3Roots San Diego Project
Environmental Impact Report

SCH No. 2018041065; Project No. 587128

Appendix Q

Preliminary Drainage Report

June 2019

PRELIMINARY
DRAINAGE REPORT
3 ROOTS

City of San Diego, CA
March 13, 2019
VTM PTS # 587128

Prepared For:

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1. INTRODUCTION

This preliminary drainage report has been prepared in support of a Vesting Tentative Map Entitlement submittal for the 3 Roots San Diego Project (the Project), which is located in the City of San Diego, California. The purpose of this report is to determine the hydrologic impact, if any, to the existing storm drain facilities or natural drainage, and to provide peak 100-year discharge values for the project.

The drainage analysis presented herein reflects a Vesting Tentative Map level-of-effort, which includes peak 100-year storm event hydrologic analyses using preliminary grades. Hydraulic analyses for inlets, pipe sizes and inverts, and HGL's will be provided during final engineering. Therefore, the purpose of this report submittal is to acquire from the City of San Diego: 1) concept approval of the proposed storm drain layout, 2) approval of the methodology used in the evaluation of the project storm drain system hydrology, and 3) identification of critical path drainage issues that need to be addressed during final engineering.

The 3Roots San Diego Project is a proposed mixed-use community located in the City of San Diego. The site is approximately 413 acres in size and is located east of Camino Santa Fe, approximately halfway between Mira Mesa Boulevard and Miramar Road, and west of Carroll Canyon Rd and Parkdale Avenue. The Property was formerly operated as a sand and gravel mining site and is currently owned by Mesa Community Partners. The Proposed Project includes approximately 256 acres of open space (including approximately 181 acres of natural open space, landscaped slopes and 76 acres of parkland), a total of 1800 residential units, and a proposed 1.5-acre on-site Transit Center adjacent to the intersection of Camino Santa Fe and Carroll Canyon Road. The vicinity map is shown in Figure 1.

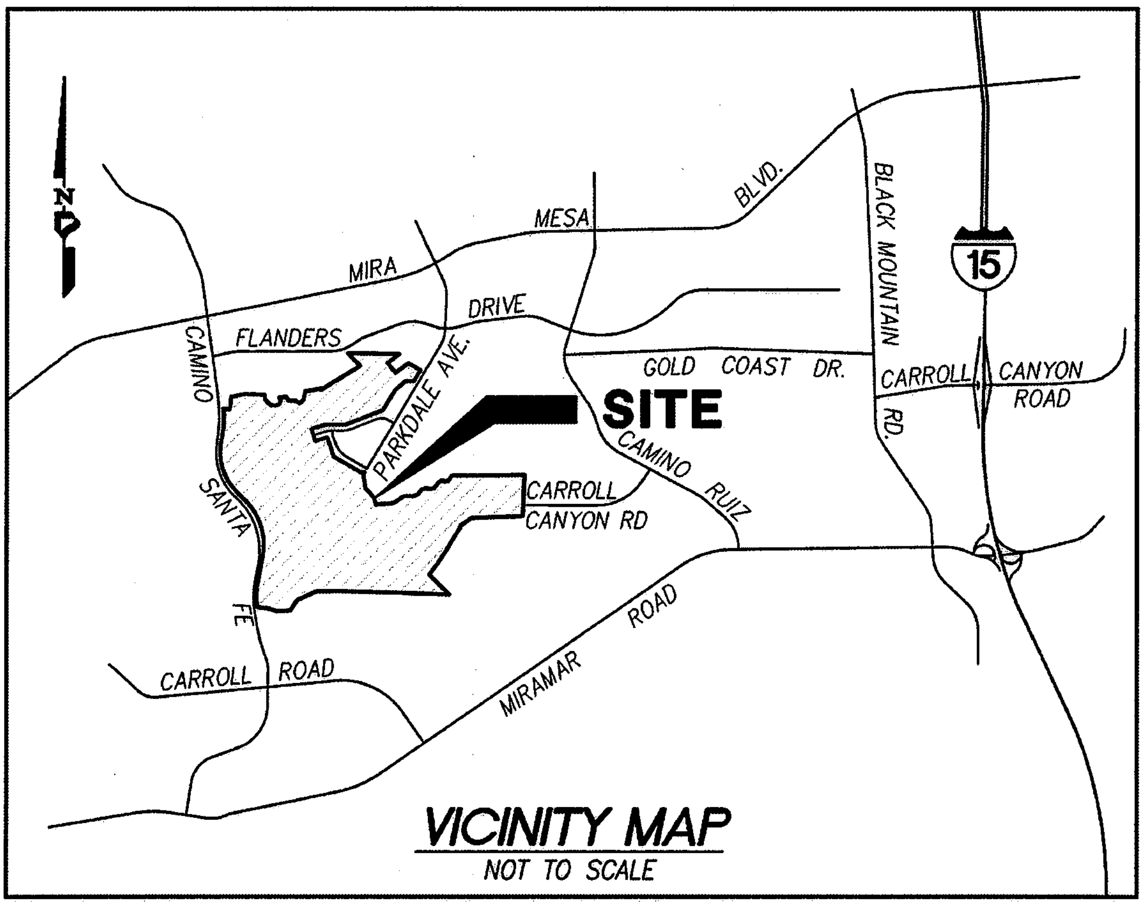


Figure 1: Project Vicinity Map

The site contained a quarry and associated operations and was operated by Hanson Aggregates Pacific Southwest, Inc. (Hanson). Redevelopment of the site will involve regrading of the site to a usable condition compatible with future land uses. The work also includes reserving and enlargement of the Carroll Canyon Creek channel to accommodate the 100-year flow. The enlargement and restoration of Carroll Canyon Creek will require environmental permitting, including a 401 Certification and an Army Corps of Engineers 404 permit. For a preliminary hydraulic analysis of the creek, refer to the project's floodplain study prepared by Chang Consultants. A blend of mixed use development, multi-family homes and single family houses is to be constructed including all associated landscaping, hardscaping, and utilities.

From a regional drainage perspective, the project's storm drain system will discharge into Carroll Canyon Creek. FEMA shaded Zone AE, Zone A and Zone X areas exist along the northern and southern boundary of the project site. Project redevelopment will include re-mapping the floodplains through the development, and will ensure the proposed developments are elevated above the floodplain elevations.

