = 0.629 CA = 0.554
1845 Subarea runoff = 0.384(CFS) for 0.199(Ac.)
1846 Total runoff = 3.153(CFS) Total area = 0.881(Ac.)
1847
1848
1849 *****
1850 Process from Point/Station 704.000 to Point/Station 111.000
1851 **** SUBAREA FLOW ADDITION ****
1852
1853 Rainfall intensity (I) = 5.693(In/Hr) for a 100.0 year storm
1854 Decimal fraction soil group A = 0.000
1855 Decimal fraction soil group B = 0.000
1856 Decimal fraction soil group C = 0.000
1857 Decimal fraction soil group D = 1.000
1858 [HIGH DENSITY RESIDENTIAL
1859 (24.0 DU/A or Less )
1860 Impervious value, Ai = 0.650
1861 Sub-Area C Value = 0.710
1862 Time of concentration = 7.89 min.
1863 Rainfall intensity = 5.693(In/Hr) for a 100.0 year storm

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1864 Effective runoff coefficient used for total area
1865 (Q=KCIA) is C = 0.655 CA = 0.846
1866 Subarea runoff = 1.665(CFS) for 0.412(Ac.)
1867 Total runoff = 4.818(CFS) Total area = 1.293(Ac.)
1868
1869
1870 ++++++
1871 Process from Point/Station 111.000 to Point/Station 111.000
1872 **** SUBAREA FLOW ADDITION ****
1873
1874 Rainfall intensity (I) = 5.693(In/Hr) for a 100.0 year storm
1875 Decimal fraction soil group A = 0.000
1876 Decimal fraction soil group B = 0.000
1877 Decimal fraction soil group C = 0.000
1878 Decimal fraction soil group D = 1.000
1879 [LOW DENSITY RESIDENTIAL ]
1880 (1.0 DU/A or Less )
1881 Impervious value, Ai = 0.100
1882 Sub-Area C Value = 0.410
1883 Time of concentration = 7.89 min.
1884 Rainfall intensity = 5.693(In/Hr) for a 100.0 year storm
1885 Effective runoff coefficient used for total area
1886 (Q=KCIA) is C = 0.588 CA = 1.044
1887 Subarea runoff = 1.127(CFS) for 0.483(Ac.)
1888 Total runoff = 5.945(CFS) Total area = 1.776(Ac.)
1889
1890
1891 ++++++
1892 Process from Point/Station 111.000 to Point/Station 111.000
1893 **** 6 HOUR HYDROGRAPH ****
1894
1895 ++++++
1896 Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003
1897
1898
1899 Time of Concentration = 7.89
1900 Basin Area = 102.06 Acres
1901 6 Hour Rainfall = 2.900 Inches
1902 Runoff Coefficient = 0.010
1903 Peak Discharge = 5.95 CFS
1904 Time (Min) Discharge (CFS)
1905 0 0.000
1906 7 0.182
1907 14 0.184
1908 21 0.189
1909 28 0.192
1910 35 0.197
1911 42 0.200
1912 49 0.206
1913 56 0.210
1914 63 0.216
1915 70 0.220
1916 77 0.228
1917 84 0.232
1918 91 0.241
1919 98 0.246
1920 105 0.257
1921 112 0.263
1922 119 0.275
1923 126 0.282
1924 133 0.298
1925 140 0.306
1926 147 0.325
1927 154 0.336
1928 161 0.360
1929 168 0.374
1930 175 0.406
1931 182 0.426
1932 189 0.472

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1933	196	0.501
1934	203	0.574
1935	210	0.622
1936	217	0.760
1937	224	0.866
1938	231	1.272
1939	238	1.792
1940	245	5.945
1941	252	1.020
1942	259	0.683
1943	266	0.534
1944	273	0.447
1945	280	0.389
1946	287	0.347
1947	294	0.315
1948	301	0.290
1949	308	0.269
1950	315	0.252
1951	322	0.237
1952	329	0.224
1953	336	0.213
1954	343	0.203
1955	350	0.194
1956	357	0.187
1957	364	0.179

+++++

6 - H O U R S T O R M
Run 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	1.5	3.0	4.5	5.9
1965								
1966								
1967	0+ 0	0.0000	0.00	Q				
1968	0+ 1	0.0000	0.03	Q				
1969	0+ 2	0.0001	0.05	Q				
1970	0+ 3	0.0002	0.08	Q				
1971	0+ 4	0.0004	0.10	Q				
1972	0+ 5	0.0005	0.13	Q				
1973	0+ 6	0.0008	0.16	VQ				
1974	0+ 7	0.0010	0.18	VQ				
1975	0+ 8	0.0013	0.18	VQ				
1976	0+ 9	0.0015	0.18	VQ				
1977	0+10	0.0018	0.18	VQ				
1978	0+11	0.0020	0.18	VQ				
1979	0+12	0.0023	0.18	VQ				
1980	0+13	0.0025	0.18	VQ				
1981	0+14	0.0028	0.18	VQ				
1982	0+15	0.0030	0.18	VQ				
1983	0+16	0.0033	0.19	VQ				
1984	0+17	0.0035	0.19	VQ				
1985	0+18	0.0038	0.19	VQ				
1986	0+19	0.0040	0.19	VQ				
1987	0+20	0.0043	0.19	VQ				
1988	0+21	0.0046	0.19	VQ				
1989	0+22	0.0048	0.19	VQ				
1990	0+23	0.0051	0.19	VQ				
1991	0+24	0.0054	0.19	VQ				
1992	0+25	0.0056	0.19	VQ				
1993	0+26	0.0059	0.19	VQ				
1994	0+27	0.0061	0.19	VQ				
1995	0+28	0.0064	0.19	Q				
1996	0+29	0.0067	0.19	Q				
1997	0+30	0.0069	0.19	Q				
1998	0+31	0.0072	0.19	Q				
1999	0+32	0.0075	0.19	Q				
2000	0+33	0.0077	0.20	Q				
2001	0+34	0.0080	0.20	Q				

2002	0+35	0.0083	0.20	Q				
2003	0+36	0.0086	0.20	Q				
2004	0+37	0.0088	0.20	Q				
2005	0+38	0.0091	0.20	Q				
2006	0+39	0.0094	0.20	Q				
2007	0+40	0.0096	0.20	Q				
2008	0+41	0.0099	0.20	Q				
2009	0+42	0.0102	0.20	Q				
2010	0+43	0.0105	0.20	Q				
2011	0+44	0.0108	0.20	Q				
2012	0+45	0.0110	0.20	Q				
2013	0+46	0.0113	0.20	Q				
2014	0+47	0.0116	0.20	Q				
2015	0+48	0.0119	0.21	Q				
2016	0+49	0.0122	0.21	Q				
2017	0+50	0.0124	0.21	QV				
2018	0+51	0.0127	0.21	QV				
2019	0+52	0.0130	0.21	QV				
2020	0+53	0.0133	0.21	QV				
2021	0+54	0.0136	0.21	QV				
2022	0+55	0.0139	0.21	QV				
2023	0+56	0.0142	0.21	QV				
2024	0+57	0.0145	0.21	QV				
2025	0+58	0.0148	0.21	QV				
2026	0+59	0.0150	0.21	QV				
2027	1+ 0	0.0153	0.21	QV				
2028	1+ 1	0.0156	0.21	QV				
2029	1+ 2	0.0159	0.22	QV				
2030	1+ 3	0.0162	0.22	QV				
2031	1+ 4	0.0165	0.22	QV				
2032	1+ 5	0.0168	0.22	QV				
2033	1+ 6	0.0171	0.22	QV				
2034	1+ 7	0.0174	0.22	QV				
2035	1+ 8	0.0177	0.22	QV				
2036	1+ 9	0.0180	0.22	QV				
2037	1+10	0.0183	0.22	QV				
2038	1+11	0.0186	0.22	Q V				
2039	1+12	0.0189	0.22	Q V				
2040	1+13	0.0193	0.22	Q V				
2041	1+14	0.0196	0.22	Q V				
2042	1+15	0.0199	0.23	Q V				
2043	1+16	0.0202	0.23	Q V				
2044	1+17	0.0205	0.23	Q V				
2045	1+18	0.0208	0.23	Q V				
2046	1+19	0.0211	0.23	Q V				
2047	1+20	0.0214	0.23	Q V				
2048	1+21	0.0218	0.23	Q V				
2049	1+22	0.0221	0.23	Q V				
2050	1+23	0.0224	0.23	Q V				
2051	1+24	0.0227	0.23	Q V				
2052	1+25	0.0230	0.23	Q V				
2053	1+26	0.0234	0.23	Q V				
2054	1+27	0.0237	0.24	Q V				
2055	1+28	0.0240	0.24	Q V				
2056	1+29	0.0244	0.24	Q V				
2057	1+30	0.0247	0.24	Q V				
2058	1+31	0.0250	0.24	Q V				
2059	1+32	0.0253	0.24	Q V				
2060	1+33	0.0257	0.24	Q V				
2061	1+34	0.0260	0.24	Q V				
2062	1+35	0.0264	0.24	Q V				
2063	1+36	0.0267	0.24	Q V				
2064	1+37	0.0270	0.25	Q V				
2065	1+38	0.0274	0.25	Q V				
2066	1+39	0.0277	0.25	Q V				
2067	1+40	0.0281	0.25	Q V				
2068	1+41	0.0284	0.25	Q V				
2069	1+42	0.0287	0.25	Q V				
2070	1+43	0.0291	0.25	Q V				

2071	1+44	0.0295	0.26	Q	V				
2072	1+45	0.0298	0.26	Q	V				
2073	1+46	0.0302	0.26	Q	V				
2074	1+47	0.0305	0.26	Q	V				
2075	1+48	0.0309	0.26	Q	V				
2076	1+49	0.0312	0.26	Q	V				
2077	1+50	0.0316	0.26	Q	V				
2078	1+51	0.0320	0.26	Q	V				
2079	1+52	0.0323	0.26	Q	V				
2080	1+53	0.0327	0.26	Q	V				
2081	1+54	0.0330	0.27	Q	V				
2082	1+55	0.0334	0.27	Q	V				
2083	1+56	0.0338	0.27	Q	V				
2084	1+57	0.0342	0.27	Q	V				
2085	1+58	0.0345	0.27	Q	V				
2086	1+59	0.0349	0.28	Q	V				
2087	2+ 0	0.0353	0.28	Q	V				
2088	2+ 1	0.0357	0.28	Q	V				
2089	2+ 2	0.0361	0.28	Q	V				
2090	2+ 3	0.0364	0.28	Q	V				
2091	2+ 4	0.0368	0.28	Q	V				
2092	2+ 5	0.0372	0.28	Q	V				
2093	2+ 6	0.0376	0.28	Q	V				
2094	2+ 7	0.0380	0.28	Q	V				
2095	2+ 8	0.0384	0.29	Q	V				
2096	2+ 9	0.0388	0.29	Q	V				
2097	2+10	0.0392	0.29	Q	V				
2098	2+11	0.0396	0.29	Q	V				
2099	2+12	0.0400	0.30	Q	V				
2100	2+13	0.0404	0.30	Q	V				
2101	2+14	0.0408	0.30	Q	V				
2102	2+15	0.0412	0.30	Q	V				
2103	2+16	0.0417	0.30	Q	V				
2104	2+17	0.0421	0.30	Q	V				
2105	2+18	0.0425	0.30	Q	V				
2106	2+19	0.0429	0.30	Q	V				
2107	2+20	0.0433	0.31	Q	V				
2108	2+21	0.0438	0.31	Q	V				
2109	2+22	0.0442	0.31	Q	V				
2110	2+23	0.0446	0.31	Q	V				
2111	2+24	0.0451	0.32	Q	V				
2112	2+25	0.0455	0.32	Q	V				
2113	2+26	0.0459	0.32	Q	V				
2114	2+27	0.0464	0.33	Q	V				
2115	2+28	0.0468	0.33	Q	V				
2116	2+29	0.0473	0.33	Q	V				
2117	2+30	0.0477	0.33	Q	V				
2118	2+31	0.0482	0.33	Q	V				
2119	2+32	0.0487	0.33	Q	V				
2120	2+33	0.0491	0.33	Q	V				
2121	2+34	0.0496	0.34	Q	V				
2122	2+35	0.0501	0.34	Q	V				
2123	2+36	0.0505	0.34	Q	V				
2124	2+37	0.0510	0.35	Q	V				
2125	2+38	0.0515	0.35	Q	V				
2126	2+39	0.0520	0.35	Q	V				
2127	2+40	0.0525	0.36	Q	V				
2128	2+41	0.0530	0.36	Q	V				
2129	2+42	0.0535	0.36	Q	V				
2130	2+43	0.0540	0.36	Q	V				
2131	2+44	0.0545	0.37	Q	V				
2132	2+45	0.0550	0.37	Q	V				
2133	2+46	0.0555	0.37	Q	V				
2134	2+47	0.0560	0.37	Q	V				
2135	2+48	0.0565	0.37	Q	V				
2136	2+49	0.0570	0.38	Q	V				
2137	2+50	0.0576	0.38	Q	V				
2138	2+51	0.0581	0.39	Q	V				
2139	2+52	0.0586	0.39	Q	V				

2140	2+53	0.0592	0.40	Q	V				
2141	2+54	0.0597	0.40	Q	V				
2142	2+55	0.0603	0.41	Q	V				
2143	2+56	0.0608	0.41	Q	V				
2144	2+57	0.0614	0.41	Q	V				
2145	2+58	0.0620	0.41	Q	V				
2146	2+59	0.0626	0.42	Q	V				
2147	3+ 0	0.0631	0.42	Q	V				
2148	3+ 1	0.0637	0.42	Q	V				
2149	3+ 2	0.0643	0.43	Q	V				
2150	3+ 3	0.0649	0.43	Q	V				
2151	3+ 4	0.0655	0.44	Q	V				
2152	3+ 5	0.0661	0.45	Q	V				
2153	3+ 6	0.0667	0.45	Q	V				
2154	3+ 7	0.0674	0.46	Q	V				
2155	3+ 8	0.0680	0.47	Q	V				
2156	3+ 9	0.0687	0.47	Q	V				
2157	3+10	0.0693	0.48	Q	V				
2158	3+11	0.0700	0.48	Q	V				
2159	3+12	0.0707	0.48	Q	V				
2160	3+13	0.0713	0.49	Q	V				
2161	3+14	0.0720	0.49	Q	V				
2162	3+15	0.0727	0.50	Q	V				
2163	3+16	0.0734	0.50	Q	V				
2164	3+17	0.0741	0.51	Q	V				
2165	3+18	0.0748	0.52	Q	V				
2166	3+19	0.0755	0.53	Q	V				
2167	3+20	0.0763	0.54	Q	V				
2168	3+21	0.0770	0.55	Q	V				
2169	3+22	0.0778	0.56	Q	V				
2170	3+23	0.0786	0.57	Q	V				
2171	3+24	0.0794	0.58	Q	V				
2172	3+25	0.0802	0.59	Q	V				
2173	3+26	0.0810	0.59	Q	V				
2174	3+27	0.0819	0.60	Q	V				
2175	3+28	0.0827	0.61	Q	V				
2176	3+29	0.0836	0.62	Q	V				
2177	3+30	0.0844	0.62	Q	V				
2178	3+31	0.0853	0.64	Q	V				
2179	3+32	0.0862	0.66	Q	V				
2180	3+33	0.0871	0.68	Q	V				
2181	3+34	0.0881	0.70	Q	V				
2182	3+35	0.0891	0.72	Q	V				
2183	3+36	0.0901	0.74	Q	V				
2184	3+37	0.0912	0.76	Q	V				
2185	3+38	0.0922	0.78	Q	V				
2186	3+39	0.0933	0.79	Q	V				
2187	3+40	0.0944	0.81	Q	V				
2188	3+41	0.0956	0.82	Q	V				
2189	3+42	0.0967	0.84	Q	V				
2190	3+43	0.0979	0.85	Q	V				
2191	3+44	0.0991	0.87	Q	V				
2192	3+45	0.1004	0.92	Q	V				
2193	3+46	0.1017	0.98	Q	V				
2194	3+47	0.1031	1.04	Q	V				
2195	3+48	0.1047	1.10	Q	V				
2196	3+49	0.1062	1.16	Q	V				
2197	3+50	0.1079	1.21	Q	V				
2198	3+51	0.1097	1.27	Q	V				
2199	3+52	0.1115	1.35	Q	V				
2200	3+53	0.1135	1.42	Q	V				
2201	3+54	0.1155	1.49	Q	V				
2202	3+55	0.1177	1.57	Q	V				
2203	3+56	0.1200	1.64	Q	V				
2204	3+57	0.1223	1.72	Q	V				
2205	3+58	0.1248	1.79	Q	V				
2206	3+59	0.1281	2.39		Q				
2207	4+ 0	0.1322	2.98			Q			
2208	4+ 1	0.1371	3.57				Q		

2209	4+ 2	0.1428	4.17				V	Q		
2210	4+ 3	0.1494	4.76				V		Q	
2211	4+ 4	0.1568	5.35				V			Q
2212	4+ 5	0.1650	5.95				V			
2213	4+ 6	0.1722	5.24				V		Q	
2214	4+ 7	0.1784	4.54					V	Q	
2215	4+ 8	0.1837	3.83					V		
2216	4+ 9	0.1880	3.13				Q	V		
2217	4+10	0.1914	2.43			Q		V		
2218	4+11	0.1937	1.72		Q			V		
2219	4+12	0.1952	1.02					V		
2220	4+13	0.1965	0.97					V		
2221	4+14	0.1978	0.92						V	
2222	4+15	0.1990	0.88						V	
2223	4+16	0.2001	0.83						V	
2224	4+17	0.2012	0.78						V	
2225	4+18	0.2022	0.73						V	
2226	4+19	0.2031	0.68						V	
2227	4+20	0.2040	0.66						V	
2228	4+21	0.2049	0.64						V	
2229	4+22	0.2058	0.62						V	
2230	4+23	0.2066	0.60						V	
2231	4+24	0.2074	0.58						V	
2232	4+25	0.2082	0.56						V	
2233	4+26	0.2089	0.53						V	
2234	4+27	0.2096	0.52						V	
2235	4+28	0.2103	0.51						V	
2236	4+29	0.2110	0.50						V	
2237	4+30	0.2117	0.48						V	
2238	4+31	0.2123	0.47						V	
2239	4+32	0.2129	0.46						V	
2240	4+33	0.2136	0.45						V	
2241	4+34	0.2142	0.44						V	
2242	4+35	0.2148	0.43						V	
2243	4+36	0.2153	0.42						V	
2244	4+37	0.2159	0.41						V	
2245	4+38	0.2165	0.41						V	
2246	4+39	0.2170	0.40						V	
2247	4+40	0.2176	0.39						V	
2248	4+41	0.2181	0.38						V	
2249	4+42	0.2186	0.38						V	
2250	4+43	0.2191	0.37						V	
2251	4+44	0.2196	0.37						V	
2252	4+45	0.2201	0.36						V	
2253	4+46	0.2206	0.35						V	
2254	4+47	0.2211	0.35						V	
2255	4+48	0.2215	0.34						V	
2256	4+49	0.2220	0.34						V	
2257	4+50	0.2225	0.33						V	
2258	4+51	0.2229	0.33						V	
2259	4+52	0.2234	0.32						V	
2260	4+53	0.2238	0.32						V	
2261	4+54	0.2242	0.32						V	
2262	4+55	0.2247	0.31						V	
2263	4+56	0.2251	0.31						V	
2264	4+57	0.2255	0.30						V	
2265	4+58	0.2259	0.30						V	
2266	4+59	0.2263	0.30						V	
2267	5+ 0	0.2267	0.29						V	
2268	5+ 1	0.2271	0.29						V	
2269	5+ 2	0.2275	0.29						V	
2270	5+ 3	0.2279	0.28						V	
2271	5+ 4	0.2283	0.28						V	
2272	5+ 5	0.2287	0.28						V	
2273	5+ 6	0.2291	0.27						V	
2274	5+ 7	0.2295	0.27						V	
2275	5+ 8	0.2298	0.27						V	
2276	5+ 9	0.2302	0.27						V	
2277	5+10	0.2306	0.26						V	

2278	5+11	0.2309	0.26	Q				V
2279	5+12	0.2313	0.26	Q				V
2280	5+13	0.2316	0.26	Q				V
2281	5+14	0.2320	0.25	Q				V
2282	5+15	0.2323	0.25	Q				V
2283	5+16	0.2327	0.25	Q				V
2284	5+17	0.2330	0.25	Q				V
2285	5+18	0.2333	0.25	Q				V
2286	5+19	0.2337	0.24	Q				V
2287	5+20	0.2340	0.24	Q				V
2288	5+21	0.2343	0.24	Q				V
2289	5+22	0.2347	0.24	Q				V
2290	5+23	0.2350	0.23	Q				V
2291	5+24	0.2353	0.23	Q				V
2292	5+25	0.2356	0.23	Q				V
2293	5+26	0.2359	0.23	Q				V
2294	5+27	0.2363	0.23	Q				V
2295	5+28	0.2366	0.23	Q				V
2296	5+29	0.2369	0.22	Q				V
2297	5+30	0.2372	0.22	Q				V
2298	5+31	0.2375	0.22	Q				V
2299	5+32	0.2378	0.22	Q				V
2300	5+33	0.2381	0.22	Q				V
2301	5+34	0.2384	0.22	Q				V
2302	5+35	0.2387	0.21	Q				V
2303	5+36	0.2390	0.21	Q				V
2304	5+37	0.2393	0.21	Q				V
2305	5+38	0.2396	0.21	Q				V
2306	5+39	0.2398	0.21	Q				V
2307	5+40	0.2401	0.21	Q				V
2308	5+41	0.2404	0.21	Q				V
2309	5+42	0.2407	0.20	Q				V
2310	5+43	0.2410	0.20	Q				V
2311	5+44	0.2413	0.20	Q				V
2312	5+45	0.2415	0.20	Q				V
2313	5+46	0.2418	0.20	Q				V
2314	5+47	0.2421	0.20	Q				V
2315	5+48	0.2423	0.20	Q				V
2316	5+49	0.2426	0.20	Q				V
2317	5+50	0.2429	0.19	Q				V
2318	5+51	0.2432	0.19	Q				V
2319	5+52	0.2434	0.19	Q				V
2320	5+53	0.2437	0.19	Q				V
2321	5+54	0.2439	0.19	Q				V
2322	5+55	0.2442	0.19	Q				V
2323	5+56	0.2445	0.19	Q				V
2324	5+57	0.2447	0.19	Q				V
2325	5+58	0.2450	0.19	Q				V
2326	5+59	0.2452	0.18	Q				V
2327	6+ 0	0.2455	0.18	Q				V
2328	6+ 1	0.2457	0.18	Q				V
2329	6+ 2	0.2460	0.18	Q				V
2330	6+ 3	0.2462	0.18	Q				V
2331	6+ 4	0.2465	0.18	Q				V

2332 -----

2333

2334

2335

2336

2337

2338

2339 ++++++

2340 Process from Point/Station 111.000 to Point/Station 111.000

2341 **** CONFLUENCE OF MAIN STREAMS ****

2342

2343 The following data inside Main Stream is listed:

2344 In Main Stream number: 2

2345 Stream flow area = 1.776 (Ac.)

2346 Runoff from this stream = 5.945 (CFS)

```

2347 Time of concentration = 7.89 min.
2348 Rainfall intensity = 5.693 (In/Hr)
2349 Summary of stream data:
2350
2351 Stream Flow rate TC Rainfall Intensity
2352 No. (CFS) (min) (In/Hr)
2353
2354
2355 1 123.674 20.81 3.046
2356 2 5.945 7.89 5.693
2357 Qmax(1) =
2358 1.000 * 1.000 * 123.674) +
2359 0.535 * 1.000 * 5.945) + = 126.855
2360 Qmax(2) =
2361 1.000 * 0.379 * 123.674) +
2362 1.000 * 1.000 * 5.945) + = 52.844
2363
2364 Total of 2 main streams to confluence:
2365 Flow rates before confluence point:
2366 123.674 5.945
2367 Maximum flow rates at confluence using above data:
2368 126.855 52.844
2369 Area of streams before confluence:
2370 100.281 1.776
2371
2372
2373 Results of confluence:
2374 Total flow rate = 126.855 (CFS)
2375 Time of concentration = 20.810 min.
2376 Effective stream area after confluence = 102.057 (Ac.)
2377
2378
2379 ++++++
2380 Process from Point/Station 111.000 to Point/Station 111.000
2381 **** CONFLUENCE OF MINOR STREAMS ****
2382
2383 Along Main Stream number: 1 in normal stream number 1
2384 Stream flow area = 102.057 (Ac.)
2385 Runoff from this stream = 126.855 (CFS)
2386 Time of concentration = 20.81 min.
2387 Rainfall intensity = 3.046 (In/Hr)
2388
2389
2390 ++++++
2391 Process from Point/Station 801.000 to Point/Station 802.000
2392 **** INITIAL AREA EVALUATION ****
2393
2394 Decimal fraction soil group A = 0.000
2395 Decimal fraction soil group B = 0.000
2396 Decimal fraction soil group C = 0.000
2397 Decimal fraction soil group D = 1.000
2398 [UNDISTURBED NATURAL TERRAIN ]
2399 (Permanent Open Space )
2400 Impervious value, Ai = 0.000
2401 Sub-Area C Value = 0.350
2402 Initial subarea total flow distance = 100.000 (Ft.)
2403 Highest elevation = 596.000 (Ft.)
2404 Lowest elevation = 576.000 (Ft.)
2405 Elevation difference = 20.000 (Ft.) Slope = 20.000 %
2406 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
2407 The maximum overland flow distance is 100.00 (Ft)
2408 for the top area slope value of 20.00 %, in a development type of
2409 Permanent Open Space
2410 In Accordance With Figure 3-3
2411 Initial Area Time of Concentration = 4.97 minutes
2412 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
2413 TC = [1.8*(1.1-0.3500)*( 100.000^.5)/( 20.000^(1/3)]= 4.97
2414 Calculated TC of 4.973 minutes is less than 5 minutes,
2415 resetting TC to 5.0 minutes for rainfall intensity calculations

```

```

2416 Rainfall intensity (I) =      7.641(In/Hr) for a   100.0 year storm
2417 Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
2418 Subarea runoff =      0.957(CFS)
2419 Total initial stream area =      0.358(Ac.)
2420
2421
2422 ++++++
2423 Process from Point/Station      802.000 to Point/Station      803.000
2424 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
2425
2426 -----
2426 Estimated mean flow rate at midpoint of channel =      3.677(CFS)
2427 Depth of flow =      0.096(Ft.), Average velocity =      3.758(Ft/s)
2428 ***** Irregular Channel Data *****
2429 -----
2430 Information entered for subchannel number 1 :
2431 Point number      'X' coordinate      'Y' coordinate
2432      1              0.00              18.00
2433      2              45.00              0.00
2434      3              55.00              0.00
2435      4             100.00              18.00
2436 Manning's 'N' friction factor =      0.040
2437 -----
2438 Sub-Channel flow =      3.677(CFS)
2439 '      '      flow top width =      10.478(Ft.)
2440 '      '      velocity=      3.758(Ft/s)
2441 '      '      area =      0.978(Sq.Ft)
2442 '      '      Froude number =      2.167
2443
2444 Upstream point elevation =      576.000(Ft.)
2445 Downstream point elevation =      485.000(Ft.)
2446 Flow length =      375.000(Ft.)
2447 Travel time =      1.66 min.
2448 Time of concentration =      6.64 min.
2449 Depth of flow =      0.096(Ft.)
2450 Average velocity =      3.758(Ft/s)
2451 Total irregular channel flow =      3.677(CFS)
2452 Irregular channel normal depth above invert elev. =      0.096(Ft.)
2453 Average velocity of channel(s) =      3.758(Ft/s)
2454 Adding area flow to channel
2455 Rainfall intensity (I) =      6.365(In/Hr) for a   100.0 year storm
2456 Decimal fraction soil group A = 0.000
2457 Decimal fraction soil group B = 0.000
2458 Decimal fraction soil group C = 0.000
2459 Decimal fraction soil group D = 1.000
2460 [UNDISTURBED NATURAL TERRAIN      ]
2461 (Permanent Open Space      )
2462 Impervious value, Ai = 0.000
2463 Sub-Area C Value = 0.350
2464 Rainfall intensity =      6.365(In/Hr) for a   100.0 year storm
2465 Effective runoff coefficient used for total area
2466 (Q=KCIA) is C = 0.350 CA =      0.990
2467 Subarea runoff =      5.347(CFS) for      2.472(Ac.)
2468 Total runoff =      6.305(CFS) Total area =      2.830(Ac.)
2469 Depth of flow =      0.132(Ft.), Average velocity =      4.628(Ft/s)
2470
2471
2472 ++++++
2473 Process from Point/Station      803.000 to Point/Station      111.000
2474 **** IMPROVED CHANNEL TRAVEL TIME ****
2475
2476 -----
2476 Upstream point elevation =      485.000(Ft.)
2477 Downstream point elevation =      432.000(Ft.)
2478 Channel length thru subarea =      775.000(Ft.)
2479 Channel base width =      1.000(Ft.)
2480 Slope or 'Z' of left channel bank = 100.000
2481 Slope or 'Z' of right channel bank = 100.000
2482 Manning's 'N' = 0.016
2483 Maximum depth of channel =      1.500(Ft.)
2484 Flow(q) thru subarea =      6.305(CFS)

```

```

2485 Depth of flow = 0.123(Ft.), Average velocity = 3.875(Ft/s)
2486 Channel flow top width = 25.531(Ft.)
2487 Flow Velocity = 3.87(Ft/s)
2488 Travel time = 3.33 min.
2489 Time of concentration = 9.97 min.
2490 Critical depth = 0.186(Ft.)
2491
2492
2493 ++++++
2494 Process from Point/Station 804.000 to Point/Station 111.000
2495 **** SUBAREA FLOW ADDITION ****
2496
2497 Rainfall intensity (I) = 4.896(In/Hr) for a 100.0 year storm
2498 Decimal fraction soil group A = 0.000
2499 Decimal fraction soil group B = 0.000
2500 Decimal fraction soil group C = 0.000
2501 Decimal fraction soil group D = 1.000
2502 [UNDISTURBED NATURAL TERRAIN ]
2503 (Permanent Open Space )
2504 Impervious value, Ai = 0.000
2505 Sub-Area C Value = 0.350
2506 Time of concentration = 9.97 min.
2507 Rainfall intensity = 4.896(In/Hr) for a 100.0 year storm
2508 Effective runoff coefficient used for total area
2509 (Q=KCIA) is C = 0.350 CA = 2.660
2510 Subarea runoff = 6.719(CFS) for 4.771(Ac.)
2511 Total runoff = 13.024(CFS) Total area = 7.601(Ac.)
2512
2513
2514 ++++++
2515 Process from Point/Station 805.000 to Point/Station 111.000
2516 **** SUBAREA FLOW ADDITION ****
2517
2518 Rainfall intensity (I) = 4.896(In/Hr) for a 100.0 year storm
2519 Decimal fraction soil group A = 0.000
2520 Decimal fraction soil group B = 0.000
2521 Decimal fraction soil group C = 0.000
2522 Decimal fraction soil group D = 1.000
2523 [UNDISTURBED NATURAL TERRAIN ]
2524 (Permanent Open Space )
2525 Impervious value, Ai = 0.000
2526 Sub-Area C Value = 0.350
2527 Time of concentration = 9.97 min.
2528 Rainfall intensity = 4.896(In/Hr) for a 100.0 year storm
2529 Effective runoff coefficient used for total area
2530 (Q=KCIA) is C = 0.350 CA = 3.421
2531 Subarea runoff = 3.722(CFS) for 2.172(Ac.)
2532 Total runoff = 16.746(CFS) Total area = 9.773(Ac.)
2533
2534
2535 ++++++
2536 Process from Point/Station 111.000 to Point/Station 111.000
2537 **** CONFLUENCE OF MINOR STREAMS ****
2538
2539 Along Main Stream number: 1 in normal stream number 2
2540 Stream flow area = 9.773(Ac.)
2541 Runoff from this stream = 16.746(CFS)
2542 Time of concentration = 9.97 min.
2543 Rainfall intensity = 4.896(In/Hr)
2544 Summary of stream data:
2545
2546 Stream Flow rate TC Rainfall Intensity
2547 No. (CFS) (min) (In/Hr)
2548
2549
2550 1 126.855 20.81 3.046
2551 2 16.746 9.97 4.896
2552 Qmax(1) =
2553 1.000 * 1.000 * 126.855) +

```

```

2554         0.622 *      1.000 *      16.746) + =      137.273
2555 Qmax (2) =
2556         1.000 *      0.479 *      126.855) +
2557         1.000 *      1.000 *      16.746) + =      77.521
2558
2559 Total of 2 streams to confluence:
2560 Flow rates before confluence point:
2561      126.855      16.746
2562 Maximum flow rates at confluence using above data:
2563      137.273      77.521
2564 Area of streams before confluence:
2565      102.057      9.773
2566 Results of confluence:
2567 Total flow rate =      137.273 (CFS)
2568 Time of concentration =      20.810 min.
2569 Effective stream area after confluence =      111.830 (Ac.)
2570 End of computations, total study area =      111.830 (Ac.)
2571
2572
2573

```


San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 01/15/26

POST-DEVELOPMENT
POC-2 UN-MITIGATED
100-YR Storm
UPDATED 9-8-25

***** 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) = 2.900
24 hour precipitation(inches) = 5.250
P6/P24 = 55.2%
San Diego hydrology manual 'C' values used

Process from Point/Station 401.000 to Point/Station 402.000
**** 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
[UNDISTURBED NATURAL TERRAIN]
(Permanent Open Space)
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance = 82.000 (Ft.)
Highest elevation = 598.000 (Ft.)
Lowest elevation = 586.000 (Ft.)
Elevation difference = 12.000 (Ft.) Slope = 14.634 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 14.63 %, in a development type of
Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration = 5.52 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance (Ft.)}^{.5} / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.3500) * (100.000^{.5}) / (14.634^{(1/3)})] = 5.52$
Rainfall intensity (I) = 7.169 (In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff = 0.276 (CFS)
Total initial stream area = 0.110 (Ac.)

Process from Point/Station 402.000 to Point/Station 403.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 5.841 (CFS)
Depth of flow = 0.193 (Ft.), Average velocity = 5.245 (Ft/s)
***** Irregular Channel Data *****

```

70 -----
71 Information entered for subchannel number 1 :
72 Point number      'X' coordinate      'Y' coordinate
73      1              0.00              5.00
74      2              20.00              0.00
75      3              25.00              0.00
76      4              45.00              5.00
77 Manning's 'N' friction factor =    0.040
78 -----
79 Sub-Channel flow =    5.841 (CFS)
80 '      '      flow top width =    6.544 (Ft.)
81 '      '      velocity=    5.245 (Ft/s)
82 '      '      area =    1.114 (Sq.Ft)
83 '      '      Froude number =    2.240
84
85 Upstream point elevation =    586.000 (Ft.)
86 Downstream point elevation =    436.000 (Ft.)
87 Flow length =    703.000 (Ft.)
88 Travel time =    2.23 min.
89 Time of concentration =    7.75 min.
90 Depth of flow =    0.193 (Ft.)
91 Average velocity =    5.245 (Ft/s)
92 Total irregular channel flow =    5.841 (CFS)
93 Irregular channel normal depth above invert elev. =    0.193 (Ft.)
94 Average velocity of channel(s) =    5.245 (Ft/s)
95 Adding area flow to channel
96 Rainfall intensity (I) =    5.758 (In/Hr) for a    100.0 year storm
97 Decimal fraction soil group A =    0.000
98 Decimal fraction soil group B =    0.000
99 Decimal fraction soil group C =    0.000
100 Decimal fraction soil group D =    1.000
101 [UNDISTURBED NATURAL TERRAIN
102 (Permanent Open Space )
103 Impervious value, Ai =    0.000
104 Sub-Area C Value =    0.350
105 Rainfall intensity =    5.758 (In/Hr) for a    100.0 year storm
106 Effective runoff coefficient used for total area
107 (Q=KCIA) is C =    0.350 CA =    1.971
108 Subarea runoff =    11.072 (CFS) for    5.521 (Ac.)
109 Total runoff =    11.348 (CFS) Total area =    5.631 (Ac.)
110 Depth of flow =    0.282 (Ft.), Average velocity =    6.557 (Ft/s)
111
112
113 ++++++
114 Process from Point/Station    409.000 to Point/Station    409.000
115 **** CONFLUENCE OF MINOR STREAMS ****
116
117 -----
118 Along Main Stream number: 1 in normal stream number 1
119 Stream flow area =    5.631 (Ac.)
120 Runoff from this stream =    11.348 (CFS)
121 Time of concentration =    7.75 min.
122 Rainfall intensity =    5.758 (In/Hr)
123
124 ++++++
125 Process from Point/Station    404.000 to Point/Station    405.000
126 **** INITIAL AREA EVALUATION ****
127
128 -----
129 Decimal fraction soil group A =    0.000
130 Decimal fraction soil group B =    0.000
131 Decimal fraction soil group C =    0.000
132 Decimal fraction soil group D =    1.000
133 [UNDISTURBED NATURAL TERRAIN
134 (Permanent Open Space )
135 Impervious value, Ai =    0.000
136 Sub-Area C Value =    0.350
137 Initial subarea total flow distance =    120.000 (Ft.)
138 Highest elevation =    503.000 (Ft.)
139 Lowest elevation =    483.000 (Ft.)

```

```

139 Elevation difference = 20.000(Ft.) Slope = 16.667 %
140 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
141 The maximum overland flow distance is 100.00 (Ft)
142 for the top area slope value of 16.67 %, in a development type of
143 Permanent Open Space
144 In Accordance With Figure 3-3
145 Initial Area Time of Concentration = 5.29 minutes
146  $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5}] / (\% slope^{(1/3)})]$ 
147  $TC = [1.8 * (1.1 - 0.3500) * (100.000^{.5}) / (16.667^{(1/3)})] = 5.29$ 
148 The initial area total distance of 120.00 (Ft.) entered leaves a
149 remaining distance of 20.00 (Ft.)
150 Using Figure 3-4, the travel time for this distance is 0.16 minutes
151 for a distance of 20.00 (Ft.) and a slope of 16.67 %
152 with an elevation difference of 3.33(Ft.) from the end of the top area
153  $Tt = [11.9 * length(Mi)^3] / (elevation change(Ft.))^{.385} * 60 (min/hr)$ 
154 = 0.156 Minutes
155  $Tt = [(11.9 * 0.0038^3) / (3.33)]^{.385} = 0.16$ 
156 Total initial area  $Ti = 5.29$  minutes from Figure 3-3 formula plus
157 0.16 minutes from the Figure 3-4 formula = 5.44 minutes
158 Rainfall intensity (I) = 7.235(In/Hr) for a 100.0 year storm
159 Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
160 Subarea runoff = 0.251(CFS)
161 Total initial stream area = 0.099(Ac.)
162
163
164 ++++++
165 Process from Point/Station 405.000 to Point/Station 406.000
166 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
167
168 -----
169 Estimated mean flow rate at midpoint of channel = 2.869(CFS)
170 Depth of flow = 0.174(Ft.), Average velocity = 1.852(Ft/s)
171 ***** Irregular Channel Data *****
172 -----
173 Information entered for subchannel number 1 :
174 Point number 'X' coordinate 'Y' coordinate
175 1 0.00 1.00
176 2 100.00 0.00
177 3 102.00 1.00
178 Manning's 'N' friction factor = 0.016
179 -----
180 Sub-Channel flow = 2.869(CFS)
181 ' ' flow top width = 17.778(Ft.)
182 ' ' velocity = 1.852(Ft/s)
183 ' ' area = 1.549(Sq.Ft)
184 ' ' Froude number = 1.106
185
186 Upstream point elevation = 483.000(Ft.)
187 Downstream point elevation = 479.500(Ft.)
188 Flow length = 339.000(Ft.)
189 Travel time = 3.05 min.
190 Time of concentration = 8.49 min.
191 Depth of flow = 0.174(Ft.)
192 Average velocity = 1.852(Ft/s)
193 Total irregular channel flow = 2.869(CFS)
194 Irregular channel normal depth above invert elev. = 0.174(Ft.)
195 Average velocity of channel(s) = 1.852(Ft/s)
196 Adding area flow to channel
197 Rainfall intensity (I) = 5.429(In/Hr) for a 100.0 year storm
198 Decimal fraction soil group A = 0.000
199 Decimal fraction soil group B = 0.000
200 Decimal fraction soil group C = 0.000
201 Decimal fraction soil group D = 1.000
202 [HIGH DENSITY RESIDENTIAL ]
203 (24.0 DU/A or Less )
204 Impervious value,  $A_i = 0.650$ 
205 Sub-Area C Value = 0.710
206 Rainfall intensity = 5.429(In/Hr) for a 100.0 year storm
207 Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.686 CA = 1.024

```

208 Subarea runoff = 5.307(CFS) for 1.393(Ac.)
209 Total runoff = 5.558(CFS) Total area = 1.492(Ac.)
210 Depth of flow = 0.223(Ft.), Average velocity = 2.185(Ft/s)
211
212

213 ++++++
214 Process from Point/Station 406.000 to Point/Station 406.000
215 **** 6 HOUR HYDROGRAPH ****
216

217 ++++++
218 Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003
219

220
221 Time of Concentration = 8.49
222 Basin Area = 7.12 Acres
223 6 Hour Rainfall = 2.900 Inches
224 Runoff Coefficient = 0.144
225 Peak Discharge = 5.56 CFS

Time (Min)	Discharge (CFS)
0	0.000
8	0.177
16	0.180
24	0.185
32	0.188
40	0.195
48	0.198
56	0.205
64	0.209
72	0.217
80	0.222
88	0.231
96	0.236
104	0.248
112	0.254
120	0.268
128	0.275
136	0.292
144	0.302
152	0.324
160	0.336
168	0.365
176	0.383
184	0.424
192	0.450
200	0.516
208	0.559
216	0.684
224	0.779
232	1.144
240	1.611
248	5.558
256	0.917
264	0.614
272	0.480
280	0.402
288	0.350
296	0.312
304	0.283
312	0.261
320	0.242
328	0.226
336	0.213
344	0.201
352	0.191
360	0.183
368	0.175

274 ++++++
275 6 - H O U R S T O R M
276 R u n o f f H y d r o g r a p h

277

278

279

280

Hydrograph in 1 Minute intervals ((CFS))

281

Time (h+m) Volume Ac.Ft Q(CFS) 0 1.4 2.8 4.2 5.6

282

283 0+ 0 0.0000 0.00 Q

284 0+ 1 0.0000 0.02 Q

285 0+ 2 0.0001 0.04 Q

286 0+ 3 0.0002 0.07 Q

287 0+ 4 0.0003 0.09 Q

288 0+ 5 0.0005 0.11 Q

289 0+ 6 0.0006 0.13 Q

290 0+ 7 0.0009 0.16 VQ

291 0+ 8 0.0011 0.18 VQ

292 0+ 9 0.0013 0.18 VQ

293 0+10 0.0016 0.18 VQ

294 0+11 0.0018 0.18 VQ

295 0+12 0.0021 0.18 VQ

296 0+13 0.0023 0.18 VQ

297 0+14 0.0026 0.18 VQ

298 0+15 0.0028 0.18 VQ

299 0+16 0.0031 0.18 VQ

300 0+17 0.0033 0.18 VQ

301 0+18 0.0036 0.18 VQ

302 0+19 0.0038 0.18 VQ

303 0+20 0.0041 0.18 VQ

304 0+21 0.0043 0.18 VQ

305 0+22 0.0046 0.18 VQ

306 0+23 0.0048 0.18 VQ

307 0+24 0.0051 0.19 VQ

308 0+25 0.0053 0.19 VQ

309 0+26 0.0056 0.19 VQ

310 0+27 0.0059 0.19 VQ

311 0+28 0.0061 0.19 VQ

312 0+29 0.0064 0.19 Q

313 0+30 0.0066 0.19 Q

314 0+31 0.0069 0.19 Q

315 0+32 0.0071 0.19 Q

316 0+33 0.0074 0.19 Q

317 0+34 0.0077 0.19 Q

318 0+35 0.0079 0.19 Q

319 0+36 0.0082 0.19 Q

320 0+37 0.0085 0.19 Q

321 0+38 0.0087 0.19 Q

322 0+39 0.0090 0.19 Q

323 0+40 0.0093 0.19 Q

324 0+41 0.0095 0.20 Q

325 0+42 0.0098 0.20 Q

326 0+43 0.0101 0.20 Q

327 0+44 0.0103 0.20 Q

328 0+45 0.0106 0.20 Q

329 0+46 0.0109 0.20 Q

330 0+47 0.0112 0.20 Q

331 0+48 0.0114 0.20 Q

332 0+49 0.0117 0.20 Q

333 0+50 0.0120 0.20 Q

334 0+51 0.0123 0.20 QV

335 0+52 0.0125 0.20 QV

336 0+53 0.0128 0.20 QV

337 0+54 0.0131 0.20 QV

338 0+55 0.0134 0.20 QV

339 0+56 0.0137 0.21 QV

340 0+57 0.0139 0.21 QV

341 0+58 0.0142 0.21 QV

342 0+59 0.0145 0.21 QV

343 1+ 0 0.0148 0.21 QV

344 1+ 1 0.0151 0.21 QV

345 1+ 2 0.0154 0.21 QV

346	1+ 3	0.0156	0.21	QV				
347	1+ 4	0.0159	0.21	QV				
348	1+ 5	0.0162	0.21	QV				
349	1+ 6	0.0165	0.21	QV				
350	1+ 7	0.0168	0.21	QV				
351	1+ 8	0.0171	0.21	QV				
352	1+ 9	0.0174	0.21	QV				
353	1+10	0.0177	0.22	QV				
354	1+11	0.0180	0.22	QV				
355	1+12	0.0183	0.22	QV				
356	1+13	0.0186	0.22	Q V				
357	1+14	0.0189	0.22	Q V				
358	1+15	0.0192	0.22	Q V				
359	1+16	0.0195	0.22	Q V				
360	1+17	0.0198	0.22	Q V				
361	1+18	0.0201	0.22	Q V				
362	1+19	0.0204	0.22	Q V				
363	1+20	0.0207	0.22	Q V				
364	1+21	0.0210	0.22	Q V				
365	1+22	0.0213	0.22	Q V				
366	1+23	0.0216	0.23	Q V				
367	1+24	0.0219	0.23	Q V				
368	1+25	0.0223	0.23	Q V				
369	1+26	0.0226	0.23	Q V				
370	1+27	0.0229	0.23	Q V				
371	1+28	0.0232	0.23	Q V				
372	1+29	0.0235	0.23	Q V				
373	1+30	0.0239	0.23	Q V				
374	1+31	0.0242	0.23	Q V				
375	1+32	0.0245	0.23	Q V				
376	1+33	0.0248	0.23	Q V				
377	1+34	0.0251	0.24	Q V				
378	1+35	0.0255	0.24	Q V				
379	1+36	0.0258	0.24	Q V				
380	1+37	0.0261	0.24	Q V				
381	1+38	0.0264	0.24	Q V				
382	1+39	0.0268	0.24	Q V				
383	1+40	0.0271	0.24	Q V				
384	1+41	0.0274	0.24	Q V				
385	1+42	0.0278	0.24	Q V				
386	1+43	0.0281	0.25	Q V				
387	1+44	0.0285	0.25	Q V				
388	1+45	0.0288	0.25	Q V				
389	1+46	0.0292	0.25	Q V				
390	1+47	0.0295	0.25	Q V				
391	1+48	0.0298	0.25	Q V				
392	1+49	0.0302	0.25	Q V				
393	1+50	0.0305	0.25	Q V				
394	1+51	0.0309	0.25	Q V				
395	1+52	0.0312	0.25	Q V				
396	1+53	0.0316	0.26	Q V				
397	1+54	0.0319	0.26	Q V				
398	1+55	0.0323	0.26	Q V				
399	1+56	0.0327	0.26	Q V				
400	1+57	0.0330	0.26	Q V				
401	1+58	0.0334	0.26	Q V				
402	1+59	0.0337	0.27	Q V				
403	2+ 0	0.0341	0.27	Q V				
404	2+ 1	0.0345	0.27	Q V				
405	2+ 2	0.0349	0.27	Q V				
406	2+ 3	0.0352	0.27	Q V				
407	2+ 4	0.0356	0.27	Q V				
408	2+ 5	0.0360	0.27	Q V				
409	2+ 6	0.0364	0.27	Q V				
410	2+ 7	0.0367	0.27	Q V				
411	2+ 8	0.0371	0.28	Q V				
412	2+ 9	0.0375	0.28	Q V				
413	2+10	0.0379	0.28	Q V				
414	2+11	0.0383	0.28	Q V				

415	2+12	0.0387	0.28	Q	V				
416	2+13	0.0391	0.29	Q	V				
417	2+14	0.0394	0.29	Q	V				
418	2+15	0.0398	0.29	Q	V				
419	2+16	0.0403	0.29	Q	V				
420	2+17	0.0407	0.29	Q	V				
421	2+18	0.0411	0.29	Q	V				
422	2+19	0.0415	0.30	Q	V				
423	2+20	0.0419	0.30	Q	V				
424	2+21	0.0423	0.30	Q	V				
425	2+22	0.0427	0.30	Q	V				
426	2+23	0.0431	0.30	Q	V				
427	2+24	0.0435	0.30	Q	V				
428	2+25	0.0440	0.30	Q	V				
429	2+26	0.0444	0.31	Q	V				
430	2+27	0.0448	0.31	Q	V				
431	2+28	0.0452	0.31	Q	V				
432	2+29	0.0457	0.32	Q	V				
433	2+30	0.0461	0.32	Q	V				
434	2+31	0.0465	0.32	Q	V				
435	2+32	0.0470	0.32	Q	V				
436	2+33	0.0474	0.33	Q	V				
437	2+34	0.0479	0.33	Q	V				
438	2+35	0.0483	0.33	Q	V				
439	2+36	0.0488	0.33	Q	V				
440	2+37	0.0493	0.33	Q	V				
441	2+38	0.0497	0.33	Q	V				
442	2+39	0.0502	0.33	Q	V				
443	2+40	0.0506	0.34	Q	V				
444	2+41	0.0511	0.34	Q	V				
445	2+42	0.0516	0.34	Q	V				
446	2+43	0.0521	0.35	Q	V				
447	2+44	0.0525	0.35	Q	V				
448	2+45	0.0530	0.35	Q	V				
449	2+46	0.0535	0.36	Q	V				
450	2+47	0.0540	0.36	Q	V				
451	2+48	0.0545	0.37	Q	V				
452	2+49	0.0550	0.37	Q	V				
453	2+50	0.0555	0.37	Q	V				
454	2+51	0.0561	0.37	Q	V				
455	2+52	0.0566	0.37	Q	V				
456	2+53	0.0571	0.38	Q	V				
457	2+54	0.0576	0.38	Q	V				
458	2+55	0.0581	0.38	Q	V				
459	2+56	0.0587	0.38	Q	V				
460	2+57	0.0592	0.39	Q	V				
461	2+58	0.0597	0.39	Q	V				
462	2+59	0.0603	0.40	Q	V				
463	3+ 0	0.0608	0.40	Q	V				
464	3+ 1	0.0614	0.41	Q	V				
465	3+ 2	0.0620	0.41	Q	V				
466	3+ 3	0.0626	0.42	Q	V				
467	3+ 4	0.0631	0.42	Q	V				
468	3+ 5	0.0637	0.43	Q	V				
469	3+ 6	0.0643	0.43	Q	V				
470	3+ 7	0.0649	0.43	Q	V				
471	3+ 8	0.0655	0.44	Q	V				
472	3+ 9	0.0661	0.44	Q	V				
473	3+10	0.0667	0.44	Q	V				
474	3+11	0.0674	0.45	Q	V				
475	3+12	0.0680	0.45	Q	V				
476	3+13	0.0686	0.46	Q	V				
477	3+14	0.0692	0.47	Q	V				
478	3+15	0.0699	0.47	Q	V				
479	3+16	0.0706	0.48	Q	V				
480	3+17	0.0712	0.49	Q	V				
481	3+18	0.0719	0.50	Q	V				
482	3+19	0.0726	0.51	Q	V				
483	3+20	0.0733	0.52	Q	V				

484	3+21	0.0741	0.52	Q	V				
485	3+22	0.0748	0.53	Q	V				
486	3+23	0.0755	0.53	Q	V				
487	3+24	0.0763	0.54	Q	V				
488	3+25	0.0770	0.54	Q	V				
489	3+26	0.0778	0.55	Q	V				
490	3+27	0.0785	0.55	Q	V				
491	3+28	0.0793	0.56	Q	V				
492	3+29	0.0801	0.58	Q	V				
493	3+30	0.0809	0.59	Q	V				
494	3+31	0.0817	0.61	Q	V				
495	3+32	0.0826	0.62	Q	V				
496	3+33	0.0835	0.64	Q	V				
497	3+34	0.0844	0.65	Q	V				
498	3+35	0.0853	0.67	Q	V				
499	3+36	0.0862	0.68	Q	V				
500	3+37	0.0872	0.70	Q	V				
501	3+38	0.0882	0.71	Q	V				
502	3+39	0.0892	0.72	Q	V				
503	3+40	0.0902	0.73	Q	V				
504	3+41	0.0912	0.74	Q	V				
505	3+42	0.0922	0.76	Q	V				
506	3+43	0.0933	0.77	Q	V				
507	3+44	0.0944	0.78	Q	V				
508	3+45	0.0955	0.82	Q	V				
509	3+46	0.0967	0.87	Q	V				
510	3+47	0.0980	0.92	Q	V				
511	3+48	0.0993	0.96	Q	V				
512	3+49	0.1007	1.01	Q	V				
513	3+50	0.1021	1.05	Q	V				
514	3+51	0.1036	1.10	Q	V				
515	3+52	0.1052	1.14	Q	V				
516	3+53	0.1069	1.20	Q	V				
517	3+54	0.1086	1.26	Q	V				
518	3+55	0.1104	1.32	Q	V				
519	3+56	0.1123	1.38	Q	V				
520	3+57	0.1143	1.44	Q	V				
521	3+58	0.1163	1.49	Q	V				
522	3+59	0.1185	1.55	Q	V				
523	4+ 0	0.1207	1.61	Q	V				
524	4+ 1	0.1236	2.10		Q	V			
525	4+ 2	0.1272	2.60		Q	V			
526	4+ 3	0.1314	3.09		Q	V			
527	4+ 4	0.1364	3.58		Q	V			
528	4+ 5	0.1420	4.08		Q	V			
529	4+ 6	0.1483	4.57		Q	V			
530	4+ 7	0.1553	5.06		Q	V			
531	4+ 8	0.1629	5.56		Q	V			
532	4+ 9	0.1698	4.98		Q	V			
533	4+10	0.1758	4.40		Q	V			
534	4+11	0.1811	3.82		Q	V			
535	4+12	0.1856	3.24		Q	V			
536	4+13	0.1892	2.66		Q	V			
537	4+14	0.1921	2.08		Q	V			
538	4+15	0.1941	1.50		Q	V			
539	4+16	0.1954	0.92		Q	V			
540	4+17	0.1966	0.88		Q	V			
541	4+18	0.1978	0.84		Q	V			
542	4+19	0.1989	0.80		Q	V			
543	4+20	0.1999	0.77		Q	V			
544	4+21	0.2009	0.73		Q	V			
545	4+22	0.2019	0.69		Q	V			
546	4+23	0.2028	0.65		Q	V			
547	4+24	0.2036	0.61		Q	V			
548	4+25	0.2045	0.60		Q	V			
549	4+26	0.2053	0.58		Q	V			
550	4+27	0.2060	0.56		Q	V			
551	4+28	0.2068	0.55		Q	V			
552	4+29	0.2075	0.53		Q	V			

553	4+30	0.2082	0.51	Q				V
554	4+31	0.2089	0.50	Q				V
555	4+32	0.2096	0.48	Q				V
556	4+33	0.2102	0.47	Q				V
557	4+34	0.2108	0.46	Q				V
558	4+35	0.2115	0.45	Q				V
559	4+36	0.2121	0.44	Q				V
560	4+37	0.2127	0.43	Q				V
561	4+38	0.2133	0.42	Q				V
562	4+39	0.2138	0.41	Q				V
563	4+40	0.2144	0.40	Q				V
564	4+41	0.2149	0.40	Q				V
565	4+42	0.2155	0.39	Q				V
566	4+43	0.2160	0.38	Q				V
567	4+44	0.2165	0.38	Q				V
568	4+45	0.2170	0.37	Q				V
569	4+46	0.2175	0.36	Q				V
570	4+47	0.2180	0.36	Q				V
571	4+48	0.2185	0.35	Q				V
572	4+49	0.2190	0.35	Q				V
573	4+50	0.2194	0.34	Q				V
574	4+51	0.2199	0.34	Q				V
575	4+52	0.2203	0.33	Q				V
576	4+53	0.2208	0.33	Q				V
577	4+54	0.2212	0.32	Q				V
578	4+55	0.2217	0.32	Q				V
579	4+56	0.2221	0.31	Q				V
580	4+57	0.2225	0.31	Q				V
581	4+58	0.2230	0.31	Q				V
582	4+59	0.2234	0.30	Q				V
583	5+ 0	0.2238	0.30	Q				V
584	5+ 1	0.2242	0.29	Q				V
585	5+ 2	0.2246	0.29	Q				V
586	5+ 3	0.2250	0.29	Q				V
587	5+ 4	0.2254	0.28	Q				V
588	5+ 5	0.2258	0.28	Q				V
589	5+ 6	0.2261	0.28	Q				V
590	5+ 7	0.2265	0.27	Q				V
591	5+ 8	0.2269	0.27	Q				V
592	5+ 9	0.2273	0.27	Q				V
593	5+10	0.2276	0.27	Q				V
594	5+11	0.2280	0.26	Q				V
595	5+12	0.2284	0.26	Q				V
596	5+13	0.2287	0.26	Q				V
597	5+14	0.2291	0.26	Q				V
598	5+15	0.2294	0.25	Q				V
599	5+16	0.2298	0.25	Q				V
600	5+17	0.2301	0.25	Q				V
601	5+18	0.2304	0.25	Q				V
602	5+19	0.2308	0.24	Q				V
603	5+20	0.2311	0.24	Q				V
604	5+21	0.2314	0.24	Q				V
605	5+22	0.2318	0.24	Q				V
606	5+23	0.2321	0.24	Q				V
607	5+24	0.2324	0.23	Q				V
608	5+25	0.2327	0.23	Q				V
609	5+26	0.2330	0.23	Q				V
610	5+27	0.2334	0.23	Q				V
611	5+28	0.2337	0.23	Q				V
612	5+29	0.2340	0.22	Q				V
613	5+30	0.2343	0.22	Q				V
614	5+31	0.2346	0.22	Q				V
615	5+32	0.2349	0.22	Q				V
616	5+33	0.2352	0.22	Q				V
617	5+34	0.2355	0.22	Q				V
618	5+35	0.2358	0.21	Q				V
619	5+36	0.2361	0.21	Q				V
620	5+37	0.2364	0.21	Q				V
621	5+38	0.2367	0.21	Q				V

622	5+39	0.2370	0.21	Q				V
623	5+40	0.2372	0.21	Q				V
624	5+41	0.2375	0.21	Q				V
625	5+42	0.2378	0.20	Q				V
626	5+43	0.2381	0.20	Q				V
627	5+44	0.2384	0.20	Q				V
628	5+45	0.2386	0.20	Q				V
629	5+46	0.2389	0.20	Q				V
630	5+47	0.2392	0.20	Q				V
631	5+48	0.2395	0.20	Q				V
632	5+49	0.2397	0.20	Q				V
633	5+50	0.2400	0.19	Q				V
634	5+51	0.2403	0.19	Q				V
635	5+52	0.2405	0.19	Q				V
636	5+53	0.2408	0.19	Q				V
637	5+54	0.2410	0.19	Q				V
638	5+55	0.2413	0.19	Q				V
639	5+56	0.2416	0.19	Q				V
640	5+57	0.2418	0.19	Q				V
641	5+58	0.2421	0.18	Q				V
642	5+59	0.2423	0.18	Q				V
643	6+ 0	0.2426	0.18	Q				V
644	6+ 1	0.2428	0.18	Q				V
645	6+ 2	0.2431	0.18	Q				V
646	6+ 3	0.2433	0.18	Q				V
647	6+ 4	0.2436	0.18	Q				V
648	6+ 5	0.2438	0.18	Q				V
649	6+ 6	0.2441	0.18	Q				V
650	6+ 7	0.2443	0.18	Q				V
651	6+ 8	0.2445	0.17	Q				V

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659 *****
660 Process from Point/Station 406.000 to Point/Station 407.000
661 **** PIPEFLOW TRAVEL TIME (User specified size) ****
662

663 Upstream point/station elevation = 475.500 (Ft.)
664 Downstream point/station elevation = 474.090 (Ft.)
665 Pipe length = 158.00 (Ft.) Slope = 0.0089 Manning's N = 0.015
666 No. of pipes = 1 Required pipe flow = 5.558 (CFS)
667 Given pipe size = 18.00 (In.)
668 Calculated individual pipe flow = 5.558 (CFS)
669 Normal flow depth in pipe = 10.54 (In.)
670 Flow top width inside pipe = 17.74 (In.)
671 Critical Depth = 10.90 (In.)
672 Pipe flow velocity = 5.17 (Ft/s)
673 Travel time through pipe = 0.51 min.
674 Time of concentration (TC) = 9.00 min.
675
676

677 *****
678 Process from Point/Station 407.000 to Point/Station 407.000
679 **** SUBAREA FLOW ADDITION ****
680

681 Rainfall intensity (I) = 5.229 (In/Hr) for a 100.0 year storm
682 Decimal fraction soil group A = 0.000
683 Decimal fraction soil group B = 0.000
684 Decimal fraction soil group C = 0.000
685 Decimal fraction soil group D = 1.000
686 [LOW DENSITY RESIDENTIAL]
687 (1.0 DU/A or Less)
688 Impervious value, Ai = 0.100
689 Sub-Area C Value = 0.410
690 Time of concentration = 9.00 min.