Treatment of onsite storm water prior to discharging into the downstream systems will be facilitated by several biofiltration basins. Treatment of offsite Carroll Canyon Road storm water will be facilitated by modular wetland units, bio-retention median, and underground storage vault. For a detailed discussion of the project's stormwater quality BMPs and hydromodification management approach, refer to the Preliminary Stormwater Quality Management Plan (SWQMP) report. For the Southern California Coastal Water Research Project (SCCWRP) channel screening report for the project, refer to the SCCWRP report prepared by Chang Consultants and submitted under a separate cover. The SCCWRP report documents the channel erosivity analysis, which was used to document the low flow threshold to be used for design of the proposed hydromodification management facilities. The final post-construction BMP design will be provided during final engineering.

2. EXISTING AND PROPOSED DRAINAGE PATTERNS

2.1 Existing Drainage Patterns

As the site is undergoing ongoing mining operations, the current existing conditions may not represent the historical drainage patterns. Carroll Canyon Creek drains through the property in an east-west direction. Generally the site drains towards the middle of the creek via sheetflow, or via multiple concentration points. A portion of the site drains to an existing storm drain within Camino Santa Fe.

Canyons with steep slopes border the southern and northern edges of the project site, and drain down from project site boundary to downstream creeks. There are a couple of fragments of runon areas outsite the project boundary which drains onto the site.

There are several existing storm drain systems within Camino Santa Fe. The major two systems include a 60-inch storm drain per Drawing 31390-6-D and a 4-14'x12' culvert box per Drawing 31390-14-D. The 60-inch storm drain is located at the northwest corner of the project site, i.e.

intersection of Camino Santa Fe and Miratech Drive / Spine Road. There are two additional smaller size (30" and 24") storm drain stubs along Camino Santa Fe, which were previously designed for ultimate built-out conditions, based on the Preliminary Drainage Study for Fenton Carroll Canyon prepared by Rick Engineering dated August 23, 1999. Refer to excerpts in Appendix 4 for the backbone study and As-built drawings.

Onsite, under existing conditions, the site generally sheetflows into one of two storm drain systems conveying flows into downstream channels.

See Exhibit A in Appendix 5 for an existing conditions drainage map. Note that for some of the systems, the downstream limits of the onsite drainage areas were set to approximate the downstream limits of the proposed drainage areas, in order to compare pre-project and post-project flows.

2.2 Proposed Drainage Patterns and Storm Drain Improvements

Redevelopment will disturb approximately 262 acres of the project site. Proposed development will not significantly alter ultimate discharge points of onsite and offsite runoff. Flows generated at slopes south and north of the Project site will primarily be collected in inlets, prior to entering the developed area and will be conveyed through storm drain systems to the downstream channels. Generally, proposed onsite drainage patterns will mimic existing drainage patterns. Some local re-direction of runoff occurs onsite, however most flows converge in the storm drain system on the west side of Camino Santa Fe and ultimately discharge into Carroll Canyon Creek.

The major part of the project site will continue to discharge to the downstream channel at the west side of the Camino Santa Fe through a public storm drain culvert box with a 100-year design flow of 4500 cfs. The proposed drainage improvements include private storm drains collecting rooftop and surface drainage and public storm drains in public roads. Refer to Exhibit B in Appendix 5 for the proposed condition drainage map.

3. HYDROLOGY CRITERIA, METHODOLOGY, AND RESULTS

3.1 Hydrology Criteria

Table 1 summarizes the key hydrology assumptions and criteria used for the hydrologic modeling.

Table 1: Hydrology Criteria

Existing and Proposed Hydrology:	100-year storm frequency
Soil Type:	Hydrologic Soil Group D per Drainage Design Manual requirements
Runoff coefficients:	Based on land use in sub-drainage area, from C=0.45 to 0.95. See Rational Method output.
Rainfall intensity:	Based on the City of San Diego Intensity Frequency Duration Curves presented in the 2017 City of San Diego Drainage Design Manual.

3.2 Hydrology Methodology

Hydrology calculations were completed for existing and proposed conditions accounting for all areas draining to the onsite storm drain systems. Drainage areas were defined from existing and proposed topographic maps of the area. Hydrologic analysis was completed utilizing the Rational Method, outlined in the 2017 City of San Diego Drainage Design Manual. The goal of the Rational Method analysis was to determine the peak 100-year flow rates for the storm drain pipes by developing a node link model of the contributing drainage area and applying the intensity-duration-frequency (IDF) curve to the areas. See Appendix 1 for the City of San Diego IDF curve.

The Civil-D computer program was used to obtain peak flow rates for the offsite and onsite drainage areas in existing and proposed conditions. The Civil-D Modified Rational Method Hydrology Program is a computer-aided design program where the user develops a node link model of the watershed. Developing independent node link models for each interior watershed and linking these sub-models together at confluence points creates the node link model. The intensity-duration-frequency relationships are applied to each of the drainage areas in the model to get the peak flow rates at each point of interest.

The project drainage areas were split into multiple systems representing different outfall areas of concern. For the proposed condition, System 1000 represents the northwest corner of project site conveyed to Biofiltration Basin 1 (See Exhibits in Appendix 5 for details). System 2000 includes the drainage area southwest of Spine Road and Street E, which drains to Biofiltration Basin 2. System 3000 generally bounded by System 1000 to the west, System 2000 to the south and Street D to the east, and drains to Biofiltration Basin 3. System 1000, 2000 and 3000 all discharge into the same 60" RCP stub location on Camino Santa Fe per Drawing 31390-6-D.

System 5000 includes a large portion of the northern slope and residential areas along Street D and Street E, draining to Basin 5. System 6000 includes the drainage area along southeast ends of Street D and Street B, draining to Basin 6 and to Carroll Canyon Creek. System 7000 includes multifamily units and park area along Spine Road, draining to Basin 7 and to Carroll Canyon Creek. System 8000 includes southern areas of the project site along Carroll Canyon Road. It is composed mainly of residential areas, driveways and a 28-acre community park, draining to Basin 8 and to Carroll Canyon Creek. System 9000 includes residential areas west of Spine Road, draining to Basin 9 and to Carroll Canyon Creek. System 5000-9000 will be piped downstream of the treatment basins to the existing 4-14'x12' box culvert (per Drawing 31390-14-D). Offsite systems 4200 and 4400 will drain to offsite pipes and to Carroll Canyon Creek.