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691 Rainfall intensity =      5.229(In/Hr) for a   100.0 year storm
692 Effective runoff coefficient used for total area
693 (Q=KCIA) is C = 0.596  CA =      1.321
694 Subarea runoff =      1.352(CFS) for      0.726(Ac.)
695 Total runoff =      6.910(CFS)  Total area =      2.218(Ac.)
696
697
698 ++++++
699 Process from Point/Station      407.000 to Point/Station      408.000
700 **** PIPEFLOW TRAVEL TIME (User specified size) ****
701
702 Upstream point/station elevation =   474.090(Ft.)
703 Downstream point/station elevation =   472.770(Ft.)
704 Pipe length =    62.00(Ft.) Slope =    0.0213  Manning's N = 0.013
705 No. of pipes = 1  Required pipe flow =    6.910(CFS)
706 Given pipe size =    18.00(In.)
707 Calculated individual pipe flow =    6.910(CFS)
708 Normal flow depth in pipe =    8.47(In.)
709 Flow top width inside pipe =   17.97(In.)
710 Critical Depth =   12.22(In.)
711 Pipe flow velocity =    8.45(Ft/s)
712 Travel time through pipe =    0.12 min.
713 Time of concentration (TC) =    9.12 min.
714
715
716 ++++++
717 Process from Point/Station      408.000 to Point/Station      409.000
718 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
719
720 Depth of flow =    0.589(Ft.), Average velocity =   13.300(Ft/s)
721 ***** Irregular Channel Data *****
722 -----
723 Information entered for subchannel number 1 :
724 Point number      'X' coordinate      'Y' coordinate
725      1              0.00              1.00
726      2              1.50              0.00
727      3              3.00              1.00
728 Manning's 'N' friction factor =    0.015
729 -----
730 Sub-Channel flow =    6.910(CFS)
731 '      '      flow top width =    1.766(Ft.)
732 '      '      velocity=   13.300(Ft/s)
733 '      '      area =    0.520(Sq.Ft)
734 '      '      Froude number =    4.321
735
736 Upstream point elevation =   472.770(Ft.)
737 Downstream point elevation =   449.000(Ft.)
738 Flow length =   202.000(Ft.)
739 Travel time =    0.25 min.
740 Time of concentration =    9.38 min.
741 Depth of flow =    0.589(Ft.)
742 Average velocity =   13.300(Ft/s)
743 Total irregular channel flow =    6.910(CFS)
744 Irregular channel normal depth above invert elev. =    0.589(Ft.)
745 Average velocity of channel(s) =   13.300(Ft/s)
746
747
748 ++++++
749 Process from Point/Station      409.000 to Point/Station      409.000
750 **** SUBAREA FLOW ADDITION ****
751
752 Rainfall intensity (I) =    5.093(In/Hr) for a   100.0 year storm
753 Decimal fraction soil group A = 0.000
754 Decimal fraction soil group B = 0.000
755 Decimal fraction soil group C = 0.000
756 Decimal fraction soil group D = 1.000
757 [HIGH DENSITY RESIDENTIAL
758 (24.0 DU/A or Less
759 Impervious value, Ai = 0.650

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760 Sub-Area C Value = 0.710
761 Time of concentration = 9.38 min.
762 Rainfall intensity = 5.093(In/Hr) for a 100.0 year storm
763 Effective runoff coefficient used for total area
764 (Q=KCIA) is C = 0.619 CA = 1.726
765 Subarea runoff = 1.882(CFS) for 0.570(Ac.)
766 Total runoff = 8.791(CFS) Total area = 2.788(Ac.)
767
768
769 ++++++
770 Process from Point/Station 409.000 to Point/Station 410.000
771 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
772
773 -----
773 Depth of flow = 0.752(Ft.), Average velocity = 10.359(Ft/s)
774 ***** Irregular Channel Data *****
775 -----
776 Information entered for subchannel number 1 :
777 Point number 'X' coordinate 'Y' coordinate
778 1 0.00 1.00
779 2 1.50 0.00
780 3 3.00 1.00
781 Manning's 'N' friction factor = 0.015
782 -----
783 Sub-Channel flow = 8.791(CFS)
784 ' ' flow top width = 2.257(Ft.)
785 ' ' velocity= 10.359(Ft/s)
786 ' ' area = 0.849(Sq.Ft)
787 ' ' Froude number = 2.977
788
789 Upstream point elevation = 449.000(Ft.)
790 Downstream point elevation = 442.000(Ft.)
791 Flow length = 136.000(Ft.)
792 Travel time = 0.22 min.
793 Time of concentration = 9.60 min.
794 Depth of flow = 0.752(Ft.)
795 Average velocity = 10.359(Ft/s)
796 Total irregular channel flow = 8.791(CFS)
797 Irregular channel normal depth above invert elev. = 0.752(Ft.)
798 Average velocity of channel(s) = 10.359(Ft/s)
799
800
801 ++++++
802 Process from Point/Station 410.000 to Point/Station 410.000
803 **** CONFLUENCE OF MINOR STREAMS ****
804
805 -----
805 Along Main Stream number: 1 in normal stream number 2
806 Stream flow area = 2.788(Ac.)
807 Runoff from this stream = 8.791(CFS)
808 Time of concentration = 9.60 min.
809 Rainfall intensity = 5.018(In/Hr)
810 Summary of stream data:
811
812 Stream Flow rate TC Rainfall Intensity
813 No. (CFS) (min) (In/Hr)
814
815
816 1 11.348 7.75 5.758
817 2 8.791 9.60 5.018
818 Qmax(1) =
819 1.000 * 1.000 * 11.348) +
820 1.000 * 0.808 * 8.791) + = 18.451
821 Qmax(2) =
822 0.872 * 1.000 * 11.348) +
823 1.000 * 1.000 * 8.791) + = 18.681
824
825 Total of 2 streams to confluence:
826 Flow rates before confluence point:
827 11.348 8.791
828 Maximum flow rates at confluence using above data:

```

```
829         18.451         18.681
830     Area of streams before confluence:
831         5.631         2.788
832     Results of confluence:
833     Total flow rate =      18.681 (CFS)
834     Time of concentration =    9.595 min.
835     Effective stream area after confluence =    8.419 (Ac.)
836     End of computations, total study area =    8.419 (Ac.)
837
838
839
```

```

1
2 San Diego County Rational Hydrology Program
3
4 CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
5
6 Rational method hydrology program based on
7 San Diego County Flood Control Division 2003 hydrology manual
8 Rational Hydrology Study Date: 09/12/25
9
10 -----
11 POST-DEVELOPMENT
12 POC-3 UN-MITIGATED
13 100-YR Storm
14 UPDATED
15 -----
16 ***** Hydrology Study Control Information *****
17 -----
18
19
20 Program License Serial Number 6332
21
22 -----
23 Rational hydrology study storm event year is 100.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 2.900
28 24 hour precipitation(inches) = 5.250
29 P6/P24 = 55.2%
30 San Diego hydrology manual 'C' values used
31
32
33 +-----+
34 Process from Point/Station 901.000 to Point/Station 902.000
35 **** INITIAL AREA EVALUATION ****
36
37 -----
38 Decimal fraction soil group A = 0.000
39 Decimal fraction soil group B = 0.000
40 Decimal fraction soil group C = 0.000
41 Decimal fraction soil group D = 1.000
42 [HIGH DENSITY RESIDENTIAL ]
43 (43.0 DU/A or Less )
44 Impervious value, Ai = 0.800
45 Sub-Area C Value = 0.790
46 Initial subarea total flow distance = 80.000 (Ft.)
47 Highest elevation = 480.000 (Ft.)
48 Lowest elevation = 478.400 (Ft.)
49 Elevation difference = 1.600 (Ft.) Slope = 2.000 %
50 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
51 The maximum overland flow distance is 75.00 (Ft)
52 for the top area slope value of 2.00 %, in a development type of
53 43.0 DU/A or Less
54 In Accordance With Figure 3-3
55 Initial Area Time of Concentration = 3.84 minutes
56 TC = [1.8*(1.1-C)*distance (Ft.)^.5]/(% slope^(1/3)]
57 TC = [1.8*(1.1-0.7900)*( 75.000^.5)/( 2.000^(1/3)]= 3.84
58 The initial area total distance of 80.00 (Ft.) entered leaves a
59 remaining distance of 5.00 (Ft.)
60 Using Figure 3-4, the travel time for this distance is 0.12 minutes
61 for a distance of 5.00 (Ft.) and a slope of 2.00 %
62 with an elevation difference of 0.10 (Ft.) from the end of the top area
63 Tt = [11.9*length (Mi)^3]/(elevation change (Ft.))]^.385 *60 (min/hr)
64 = 0.122 Minutes
65 Tt=[(11.9*0.0009^3)/( 0.10)]^.385= 0.12
66 Total initial area Ti = 3.84 minutes from Figure 3-3 formula plus
67 0.12 minutes from the Figure 3-4 formula = 3.96 minutes
68 Calculated TC of 3.957 minutes is less than 5 minutes,
69 resetting TC to 5.0 minutes for rainfall intensity calculations
70 Rainfall intensity (I) = 7.641 (In/Hr) for a 100.0 year storm

```

```

70 Effective runoff coefficient used for area (Q=KCIA) is C = 0.790
71 Subarea runoff = 0.785 (CFS)
72 Total initial stream area = 0.130 (Ac.)
73
74
75 ++++++
76 Process from Point/Station 902.000 to Point/Station 903.000
77 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
78
79 -----
79 Estimated mean flow rate at midpoint of channel = 2.873 (CFS)
80 Depth of flow = 0.223 (Ft.), Average velocity = 6.302 (Ft/s)
81 ***** Irregular Channel Data *****
82
83 -----
83 Information entered for subchannel number 1 :
84 Point number 'X' coordinate 'Y' coordinate
85 1 0.00 0.50
86 2 0.50 0.50
87 3 0.50 0.00
88 4 2.00 0.13
89 5 12.50 0.34
90 Manning's 'N' friction factor = 0.015
91
92 -----
92 Sub-Channel flow = 2.873 (CFS)
93 ' ' flow top width = 6.172 (Ft.)
94 ' ' velocity = 6.302 (Ft/s)
95 ' ' area = 0.456 (Sq.Ft)
96 ' ' Froude number = 4.086
97
98 Upstream point elevation = 478.400 (Ft.)
99 Downstream point elevation = 420.000 (Ft.)
100 Flow length = 426.000 (Ft.)
101 Travel time = 1.13 min.
102 Time of concentration = 5.08 min.
103 Depth of flow = 0.223 (Ft.)
104 Average velocity = 6.302 (Ft/s)
105 Total irregular channel flow = 2.873 (CFS)
106 Irregular channel normal depth above invert elev. = 0.223 (Ft.)
107 Average velocity of channel(s) = 6.302 (Ft/s)
108 Adding area flow to channel
109 Rainfall intensity (I) = 7.559 (In/Hr) for a 100.0 year storm
110 Decimal fraction soil group A = 0.000
111 Decimal fraction soil group B = 0.000
112 Decimal fraction soil group C = 0.000
113 Decimal fraction soil group D = 1.000
114 [HIGH DENSITY RESIDENTIAL ]
115 (43.0 DU/A or Less )
116 Impervious value, Ai = 0.800
117 Sub-Area C Value = 0.790
118 Rainfall intensity = 7.559 (In/Hr) for a 100.0 year storm
119 Effective runoff coefficient used for total area
120 (Q=KCIA) is C = 0.790 CA = 0.649
121 Subarea runoff = 4.124 (CFS) for 0.692 (Ac.)
122 Total runoff = 4.909 (CFS) Total area = 0.822 (Ac.)
123 Depth of flow = 0.257 (Ft.), Average velocity = 7.102 (Ft/s)
124
125
126 ++++++
127 Process from Point/Station 903.000 to Point/Station 903.000
128 **** 6 HOUR HYDROGRAPH ****
129
130 -----
131 ++++++
131 Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003
132
133
134 Time of Concentration = 5.08
135 Basin Area = 0.82 Acres
136 6 Hour Rainfall = 2.900 Inches
137 Runoff Coefficient = 0.790
138 Peak Discharge = 4.91 CFS

```


139	Time (Min)	Discharge (CFS)
140	0	0.000
141	5	0.112
142	10	0.113
143	15	0.115
144	20	0.116
145	25	0.119
146	30	0.120
147	35	0.122
148	40	0.124
149	45	0.126
150	50	0.128
151	55	0.131
152	60	0.132
153	65	0.135
154	70	0.137
155	75	0.140
156	80	0.142
157	85	0.146
158	90	0.148
159	95	0.152
160	100	0.155
161	105	0.159
162	110	0.162
163	115	0.167
164	120	0.170
165	125	0.176
166	130	0.179
167	135	0.187
168	140	0.190
169	145	0.199
170	150	0.203
171	155	0.213
172	160	0.218
173	165	0.230
174	170	0.236
175	175	0.251
176	180	0.259
177	185	0.278
178	190	0.289
179	195	0.314
180	200	0.329
181	205	0.365
182	210	0.387
183	215	0.443
184	220	0.481
185	225	0.587
186	230	0.669
187	235	0.982
188	240	1.384
189	245	4.909
190	250	0.788
191	255	0.527
192	260	0.413
193	265	0.346
194	270	0.301
195	275	0.268
196	280	0.243
197	285	0.224
198	290	0.208
199	295	0.194
200	300	0.183
201	305	0.173
202	310	0.164
203	315	0.157
204	320	0.150
205	325	0.144
206	330	0.139
207	335	0.134

208	340	0.129
209	345	0.125
210	350	0.121
211	355	0.118
212	360	0.114
213	365	0.111

+++++

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	1.2	2.5	3.7	4.9
------------	--------	-------	---------	---	-----	-----	-----	-----

223	0+ 0	0.0000	0.00	Q
224	0+ 1	0.0000	0.02	Q
225	0+ 2	0.0001	0.04	Q
226	0+ 3	0.0002	0.07	Q
227	0+ 4	0.0003	0.09	Q
228	0+ 5	0.0005	0.11	Q
229	0+ 6	0.0006	0.11	Q
230	0+ 7	0.0008	0.11	Q
231	0+ 8	0.0009	0.11	Q
232	0+ 9	0.0011	0.11	Q
233	0+10	0.0012	0.11	Q
234	0+11	0.0014	0.11	Q
235	0+12	0.0016	0.11	Q
236	0+13	0.0017	0.11	Q
237	0+14	0.0019	0.11	Q
238	0+15	0.0020	0.12	Q
239	0+16	0.0022	0.12	Q
240	0+17	0.0023	0.12	Q
241	0+18	0.0025	0.12	Q
242	0+19	0.0027	0.12	Q
243	0+20	0.0028	0.12	Q
244	0+21	0.0030	0.12	Q
245	0+22	0.0031	0.12	Q
246	0+23	0.0033	0.12	Q
247	0+24	0.0035	0.12	Q
248	0+25	0.0036	0.12	Q
249	0+26	0.0038	0.12	Q
250	0+27	0.0040	0.12	QV
251	0+28	0.0041	0.12	QV
252	0+29	0.0043	0.12	QV
253	0+30	0.0045	0.12	QV
254	0+31	0.0046	0.12	QV
255	0+32	0.0048	0.12	QV
256	0+33	0.0050	0.12	QV
257	0+34	0.0051	0.12	QV
258	0+35	0.0053	0.12	QV
259	0+36	0.0055	0.12	QV
260	0+37	0.0056	0.12	Q
261	0+38	0.0058	0.12	Q
262	0+39	0.0060	0.12	Q
263	0+40	0.0061	0.12	Q
264	0+41	0.0063	0.12	Q
265	0+42	0.0065	0.12	Q
266	0+43	0.0067	0.13	Q
267	0+44	0.0068	0.13	Q
268	0+45	0.0070	0.13	Q
269	0+46	0.0072	0.13	Q
270	0+47	0.0074	0.13	Q
271	0+48	0.0075	0.13	Q
272	0+49	0.0077	0.13	Q
273	0+50	0.0079	0.13	QV
274	0+51	0.0081	0.13	QV
275	0+52	0.0082	0.13	QV
276	0+53	0.0084	0.13	QV

277	0+54	0.0086	0.13	QV				
278	0+55	0.0088	0.13	QV				
279	0+56	0.0090	0.13	QV				
280	0+57	0.0091	0.13	QV				
281	0+58	0.0093	0.13	QV				
282	0+59	0.0095	0.13	QV				
283	1+ 0	0.0097	0.13	QV				
284	1+ 1	0.0099	0.13	QV				
285	1+ 2	0.0100	0.13	QV				
286	1+ 3	0.0102	0.13	QV				
287	1+ 4	0.0104	0.13	QV				
288	1+ 5	0.0106	0.14	QV				
289	1+ 6	0.0108	0.14	QV				
290	1+ 7	0.0110	0.14	QV				
291	1+ 8	0.0112	0.14	QV				
292	1+ 9	0.0114	0.14	QV				
293	1+10	0.0115	0.14	QV				
294	1+11	0.0117	0.14	Q V				
295	1+12	0.0119	0.14	Q V				
296	1+13	0.0121	0.14	Q V				
297	1+14	0.0123	0.14	Q V				
298	1+15	0.0125	0.14	Q V				
299	1+16	0.0127	0.14	Q V				
300	1+17	0.0129	0.14	Q V				
301	1+18	0.0131	0.14	Q V				
302	1+19	0.0133	0.14	Q V				
303	1+20	0.0135	0.14	Q V				
304	1+21	0.0137	0.14	Q V				
305	1+22	0.0139	0.14	Q V				
306	1+23	0.0141	0.14	Q V				
307	1+24	0.0143	0.15	Q V				
308	1+25	0.0145	0.15	Q V				
309	1+26	0.0147	0.15	Q V				
310	1+27	0.0149	0.15	Q V				
311	1+28	0.0151	0.15	Q V				
312	1+29	0.0153	0.15	Q V				
313	1+30	0.0155	0.15	Q V				
314	1+31	0.0157	0.15	Q V				
315	1+32	0.0159	0.15	Q V				
316	1+33	0.0161	0.15	Q V				
317	1+34	0.0163	0.15	Q V				
318	1+35	0.0165	0.15	Q V				
319	1+36	0.0167	0.15	Q V				
320	1+37	0.0169	0.15	Q V				
321	1+38	0.0171	0.15	Q V				
322	1+39	0.0174	0.15	Q V				
323	1+40	0.0176	0.15	Q V				
324	1+41	0.0178	0.16	Q V				
325	1+42	0.0180	0.16	Q V				
326	1+43	0.0182	0.16	Q V				
327	1+44	0.0184	0.16	Q V				
328	1+45	0.0187	0.16	Q V				
329	1+46	0.0189	0.16	Q V				
330	1+47	0.0191	0.16	Q V				
331	1+48	0.0193	0.16	Q V				
332	1+49	0.0195	0.16	Q V				
333	1+50	0.0198	0.16	Q V				
334	1+51	0.0200	0.16	Q V				
335	1+52	0.0202	0.16	Q V				
336	1+53	0.0204	0.17	Q V				
337	1+54	0.0207	0.17	Q V				
338	1+55	0.0209	0.17	Q V				
339	1+56	0.0211	0.17	Q V				
340	1+57	0.0214	0.17	Q V				
341	1+58	0.0216	0.17	Q V				
342	1+59	0.0218	0.17	Q V				
343	2+ 0	0.0221	0.17	Q V				
344	2+ 1	0.0223	0.17	Q V				
345	2+ 2	0.0225	0.17	Q V				

346	2+ 3	0.0228	0.17	Q	V				
347	2+ 4	0.0230	0.17	Q	V				
348	2+ 5	0.0233	0.18	Q	V				
349	2+ 6	0.0235	0.18	Q	V				
350	2+ 7	0.0238	0.18	Q	V				
351	2+ 8	0.0240	0.18	Q	V				
352	2+ 9	0.0242	0.18	Q	V				
353	2+10	0.0245	0.18	Q	V				
354	2+11	0.0247	0.18	Q	V				
355	2+12	0.0250	0.18	Q	V				
356	2+13	0.0252	0.18	Q	V				
357	2+14	0.0255	0.19	Q	V				
358	2+15	0.0258	0.19	Q	V				
359	2+16	0.0260	0.19	Q	V				
360	2+17	0.0263	0.19	Q	V				
361	2+18	0.0265	0.19	Q	V				
362	2+19	0.0268	0.19	Q	V				
363	2+20	0.0271	0.19	Q	V				
364	2+21	0.0273	0.19	Q	V				
365	2+22	0.0276	0.19	Q	V				
366	2+23	0.0279	0.20	Q	V				
367	2+24	0.0281	0.20	Q	V				
368	2+25	0.0284	0.20	Q	V				
369	2+26	0.0287	0.20	Q	V				
370	2+27	0.0290	0.20	Q	V				
371	2+28	0.0292	0.20	Q	V				
372	2+29	0.0295	0.20	Q	V				
373	2+30	0.0298	0.20	Q	V				
374	2+31	0.0301	0.20	Q	V				
375	2+32	0.0304	0.21	Q	V				
376	2+33	0.0306	0.21	Q	V				
377	2+34	0.0309	0.21	Q	V				
378	2+35	0.0312	0.21	Q	V				
379	2+36	0.0315	0.21	Q	V				
380	2+37	0.0318	0.21	Q	V				
381	2+38	0.0321	0.22	Q	V				
382	2+39	0.0324	0.22	Q	V				
383	2+40	0.0327	0.22	Q	V				
384	2+41	0.0330	0.22	Q	V				
385	2+42	0.0333	0.22	Q	V				
386	2+43	0.0336	0.23	Q	V				
387	2+44	0.0339	0.23	Q	V				
388	2+45	0.0343	0.23	Q	V				
389	2+46	0.0346	0.23	Q	V				
390	2+47	0.0349	0.23	Q	V				
391	2+48	0.0352	0.23	Q	V				
392	2+49	0.0355	0.24	Q	V				
393	2+50	0.0359	0.24	Q	V				
394	2+51	0.0362	0.24	Q	V				
395	2+52	0.0365	0.24	Q	V				
396	2+53	0.0369	0.25	Q	V				
397	2+54	0.0372	0.25	Q	V				
398	2+55	0.0376	0.25	Q	V				
399	2+56	0.0379	0.25	Q	V				
400	2+57	0.0383	0.25	Q	V				
401	2+58	0.0386	0.26	Q	V				
402	2+59	0.0390	0.26	Q	V				
403	3+ 0	0.0393	0.26	Q	V				
404	3+ 1	0.0397	0.26	Q	V				
405	3+ 2	0.0401	0.27	Q	V				
406	3+ 3	0.0404	0.27	Q	V				
407	3+ 4	0.0408	0.27	Q	V				
408	3+ 5	0.0412	0.28	Q	V				
409	3+ 6	0.0416	0.28	Q	V				
410	3+ 7	0.0420	0.28	Q	V				
411	3+ 8	0.0424	0.28	Q	V				
412	3+ 9	0.0428	0.29	Q	V				
413	3+10	0.0431	0.29	Q	V				
414	3+11	0.0436	0.29	Q	V				

415	3+12	0.0440	0.30	Q	V				
416	3+13	0.0444	0.30	Q	V				
417	3+14	0.0448	0.31	Q	V				
418	3+15	0.0452	0.31	Q	V				
419	3+16	0.0457	0.32	Q	V				
420	3+17	0.0461	0.32	Q	V				
421	3+18	0.0466	0.32	Q	V				
422	3+19	0.0470	0.33	Q	V				
423	3+20	0.0475	0.33	Q	V				
424	3+21	0.0479	0.34	Q	V				
425	3+22	0.0484	0.34	Q	V				
426	3+23	0.0489	0.35	Q	V				
427	3+24	0.0494	0.36	Q	V				
428	3+25	0.0499	0.36	Q	V				
429	3+26	0.0504	0.37	Q	V				
430	3+27	0.0509	0.37	Q	V				
431	3+28	0.0514	0.38	Q	V				
432	3+29	0.0519	0.38	Q	V				
433	3+30	0.0525	0.39	Q	V				
434	3+31	0.0530	0.40	Q	V				
435	3+32	0.0536	0.41	Q	V				
436	3+33	0.0542	0.42	Q	V				
437	3+34	0.0548	0.43	Q	V				
438	3+35	0.0554	0.44	Q	V				
439	3+36	0.0560	0.45	Q	V				
440	3+37	0.0566	0.46	Q	V				
441	3+38	0.0573	0.47	Q	V				
442	3+39	0.0579	0.47	Q	V				
443	3+40	0.0586	0.48	Q	V				
444	3+41	0.0593	0.50	Q	V				
445	3+42	0.0600	0.52	Q	V				
446	3+43	0.0607	0.54	Q	V				
447	3+44	0.0615	0.57	Q	V				
448	3+45	0.0623	0.59	Q	V				
449	3+46	0.0632	0.60	Q	V				
450	3+47	0.0640	0.62	Q	V				
451	3+48	0.0649	0.64	Q	V				
452	3+49	0.0658	0.65	Q	V				
453	3+50	0.0667	0.67	Q	V				
454	3+51	0.0677	0.73	Q	V				
455	3+52	0.0688	0.79	Q	V				
456	3+53	0.0700	0.86	Q	V				
457	3+54	0.0713	0.92	Q	V				
458	3+55	0.0726	0.98	Q	V				
459	3+56	0.0741	1.06	Q	V				
460	3+57	0.0757	1.14	Q	V				
461	3+58	0.0773	1.22	Q	V				
462	3+59	0.0791	1.30	Q	V				
463	4+ 0	0.0810	1.38	Q	V				
464	4+ 1	0.0839	2.09		Q				
465	4+ 2	0.0878	2.79		Q				
466	4+ 3	0.0926	3.50		Q				
467	4+ 4	0.0984	4.20		Q				
468	4+ 5	0.1051	4.91		Q				
469	4+ 6	0.1108	4.08		Q				
470	4+ 7	0.1153	3.26		Q				
471	4+ 8	0.1186	2.44		Q				
472	4+ 9	0.1208	1.61		Q				
473	4+10	0.1219	0.79		Q				
474	4+11	0.1229	0.74		Q				
475	4+12	0.1239	0.68		Q				
476	4+13	0.1248	0.63		Q				
477	4+14	0.1255	0.58		Q				
478	4+15	0.1263	0.53		Q				
479	4+16	0.1270	0.50		Q				
480	4+17	0.1276	0.48		Q				
481	4+18	0.1283	0.46		Q				
482	4+19	0.1289	0.44		Q				
483	4+20	0.1294	0.41		Q				

484	4+21	0.1300	0.40	Q				V
485	4+22	0.1305	0.39	Q				V
486	4+23	0.1310	0.37	Q				V
487	4+24	0.1315	0.36	Q				V
488	4+25	0.1320	0.35	Q				V
489	4+26	0.1325	0.34	Q				V
490	4+27	0.1329	0.33	Q				V
491	4+28	0.1333	0.32	Q				V
492	4+29	0.1338	0.31	Q				V
493	4+30	0.1342	0.30	Q				V
494	4+31	0.1346	0.29	Q				V
495	4+32	0.1350	0.29	Q				V
496	4+33	0.1354	0.28	Q				V
497	4+34	0.1358	0.27	Q				V
498	4+35	0.1361	0.27	Q				V
499	4+36	0.1365	0.26	Q				V
500	4+37	0.1368	0.26	Q				V
501	4+38	0.1372	0.25	Q				V
502	4+39	0.1375	0.25	Q				V
503	4+40	0.1379	0.24	Q				V
504	4+41	0.1382	0.24	Q				V
505	4+42	0.1385	0.24	Q				V
506	4+43	0.1388	0.23	Q				V
507	4+44	0.1392	0.23	Q				V
508	4+45	0.1395	0.22	Q				V
509	4+46	0.1398	0.22	Q				V
510	4+47	0.1401	0.22	Q				V
511	4+48	0.1404	0.21	Q				V
512	4+49	0.1407	0.21	Q				V
513	4+50	0.1409	0.21	Q				V
514	4+51	0.1412	0.21	Q				V
515	4+52	0.1415	0.20	Q				V
516	4+53	0.1418	0.20	Q				V
517	4+54	0.1421	0.20	Q				V
518	4+55	0.1423	0.19	Q				V
519	4+56	0.1426	0.19	Q				V
520	4+57	0.1428	0.19	Q				V
521	4+58	0.1431	0.19	Q				V
522	4+59	0.1434	0.19	Q				V
523	5+ 0	0.1436	0.18	Q				V
524	5+ 1	0.1439	0.18	Q				V
525	5+ 2	0.1441	0.18	Q				V
526	5+ 3	0.1443	0.18	Q				V
527	5+ 4	0.1446	0.18	Q				V
528	5+ 5	0.1448	0.17	Q				V
529	5+ 6	0.1451	0.17	Q				V
530	5+ 7	0.1453	0.17	Q				V
531	5+ 8	0.1455	0.17	Q				V
532	5+ 9	0.1458	0.17	Q				V
533	5+10	0.1460	0.16	Q				V
534	5+11	0.1462	0.16	Q				V
535	5+12	0.1464	0.16	Q				V
536	5+13	0.1467	0.16	Q				V
537	5+14	0.1469	0.16	Q				V
538	5+15	0.1471	0.16	Q				V
539	5+16	0.1473	0.16	Q				V
540	5+17	0.1475	0.15	Q				V
541	5+18	0.1477	0.15	Q				V
542	5+19	0.1479	0.15	Q				V
543	5+20	0.1481	0.15	Q				V
544	5+21	0.1483	0.15	Q				V
545	5+22	0.1485	0.15	Q				V
546	5+23	0.1487	0.15	Q				V
547	5+24	0.1489	0.15	Q				V
548	5+25	0.1491	0.14	Q				V
549	5+26	0.1493	0.14	Q				V
550	5+27	0.1495	0.14	Q				V
551	5+28	0.1497	0.14	Q				V
552	5+29	0.1499	0.14	Q				V

553	5+30	0.1501	0.14	Q				V
554	5+31	0.1503	0.14	Q				V
555	5+32	0.1505	0.14	Q				V
556	5+33	0.1507	0.14	Q				V
557	5+34	0.1509	0.13	Q				V
558	5+35	0.1511	0.13	Q				V
559	5+36	0.1512	0.13	Q				V
560	5+37	0.1514	0.13	Q				V
561	5+38	0.1516	0.13	Q				V
562	5+39	0.1518	0.13	Q				V
563	5+40	0.1520	0.13	Q				V
564	5+41	0.1521	0.13	Q				V
565	5+42	0.1523	0.13	Q				V
566	5+43	0.1525	0.13	Q				V
567	5+44	0.1527	0.13	Q				V
568	5+45	0.1528	0.12	Q				V
569	5+46	0.1530	0.12	Q				V
570	5+47	0.1532	0.12	Q				V
571	5+48	0.1533	0.12	Q				V
572	5+49	0.1535	0.12	Q				V
573	5+50	0.1537	0.12	Q				V
574	5+51	0.1538	0.12	Q				V
575	5+52	0.1540	0.12	Q				V
576	5+53	0.1542	0.12	Q				V
577	5+54	0.1543	0.12	Q				V
578	5+55	0.1545	0.12	Q				V
579	5+56	0.1546	0.12	Q				V
580	5+57	0.1548	0.12	Q				V
581	5+58	0.1550	0.12	Q				V
582	5+59	0.1551	0.11	Q				V
583	6+ 0	0.1553	0.11	Q				V
584	6+ 1	0.1554	0.11	Q				V
585	6+ 2	0.1556	0.11	Q				V
586	6+ 3	0.1558	0.11	Q				V
587	6+ 4	0.1559	0.11	Q				V
588	6+ 5	0.1561	0.11	Q				V

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590

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End of computations, total study area =

0.822 (Ac.)

ATTACHMENT 3.3

```

1
2 San Diego County Rational Hydrology Program
3
4 CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
5
6 Rational method hydrology program based on
7 San Diego County Flood Control Division 2003 hydrology manual
8 Rational Hydrology Study Date: 03/11/26
9
10 POST-DEVELOPMENT
11 POC-1 MITIGATED
12 100-YR STORM
13
14
15 ***** Hydrology Study Control Information *****
16
17
18
19
20 Program License Serial Number 6332
21
22
23 Rational hydrology study storm event year is 100.0
24 English (in-lb) input data Units used
25
26 Map data precipitation entered:
27 6 hour, precipitation(inches) = 2.900
28 24 hour precipitation(inches) = 5.250
29 P6/P24 = 55.2%
30 San Diego hydrology manual 'C' values used
31
32
33 ++++++
34 Process from Point/Station 101.000 to Point/Station 102.000
35 **** INITIAL AREA EVALUATION ****
36
37 Decimal fraction soil group A = 0.000
38 Decimal fraction soil group B = 0.000
39 Decimal fraction soil group C = 0.000
40 Decimal fraction soil group D = 1.000
41 [MEDIUM DENSITY RESIDENTIAL ]
42 (4.3 DU/A or Less )
43 Impervious value, Ai = 0.300
44 Sub-Area C Value = 0.520
45 Initial subarea total flow distance = 98.000 (Ft.)
46 Highest elevation = 776.000 (Ft.)
47 Lowest elevation = 775.500 (Ft.)
48 Elevation difference = 0.500 (Ft.) Slope = 0.510 %
49 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
50 The maximum overland flow distance is 50.00 (Ft)
51 for the top area slope value of 0.51 %, in a development type of
52 4.3 DU/A or Less
53 In Accordance With Figure 3-3
54 Initial Area Time of Concentration = 9.24 minutes
55  $TC = [1.8 * (1.1 - C) * distance(Ft.)^{.5} / (% slope^{(1/3)})]$ 
56  $TC = [1.8 * (1.1 - 0.5200) * (50.000^{.5}) / (0.510^{(1/3)})] = 9.24$ 
57 The initial area total distance of 98.00 (Ft.) entered leaves a
58 remaining distance of 48.00 (Ft.)
59 Using Figure 3-4, the travel time for this distance is 1.17 minutes
60 for a distance of 48.00 (Ft.) and a slope of 0.51 %
61 with an elevation difference of 0.24 (Ft.) from the end of the top area
62  $Tt = [11.9 * length(Mi)^3 / (elevation change(Ft.))]^{.385} * 60 (min/hr)$ 
63 = 1.174 Minutes
64  $Tt = [(11.9 * 0.0091^3) / (0.24)]^{.385} = 1.17$ 
65 Total initial area Ti = 9.24 minutes from Figure 3-3 formula plus
66 1.17 minutes from the Figure 3-4 formula = 10.41 minutes
67 Rainfall intensity (I) = 4.760 (In/Hr) for a 100.0 year storm
68 Effective runoff coefficient used for area (Q=KCIA) is C = 0.520
69 Subarea runoff = 0.673 (CFS)

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70 Total initial stream area = 0.272 (Ac.)
71
72
73 ++++++
74 Process from Point/Station 102.000 to Point/Station 103.000
75 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
76
77 -----
78 Estimated mean flow rate at midpoint of channel = 7.957 (CFS)
79 Depth of flow = 0.247 (Ft.), Average velocity = 5.183 (Ft/s)
80 ***** Irregular Channel Data *****
81 -----
82 Information entered for subchannel number 1 :
83 Point number 'X' coordinate 'Y' coordinate
84 1 0.00 0.50
85 2 25.00 0.00
86 3 25.10 0.50
87 4 30.00 0.51
88 Manning's 'N' friction factor = 0.013
89 -----
90 Sub-Channel flow = 7.957 (CFS)
91 ' ' flow top width = 12.415 (Ft.)
92 ' ' velocity = 5.184 (Ft/s)
93 ' ' area = 1.535 (Sq.Ft)
94 ' ' Froude number = 2.598
95
96 Upstream point elevation = 775.500 (Ft.)
97 Downstream point elevation = 748.000 (Ft.)
98 Flow length = 806.000 (Ft.)
99 Travel time = 2.59 min.
100 Time of concentration = 13.01 min.
101 Depth of flow = 0.247 (Ft.)
102 Average velocity = 5.183 (Ft/s)
103 Total irregular channel flow = 7.957 (CFS)
104 Irregular channel normal depth above invert elev. = 0.247 (Ft.)
105 Average velocity of channel(s) = 5.183 (Ft/s)
106 Adding area flow to channel
107 Rainfall intensity (I) = 4.124 (In/Hr) for a 100.0 year storm
108 Decimal fraction soil group A = 0.000
109 Decimal fraction soil group B = 0.000
110 Decimal fraction soil group C = 0.000
111 Decimal fraction soil group D = 1.000
112 [MEDIUM DENSITY RESIDENTIAL ]
113 (4.3 DU/A or Less )
114 Impervious value, Ai = 0.300
115 Sub-Area C Value = 0.520
116 Rainfall intensity = 4.124 (In/Hr) for a 100.0 year storm
117 Effective runoff coefficient used for total area
118 (Q=KCIA) is C = 0.520 CA = 3.675
119 Subarea runoff = 14.485 (CFS) for 6.796 (Ac.)
120 Total runoff = 15.159 (CFS) Total area = 7.068 (Ac.)
121 Depth of flow = 0.315 (Ft.), Average velocity = 6.090 (Ft/s)
122
123 ++++++
124 Process from Point/Station 104.000 to Point/Station 104.000
125 **** SUBAREA FLOW ADDITION ****
126
127 -----
128 Rainfall intensity (I) = 4.124 (In/Hr) for a 100.0 year storm
129 Decimal fraction soil group A = 0.000
130 Decimal fraction soil group B = 0.000
131 Decimal fraction soil group C = 0.000
132 Decimal fraction soil group D = 1.000
133 [MEDIUM DENSITY RESIDENTIAL ]
134 (4.3 DU/A or Less )
135 Impervious value, Ai = 0.300
136 Sub-Area C Value = 0.520
137 Time of concentration = 13.01 min.
138 Rainfall intensity = 4.124 (In/Hr) for a 100.0 year storm
139 Effective runoff coefficient used for total area

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139      (Q=KCIA) is C = 0.520   CA =      6.694
140      Subarea runoff =      12.452(CFS) for      5.806(Ac.)
141      Total runoff =      27.611(CFS)   Total area =      12.874(Ac.)
142
143
144      ++++++
145      Process from Point/Station      104.000 to Point/Station      105.000
146      **** PIPEFLOW TRAVEL TIME (User specified size) ****
147
148      Upstream point/station elevation =      738.000(Ft.)
149      Downstream point/station elevation =      732.000(Ft.)
150      Pipe length =      305.00(Ft.) Slope =      0.0197   Manning's N = 0.013
151      No. of pipes = 1   Required pipe flow =      27.611(CFS)
152      Given pipe size =      24.00(In.)
153      Calculated individual pipe flow =      27.611(CFS)
154      Normal flow depth in pipe =      17.32(In.)
155      Flow top width inside pipe =      21.51(In.)
156      Critical Depth =      21.84(In.)
157      Pipe flow velocity =      11.38(Ft/s)
158      Travel time through pipe =      0.45 min.
159      Time of concentration (TC) =      13.45 min.
160
161
162      ++++++
163      Process from Point/Station      105.000 to Point/Station      106.000
164      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
165
166      Estimated mean flow rate at midpoint of channel =      31.525(CFS)
167      Depth of flow =      0.389(Ft.), Average velocity =      7.387(Ft/s)
168      ***** Irregular Channel Data *****
169
170      -----
171      Information entered for subchannel number 1 :
172      Point number      'X' coordinate      'Y' coordinate
173      1                  0.00                  18.00
174      2                  45.00                  0.00
175      3                  55.00                  0.00
176      4                  100.00                 18.00
177      Manning's 'N' friction factor =      0.040
178
179      -----
180      Sub-Channel flow =      31.525(CFS)
181      '      '      flow top width =      11.945(Ft.)
182      '      '      velocity=      7.387(Ft/s)
183      '      '      area =      4.267(Sq.Ft)
184      '      '      Froude number =      2.178
185
186      Upstream point elevation =      732.000(Ft.)
187      Downstream point elevation =      516.000(Ft.)
188      Flow length =      1362.000(Ft.)
189      Travel time =      3.07 min.
190      Time of concentration =      16.53 min.
191      Depth of flow =      0.389(Ft.)
192      Average velocity =      7.387(Ft/s)
193      Total irregular channel flow =      31.525(CFS)
194      Irregular channel normal depth above invert elev. =      0.389(Ft.)
195      Average velocity of channel(s) =      7.387(Ft/s)
196      Adding area flow to channel
197      Rainfall intensity (I) =      3.534(In/Hr) for a      100.0 year storm
198      Decimal fraction soil group A = 0.000
199      Decimal fraction soil group B = 0.000
200      Decimal fraction soil group C = 0.000
201      Decimal fraction soil group D = 1.000
202      [UNDISTURBED NATURAL TERRAIN      ]
203      (Permanent Open Space      )
204      Impervious value, Ai = 0.000
205      Sub-Area C Value = 0.350
206      Rainfall intensity =      3.534(In/Hr) for a      100.0 year storm
207      Effective runoff coefficient used for total area
208      (Q=KCIA) is C = 0.448   CA =      10.012
209      Subarea runoff =      7.771(CFS) for      9.478(Ac.)

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208 Total runoff =      35.382(CFS) Total area =      22.352(Ac.)
209 Depth of flow =    0.416(Ft.), Average velocity =    7.699(Ft/s)
210
211
212 ++++++
213 Process from Point/Station      106.000 to Point/Station      106.000
214 **** CONFLUENCE OF MINOR STREAMS ****
215
216 -----
217 Along Main Stream number: 1 in normal stream number 1
218 Stream flow area =      22.352(Ac.)
219 Runoff from this stream =      35.382(CFS)
220 Time of concentration =    16.53 min.
221 Rainfall intensity =      3.534(In/Hr)
222
223 ++++++
224 Process from Point/Station      201.000 to Point/Station      202.000
225 **** INITIAL AREA EVALUATION ****
226
227 -----
228 Decimal fraction soil group A = 0.000
229 Decimal fraction soil group B = 0.000
230 Decimal fraction soil group C = 0.000
231 Decimal fraction soil group D = 1.000
232 [UNDISTURBED NATURAL TERRAIN
233 (Permanent Open Space )
234 Impervious value, Ai = 0.000
235 Sub-Area C Value = 0.350
236 Initial subarea total flow distance = 117.000(Ft.)
237 Highest elevation = 748.000(Ft.)
238 Lowest elevation = 716.000(Ft.)
239 Elevation difference = 32.000(Ft.) Slope = 27.350 %
240 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
241 The maximum overland flow distance is 100.00 (Ft)
242 for the top area slope value of 27.35 %, in a development type of
243 Permanent Open Space
244 In Accordance With Figure 3-3
245 Initial Area Time of Concentration = 4.48 minutes
246 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
247 TC = [1.8*(1.1-0.3500)*( 100.000^.5)/( 27.350^(1/3)]= 4.48
248 The initial area total distance of 117.00 (Ft.) entered leaves a
249 remaining distance of 17.00 (Ft.)
250 Using Figure 3-4, the travel time for this distance is 0.11 minutes
251 for a distance of 17.00 (Ft.) and a slope of 27.35 %
252 with an elevation difference of 4.65(Ft.) from the end of the top area
253 Tt = [11.9*length(Mi)^3]/(elevation change(Ft.))]^.385 *60(min/hr)
254 = 0.114 Minutes
255 Tt=[(11.9*0.0032^3)/( 4.65)]^.385= 0.11
256 Total initial area Ti = 4.48 minutes from Figure 3-3 formula plus
257 0.11 minutes from the Figure 3-4 formula = 4.59 minutes
258 Calculated TC of 4.595 minutes is less than 5 minutes,
259 resetting TC to 5.0 minutes for rainfall intensity calculations
260 Rainfall intensity (I) = 7.641(In/Hr) for a 100.0 year storm
261 Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
262 Subarea runoff = 0.251(CFS)
263 Total initial stream area = 0.094(Ac.)
264
265 ++++++
266 Process from Point/Station      202.000 to Point/Station      106.000
267 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
268
269 -----
270 Estimated mean flow rate at midpoint of channel = 8.354(CFS)
271 Depth of flow = 0.170(Ft.), Average velocity = 4.712(Ft/s)
272 ***** Irregular Channel Data *****
273 -----
274 Information entered for subchannel number 1 :
275 Point number 'X' coordinate 'Y' coordinate
276 1 0.00 18.00
277 2 45.00 0.00

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277      3      55.00      0.00
278      4      100.00      18.00
279 Manning's 'N' friction factor = 0.040
280 -----
281 Sub-Channel flow = 8.355 (CFS)
282 ' ' flow top width = 10.850 (Ft.)
283 ' ' velocity = 4.712 (Ft/s)
284 ' ' area = 1.773 (Sq.Ft)
285 ' ' Froude number = 2.054
286
287 Upstream point elevation = 716.000 (Ft.)
288 Downstream point elevation = 516.000 (Ft.)
289 Flow length = 1102.000 (Ft.)
290 Travel time = 3.90 min.
291 Time of concentration = 8.49 min.
292 Depth of flow = 0.170 (Ft.)
293 Average velocity = 4.712 (Ft/s)
294 Total irregular channel flow = 8.354 (CFS)
295 Irregular channel normal depth above invert elev. = 0.170 (Ft.)
296 Average velocity of channel(s) = 4.712 (Ft/s)
297 Adding area flow to channel
298 Rainfall intensity (I) = 5.429 (In/Hr) for a 100.0 year storm
299 Decimal fraction soil group A = 0.000
300 Decimal fraction soil group B = 0.000
301 Decimal fraction soil group C = 0.000
302 Decimal fraction soil group D = 1.000
303 [UNDISTURBED NATURAL TERRAIN ]
304 (Permanent Open Space )
305 Impervious value, Ai = 0.000
306 Sub-Area C Value = 0.350
307 Rainfall intensity = 5.429 (In/Hr) for a 100.0 year storm
308 Effective runoff coefficient used for total area
309 (Q=KCIA) is C = 0.350 CA = 3.014
310 Subarea runoff = 16.113 (CFS) for 8.518 (Ac.)
311 Total runoff = 16.364 (CFS) Total area = 8.612 (Ac.)
312 Depth of flow = 0.254 (Ft.), Average velocity = 6.067 (Ft/s)
313
314
315 ++++++
316 Process from Point/Station 203.000 to Point/Station 203.000
317 **** SUBAREA FLOW ADDITION ****
318 -----
319 Rainfall intensity (I) = 5.429 (In/Hr) for a 100.0 year storm
320 Decimal fraction soil group A = 0.000
321 Decimal fraction soil group B = 0.000
322 Decimal fraction soil group C = 0.000
323 Decimal fraction soil group D = 1.000
324 [UNDISTURBED NATURAL TERRAIN ]
325 (Permanent Open Space )
326 Impervious value, Ai = 0.000
327 Sub-Area C Value = 0.350
328 Time of concentration = 8.49 min.
329 Rainfall intensity = 5.429 (In/Hr) for a 100.0 year storm
330 Effective runoff coefficient used for total area
331 (Q=KCIA) is C = 0.350 CA = 8.389
332 Subarea runoff = 29.179 (CFS) for 15.356 (Ac.)
333 Total runoff = 45.544 (CFS) Total area = 23.968 (Ac.)
334
335
336 ++++++
337 Process from Point/Station 106.000 to Point/Station 106.000
338 **** CONFLUENCE OF MINOR STREAMS ****
339 -----
340 Along Main Stream number: 1 in normal stream number 2
341 Stream flow area = 23.968 (Ac.)
342 Runoff from this stream = 45.544 (CFS)
343 Time of concentration = 8.49 min.
344 Rainfall intensity = 5.429 (In/Hr)
345 Summary of stream data:

```

```

346
347 Stream      Flow rate      TC      Rainfall Intensity
348   No.      (CFS)      (min)      (In/Hr)
349
350
351 1          35.382      16.53      3.534
352 2          45.544      8.49      5.429
353 Qmax(1) =
354     1.000 *      1.000 *      35.382) +
355     0.651 *      1.000 *      45.544) + =      65.028
356 Qmax(2) =
357     1.000 *      0.514 *      35.382) +
358     1.000 *      1.000 *      45.544) + =      63.728
359
360 Total of 2 streams to confluence:
361 Flow rates before confluence point:
362     35.382      45.544
363 Maximum flow rates at confluence using above data:
364     65.028      63.728
365 Area of streams before confluence:
366     22.352      23.968
367 Results of confluence:
368 Total flow rate =      65.028 (CFS)
369 Time of concentration =      16.525 min.
370 Effective stream area after confluence =      46.320 (Ac.)
371
372
373 ++++++
374 Process from Point/Station      106.000 to Point/Station      107.000
375 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
376
377 -----
378 Estimated mean flow rate at midpoint of channel =      65.078 (CFS)
379 Depth of flow =      0.837 (Ft.), Average velocity =      6.432 (Ft/s)
380 ***** Irregular Channel Data *****
381
382 -----
383 Information entered for subchannel number 1 :
384 Point number      'X' coordinate      'Y' coordinate
385 1          0.00      18.00
386 2          45.00      0.00
387 3          55.00      0.00
388 4          100.00      18.00
389 Manning's 'N' friction factor =      0.040
390
391 -----
392 Sub-Channel flow =      65.078 (CFS)
393 '      '      flow top width =      14.184 (Ft.)
394 '      '      velocity=      6.432 (Ft/s)
395 '      '      area =      10.118 (Sq.Ft)
396 '      '      Froude number =      1.342
397
398 Upstream point elevation =      516.000 (Ft.)
399 Downstream point elevation =      505.000 (Ft.)
400 Flow length =      227.000 (Ft.)
401 Travel time =      0.59 min.
402 Time of concentration =      17.11 min.
403 Depth of flow =      0.837 (Ft.)
404 Average velocity =      6.432 (Ft/s)
405 Total irregular channel flow =      65.078 (CFS)
406 Irregular channel normal depth above invert elev. =      0.837 (Ft.)
407 Average velocity of channel(s) =      6.432 (Ft/s)
408 Adding area flow to channel
409 Rainfall intensity (I) =      3.455 (In/Hr) for a      100.0 year storm
410 Decimal fraction soil group A = 0.000
411 Decimal fraction soil group B = 0.000
412 Decimal fraction soil group C = 0.000
413 Decimal fraction soil group D = 1.000
414 [UNDISTURBED NATURAL TERRAIN      ]
415 (Permanent Open Space      )
416 Impervious value, Ai = 0.000
417 Sub-Area C Value = 0.350

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415 Rainfall intensity =      3.455(In/Hr) for a   100.0 year storm
416 Effective runoff coefficient used for total area
417 (Q=KCIA) is C = 0.396  CA =      18.834
418 Subarea runoff =      0.048(CFS) for      1.239(Ac.)
419 Total runoff =      65.075(CFS)  Total area =      47.559(Ac.)
420 Depth of flow =      0.837(Ft.), Average velocity =      6.432(Ft/s)
421
422
423 ++++++
424 Process from Point/Station      107.000 to Point/Station      107.000
425 **** CONFLUENCE OF MINOR STREAMS ****
426
427 -----
428 Along Main Stream number: 1 in normal stream number 1
429 Stream flow area =      47.559(Ac.)
430 Runoff from this stream =      65.075(CFS)
431 Time of concentration =      17.11 min.
432 Rainfall intensity =      3.455(In/Hr)
433
434 ++++++
435 Process from Point/Station      301.000 to Point/Station      302.000
436 **** INITIAL AREA EVALUATION ****
437
438 -----
439 Decimal fraction soil group A = 0.000
440 Decimal fraction soil group B = 0.000
441 Decimal fraction soil group C = 0.000
442 Decimal fraction soil group D = 1.000
443 [UNDISTURBED NATURAL TERRAIN          ]
444 (Permanent Open Space   )
445 Impervious value, Ai = 0.000
446 Sub-Area C Value = 0.350
447 Initial subarea total flow distance = 102.000(Ft.)
448 Highest elevation = 810.000(Ft.)
449 Lowest elevation = 808.000(Ft.)
450 Elevation difference = 2.000(Ft.) Slope = 1.961 %
451 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
452 The maximum overland flow distance is 85.00 (Ft)
453 for the top area slope value of 1.96 %, in a development type of
454 Permanent Open Space
455 In Accordance With Figure 3-3
456 Initial Area Time of Concentration = 9.94 minutes
457 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
458 TC = [1.8*(1.1-0.3500)*( 85.000^.5)/( 1.961^(1/3)]= 9.94
459 The initial area total distance of 102.00 (Ft.) entered leaves a
460 remaining distance of 17.00 (Ft.)
461 Using Figure 3-4, the travel time for this distance is 0.31 minutes
462 for a distance of 17.00 (Ft.) and a slope of 1.96 %
463 with an elevation difference of 0.33(Ft.) from the end of the top area
464 Tt = [11.9*length(Mi)^3]/(elevation change(Ft.))]^.385 *60(min/hr)
465 = 0.314 Minutes
466 Tt=[(11.9*0.0032^3)/( 0.33)]^.385= 0.31
467 Total initial area Ti = 9.94 minutes from Figure 3-3 formula plus
468 0.31 minutes from the Figure 3-4 formula = 10.26 minutes
469 Rainfall intensity (I) =      4.807(In/Hr) for a   100.0 year storm
470 Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
471 Subarea runoff =      0.119(CFS)
472 Total initial stream area =      0.071(Ac.)
473
474 ++++++
475 Process from Point/Station      302.000 to Point/Station      107.000
476 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
477
478 -----
479 Estimated mean flow rate at midpoint of channel =      12.804(CFS)
480 Depth of flow =      0.234(Ft.), Average velocity =      5.172(Ft/s)
481 ***** Irregular Channel Data *****
482 -----
483 Information entered for subchannel number 1 :
484 Point number      'X' coordinate      'Y' coordinate

```

```

484         1           0.00           18.00
485         2          45.00           0.00
486         3          55.00           0.00
487         4         100.00          18.00
488 Manning's 'N' friction factor = 0.040
489 -----
490 Sub-Channel flow = 12.804 (CFS)
491 ' ' flow top width = 11.169 (Ft.)
492 ' ' velocity = 5.172 (Ft/s)
493 ' ' area = 2.475 (Sq.Ft)
494 ' ' Froude number = 1.936
495
496 Upstream point elevation = 808.000 (Ft.)
497 Downstream point elevation = 505.000 (Ft.)
498 Flow length = 2074.000 (Ft.)
499 Travel time = 6.68 min.
500 Time of concentration = 16.94 min.
501 Depth of flow = 0.234 (Ft.)
502 Average velocity = 5.172 (Ft/s)
503 Total irregular channel flow = 12.804 (CFS)
504 Irregular channel normal depth above invert elev. = 0.234 (Ft.)
505 Average velocity of channel(s) = 5.172 (Ft/s)
506 Adding area flow to channel
507 Rainfall intensity (I) = 3.478 (In/Hr) for a 100.0 year storm
508 Decimal fraction soil group A = 0.000
509 Decimal fraction soil group B = 0.000
510 Decimal fraction soil group C = 0.000
511 Decimal fraction soil group D = 1.000
512 [UNDISTURBED NATURAL TERRAIN ]
513 (Permanent Open Space )
514 Impervious value, Ai = 0.000
515 Sub-Area C Value = 0.350
516 Rainfall intensity = 3.478 (In/Hr) for a 100.0 year storm
517 Effective runoff coefficient used for total area
518 (Q=KCIA) is C = 0.350 CA = 7.309
519 Subarea runoff = 25.300 (CFS) for 20.812 (Ac.)
520 Total runoff = 25.419 (CFS) Total area = 20.883 (Ac.)
521 Depth of flow = 0.351 (Ft.), Average velocity = 6.658 (Ft/s)
522
523
524 ++++++
525 Process from Point/Station 107.000 to Point/Station 107.000
526 **** CONFLUENCE OF MINOR STREAMS ****
527 -----
528 Along Main Stream number: 1 in normal stream number 2
529 Stream flow area = 20.883 (Ac.)
530 Runoff from this stream = 25.419 (CFS)
531 Time of concentration = 16.94 min.
532 Rainfall intensity = 3.478 (In/Hr)
533 Summary of stream data:
534
535 Stream Flow rate TC Rainfall Intensity
536 No. (CFS) (min) (In/Hr)
537
538
539 1 65.075 17.11 3.455
540 2 25.419 16.94 3.478
541 Qmax (1) =
542 1.000 * 1.000 * 65.075) +
543 0.993 * 1.000 * 25.419) + = 90.329
544 Qmax (2) =
545 1.000 * 0.990 * 65.075) +
546 1.000 * 1.000 * 25.419) + = 89.840
547
548 Total of 2 streams to confluence:
549 Flow rates before confluence point:
550 65.075 25.419
551 Maximum flow rates at confluence using above data:
552 90.329 89.840

```



```

553 Area of streams before confluence:
554     47.559     20.883
555 Results of confluence:
556 Total flow rate =     90.329 (CFS)
557 Time of concentration =     17.113 min.
558 Effective stream area after confluence =     68.442 (Ac.)
559
560
561 ++++++
562 Process from Point/Station     108.000 to Point/Station     109.000
563 **** USER DEFINED FLOW INFORMATION AT A POINT ****
564
565 User specified 'C' value of 0.485 given for subarea
566 Rainfall intensity (I) =     2.395 (In/Hr) for a     100.0 year storm
567 User specified values are as follows:
568 TC =     30.20 min. Rain intensity =     2.40 (In/Hr)
569 Total area =     90.583 (Ac.) Total runoff =     105.290 (CFS)
570
571
572 ++++++
573 Process from Point/Station     109.000 to Point/Station     109.000
574 **** CONFLUENCE OF MINOR STREAMS ****
575
576 Along Main Stream number: 1 in normal stream number 1
577 Stream flow area =     90.583 (Ac.)
578 Runoff from this stream =     105.290 (CFS)
579 Time of concentration =     30.20 min.
580 Rainfall intensity =     2.395 (In/Hr)
581
582
583 ++++++
584 Process from Point/Station     501.000 to Point/Station     109.000
585 **** USER DEFINED FLOW INFORMATION AT A POINT ****
586
587 User specified 'C' value of 0.393 given for subarea
588 Rainfall intensity (I) =     2.845 (In/Hr) for a     100.0 year storm
589 User specified values are as follows:
590 TC =     23.13 min. Rain intensity =     2.84 (In/Hr)
591 Total area =     7.890 (Ac.) Total runoff =     8.812 (CFS)
592
593
594 ++++++
595 Process from Point/Station     109.000 to Point/Station     109.000
596 **** CONFLUENCE OF MINOR STREAMS ****
597
598 Along Main Stream number: 1 in normal stream number 2
599 Stream flow area =     7.890 (Ac.)
600 Runoff from this stream =     8.812 (CFS)
601 Time of concentration =     23.13 min.
602 Rainfall intensity =     2.845 (In/Hr)
603 Summary of stream data:
604
605 Stream    Flow rate    TC    Rainfall Intensity
606 No.      (CFS)      (min)      (In/Hr)
607
608
609 1        105.290    30.20    2.395
610 2         8.812    23.13    2.845
611 Qmax(1) =
612 1.000 *    1.000 *    105.290) +
613 0.842 *    1.000 *    8.812) + =    112.709
614 Qmax(2) =
615 1.000 *    0.766 *    105.290) +
616 1.000 *    1.000 *    8.812) + =    89.453
617
618 Total of 2 streams to confluence:
619 Flow rates before confluence point:
620     105.290     8.812
621 Maximum flow rates at confluence using above data:

```