For comparison purposes, existing condition drainage systems are named similarly to the post-project drainage systems. For example, System 800 for existing conditions corresponds to System 8000 for proposed conditions. System 500 and 900 are draining to the same outfall location, however, they are separated to mimic post-project systems 5000 and 9000. City of San Diego Drainage Design Manual runoff coefficients, based on land use, were assigned for each drainage sub-basin within CivilD.

3.3 Hydrology Results

The results of the Rational Method hydrology modeling are provided in Appendices 2 and 3 and the results are summarized in this section. Redevelopment of the project site increased the 100-

year runoff from the site, but peak flows after detention are less than either backbone storm drain system capacity or existing condition peak flow at the project outfall.

For outfall #1 near the northwest corner of the site, note that peak flows increase over existing conditions, but the combined post-project flows are less than the ultimate condition design flows per Drawing 31390-6-D and 31390-9-D. For outfall #1, the 100-year post-project flow rate (65.9 cfs) is less than the ultimate condition total backbone design flow of 119 cfs per Drawing 31390-6-D and 31390-9-D. For outfall #2 (which represents all of the other outfalls for the project), the 100-year post-project flow rates are increased from 272 cfs to 348 cfs. However, since all onsite flows drain ultimately to the same creek, with the backbone stubs previously designed for ultimate build-out conditions of 160.70 cfs (98.4 cfs of 60"RCP per Drawing 31390-6-D ; 20.6 cfs of 24"RCP per Drawing 31390-9-D and 41.7 cfs of 30" RCP per Drawing 31390-10-D), the proposed condition total flows of 414 cfs is in the acceptable range of the sum of the existing flows and backbone flows of 392 cfs (5.6% increase). Moreover, detention modeling was performed for representative basins, peak flows after detention are significantly less than the sum of the existing flows and back flows of 392 cfs. Therefore, there will be no adverse impact from a peak flow perspective.

For the results of the analysis, see Exhibit A for the existing conditions hydrology map and Exhibit B for the proposed conditions hydrology map in Appendix 5. Refer to the appendices for the hydrology calculations. Table 2 summarizes the hydrology results and compares existing and proposed conditions.

Table 2: Summary of Hydrology Results

	PRELIMINARY MEADOWOOD HYDROLOGY SUMMARY										
OUTFALL OF INTEREST	EXISTING CONDITION				BACKBONE COMPARISON		PROPOSED CONDITION				
					BackboneQ [1]	Qallowable					w/ Detention
	SYSTEM	AREA	TC	Q100	Q100	no backbone Q, Qallowable=Qexitin	SYSTEM	AREA	TC	Q100	Q100 [3]
		(ac)	(min)	(cfs)	(cfs)	(cfs)		(ac)	(min)	(cfs)	(cfs)
# 1 To POC 1 Outfall	100	5.7	8.9	9.0	98.4		1000	12.2	13.9	24.3	24.3
	200	1.3	8.2	2.2	20.6		2000	8.8	12.7	18.3	18.3
							3000	14.0	12.6	24.3	24.3
							1230 [2]	35.0	15.0	65.9	65.9
	TOTAL	***6.9***		***11.2***	***119.0***	***119.0***	***TOTAL***	***35.0***		***65.9***	***65.9***
	500	27.7	12.0	39.7	41.7	41.7	5000	11.2	6.1	30.3	<30.3
	600	47.1	11.2	68.8		68.8	6000	34.3	22.4	43.5	<43.5
							7000	17.9	17.0	36.1	<36.1
	800	81.8	23.2	94.9		94.2	8000	78.9	23.8	120.6	<120.6
	900	62.9	24.7	68.6		68.6	9000	49.1	14.4	117.9	<117.9
	TOTAL	**219.4**		**271.9**		**273.30**	**TOTAL**	**191.4**		**348.4**	**<348.4**
	GRAND TOTAL	**226.4**		**283.1**		**392.3**	**GRAND TOTAL**	**226.4**		**414.3**	**<392.3**
Offsite	420	20.5	14.9	27.1		27.1	4200	20.5	12.6	31.9	31.9
	440	4.8	5.0	10.0		10.0	4400	4.8	13.1	14.5	<4.3
	450	12.3	7.9	20.3		20.3	4500	12.3	7.9	21.2	21.2

Notes:

1) Backbone flowrates are based on Rick Engineering report and As-Built Drawings (see Appendix 4)

2) System 1230 represents the combined routing result of Systems 1000, 2000 and 3000

3) Q100 values are shown as "<x.x" to indicate detained flow rates. During final engineering, detention calculations will be prepared to show the final detained flow rates out of the the detention basins. The combination of basins will be sufficient to ensure the grand total Q100 for the proposed condition is less than the maximum allowable Q100. The preliminary detention calculations in Appendix 5 show that the basins have plenty of detention capacity.

3.4 Detention Basins

There are eight detention basins proposed for the project site for water quality treatment and hydromodification management. From the Rational Method results for each of the systems draining to a basin, the proposed condition peak inflow hydrographs were generated with Rick Engineering Rational Method Hydrograph Generator. This program develops a synthetic hydrograph per the 2003 County Hydrology Manual using the results of the Rational Method output.

The inflow hydrograph for each system was then entered into Haestad Method's PondPack software and the detention routing was performed with the design of the detention basin and the proposed outlet structure. The 100-year hydrograph was routed through the basin to demonstrate that the post-development peak flow rate will comply with the detention requirements and that the detention facility will not overtop during the 100-year peak event. The time of concentration coinciding with the basin outflow peak was established by adding the inflow hydrograph time of concentration plus the lag time of the detained flow within the basin. This combined time of concentration accounts for the time of concentration to get to the basin and the detention time within the basin. The riser for each basin was designed to ensure that riser size, rim elevation, and orifice placement will work in conjunction to properly mitigate the increased flow rate.