```

622         112.709         89.453
623 Area of streams before confluence:
624         90.583         7.890
625 Results of confluence:
626 Total flow rate =      112.709 (CFS)
627 Time of concentration =      30.200 min.
628 Effective stream area after confluence =      98.473 (Ac.)
629
630
631 ++++++
632 Process from Point/Station      109.000 to Point/Station      110.000
633 **** PIPEFLOW TRAVEL TIME (User specified size) ****
634
635 Upstream point/station elevation =      449.740 (Ft.)
636 Downstream point/station elevation =      438.470 (Ft.)
637 Pipe length =      483.00 (Ft.) Slope =      0.0233 Manning's N = 0.015
638 No. of pipes = 1 Required pipe flow =      112.709 (CFS)
639 Given pipe size =      48.00 (In.)
640 Calculated individual pipe flow =      112.709 (CFS)
641 Normal flow depth in pipe =      26.58 (In.)
642 Flow top width inside pipe =      47.72 (In.)
643 Critical Depth =      38.48 (In.)
644 Pipe flow velocity =      15.77 (Ft/s)
645 Travel time through pipe =      0.51 min.
646 Time of concentration (TC) =      30.71 min.
647
648
649 ++++++
650 Process from Point/Station      702.000 to Point/Station      110.000
651 **** SUBAREA FLOW ADDITION ****
652
653 Rainfall intensity (I) =      2.370 (In/Hr) for a      100.0 year storm
654 Decimal fraction soil group A = 0.000
655 Decimal fraction soil group B = 0.000
656 Decimal fraction soil group C = 0.000
657 Decimal fraction soil group D = 1.000
658 [UNDISTURBED NATURAL TERRAIN
659 (Permanent Open Space )
660 Impervious value, Ai = 0.000
661 Sub-Area C Value = 0.350
662 The area added to the existing stream causes a
663 a lower flow rate of Q =      112.152 (CFS)
664 therefore the upstream flow rate of Q =      112.709 (CFS) is being used
665 Time of concentration =      30.71 min.
666 Rainfall intensity =      2.370 (In/Hr) for a      100.0 year storm
667 Effective runoff coefficient used for total area
668 (Q=KCIA) is C = 0.477 CA =      47.330
669 Subarea runoff =      0.000 (CFS) for      0.847 (Ac.)
670 Total runoff =      112.709 (CFS) Total area =      99.320 (Ac.)
671
672
673 ++++++
674 Process from Point/Station      701.000 to Point/Station      110.000
675 **** SUBAREA FLOW ADDITION ****
676
677 Rainfall intensity (I) =      2.370 (In/Hr) for a      100.0 year storm
678 Decimal fraction soil group A = 0.000
679 Decimal fraction soil group B = 0.000
680 Decimal fraction soil group C = 0.000
681 Decimal fraction soil group D = 1.000
682 [MEDIUM DENSITY RESIDENTIAL
683 (14.5 DU/A or Less )
684 Impervious value, Ai = 0.500
685 Sub-Area C Value = 0.630
686 Time of concentration =      30.71 min.
687 Rainfall intensity =      2.370 (In/Hr) for a      100.0 year storm
688 Effective runoff coefficient used for total area
689 (Q=KCIA) is C = 0.478 CA =      47.935
690 Subarea runoff =      0.877 (CFS) for      0.961 (Ac.)

```

```

691 Total runoff =      113.587(CFS)   Total area =      100.281(Ac.)
692
693
694 ++++++
695 Process from Point/Station      110.000 to Point/Station      111.000
696 **** PIPEFLOW TRAVEL TIME (User specified size) ****
697
698 Upstream point/station elevation =    438.470(Ft.)
699 Downstream point/station elevation =    407.700(Ft.)
700 Pipe length =    212.00(Ft.) Slope =    0.1451 Manning's N = 0.015
701 No. of pipes = 1 Required pipe flow =    113.587(CFS)
702 Given pipe size =    48.00(In.)
703 Calculated individual pipe flow =    113.587(CFS)
704 Normal flow depth in pipe =    15.98(In.)
705 Flow top width inside pipe =    45.24(In.)
706 Critical Depth =    38.59(In.)
707 Pipe flow velocity =    30.99(Ft/s)
708 Travel time through pipe =    0.11 min.
709 Time of concentration (TC) =    30.82 min.
710
711
712 ++++++
713 Process from Point/Station      111.000 to Point/Station      111.000
714 **** CONFLUENCE OF MAIN STREAMS ****
715
716 The following data inside Main Stream is listed:
717 In Main Stream number: 1
718 Stream flow area =    100.281(Ac.)
719 Runoff from this stream =    113.587(CFS)
720 Time of concentration =    30.82 min.
721 Rainfall intensity =    2.364(In/Hr)
722 Program is now starting with Main Stream No. 2
723
724
725 ++++++
726 Process from Point/Station      111.000 to Point/Station      111.000
727 **** USER DEFINED FLOW INFORMATION AT A POINT ****
728
729 User specified 'C' value of 0.217 given for subarea
730 Rainfall intensity (I) =    3.780(In/Hr) for a    100.0 year storm
731 User specified values are as follows:
732 TC =    14.89 min. Rain intensity =    3.78(In/Hr)
733 Total area =    1.777(Ac.) Total runoff =    1.458(CFS)
734
735
736 ++++++
737 Process from Point/Station      111.000 to Point/Station      111.000
738 **** CONFLUENCE OF MAIN STREAMS ****
739
740 The following data inside Main Stream is listed:
741 In Main Stream number: 2
742 Stream flow area =    1.777(Ac.)
743 Runoff from this stream =    1.458(CFS)
744 Time of concentration =    14.89 min.
745 Rainfall intensity =    3.780(In/Hr)
746 Summary of stream data:
747
748 Stream      Flow rate      TC      Rainfall Intensity
749 No.          (CFS)          (min)          (In/Hr)
750
751
752 1          113.587          30.82          2.364
753 2           1.458          14.89          3.780
754 Qmax(1) =
755 1.000 *    1.000 *    113.587) +
756 0.625 *    1.000 *    1.458) + =    114.498
757 Qmax(2) =
758 1.000 *    0.483 *    113.587) +
759 1.000 *    1.000 *    1.458) + =    56.327

```

```

760
761 Total of 2 main streams to confluence:
762 Flow rates before confluence point:
763     113.587     1.458
764 Maximum flow rates at confluence using above data:
765     114.498     56.327
766 Area of streams before confluence:
767     100.281     1.777
768
769
770 Results of confluence:
771 Total flow rate = 114.498 (CFS)
772 Time of concentration = 30.825 min.
773 Effective stream area after confluence = 102.058 (Ac.)
774
775
776 ++++++
777 Process from Point/Station 111.000 to Point/Station 111.000
778 **** CONFLUENCE OF MINOR STREAMS ****
779
780 Along Main Stream number: 1 in normal stream number 1
781 Stream flow area = 102.058 (Ac.)
782 Runoff from this stream = 114.498 (CFS)
783 Time of concentration = 30.82 min.
784 Rainfall intensity = 2.364 (In/Hr)
785
786
787 ++++++
788 Process from Point/Station 801.000 to Point/Station 802.000
789 **** INITIAL AREA EVALUATION ****
790
791 Decimal fraction soil group A = 0.000
792 Decimal fraction soil group B = 0.000
793 Decimal fraction soil group C = 0.000
794 Decimal fraction soil group D = 1.000
795 [UNDISTURBED NATURAL TERRAIN ]
796 (Permanent Open Space )
797 Impervious value, Ai = 0.000
798 Sub-Area C Value = 0.350
799 Initial subarea total flow distance = 100.000 (Ft.)
800 Highest elevation = 596.000 (Ft.)
801 Lowest elevation = 576.000 (Ft.)
802 Elevation difference = 20.000 (Ft.) Slope = 20.000 %
803 INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
804 The maximum overland flow distance is 100.00 (Ft)
805 for the top area slope value of 20.00 %, in a development type of
806 Permanent Open Space
807 In Accordance With Figure 3-3
808 Initial Area Time of Concentration = 4.97 minutes
809 TC = [1.8*(1.1-C)*distance(Ft.)^.5]/(% slope^(1/3)]
810 TC = [1.8*(1.1-0.3500)*( 100.000^.5)/ ( 20.000^(1/3)]= 4.97
811 Calculated TC of 4.973 minutes is less than 5 minutes,
812 resetting TC to 5.0 minutes for rainfall intensity calculations
813 Rainfall intensity (I) = 7.641 (In/Hr) for a 100.0 year storm
814 Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
815 Subarea runoff = 0.957 (CFS)
816 Total initial stream area = 0.358 (Ac.)
817
818
819 ++++++
820 Process from Point/Station 802.000 to Point/Station 803.000
821 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
822
823 Estimated mean flow rate at midpoint of channel = 3.677 (CFS)
824 Depth of flow = 0.096 (Ft.), Average velocity = 3.758 (Ft/s)
825 ***** Irregular Channel Data *****
826
827 Information entered for subchannel number 1 :
828 Point number 'X' coordinate 'Y' coordinate

```

```

829      1          0.00          18.00
830      2          45.00          0.00
831      3          55.00          0.00
832      4          100.00         18.00
833 Manning's 'N' friction factor = 0.040
834 -----
835 Sub-Channel flow = 3.677 (CFS)
836 ' ' flow top width = 10.478 (Ft.)
837 ' ' velocity = 3.758 (Ft/s)
838 ' ' area = 0.978 (Sq.Ft)
839 ' ' Froude number = 2.167
840
841 Upstream point elevation = 576.000 (Ft.)
842 Downstream point elevation = 485.000 (Ft.)
843 Flow length = 375.000 (Ft.)
844 Travel time = 1.66 min.
845 Time of concentration = 6.64 min.
846 Depth of flow = 0.096 (Ft.)
847 Average velocity = 3.758 (Ft/s)
848 Total irregular channel flow = 3.677 (CFS)
849 Irregular channel normal depth above invert elev. = 0.096 (Ft.)
850 Average velocity of channel(s) = 3.758 (Ft/s)
851 Adding area flow to channel
852 Rainfall intensity (I) = 6.365 (In/Hr) for a 100.0 year storm
853 Decimal fraction soil group A = 0.000
854 Decimal fraction soil group B = 0.000
855 Decimal fraction soil group C = 0.000
856 Decimal fraction soil group D = 1.000
857 [UNDISTURBED NATURAL TERRAIN ]
858 (Permanent Open Space )
859 Impervious value, Ai = 0.000
860 Sub-Area C Value = 0.350
861 Rainfall intensity = 6.365 (In/Hr) for a 100.0 year storm
862 Effective runoff coefficient used for total area
863 (Q=KCIA) is C = 0.350 CA = 0.990
864 Subarea runoff = 5.347 (CFS) for 2.472 (Ac.)
865 Total runoff = 6.305 (CFS) Total area = 2.830 (Ac.)
866 Depth of flow = 0.132 (Ft.), Average velocity = 4.628 (Ft/s)
867
868
869 +-----+
870 Process from Point/Station 803.000 to Point/Station 111.000
871 **** IMPROVED CHANNEL TRAVEL TIME ****
872 -----
873 Upstream point elevation = 485.000 (Ft.)
874 Downstream point elevation = 432.000 (Ft.)
875 Channel length thru subarea = 775.000 (Ft.)
876 Channel base width = 1.000 (Ft.)
877 Slope or 'Z' of left channel bank = 100.000
878 Slope or 'Z' of right channel bank = 100.000
879 Manning's 'N' = 0.016
880 Maximum depth of channel = 1.500 (Ft.)
881 Flow(q) thru subarea = 6.305 (CFS)
882 Depth of flow = 0.123 (Ft.), Average velocity = 3.875 (Ft/s)
883 Channel flow top width = 25.531 (Ft.)
884 Flow Velocity = 3.87 (Ft/s)
885 Travel time = 3.33 min.
886 Time of concentration = 9.97 min.
887 Critical depth = 0.186 (Ft.)
888
889
890 +-----+
891 Process from Point/Station 804.000 to Point/Station 111.000
892 **** SUBAREA FLOW ADDITION ****
893 -----
894 Rainfall intensity (I) = 4.896 (In/Hr) for a 100.0 year storm
895 Decimal fraction soil group A = 0.000
896 Decimal fraction soil group B = 0.000
897 Decimal fraction soil group C = 0.000

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```

898 Decimal fraction soil group D = 1.000
899 [UNDISTURBED NATURAL TERRAIN ]
900 (Permanent Open Space )
901 Impervious value, Ai = 0.000
902 Sub-Area C Value = 0.350
903 Time of concentration = 9.97 min.
904 Rainfall intensity = 4.896(In/Hr) for a 100.0 year storm
905 Effective runoff coefficient used for total area
906 (Q=KCIA) is C = 0.350 CA = 2.660
907 Subarea runoff = 6.719(CFS) for 4.771(Ac.)
908 Total runoff = 13.024(CFS) Total area = 7.601(Ac.)
909
910
911 ++++++
912 Process from Point/Station 805.000 to Point/Station 111.000
913 **** SUBAREA FLOW ADDITION ****
914
915 Rainfall intensity (I) = 4.896(In/Hr) for a 100.0 year storm
916 Decimal fraction soil group A = 0.000
917 Decimal fraction soil group B = 0.000
918 Decimal fraction soil group C = 0.000
919 Decimal fraction soil group D = 1.000
920 [UNDISTURBED NATURAL TERRAIN ]
921 (Permanent Open Space )
922 Impervious value, Ai = 0.000
923 Sub-Area C Value = 0.350
924 Time of concentration = 9.97 min.
925 Rainfall intensity = 4.896(In/Hr) for a 100.0 year storm
926 Effective runoff coefficient used for total area
927 (Q=KCIA) is C = 0.350 CA = 3.421
928 Subarea runoff = 3.722(CFS) for 2.172(Ac.)
929 Total runoff = 16.746(CFS) Total area = 9.773(Ac.)
930
931
932 ++++++
933 Process from Point/Station 111.000 to Point/Station 111.000
934 **** CONFLUENCE OF MINOR STREAMS ****
935
936 Along Main Stream number: 1 in normal stream number 2
937 Stream flow area = 9.773(Ac.)
938 Runoff from this stream = 16.746(CFS)
939 Time of concentration = 9.97 min.
940 Rainfall intensity = 4.896(In/Hr)
941 Summary of stream data:
942
943 Stream Flow rate TC Rainfall Intensity
944 No. (CFS) (min) (In/Hr)
945
946
947 1 114.498 30.82 2.364
948 2 16.746 9.97 4.896
949 Qmax(1) =
950 1.000 * 1.000 * 114.498) +
951 0.483 * 1.000 * 16.746) + = 122.584
952 Qmax(2) =
953 1.000 * 0.323 * 114.498) +
954 1.000 * 1.000 * 16.746) + = 53.780
955
956 Total of 2 streams to confluence:
957 Flow rates before confluence point:
958 114.498 16.746
959 Maximum flow rates at confluence using above data:
960 122.584 53.780
961 Area of streams before confluence:
962 102.058 9.773
963 Results of confluence:
964 Total flow rate = 122.584(CFS)
965 Time of concentration = 30.825 min.
966 Effective stream area after confluence = 111.831(Ac.)

```


San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 01/15/26

POST-DEVELOPMENT
POC-2 MITIGATED
100-YR STORM

***** 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) = 2.900
24 hour precipitation(inches) = 5.250
P6/P24 = 55.2%
San Diego hydrology manual 'C' values used

Process from Point/Station 401.000 to Point/Station 402.000
**** 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
[UNDISTURBED NATURAL TERRAIN]
(Permanent Open Space)
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Initial subarea total flow distance = 82.000 (Ft.)
Highest elevation = 598.000 (Ft.)
Lowest elevation = 586.000 (Ft.)
Elevation difference = 12.000 (Ft.) Slope = 14.634 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 14.63 %, in a development type of
Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration = 5.52 minutes
 $TC = [1.8 * (1.1 - C) * \text{distance (Ft.)}^{.5} / (\% \text{ slope}^{(1/3)})]$
 $TC = [1.8 * (1.1 - 0.3500) * (100.000^{.5}) / (14.634^{(1/3)})] = 5.52$
Rainfall intensity (I) = 7.169 (In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.350
Subarea runoff = 0.276 (CFS)
Total initial stream area = 0.110 (Ac.)

Process from Point/Station 402.000 to Point/Station 403.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****

Estimated mean flow rate at midpoint of channel = 5.841 (CFS)
Depth of flow = 0.193 (Ft.), Average velocity = 5.245 (Ft/s)
***** Irregular Channel Data *****

```

70 -----
71 Information entered for subchannel number 1 :
72 Point number      'X' coordinate      'Y' coordinate
73     1              0.00              5.00
74     2              20.00              0.00
75     3              25.00              0.00
76     4              45.00              5.00
77 Manning's 'N' friction factor =    0.040
78 -----
79 Sub-Channel flow =    5.841 (CFS)
80 '      ' flow top width =    6.544 (Ft.)
81 '      ' velocity=    5.245 (Ft/s)
82 '      ' area =    1.114 (Sq.Ft)
83 '      ' Froude number =    2.240
84
85 Upstream point elevation =    586.000 (Ft.)
86 Downstream point elevation =    436.000 (Ft.)
87 Flow length =    703.000 (Ft.)
88 Travel time =    2.23 min.
89 Time of concentration =    7.75 min.
90 Depth of flow =    0.193 (Ft.)
91 Average velocity =    5.245 (Ft/s)
92 Total irregular channel flow =    5.841 (CFS)
93 Irregular channel normal depth above invert elev. =    0.193 (Ft.)
94 Average velocity of channel(s) =    5.245 (Ft/s)
95 Adding area flow to channel
96 Rainfall intensity (I) =    5.758 (In/Hr) for a    100.0 year storm
97 Decimal fraction soil group A =    0.000
98 Decimal fraction soil group B =    0.000
99 Decimal fraction soil group C =    0.000
100 Decimal fraction soil group D =    1.000
101 [UNDISTURBED NATURAL TERRAIN
102 (Permanent Open Space )
103 Impervious value, Ai =    0.000
104 Sub-Area C Value =    0.350
105 Rainfall intensity =    5.758 (In/Hr) for a    100.0 year storm
106 Effective runoff coefficient used for total area
107 (Q=KCIA) is C =    0.350 CA =    1.971
108 Subarea runoff =    11.072 (CFS) for    5.521 (Ac.)
109 Total runoff =    11.348 (CFS) Total area =    5.631 (Ac.)
110 Depth of flow =    0.282 (Ft.), Average velocity =    6.557 (Ft/s)
111
112
113 +-----+
114 Process from Point/Station    409.000 to Point/Station    409.000
115 **** CONFLUENCE OF MINOR STREAMS ****
116
117 -----
118 Along Main Stream number: 1 in normal stream number 1
119 Stream flow area =    5.631 (Ac.)
120 Runoff from this stream =    11.348 (CFS)
121 Time of concentration =    7.75 min.
122 Rainfall intensity =    5.758 (In/Hr)
123
124 +-----+
125 Process from Point/Station    404.000 to Point/Station    406.000
126 **** USER DEFINED FLOW INFORMATION AT A POINT ****
127
128 -----
129 User specified 'C' value of    0.601 given for subarea
130 Rainfall intensity (I) =    3.539 (In/Hr) for a    100.0 year storm
131 User specified values are as follows:
132 TC =    16.49 min. Rain intensity =    3.54 (In/Hr)
133 Total area =    1.492 (Ac.) Total runoff =    3.176 (CFS)
134
135 +-----+
136 Process from Point/Station    406.000 to Point/Station    407.000
137 **** PIPEFLOW TRAVEL TIME (User specified size) ****
138 -----

```

```

139 Upstream point/station elevation = 475.500 (Ft.)
140 Downstream point/station elevation = 474.090 (Ft.)
141 Pipe length = 158.00 (Ft.) Slope = 0.0089 Manning's N = 0.015
142 No. of pipes = 1 Required pipe flow = 3.176 (CFS)
143 Given pipe size = 18.00 (In.)
144 Calculated individual pipe flow = 3.176 (CFS)
145 Normal flow depth in pipe = 7.57 (In.)
146 Flow top width inside pipe = 17.77 (In.)
147 Critical Depth = 8.14 (In.)
148 Pipe flow velocity = 4.50 (Ft/s)
149 Travel time through pipe = 0.59 min.
150 Time of concentration (TC) = 17.08 min.
151
152
153 ++++++
154 Process from Point/Station 407.000 to Point/Station 407.000
155 **** SUBAREA FLOW ADDITION ****
156
157 Rainfall intensity (I) = 3.460 (In/Hr) for a 100.0 year storm
158 Decimal fraction soil group A = 0.000
159 Decimal fraction soil group B = 0.000
160 Decimal fraction soil group C = 0.000
161 Decimal fraction soil group D = 1.000
162 [LOW DENSITY RESIDENTIAL ]
163 (1.0 DU/A or Less )
164 Impervious value, Ai = 0.100
165 Sub-Area C Value = 0.410
166 Time of concentration = 17.08 min.
167 Rainfall intensity = 3.460 (In/Hr) for a 100.0 year storm
168 Effective runoff coefficient used for total area
169 (Q=KCIA) is C = 0.538 CA = 1.194
170 Subarea runoff = 0.957 (CFS) for 0.726 (Ac.)
171 Total runoff = 4.133 (CFS) Total area = 2.218 (Ac.)
172
173
174 ++++++
175 Process from Point/Station 407.000 to Point/Station 408.000
176 **** PIPEFLOW TRAVEL TIME (User specified size) ****
177
178 Upstream point/station elevation = 474.090 (Ft.)
179 Downstream point/station elevation = 472.770 (Ft.)
180 Pipe length = 62.00 (Ft.) Slope = 0.0213 Manning's N = 0.013
181 No. of pipes = 1 Required pipe flow = 4.133 (CFS)
182 Given pipe size = 18.00 (In.)
183 Calculated individual pipe flow = 4.133 (CFS)
184 Normal flow depth in pipe = 6.39 (In.)
185 Flow top width inside pipe = 17.22 (In.)
186 Critical Depth = 9.35 (In.)
187 Pipe flow velocity = 7.36 (Ft/s)
188 Travel time through pipe = 0.14 min.
189 Time of concentration (TC) = 17.22 min.
190
191
192 ++++++
193 Process from Point/Station 408.000 to Point/Station 409.000
194 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
195
196 Depth of flow = 0.485 (Ft.), Average velocity = 11.696 (Ft/s)
197 ***** Irregular Channel Data *****
198 -----
199 Information entered for subchannel number 1 :
200 Point number 'X' coordinate 'Y' coordinate
201 1 0.00 1.00
202 2 1.50 0.00
203 3 3.00 1.00
204 Manning's 'N' friction factor = 0.015
205 -----
206 Sub-Channel flow = 4.133 (CFS)
207 ' ' flow top width = 1.456 (Ft.)

```

```

208      '      '      velocity=  11.696 (Ft/s)
209      '      '      area =    0.353 (Sq.Ft)
210      '      '      Froude number =    4.184
211
212      Upstream point elevation =  472.770 (Ft.)
213      Downstream point elevation =  449.000 (Ft.)
214      Flow length =  202.000 (Ft.)
215      Travel time =  0.29 min.
216      Time of concentration =  17.50 min.
217      Depth of flow =  0.485 (Ft.)
218      Average velocity =  11.696 (Ft/s)
219      Total irregular channel flow =    4.133 (CFS)
220      Irregular channel normal depth above invert elev. =  0.485 (Ft.)
221      Average velocity of channel(s) =  11.696 (Ft/s)
222
223
224      ++++++
225      Process from Point/Station  409.000 to Point/Station  409.000
226      **** SUBAREA FLOW ADDITION ****
227
228      Rainfall intensity (I) =  3.405 (In/Hr) for a  100.0 year storm
229      Decimal fraction soil group A = 0.000
230      Decimal fraction soil group B = 0.000
231      Decimal fraction soil group C = 0.000
232      Decimal fraction soil group D = 1.000
233      [HIGH DENSITY RESIDENTIAL
234      (24.0 DU/A or Less
235      Impervious value, Ai = 0.650
236      Sub-Area C Value = 0.710
237      Time of concentration =  17.50 min.
238      Rainfall intensity =  3.405 (In/Hr) for a  100.0 year storm
239      Effective runoff coefficient used for total area
240      (Q=KCIA) is C = 0.574 CA =  1.599
241      Subarea runoff =  1.313 (CFS) for  0.570 (Ac.)
242      Total runoff =  5.445 (CFS) Total area =  2.788 (Ac.)
243
244
245      ++++++
246      Process from Point/Station  409.000 to Point/Station  410.000
247      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
248
249      Depth of flow =  0.628 (Ft.), Average velocity =  9.190 (Ft/s)
250      ***** Irregular Channel Data *****
251
252      Information entered for subchannel number 1 :
253      Point number      'X' coordinate      'Y' coordinate
254      1                  0.00                1.00
255      2                  1.50                0.00
256      3                  3.00                1.00
257      Manning's 'N' friction factor =  0.015
258
259      Sub-Channel flow =  5.445 (CFS)
260      '      '      flow top width =  1.885 (Ft.)
261      '      '      velocity=  9.190 (Ft/s)
262      '      '      area =  0.593 (Sq.Ft)
263      '      '      Froude number =  2.889
264
265      Upstream point elevation =  449.000 (Ft.)
266      Downstream point elevation =  442.000 (Ft.)
267      Flow length =  136.000 (Ft.)
268      Travel time =  0.25 min.
269      Time of concentration =  17.75 min.
270      Depth of flow =  0.628 (Ft.)
271      Average velocity =  9.190 (Ft/s)
272      Total irregular channel flow =  5.445 (CFS)
273      Irregular channel normal depth above invert elev. =  0.628 (Ft.)
274      Average velocity of channel(s) =  9.190 (Ft/s)
275
276

```

```

277 *****
278 Process from Point/Station      410.000 to Point/Station      410.000
279 **** CONFLUENCE OF MINOR STREAMS ****
280
281 Along Main Stream number: 1 in normal stream number 2
282 Stream flow area =      2.788 (Ac.)
283 Runoff from this stream =      5.445 (CFS)
284 Time of concentration =     17.75 min.
285 Rainfall intensity =      3.375 (In/Hr)
286 Summary of stream data:
287
288 Stream    Flow rate      TC      Rainfall Intensity
289   No.      (CFS)      (min)      (In/Hr)
290
291
292   1      11.348      7.75      5.758
293   2       5.445     17.75      3.375
294 Qmax (1) =
295     1.000 *      1.000 *      11.348) +
296     1.000 *      0.437 *      5.445) + =      13.726
297 Qmax (2) =
298     0.586 *      1.000 *      11.348) +
299     1.000 *      1.000 *      5.445) + =      12.096
300
301 Total of 2 streams to confluence:
302 Flow rates before confluence point:
303     11.348      5.445
304 Maximum flow rates at confluence using above data:
305     13.726      12.096
306 Area of streams before confluence:
307     5.631      2.788
308 Results of confluence:
309 Total flow rate =      13.726 (CFS)
310 Time of concentration =      7.753 min.
311 Effective stream area after confluence =      8.419 (Ac.)
312 End of computations, total study area =      8.419 (Ac.)
313
314
315

```

San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software, (c)1991-2019 Version 9.1
Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 11/06/25

POST-DEVELOPMENT
POC-3 MITIGATED
100-YR STORM

***** 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) = 2.900
24 hour precipitation(inches) = 5.250
P6/P24 = 55.2%
San Diego hydrology manual 'C' values used

Process from Point/Station 901.000 to Point/Station 903.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

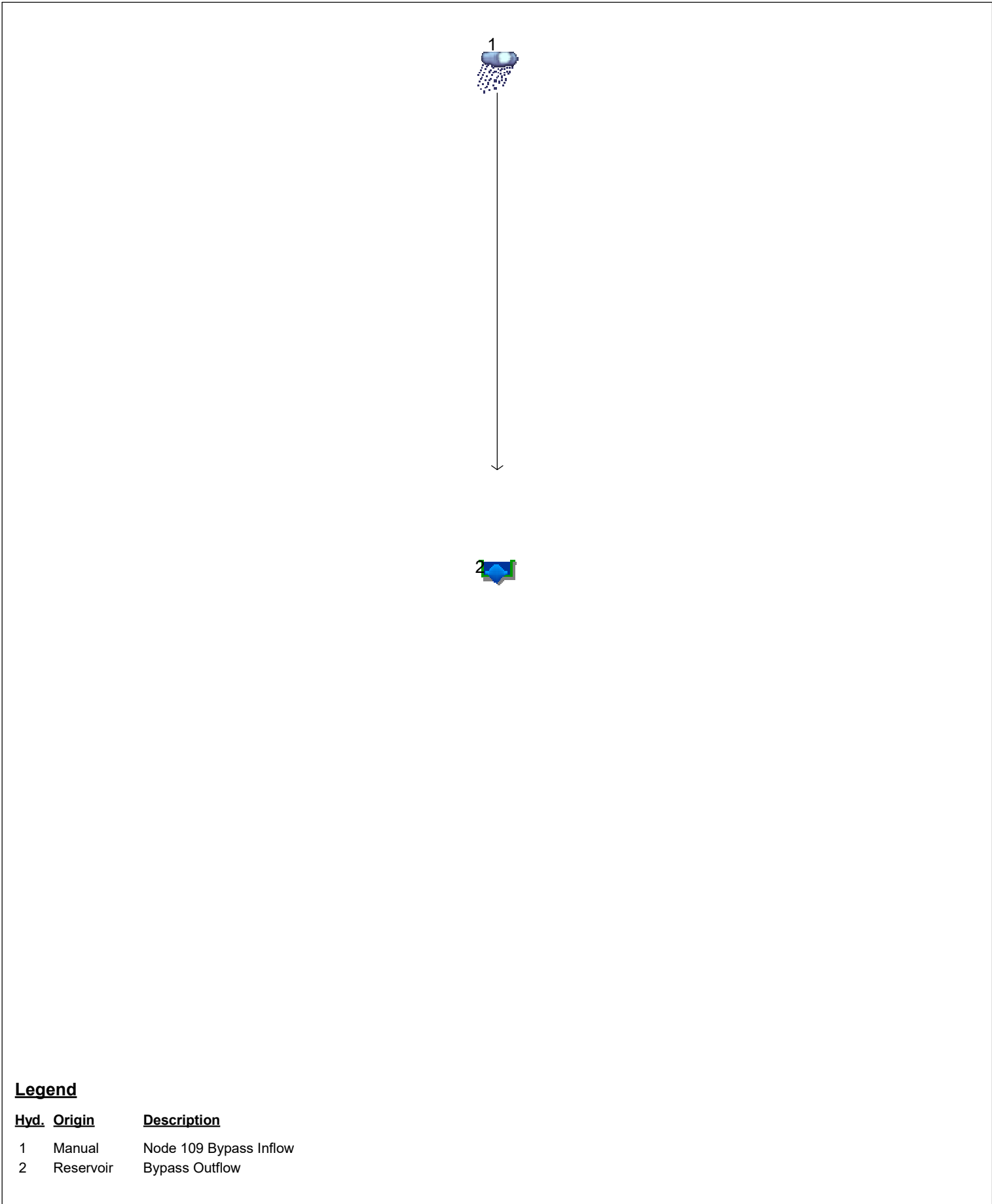
User specified 'C' value of 0.169 given for subarea
Rainfall intensity (I) = 3.335(In/Hr) for a 100.0 year storm
User specified values are as follows:
TC = 18.08 min. Rain intensity = 3.33(In/Hr)
Total area = 0.822(Ac.) Total runoff = 0.463(CFS)
End of computations, total study area = 0.822 (Ac.)

ATTACHMENT 3.4

POC-1 BYPASS DETENTION PIPE CALCULATIONS

Watershed Model Schematic

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



Legend

Hyd.	Origin	Description
1	Manual	Node 109 Bypass Inflow
2	Reservoir	Bypass Outflow

Hydrograph Report

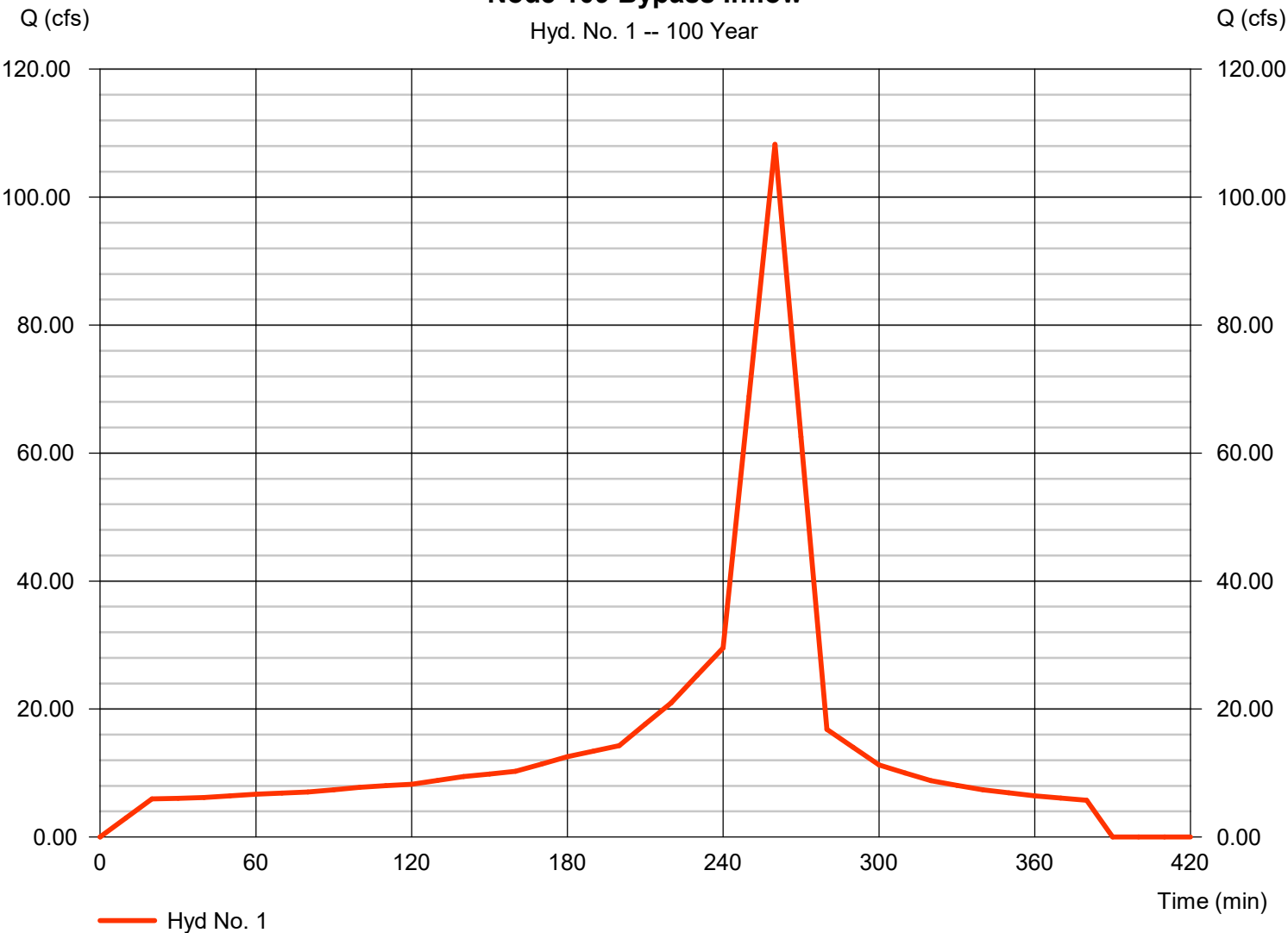
Hyd. No. 1

Node 109 Bypass Inflow

Hydrograph type	= Manual	Peak discharge	= 108.24 cfs
Storm frequency	= 100 yrs	Time to peak	= 260 min
Time interval	= 10 min	Hyd. volume	= 362,550 cuft

Node 109 Bypass Inflow

Hyd. No. 1 -- 100 Year



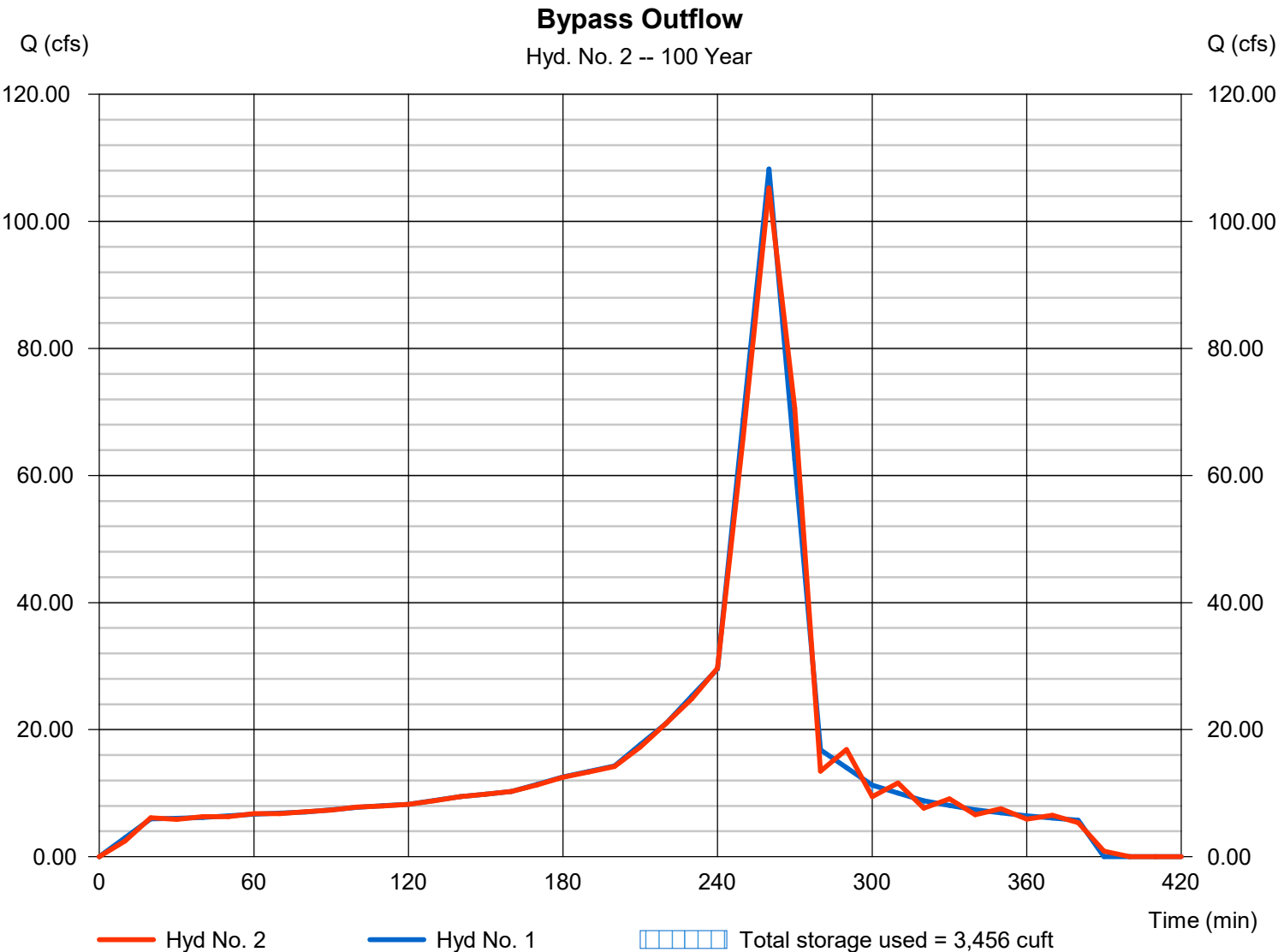
Hydrograph Report

Hyd. No. 2

Bypass Outflow

Hydrograph type	= Reservoir	Peak discharge	= 105.29 cfs
Storm frequency	= 100 yrs	Time to peak	= 260 min
Time interval	= 10 min	Hyd. volume	= 362,720 cuft
Inflow hyd. No.	= 1 - Node 109 Bypass Inflow	Max. Elevation	= 456.80 ft
Reservoir name	= Bypass Detention	Max. Storage	= 3,456 cuft

Storage Indication method used.



Pond No. 1 - Bypass Detention

Pond Data

UG Chambers -Invert elev. = 449.74 ft, Rise x Span = 4.00 x 4.00 ft, Barrel Len = 447.00 ft, No. Barrels = 1, Slope = 2.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	449.74	n/a	0	0
1.29	451.03	n/a	262	262
2.59	452.33	n/a	379	641
3.88	453.62	n/a	287	928
5.18	454.92	n/a	454	1,383
6.47	456.21	n/a	1,427	2,810
7.76	457.50	n/a	1,427	4,237
9.06	458.80	n/a	453	4,690
10.35	460.09	n/a	288	4,977
11.65	461.39	n/a	379	5,356
12.94	462.68	n/a	262	5,618

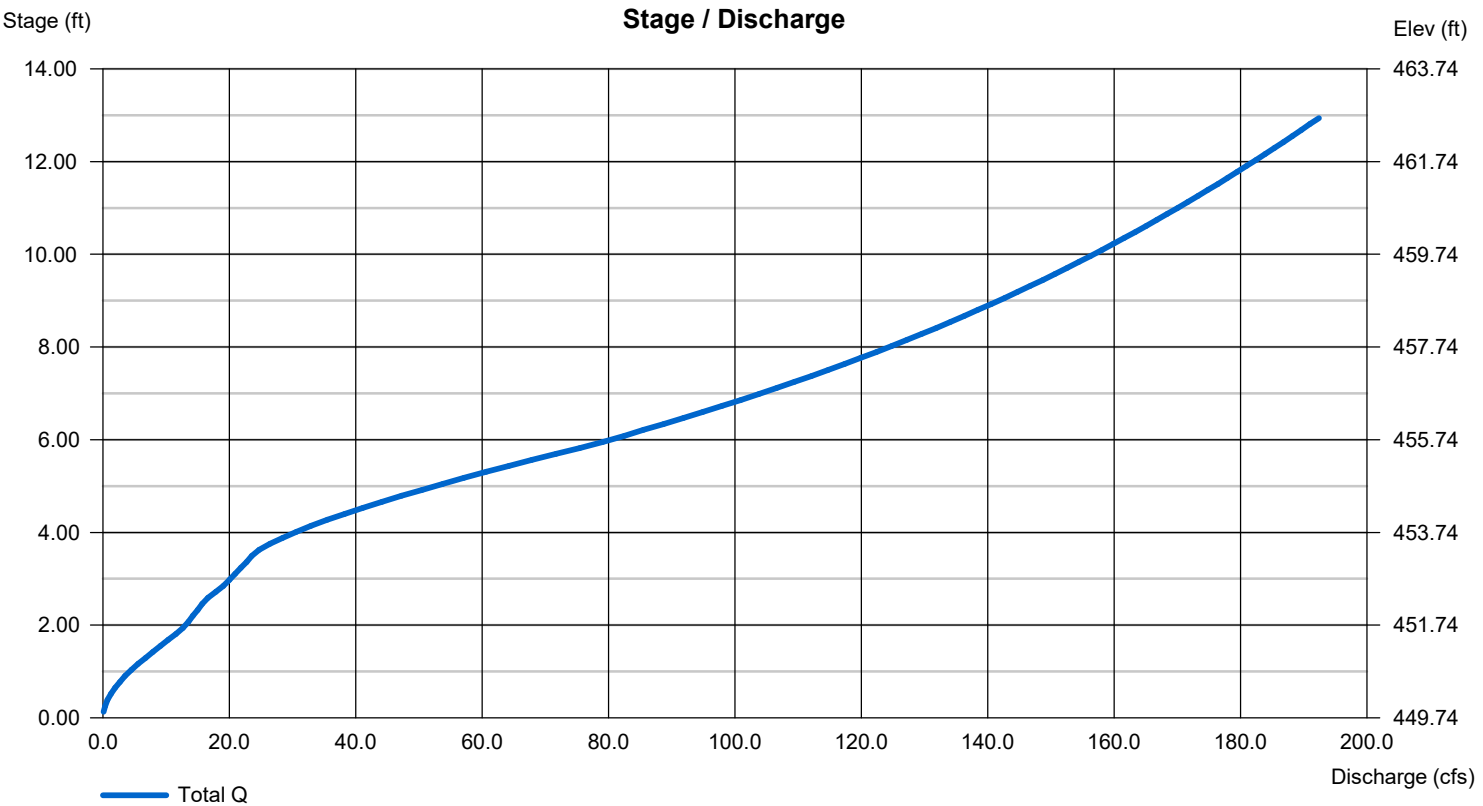
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 48.00	24.00	3.00	0.00
Span (in)	= 48.00	24.00	36.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 449.74	449.74	452.24	0.00
Length (ft)	= 483.00	0.08	0.08	0.00
Slope (%)	= 2.00	0.00	0.00	n/a
N-Value	= .015	.015	.015	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	4.00	0.00	0.00
Crest El. (ft)	= 467.25	453.24	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Broad	---	---
Multi-Stage	= Yes	Yes	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



100 Year

CALCULATIONS For Node 109 Bypass			
LINE	ITEM	AT THE OUTFLOW OF NODE 109	REMARKS
1	P6 inch	2.9	KNOWN VALUE
2	TC (inflow) mins	20.2	KNOWN VALUE
3	TC (lag) mins	10	FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins	30.2	LINE 2+3
5	I inches/hour	2.395	FROM THE INTENSITY FORMULA
6	Q(outflow)	105.29	KNOWN VALUE
7	A (inflow=outflow)	90.58	KNOWN VALUE
8	c(inflow)	0.374	KNOWN VALUE FROM THE CONTRIBUTING
9	c(outflow)	0.485	CALCULATED FROM $C=Q/IA$

POC-1 BMP-2 DETENTION BASIN AND STORAGE PIPES CALCULATIONS

Watershed Model Schematic

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



Legend

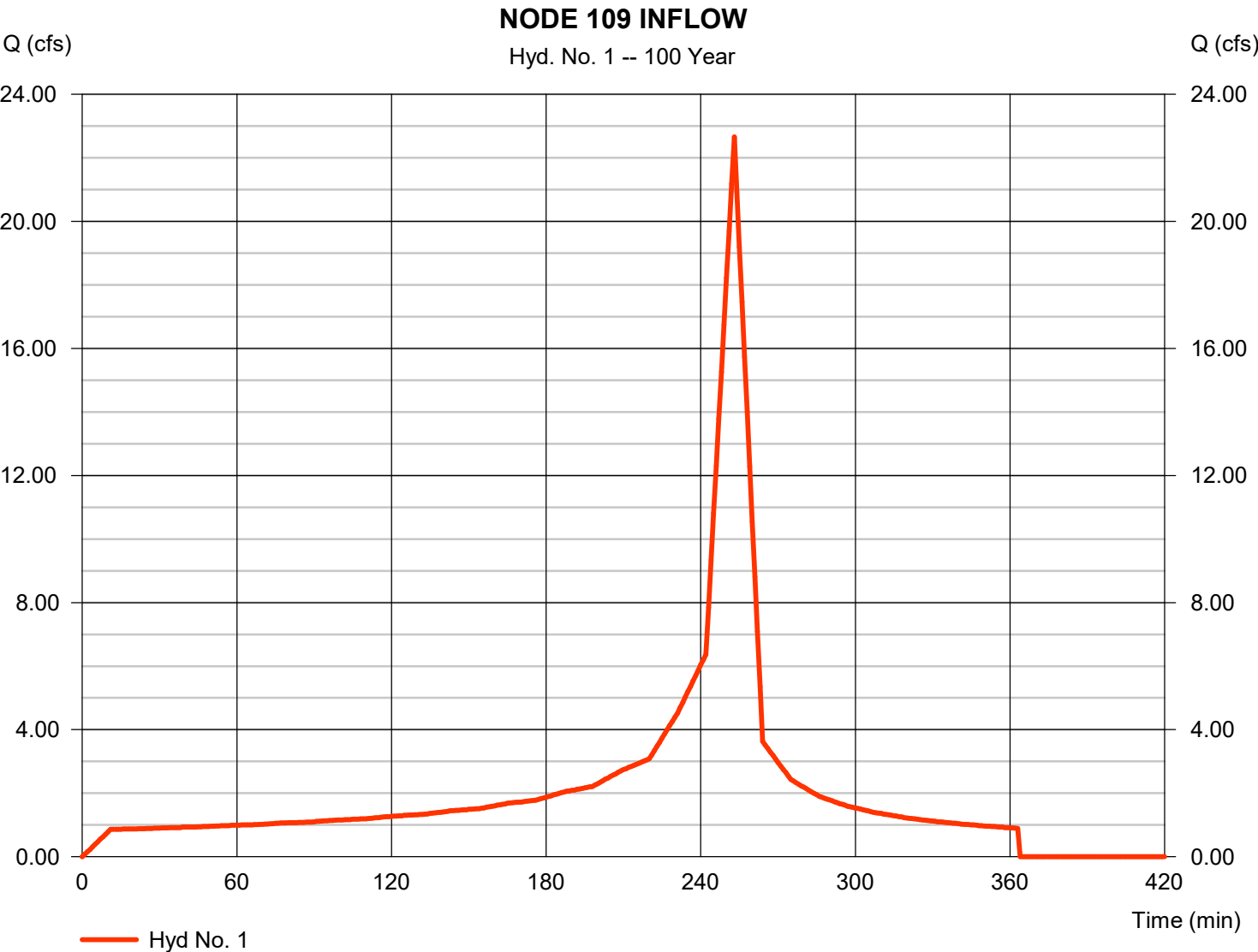
Hyd.	Origin	Description
1	Manual	NODE 109 INFLOW
2	Reservoir	BMP-2 BASIN OUTFLOW
3	Reservoir	BMP-2 TANK OUTFLOW

Hydrograph Report

Hyd. No. 1

NODE 109 INFLOW

Hydrograph type	= Manual	Peak discharge	= 22.66 cfs
Storm frequency	= 100 yrs	Time to peak	= 253 min
Time interval	= 1 min	Hyd. volume	= 51,765 cuft



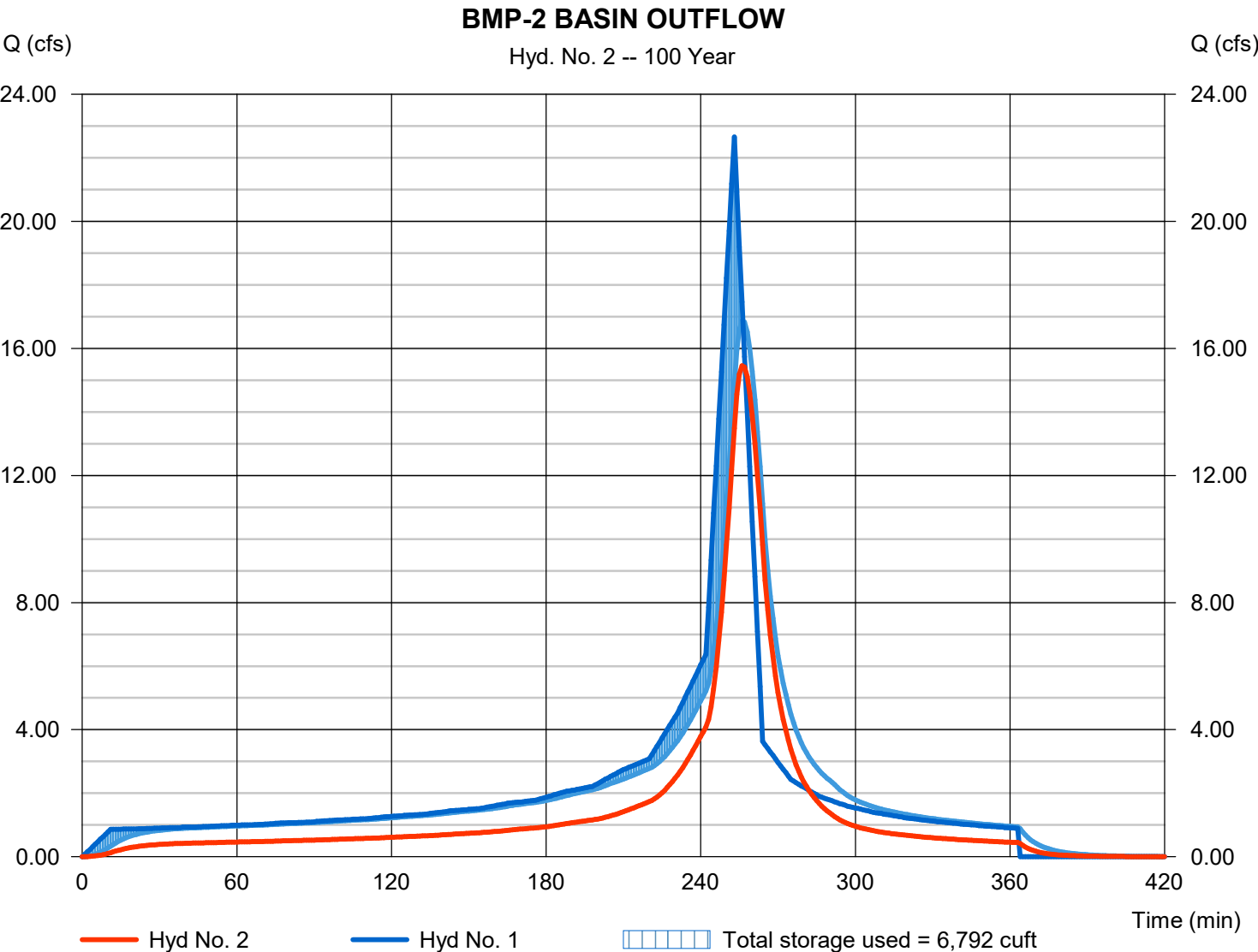
Hydrograph Report

Hyd. No. 2

BMP-2 BASIN OUTFLOW

Hydrograph type	= Reservoir	Peak discharge	= 15.45 cfs