Detention modeling has been done for representative basins Basin 5 and Basin 9. Complete set of detention models will be included during final engineering. The hydrograph routing calculations and detention models are included in Appendix 5. With detention the proposed 100-year flow rates at the project outfalls are less than the existing flow rates.

3.5 Water Quality Calculations

The water quality calculations are included, under separate cover, in the Storm Water Quality Management Plan (SWQMP) prepared by PDC. The biofiltration basins will be combined hydromodification/biofiltration/detention basins.

3.6 Hydromodification Analysis

The biofiltration basins also address hydromodification requirements, since both biofiltration basins and hydromodification basins produce similar alterations to the flow regime for the smaller, more frequent storm events. Flow duration control is the most common form of hydromodification management. The majority of all onsite water will be treated with biofiltration/hydromodification basins, which will detain the smaller, more frequent events and therefore will mitigate the post-development onsite flows. Refer to the stand alone Hydromodification report prepared by PDC for detailed calculations.

4. CONCLUSION

This drainage report supports the VTM for the proposed 3 Roots development. This report was prepared to ensure that project development would not adversely affect existing drainage patterns. Hydrology calculations indicate that redevelopment will result in an overall increase in flows from the site, but the total flow rates are similar to the ultimate condition backbone design flow of downstream storm drain systems. Small onsite re-direction of flows does not alter general drainage patterns as onsite storm drain systems ultimately discharge to the same location downstream of the project. As such, the project redevelopment should not have an adverse effect on local or global drainage patterns. The drainage system will be designed appropriately to accommodate the peak-flow conditions for the site. Detention calculations will be included during final engineering.

1

APPENDIX 1

Supporting Documentation

(IDF Curve, Runoff Coefficients, FEMA Firmette)

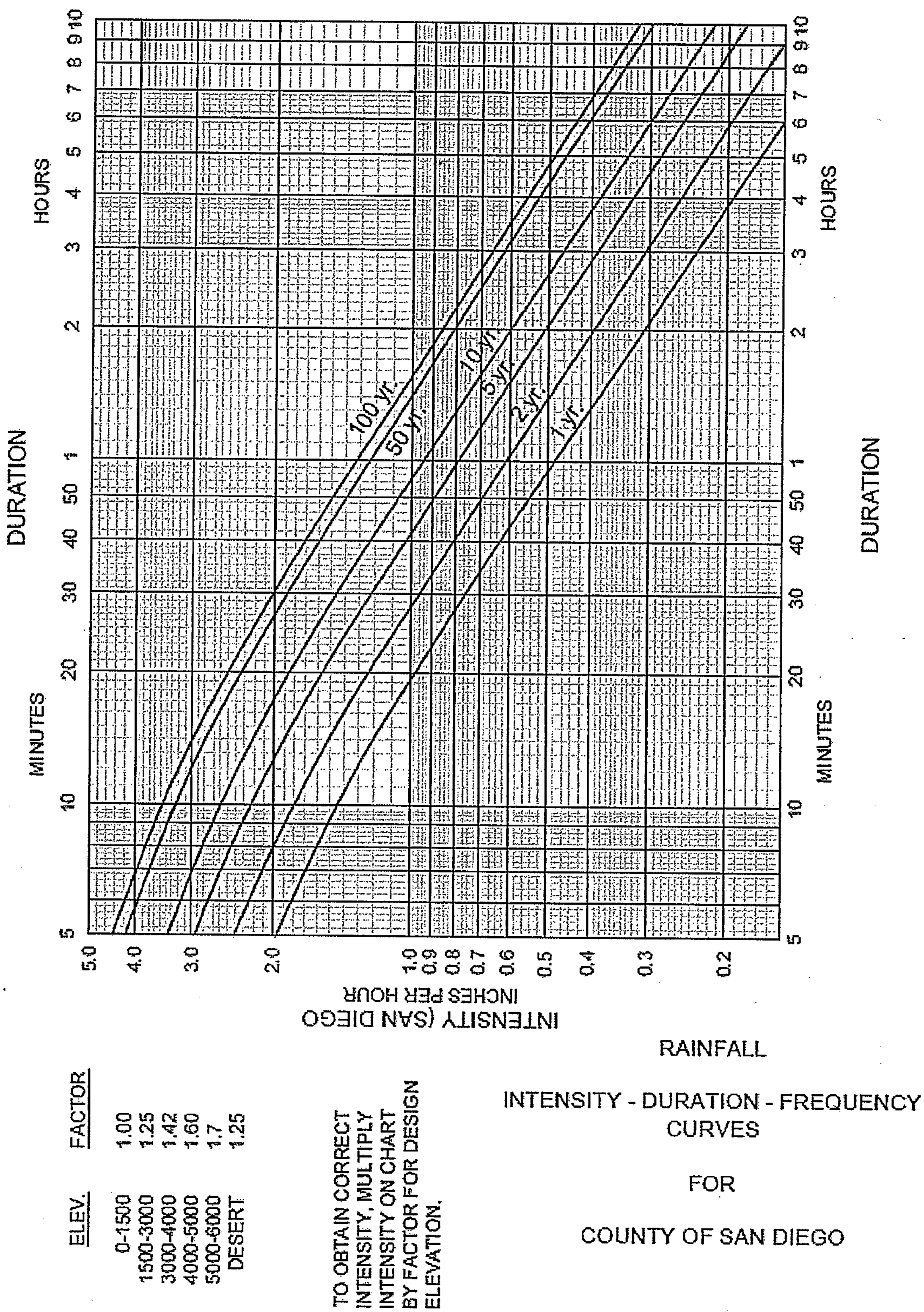


Figure A-1. Intensity-Duration-Frequency Design Chart

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C)
	Soil Type [1]
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [2]	
80% Impervious	0.85
Industrial [2]	
90% Impervious	0.95

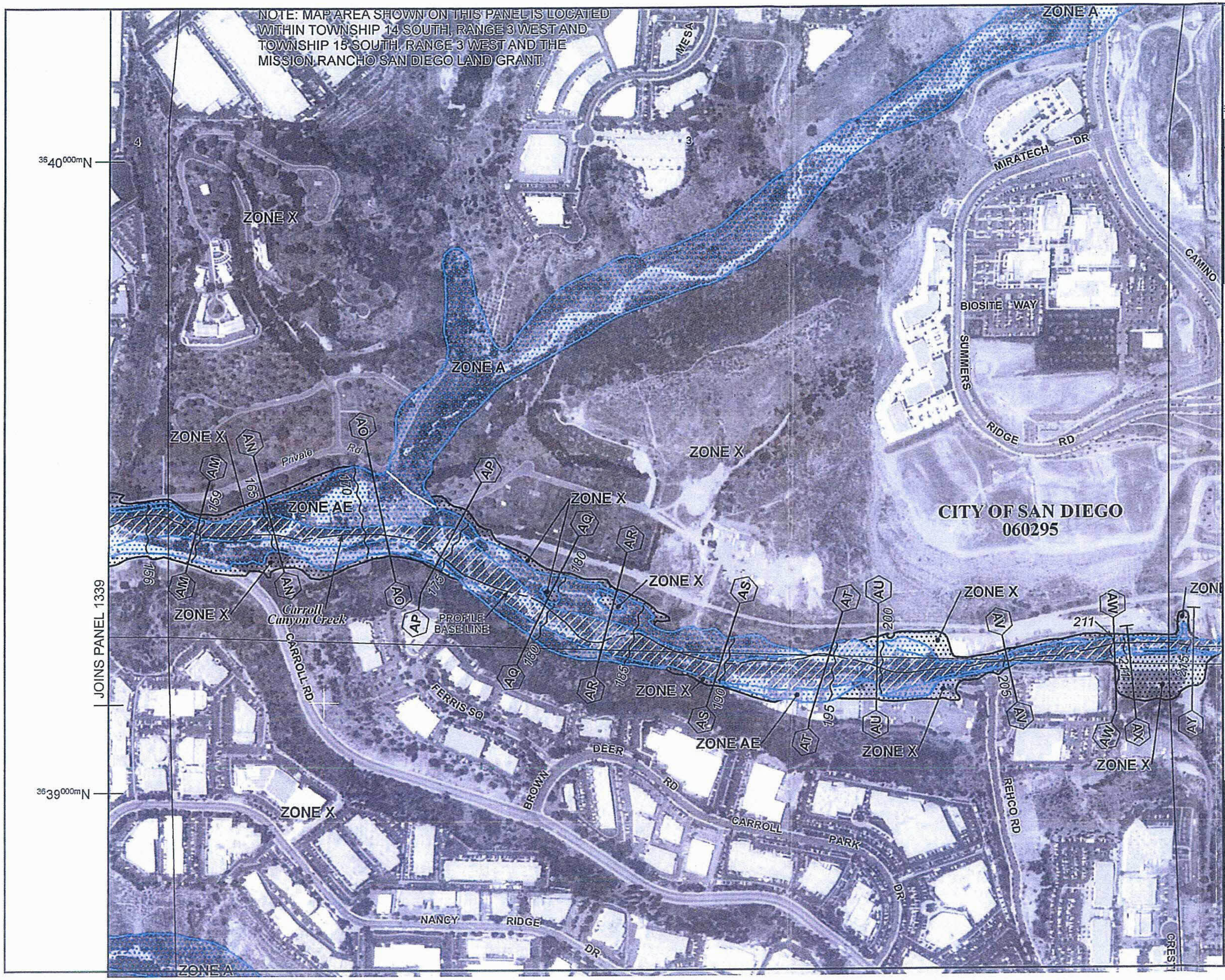
Note:
[1] Type D soil to be used for all areas.
[2] Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness		=	50%
Tabulated imperviousness		=	80%
Revised C	= (50/80) x 0.85	=	0.53

The values in Table A-1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

A.1.3. Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the T_C for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_C calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).



ance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

0 250 500 750 1,000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1343G

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA

AND INCORPORATED AREAS

PANEL 1343 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, CITY OF	060295	1343	G

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
06073C1343G

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

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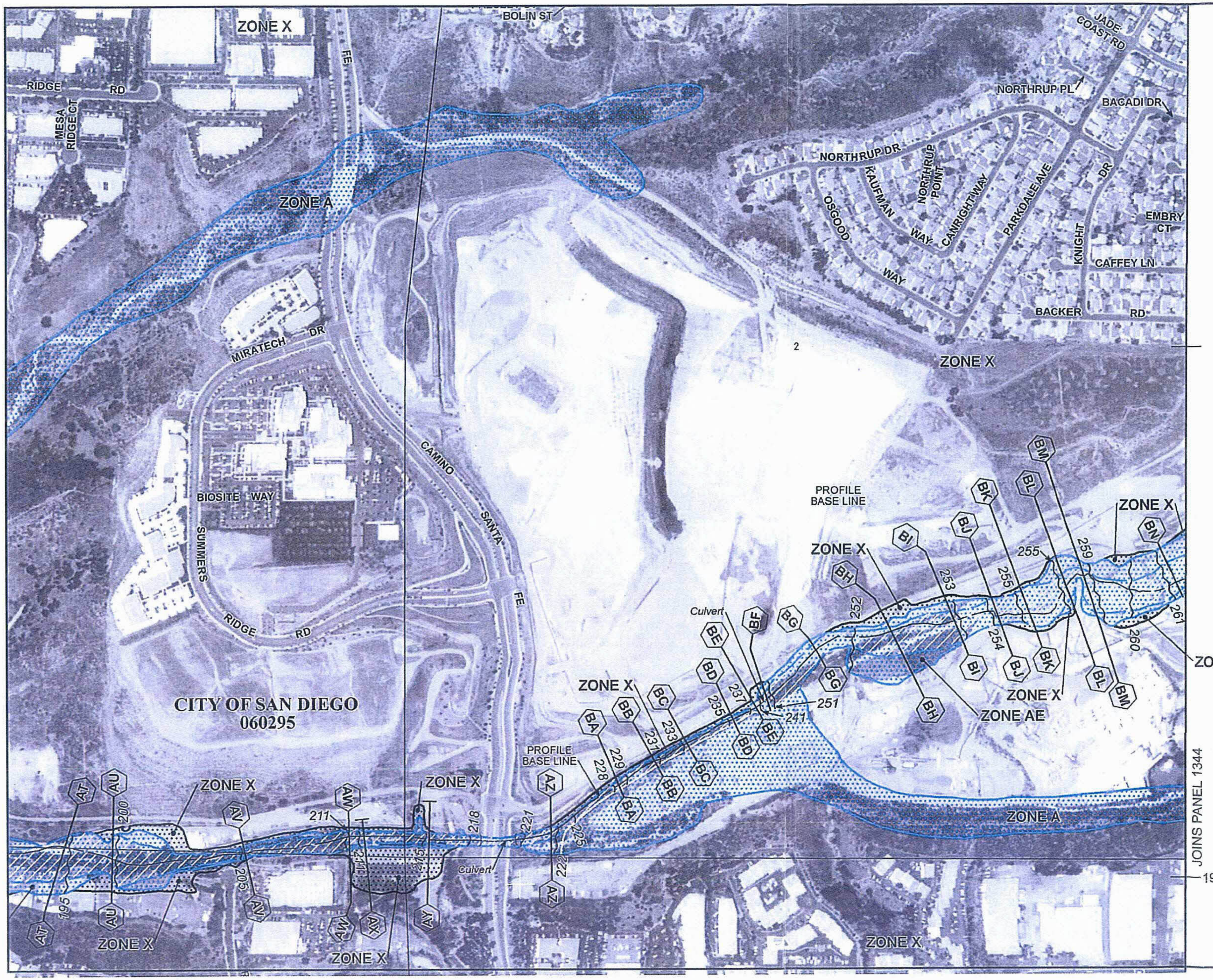