Storm frequency	= 100 yrs	Time to peak	= 256 min
Time interval	= 1 min	Hyd. volume	= 35,504 cuft
Inflow hyd. No.	= 1 - NODE 109 INFLOW	Max. Elevation	= 467.67 ft
Reservoir name	= BMP-2 BASIN	Max. Storage	= 6,792 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond No. 1 - BMP-2 BASIN

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 467.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	467.00	8,052	0	0
0.13	467.13	8,829	1,055	1,055
0.25	467.25	9,643	1,154	2,209
0.38	467.38	10,492	1,258	3,467
0.50	467.50	11,298	1,361	4,828
0.63	467.63	12,001	1,456	6,284
0.75	467.75	12,742	1,546	7,830
0.88	467.88	13,657	1,649	9,479
1.00	468.00	14,482	1,758	11,238

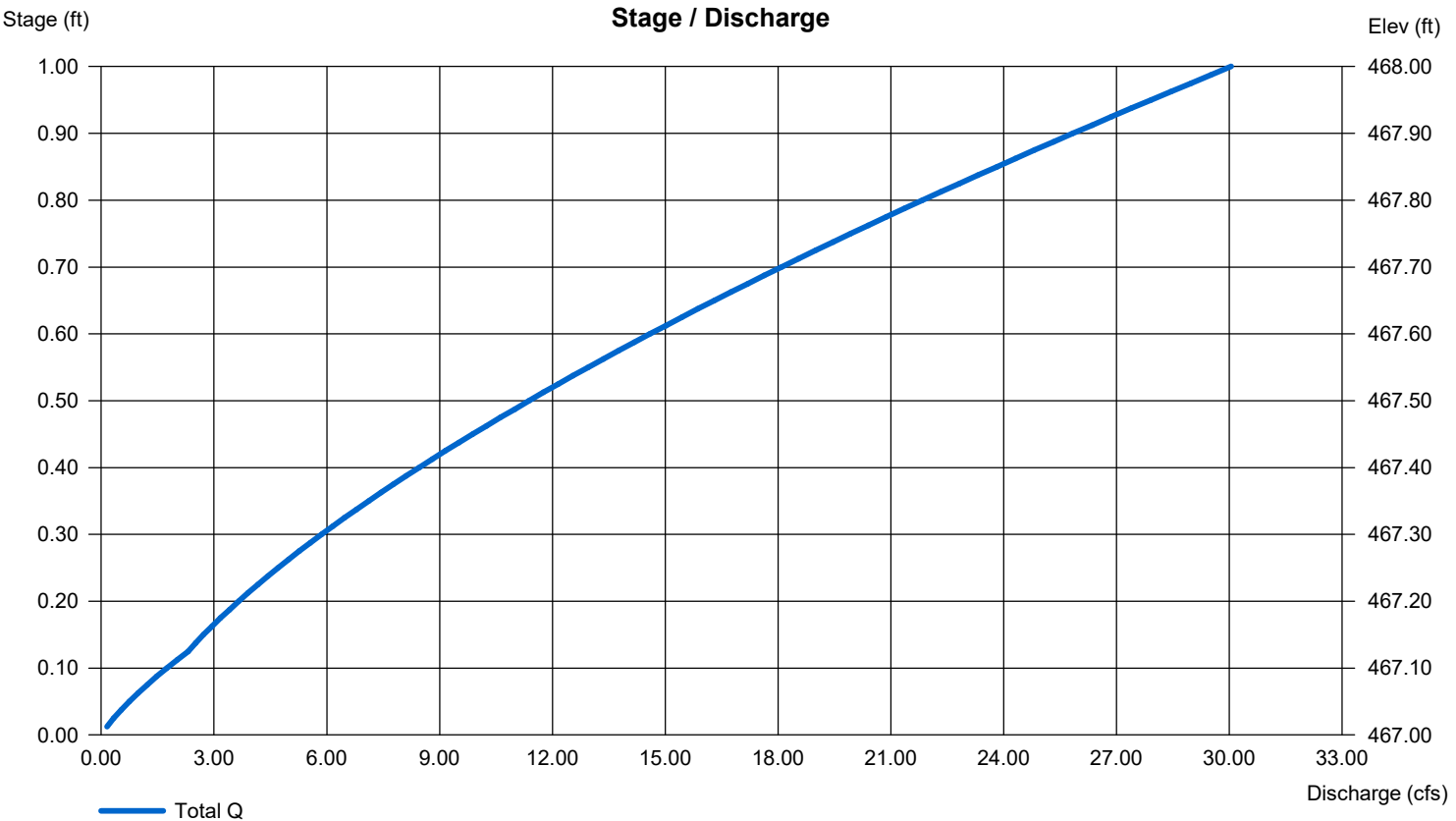
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 48.00	2.00	Inactive	0.00
Span (in)	= 48.00	2.00	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 461.00	463.75	0.00	0.00
Length (ft)	= 27.00	0.04	0.00	0.00
Slope (%)	= 0.50	0.50	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.49	0.00	0.00	0.00
Crest El. (ft)	= 467.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 5.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

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

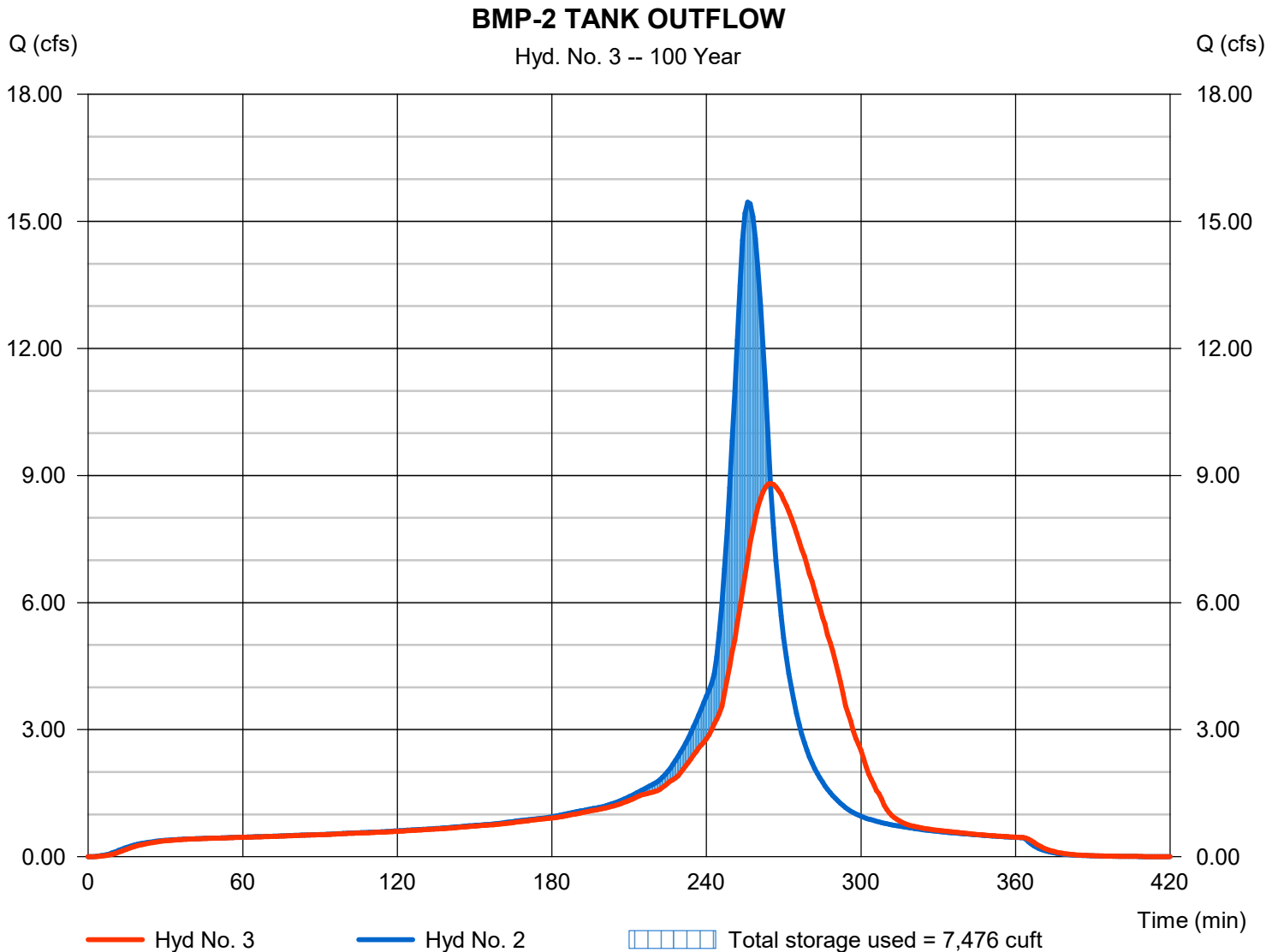
Thursday, 11 / 6 / 2025

Hyd. No. 3

BMP-2 TANK OUTFLOW

Hydrograph type	= Reservoir	Peak discharge	= 8.812 cfs
Storm frequency	= 100 yrs	Time to peak	= 265 min
Time interval	= 1 min	Hyd. volume	= 35,504 cuft
Inflow hyd. No.	= 2 - BMP-2 BASIN OUTFLOW	Max. Elevation	= 463.30 ft
Reservoir name	= BMP-2 TANKS	Max. Storage	= 7,476 cuft

Storage Indication method used.



Pond No. 2 - BMP-2 TANKS

Pond Data

UG Chambers -Invert elev. = 461.00 ft, Rise x Span = 4.00 x 4.00 ft, Barrel Len = 1000.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	461.00	n/a	0	0
0.40	461.40	n/a	654	654
0.80	461.80	n/a	1,137	1,791
1.20	462.20	n/a	1,382	3,173
1.60	462.60	n/a	1,522	4,695
2.00	463.00	n/a	1,591	6,286
2.40	463.40	n/a	1,591	7,876
2.80	463.80	n/a	1,522	9,398
3.20	464.20	n/a	1,382	10,780
3.60	464.60	n/a	1,136	11,916
4.00	465.00	n/a	653	12,569

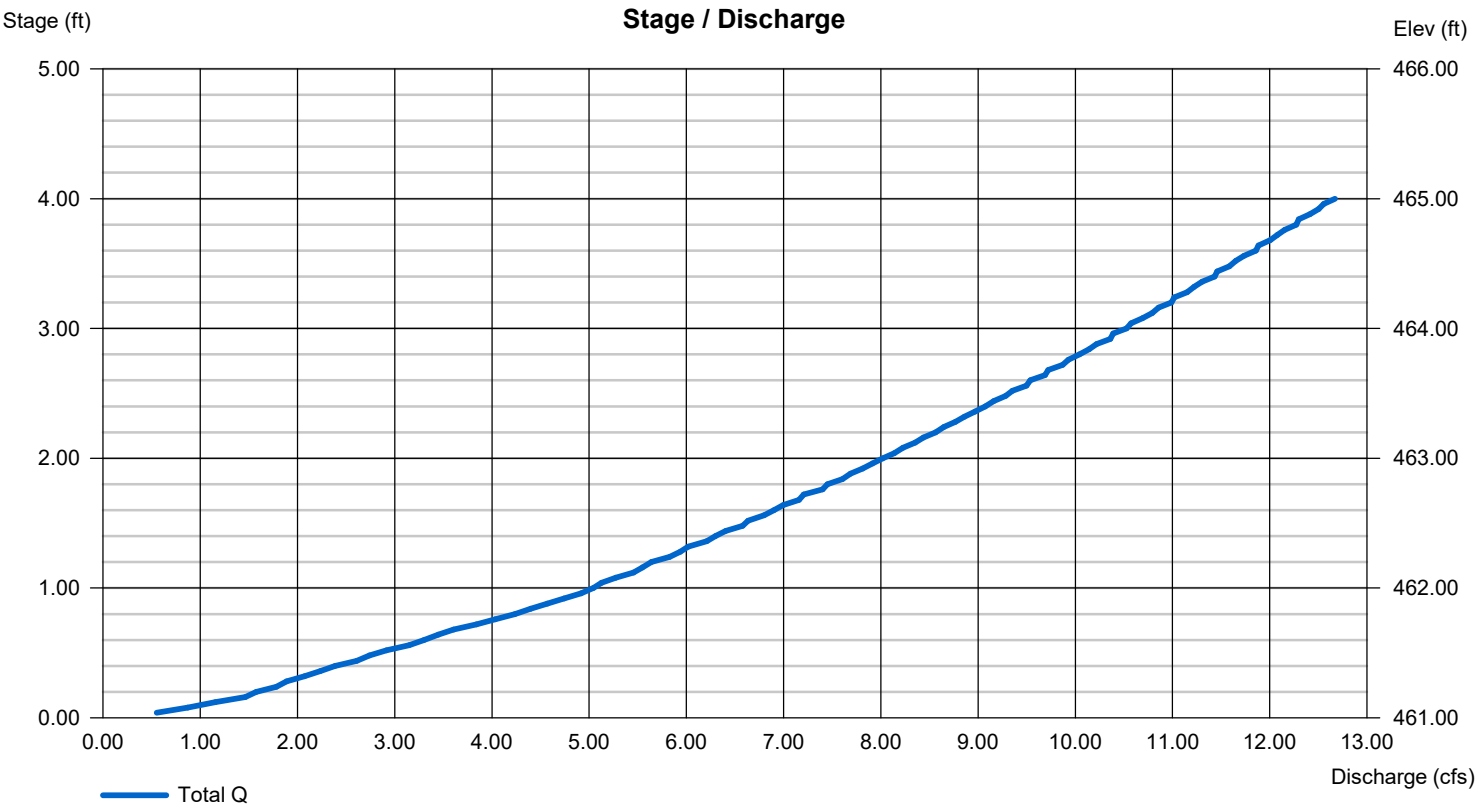
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 48.00	18.00	0.00	0.00
Span (in)	= 48.00	18.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 460.50	460.50	0.00	0.00
Length (ft)	= 14.00	0.04	0.00	0.00
Slope (%)	= 0.50	0.50	0.00	n/a
N-Value	= .015	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 469.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



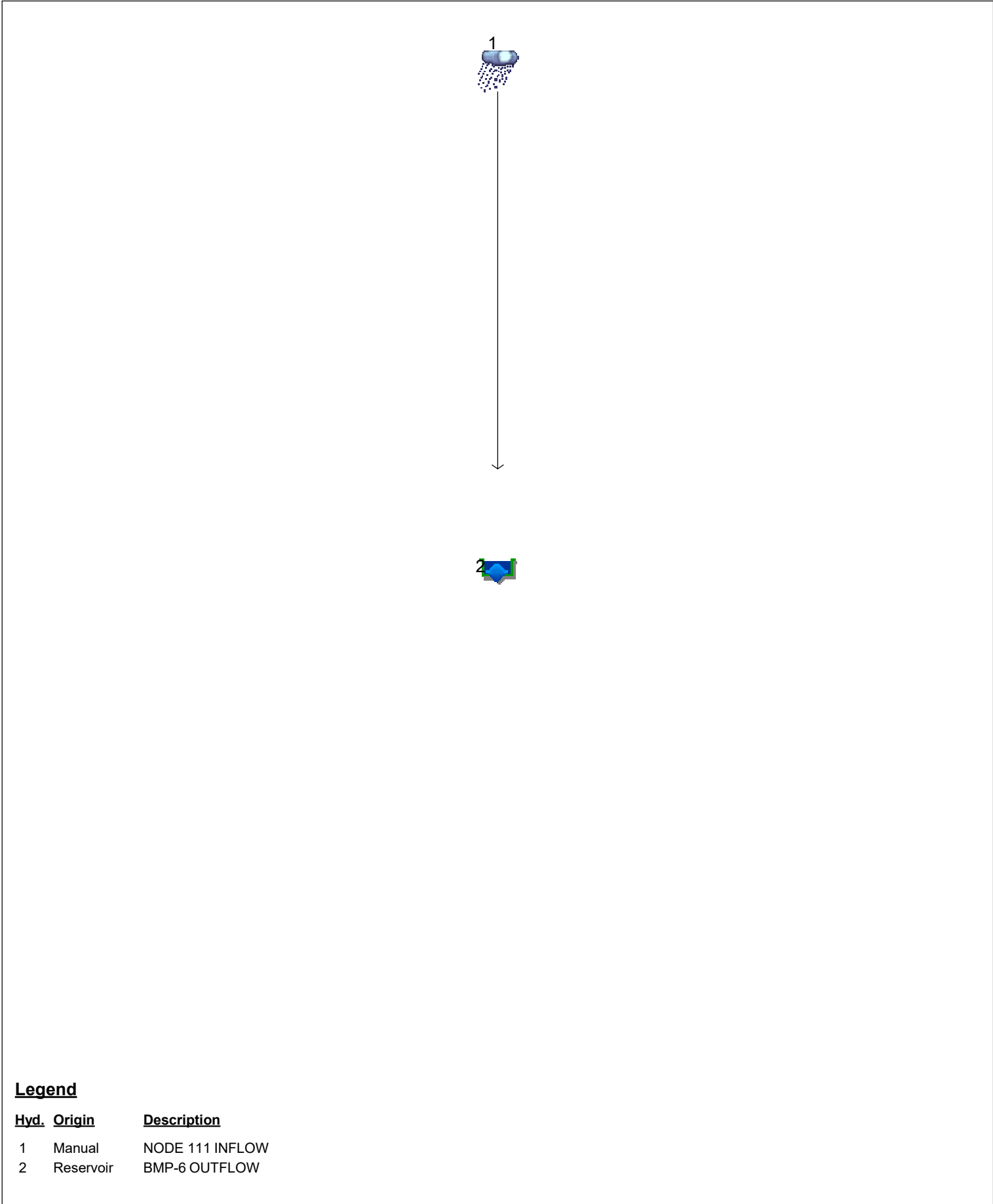
100 Year

CALCULATIONS For Node 109 Basin			
LINE	ITEM	AT THE OUTFLOW OF NODE 109	REMARKS
1	P6 inch	2.9	KNOWN VALUE
2	TC (inflow) mins	11.13	KNOWN VALUE
3	TC (lag) mins	12	FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins	23.13	LINE 2+3
5	I inches/hour	2.845	FROM THE INTENSITY FORMULA
6	Q(outflow)	8.812	KNOWN VALUE
7	A (inflow=outflow)	7.89	KNOWN VALUE
8	c(inflow)	0.71	KNOWN VALUE FROM THE CONTRIBUTING
9	c(outflow)	0.393	CALCULATED FROM $C=Q/IA$

POC-1 BMP-6 DETENTION BASIN CALCULATIONS

Watershed Model Schematic

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



Legend

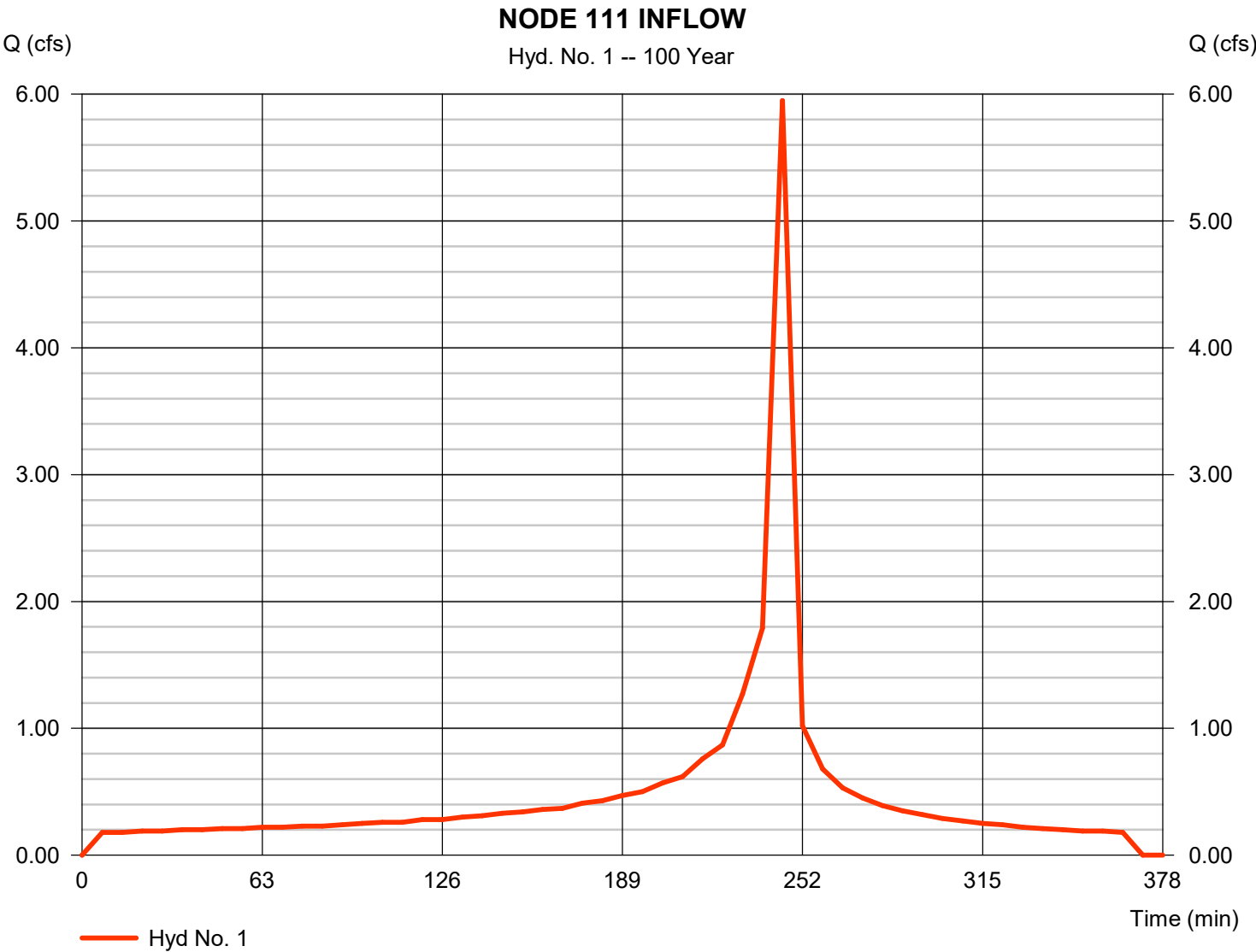
Hyd.	Origin	Description
1	Manual	NODE 111 INFLOW
2	Reservoir	BMP-6 OUTFLOW

Hydrograph Report

Hyd. No. 1

NODE 111 INFLOW

Hydrograph type	= Manual	Peak discharge	= 5.950 cfs
Storm frequency	= 100 yrs	Time to peak	= 245 min
Time interval	= 7 min	Hyd. volume	= 10,777 cuft



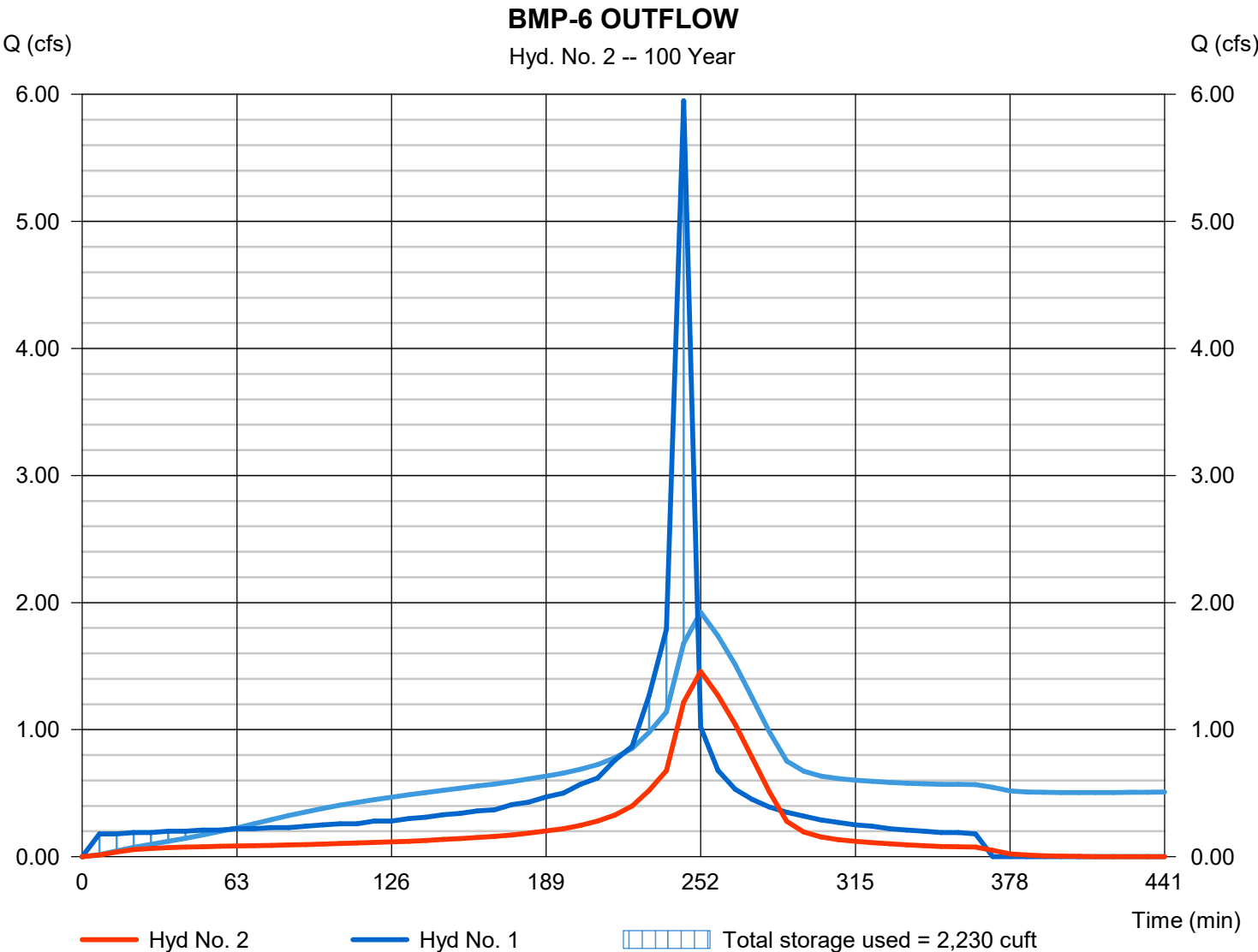
Hydrograph Report

Hyd. No. 2

BMP-6 OUTFLOW

Hydrograph type	= Reservoir	Peak discharge	= 1.458 cfs
Storm frequency	= 100 yrs	Time to peak	= 252 min
Time interval	= 7 min	Hyd. volume	= 5,639 cuft
Inflow hyd. No.	= 1 - NODE 111 INFLOW	Max. Elevation	= 414.90 ft
Reservoir name	= BMP-6 BASIN	Max. Storage	= 2,230 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond No. 1 - BMP-6 BASIN

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 414.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	414.50	5,344	0	0
0.13	414.63	5,483	677	677
0.25	414.75	5,625	694	1,371
0.38	414.88	5,768	712	2,083
0.50	415.00	5,912	730	2,813
0.63	415.13	6,057	748	3,561
0.75	415.25	6,203	766	4,327
0.88	415.38	6,349	784	5,111
1.00	415.50	6,497	803	5,914
1.13	415.63	6,547	815	6,729
1.25	415.75	6,596	821	7,550
1.38	415.88	6,695	831	8,381
1.50	416.00	6,845	846	9,227

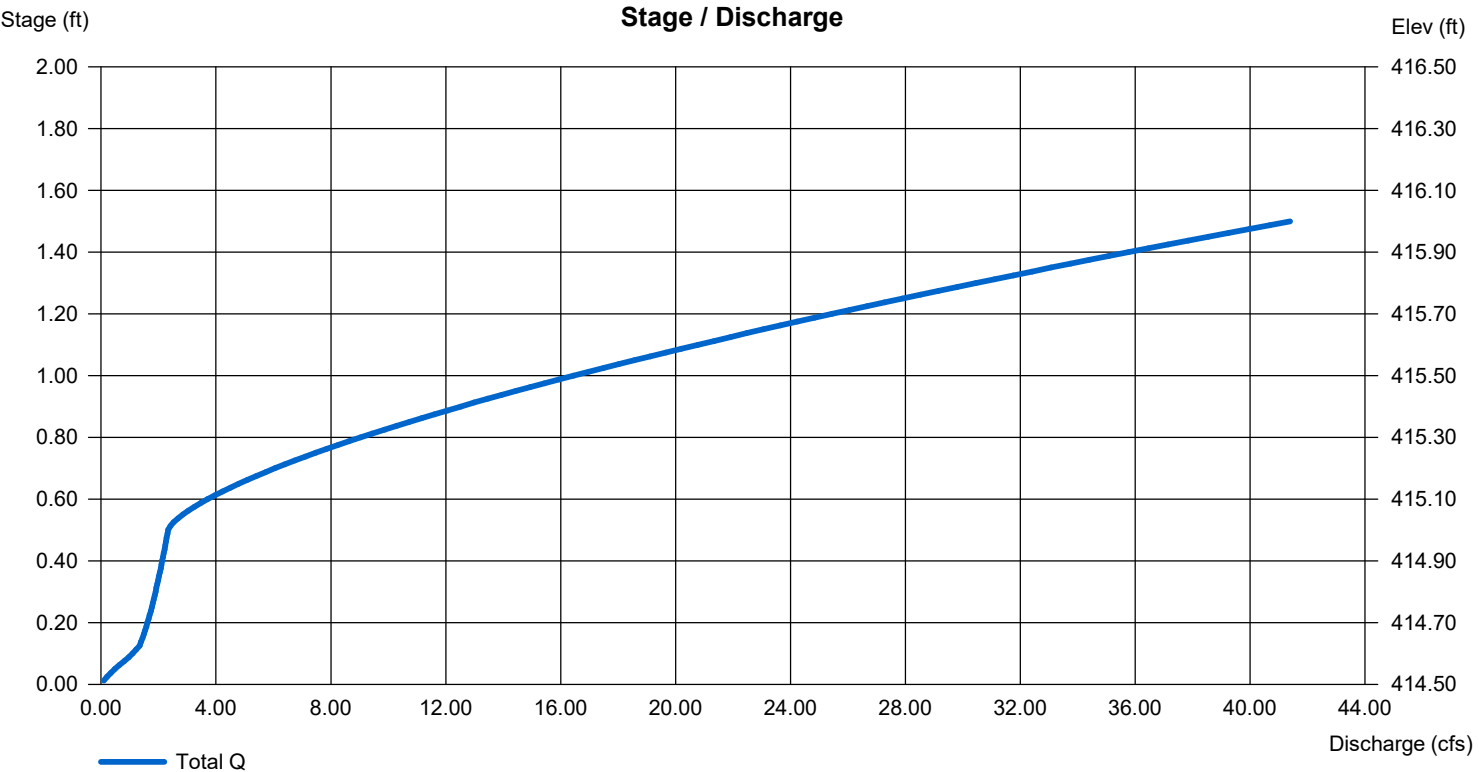
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 48.00	1.00	1.00	0.00
Span (in)	= 48.00	1.00	18.00	0.00
No. Barrels	= 1	1	4	0
Invert El. (ft)	= 407.70	411.00	414.50	0.00
Length (ft)	= 276.00	0.04	0.50	0.00
Slope (%)	= 0.50	0.50	0.50	n/a
N-Value	= .015	.013	.015	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 11.31	0.00	0.00	0.00
Crest El. (ft)	= 415.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 5.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



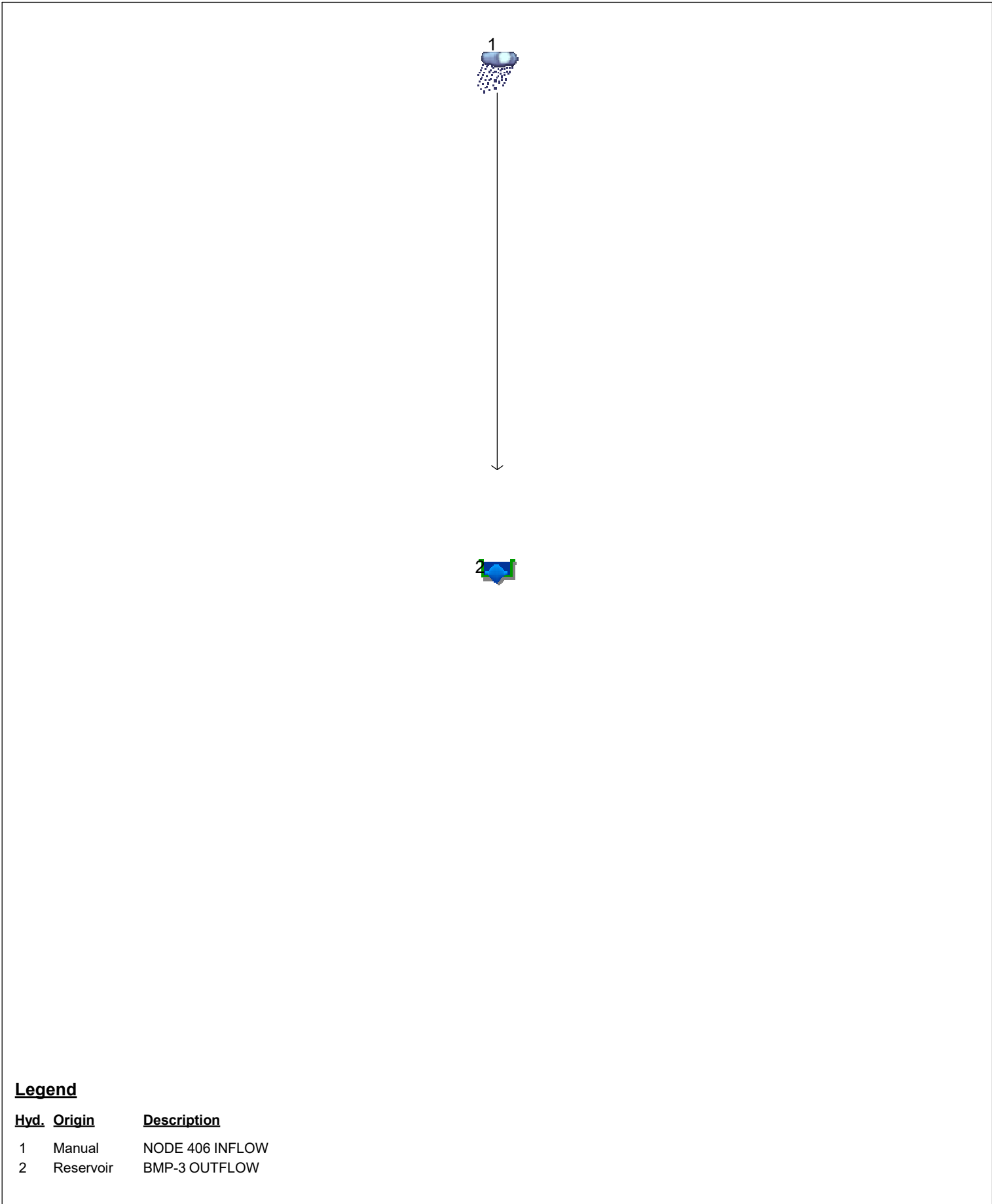
100 Year

CALCULATIONS For Node 111			
LINE	ITEM	AT THE OUTFLOW OF NODE 111	REMARKS
1	P6 inch	2.9	KNOWN VALUE
2	TC (inflow) mins	7.89	KNOWN VALUE
3	TC (lag) mins	7	FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins	14.89	LINE 2+3
5	I inches/hour	3.78	FROM THE INTENSITY FORMULA
6	Q(outflow)	1.458	KNOWN VALUE
7	A (inflow=outflow)	1.7768	KNOWN VALUE