ance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

0 250 500 750 1,000 FEET

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1343G

FIRM

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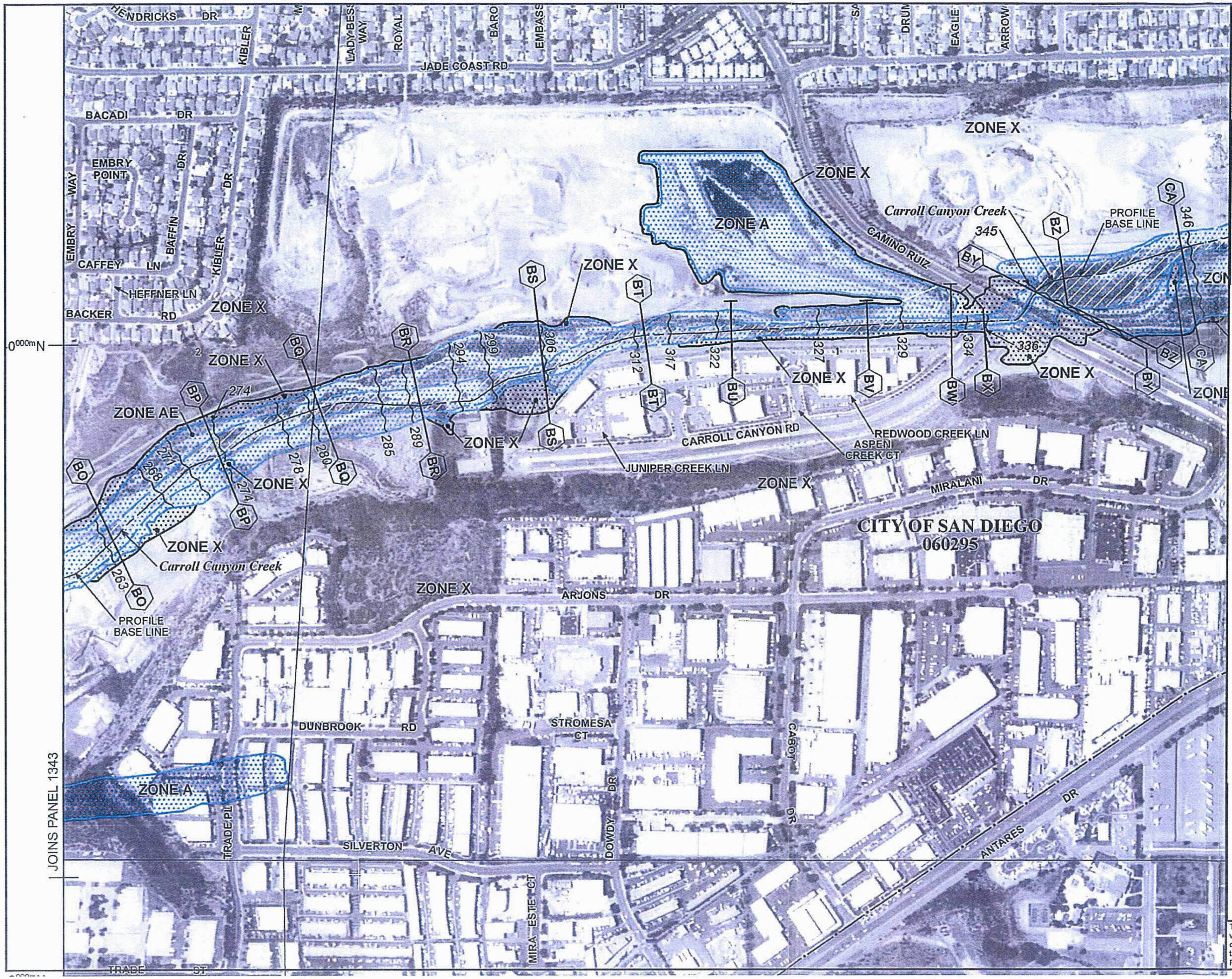

ance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

0 250 500 750 1,000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

NFIP

PANEL 1344G

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA

AND INCORPORATED AREAS

PANEL 1344 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, CITY OF	060295	1344	G

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MAP REVISED MAY 16, 2012

Federal Emergency Management Agency

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2

APPENDIX 2

Existing Conditions 100-year Rational Method Computer Output

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 05/08/17
------------------------------------------------------------------------
PROJECT CANTERA
EXISTING CONDITIONS
S100E100


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


Program License Serial Number 4049
------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

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


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** 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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  195.000(Ft.)
Highest elevation =  392.000(Ft.)
Lowest elevation =  366.000(Ft.)
Elevation difference =   26.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      6.89 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 195.000^.5)/(13.333^(1/3)]=    6.89
Rainfall intensity (I) =       3.869(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =       0.540(CFS)
Total initial stream area =        0.310(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      105.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   366.000(Ft.)
Downstream point elevation =   306.000(Ft.)
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Channel length thru subarea  =   771.000(Ft.)
Channel base width        =    3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =       2.455(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =     1.000(Ft.)
Flow(q) thru subarea =      2.455(CFS)
Depth of flow =   0.120(Ft.), Average velocity =   6.332(Ft/s)
Channel flow top width =    3.479(Ft.)
Flow Velocity =     6.33(Ft/s)
Travel time  =    2.03 min.
Time of concentration =     8.92 min.
Critical depth =       0.258(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =       3.517(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       3.482(CFS) for    2.200(Ac.)
Total runoff =      4.021(CFS)  Total area =        2.51(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      105.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =     8.92 min.
Rainfall intensity =       3.517(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       1.488(CFS) for    0.940(Ac.)
Total runoff =      5.509(CFS)  Total area =        3.45(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      105.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =     8.92 min.
Rainfall intensity =       3.517(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       3.513(CFS) for    2.220(Ac.)
Total runoff =      9.023(CFS)  Total area =        5.67(Ac.)
End of computations, total study area =          5.670 (Ac.)
```

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San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 05/08/17
------------------------------------------------------------------------
PROJECT CANTERA
EXISTING CONDITOINS
S200E100


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 *********   Hydrology Study Control Information **********
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Program License Serial Number 4049
------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

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


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** 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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  151.000(Ft.)
Highest elevation =  352.000(Ft.)
Lowest elevation =  314.000(Ft.)
Elevation difference =    38.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      4.91 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 151.000^.5)/(  25.166^(1/3)]=    4.91
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =       0.533(CFS)
Total initial stream area =        0.270(Ac.)


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Process from Point/Station      201.000 to Point/Station      202.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   314.000(Ft.)
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Downstream point elevation =   292.000(Ft.)
Channel length thru subarea  =   753.000(Ft.)
Channel base width       =     3.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =       1.521(CFS)
Manning's 'N'     = 0.015
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.521(CFS)
Depth of flow =   0.120(Ft.), Average velocity =   3.895(Ft/s)
Channel flow top width =     3.482(Ft.)
Flow Velocity =    3.90(Ft/s)
Travel time  =    3.22 min.
Time of concentration =    8.22 min.
Critical depth =      0.191(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.623(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.630(CFS) for    1.000(Ac.)
Total runoff =      2.164(CFS)  Total area =        1.27(Ac.)
End of computations, total study area =          1.270 (Ac.)
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                 San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/25/18
------------------------------------------------------------------------
PROJECT CANTERA
EXISTING CONDITIONS
S420E100


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

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Program License Serial Number 4049

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

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


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Process from Point/Station      420.000 to Point/Station      421.000
**** 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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  136.000(Ft.)
Highest elevation =  430.000(Ft.)
Lowest elevation =  380.000(Ft.)
Elevation difference =   50.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     4.10 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 136.000^.5)/(  36.765^(1/3)]=   4.10
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a  100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      0.889(CFS)
Total initial stream area =         0.450(Ac.)


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Process from Point/Station      421.000 to Point/Station      422.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   380.000(Ft.)
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Downstream point elevation =   326.000(Ft.)
Channel length thru subarea  =   880.000(Ft.)
Channel base width       =   10.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =       5.283(CFS)
Manning's 'N'     = 0.015
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      5.283(CFS)
Depth of flow =    0.100(Ft.), Average velocity =   5.227(Ft/s)
Channel flow top width =    10.200(Ft.)
Flow Velocity =    5.23(Ft/s)
Travel time  =    2.81 min.
Time of concentration =     7.81 min.
Critical depth =      0.203(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.693(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      7.395(CFS) for    4.450(Ac.)
Total runoff =      8.284(CFS)  Total area =        4.90(Ac.)
End of computations, total study area =         4.900 (Ac.)
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           San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/24/18
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PROJECT CANTERA
EXISTING CONDITIONS
S440E100


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

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Program License Serial Number 4049

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

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


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      440.000 to Point/Station      441.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =  129.280(Ft.)
Highest elevation =  259.000(Ft.)
Lowest elevation =  256.500(Ft.)
Elevation difference =    2.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      2.46 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 129.280^.5)/(    1.934^(1/3)]=    2.46
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =       0.792(CFS)
Total initial stream area =        0.190(Ac.)


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Process from Point/Station      442.000 to Point/Station      441.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =      5.00 min.
Rainfall intensity =      4.389(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       9.164(CFS) for    4.640(Ac.)
Total runoff =      9.957(CFS)   Total area =         4.83(Ac.)
End of computations, total study area =           4.830 (Ac.)
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               San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/24/18
------------------------------------------------------------------------
PROJECT CANTERA
EXISTING CONDITIONS
S450E100

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

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Program License Serial Number 4049

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

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

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      450.000 to Point/Station      451.000
**** 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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =   75.000(Ft.)
Highest elevation =  312.000(Ft.)
Lowest elevation =  288.000(Ft.)
Elevation difference =   24.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.19 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*(  75.000^.5)/(  32.000^(1/3)]=    3.19
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      0.257(CFS)
Total initial stream area =        0.130(Ac.)

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Process from Point/Station      451.000 to Point/Station      453.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   288.000(Ft.)
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Downstream point elevation =   210.000(Ft.)
Channel length thru subarea  =  1695.000(Ft.)
Channel base width       =     3.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =      12.236(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel   =    1.000(Ft.)
Flow(q) thru subarea =     12.236(CFS)