8	c(inflow)	0.588	KNOWN VALUE FROM THE CONTRIBUTING
9	c(outflow)	0.217	CALCULATED FROM $C=Q/IA$

POC-2 BMP-3 DETENTION BASIN CALCULATIONS

Watershed Model Schematic

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



Legend

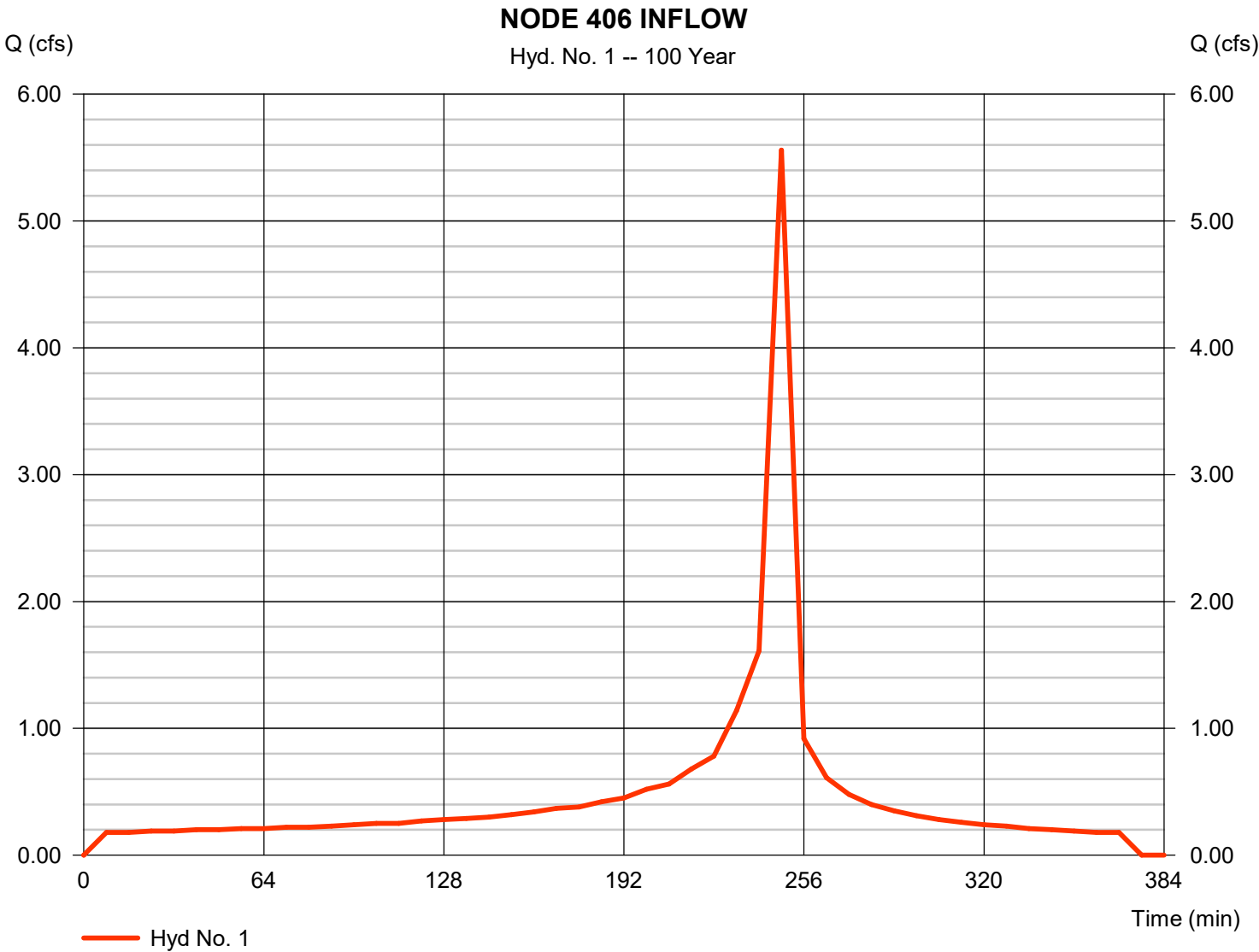
Hyd.	Origin	Description
1	Manual	NODE 406 INFLOW
2	Reservoir	BMP-3 OUTFLOW

Hydrograph Report

Hyd. No. 1

NODE 406 INFLOW

Hydrograph type	= Manual	Peak discharge	= 5.560 cfs
Storm frequency	= 100 yrs	Time to peak	= 248 min
Time interval	= 8 min	Hyd. volume	= 10,694 cuft



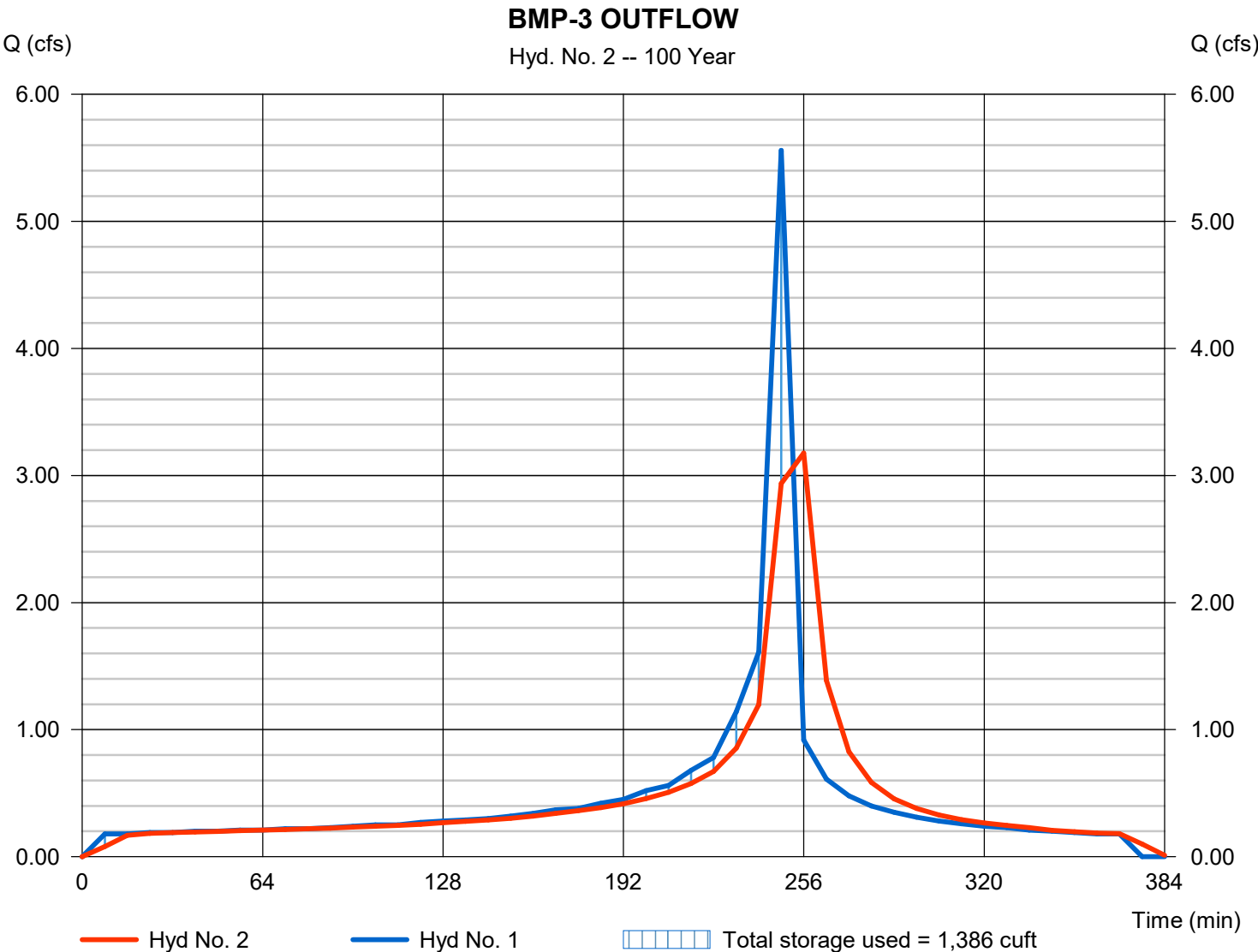
Hydrograph Report

Hyd. No. 2

BMP-3 OUTFLOW

Hydrograph type	= Reservoir	Peak discharge	= 3.176 cfs
Storm frequency	= 100 yrs	Time to peak	= 256 min
Time interval	= 8 min	Hyd. volume	= 10,694 cuft
Inflow hyd. No.	= 1 - NODE 406 INFLOW	Max. Elevation	= 480.24 ft
Reservoir name	= BMP-3 BASIN	Max. Storage	= 1,386 cuft

Storage Indication method used.



Pond Report

6

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

Thursday, 01 / 15 / 2026

Pond No. 1 - BMP-3 BASIN

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 480.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	480.00	5,518	0	0
0.13	480.13	5,686	700	700
0.25	480.25	5,855	721	1,421
0.38	480.38	6,024	742	2,164
0.50	480.50	6,194	764	2,927
0.63	480.63	6,366	785	3,712
0.75	480.75	6,538	806	4,519
0.88	480.88	6,711	828	5,346
1.00	481.00	6,885	850	6,196

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	1.00	1.00	0.00
Span (in)	= 18.00	1.00	18.00	0.00
No. Barrels	= 1	1	3	0
Invert El. (ft)	= 475.50	475.75	479.75	0.00
Length (ft)	= 158.00	0.04	0.50	0.00
Slope (%)	= 1.00	0.50	0.50	n/a
N-Value	= .013	.013	.015	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

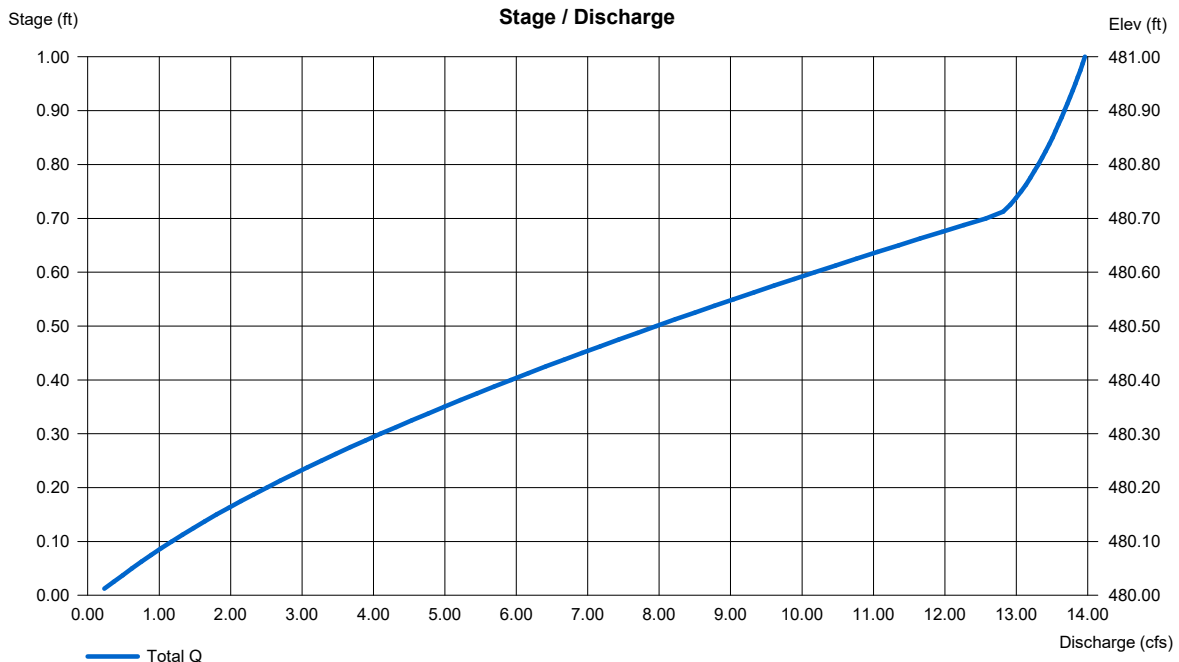
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.66	0.00	0.00	0.00
Crest El. (ft)	= 480.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	480.00	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.13	700	480.13	14.54 oc	0.01 ic	0.64 ic	---	0.83	---	---	---	---	---	1.481
0.25	1,421	480.25	14.54 oc	0.01 ic	0.90 ic	---	2.36	---	---	---	---	---	3.272
0.38	2,164	480.38	14.54 oc	0.02 ic	1.11 ic	---	4.33	---	---	---	---	---	5.450
0.50	2,927	480.50	14.54 oc	0.02 ic	1.28 ic	---	6.66	---	---	---	---	---	7.959
0.63	3,712	480.63	14.54 oc	0.02 ic	1.43 ic	---	9.31	---	---	---	---	---	10.76
0.75	4,519	480.75	14.54 oc	0.02 ic	1.56 ic	---	9.32 ic	---	---	---	---	---	10.91
0.88	5,346	480.88	14.54 oc	0.02 ic	1.69 ic	---	10.07 ic	---	---	---	---	---	11.78
1.00	6,196	481.00	14.54 oc	0.03 ic	1.81 ic	---	10.77 ic	---	---	---	---	---	12.60



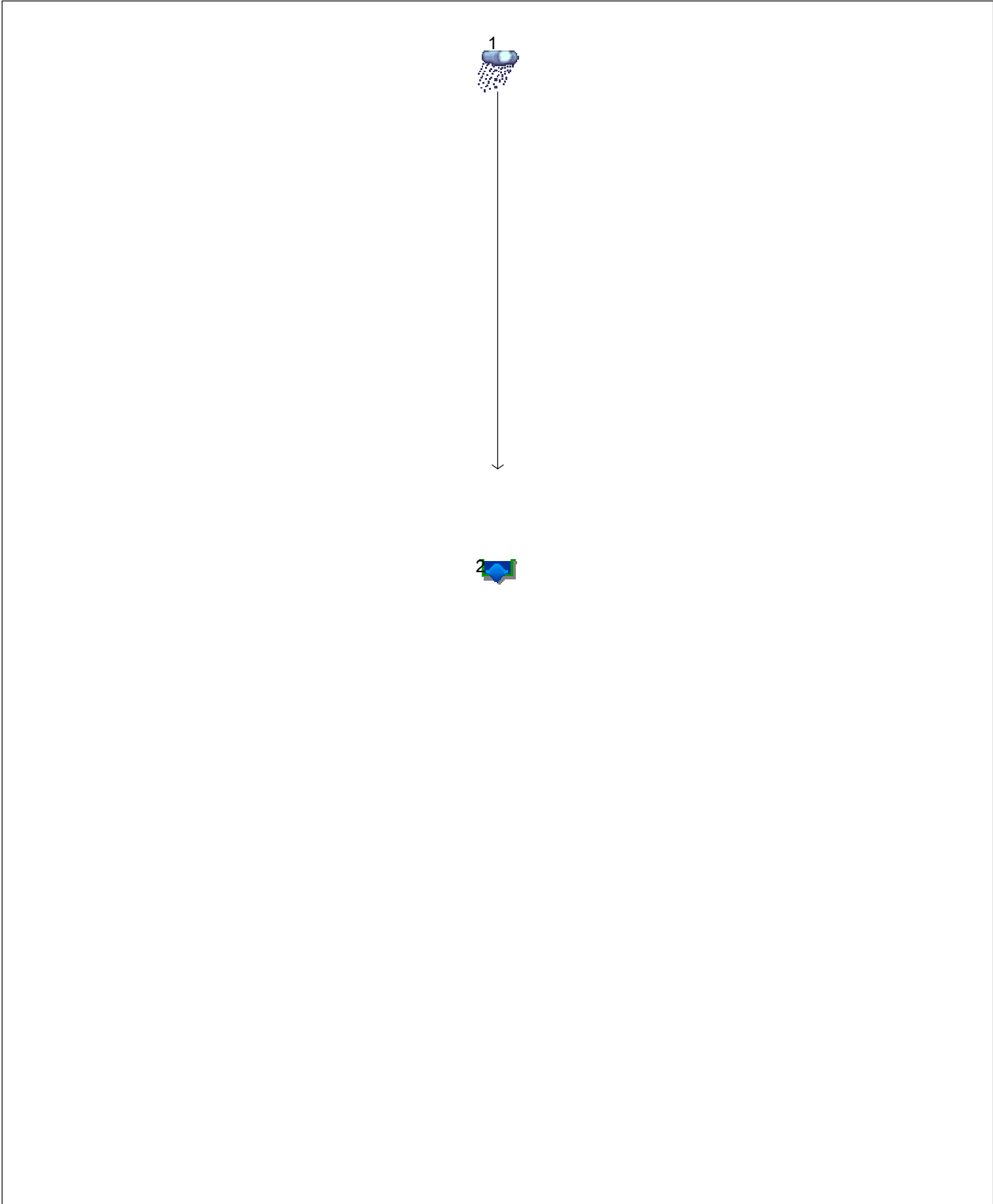
100 Year

CALCULATIONS For Node 406			
LINE	ITEM	AT THE OUTFLOW OF NODE 406	REMARKS
1	P6 inch	2.9	KNOWN VALUE
2	TC (inflow) mins	8.49	KNOWN VALUE
3	TC (lag) mins	8	FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins	16.49	LINE 2+3
5	I inches/hour	3.539	FROM THE INTENSITY FORMULA
6	Q(outflow)	3.176	KNOWN VALUE
7	A (inflow=outflow)	1.4923	KNOWN VALUE
8	c(inflow)	0.686	KNOWN VALUE FROM THE CONTRIBUTING
9	c(outflow)	0.601	CALCULATED FROM $C=Q/IA$

POC-3 BMP-5 DETENTION BASIN CALCULATIONS

Watershed Model Schematic

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

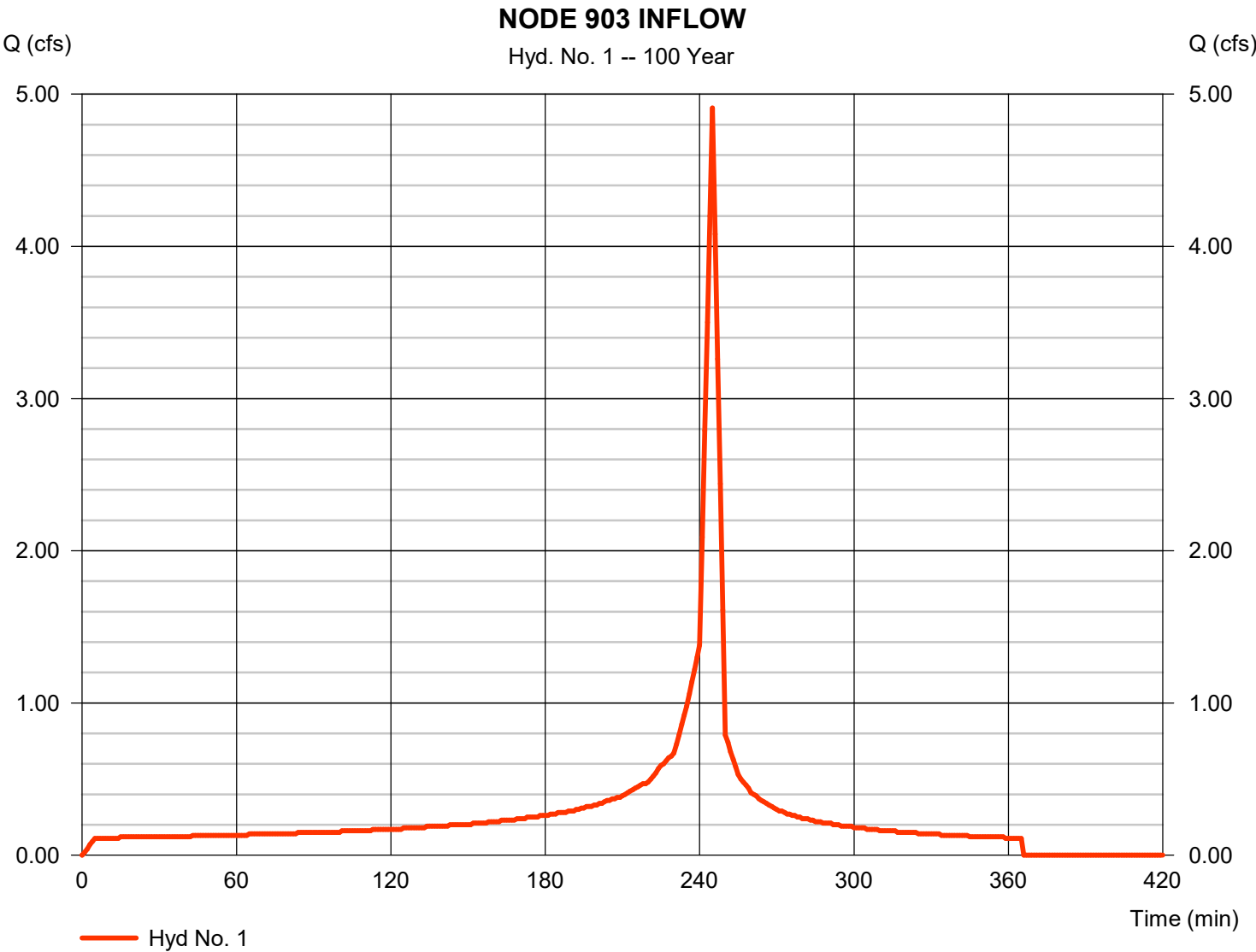


Hydrograph Report

Hyd. No. 1

NODE 903 INFLOW

Hydrograph type	= Manual	Peak discharge	= 4.910 cfs
Storm frequency	= 100 yrs	Time to peak	= 245 min
Time interval	= 1 min	Hyd. volume	= 6,796 cuft



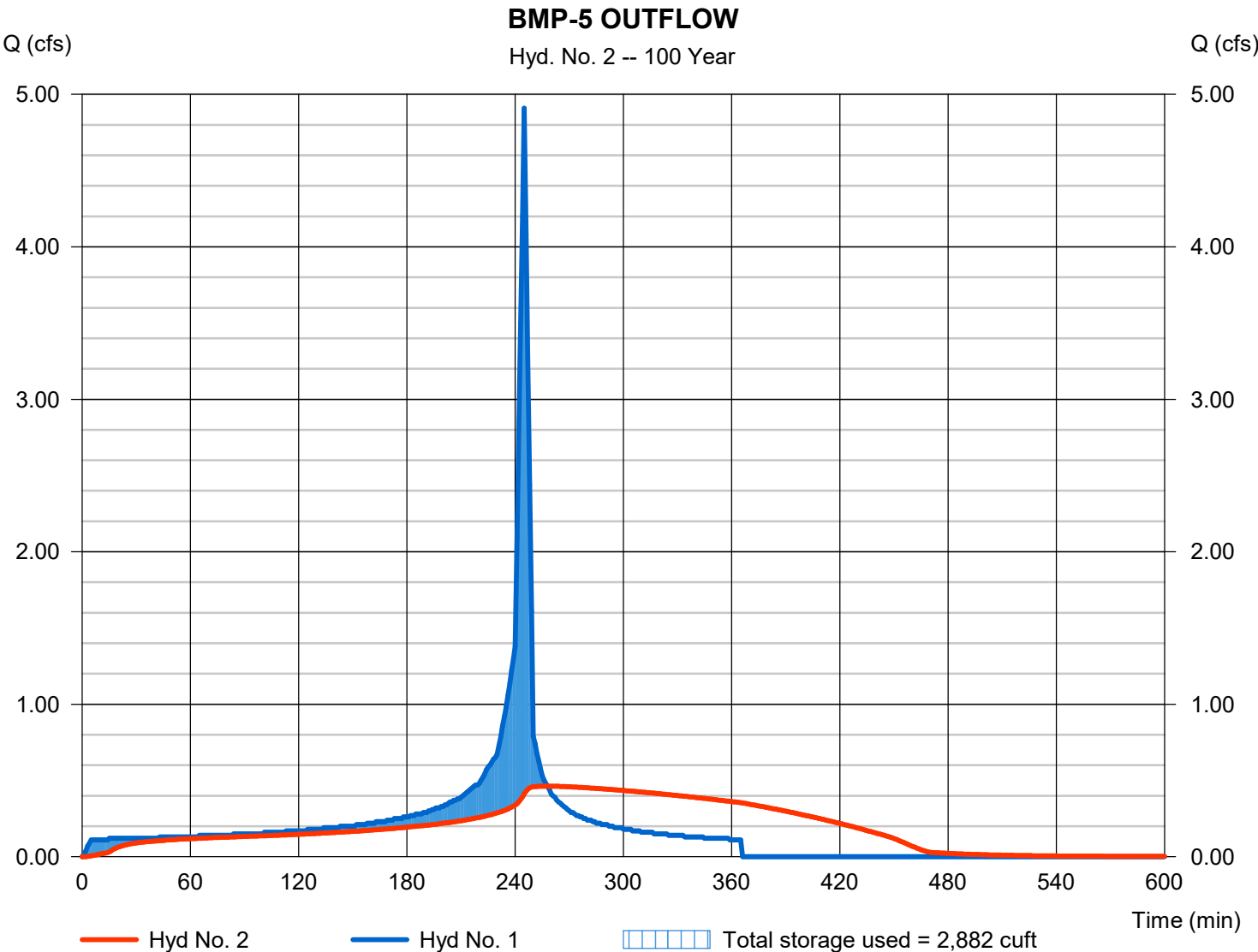
Hydrograph Report

Hyd. No. 2

BMP-5 OUTFLOW

Hydrograph type	= Reservoir	Peak discharge	= 0.463 cfs
Storm frequency	= 100 yrs	Time to peak	= 258 min
Time interval	= 1 min	Hyd. volume	= 6,793 cuft
Inflow hyd. No.	= 1 - NODE 903 INFLOW	Max. Elevation	= 421.00 ft
Reservoir name	= BMP-5	Max. Storage	= 2,882 cuft

Storage Indication method used.



Pond No. 1 - BMP-5

Pond Data

Trapezoid -Bottom L x W = 410.0 x 4.0 ft, Side slope = 3.00:1, Bottom elev. = 420.00 ft, Depth = 1.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	420.00	1,640	0	0
0.10	420.10	1,889	176	176
0.20	420.20	2,138	201	378
0.30	420.30	2,388	226	604
0.40	420.40	2,639	251	855
0.50	420.50	2,891	277	1,132
0.60	420.60	3,143	302	1,434
0.70	420.70	3,396	327	1,761
0.80	420.80	3,650	352	2,113
0.90	420.90	3,905	378	2,491
1.00	421.00	4,160	403	2,894

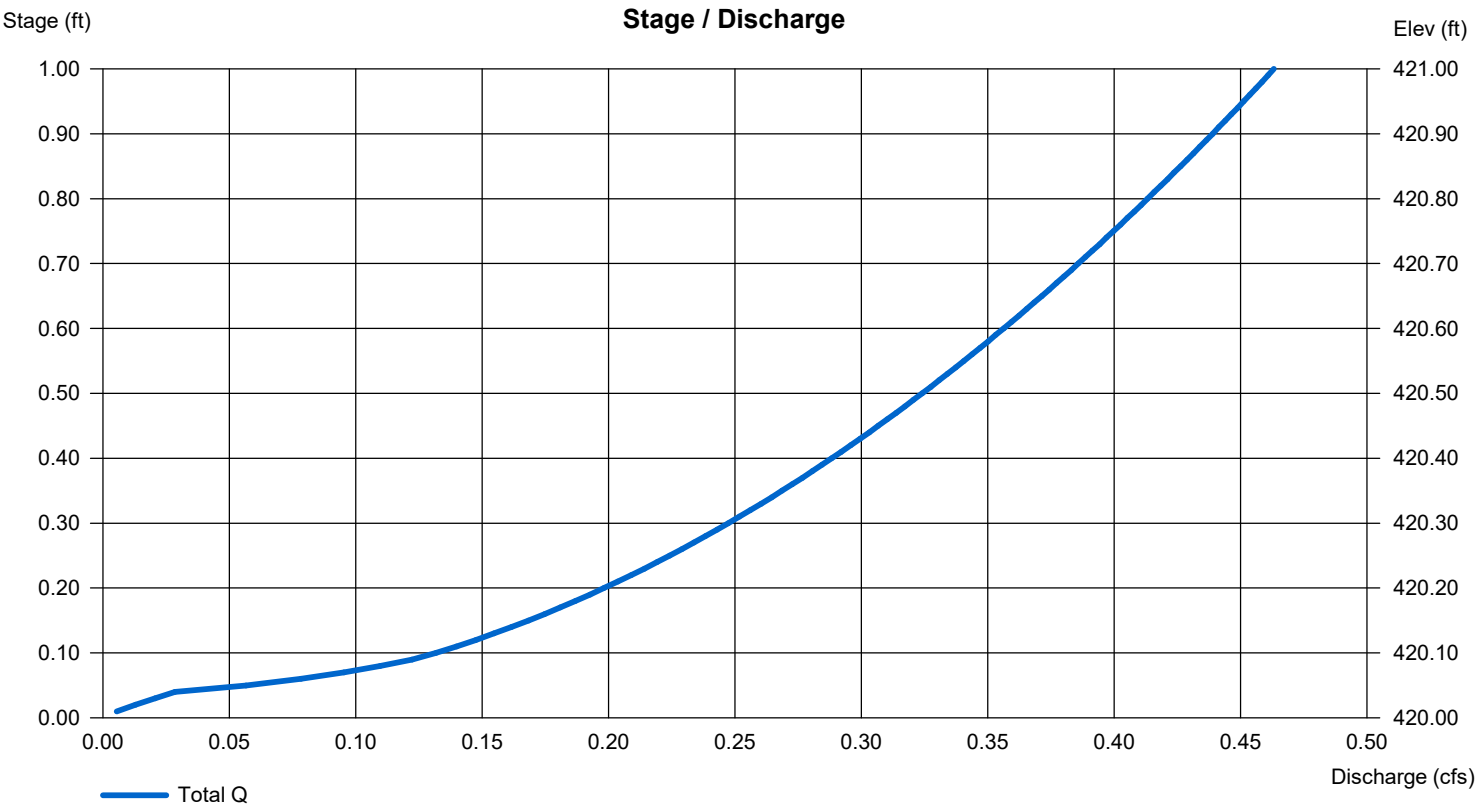
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.50	0.00	0.00	0.00
Span (in)	= 28.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 420.00	0.00	0.00	0.00
Length (ft)	= 0.50	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .015	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 421.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Ciplti	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



100 Year

CALCULATIONS For Node 903			
LINE	ITEM	AT THE OUTFLOW OF NODE 903	REMARKS
1	P6 inch	2.9	KNOWN VALUE
2	TC (inflow) mins	5.08	KNOWN VALUE
3	TC (lag) mins	13	FROM THE OUTFLOW HYDROGRAPH
4	TC (ouflow) mins	18.08	LINE 2+3
5	I inches/hour	3.335	FROM THE INTENSITY FORMULA
6	Q(outflow)	0.463	KNOWN VALUE
7	A (inflow=outflow)	0.8216	KNOWN VALUE
8	c(inflow)	0.79	KNOWN VALUE FROM THE CONTRIBUTING
9	c(outflow)	0.169	CALCULATED FROM $C=Q/IA$