Depth of flow =    0.373(Ft.), Average velocity =    9.735(Ft/s)
Channel flow top width =     3.745(Ft.)
Flow Velocity =     9.73(Ft/s)
Travel time  =    2.90 min.
Time of concentration =     7.90 min.
Critical depth =       0.734(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.676(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =     20.067(CFS) for   12.130(Ac.)
Total runoff =     20.324(CFS)  Total area =        12.26(Ac.)
End of computations, total study area =          12.260 (Ac.)
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                    San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 08/30/17
------------------------------------------------------------------------
PROJECT CANTERA
EXISTING CONDITIONS
S500E100


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

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Program License Serial Number 4049

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

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


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      500.000 to Point/Station      501.000
**** 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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  123.000(Ft.)
Highest elevation =  396.000(Ft.)
Lowest elevation =  340.000(Ft.)
Elevation difference =   56.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.63 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 123.000^.5)/(  45.528^(1/3)]=   3.63
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =       1.027(CFS)
Total initial stream area =        0.520(Ac.)


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Process from Point/Station      501.000 to Point/Station      502.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   340.000(Ft.)
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Downstream point elevation =   299.800(Ft.)
Channel length thru subarea  =  1715.000(Ft.)
Channel base width      =    12.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =      27.858(CFS)
Manning's 'N'     = 0.035
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     27.858(CFS)
Depth of flow =   0.541(Ft.), Average velocity =   4.104(Ft/s)
Channel flow top width =    13.083(Ft.)
Flow Velocity =     4.10(Ft/s)
Travel time  =    6.96 min.
Time of concentration =   11.96 min.
Critical depth =      0.543(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =       3.162(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      38.655(CFS) for   27.170(Ac.)
Total runoff =      39.682(CFS)  Total area =        27.69(Ac.)
End of computations, total study area =          27.690 (Ac.)
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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 08/30/17
------------------------------------------------------------------------
PROJECT CANTERA
EXISTING CONDITIONS
S600E100


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

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Program License Serial Number 4049

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

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


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      600.000 to Point/Station      601.000
**** 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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =   74.000(Ft.)
Highest elevation =  412.000(Ft.)
Lowest elevation =  410.000(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      7.23 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*(  74.000^.5)/( 2.703^(1/3)]=    7.23
Rainfall intensity (I) =       3.801(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =       0.496(CFS)
Total initial stream area =        0.290(Ac.)


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Process from Point/Station      601.000 to Point/Station      602.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   410.000(Ft.)
Downstream point elevation =   225.000(Ft.)
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Channel length thru subarea  =  1773.000(Ft.)
Channel base width        =  12.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =     40.509(CFS)
Manning's 'N'     = 0.035
Maximum depth of channel  =     1.000(Ft.)
Flow(q) thru subarea =     40.509(CFS)
Depth of flow =   0.433(Ft.), Average velocity =   7.530(Ft/s)
Channel flow top width =   12.865(Ft.)
Flow Velocity =    7.53(Ft/s)
Travel time  =    3.92 min.
Time of concentration =    11.15 min.
Critical depth =      0.695(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.244(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =     68.299(CFS) for   46.790(Ac.)
Total runoff =     68.795(CFS)  Total area =       47.08(Ac.)
End of computations, total study area =         47.080 (Ac.)
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            San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study         Date: 10/16/18
------------------------------------------------------------------------
PROJECT CANTERA
EXISTING CONDITIONS
S800E100


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

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Program License Serial Number 4049

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

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


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      801.000 to Point/Station      802.000
**** 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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =    82.000(Ft.)
Highest elevation =  430.000(Ft.)
Lowest elevation =  428.000(Ft.)
Elevation difference =     2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      7.87 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*(  82.000^.5)/( 2.439^(1/3)]=   7.87
Rainfall intensity (I) =       3.682(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =       0.596(CFS)
Total initial stream area =         0.360(Ac.)


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Process from Point/Station      802.000 to Point/Station      803.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   428.000(Ft.)
Downstream point elevation =   298.000(Ft.)
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Channel length thru subarea  =  2000.000(Ft.)
Channel base width        =   12.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =      21.132(CFS)
Manning's 'N'     = 0.035
Maximum depth of channel   =    1.000(Ft.)
Flow(q) thru subarea =     21.132(CFS)
Depth of flow =   0.337(Ft.), Average velocity =   5.078(Ft/s)
Channel flow top width =   12.675(Ft.)
Flow Velocity =     5.08(Ft/s)
Travel time  =    6.56 min.
Time of concentration =   14.44 min.
Critical depth =      0.453(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =       2.948(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =     32.887(CFS) for   24.790(Ac.)
Total runoff =     33.483(CFS)  Total area =        25.15(Ac.)


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Process from Point/Station      803.000 to Point/Station      804.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   298.000(Ft.)
Downstream point elevation =   253.000(Ft.)
Channel length thru subarea  =  4016.000(Ft.)
Channel base width        =    6.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =      71.194(CFS)
Manning's 'N'     = 0.020
Maximum depth of channel   =    2.000(Ft.)
Flow(q) thru subarea =     71.194(CFS)
Depth of flow =   1.274(Ft.), Average velocity =   7.681(Ft/s)
Channel flow top width =    8.548(Ft.)
Flow Velocity =     7.68(Ft/s)
Travel time  =    8.71 min.
Time of concentration =   23.15 min.
Critical depth =      1.500(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      2.411(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =     61.462(CFS) for   56.650(Ac.)
Total runoff =     94.945(CFS)  Total area =        81.80(Ac.)
End of computations, total study area =          81.800 (Ac.)
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                    San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 08/31/17
------------------------------------------------------------------------
PROJECT CANTERA
EXISTING CONDITIONS
S900E100


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

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Program License Serial Number 4049

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

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


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      900.000 to Point/Station      901.000
**** 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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  330.000(Ft.)
Highest elevation =  395.000(Ft.)
Lowest elevation =  372.000(Ft.)
Elevation difference =    23.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     11.13 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 330.000^.5)/( 6.970^(1/3)]=  11.13
Rainfall intensity (I) =        3.246(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =       0.336(CFS)
Total initial stream area =        0.230(Ac.)


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Process from Point/Station      901.000 to Point/Station      902.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   372.000(Ft.)
Downstream point elevation =   320.000(Ft.)
```



```
Channel length thru subarea  =   139.000(Ft.)
Channel base width       =    5.000(Ft.)
Slope or 'Z' of left channel bank =    1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =       0.614(CFS)
Manning's 'N'     = 0.035
Maximum depth of channel   =     1.000(Ft.)
Flow(q) thru subarea =      0.614(CFS)
Depth of flow =    0.040(Ft.), Average velocity =   3.022(Ft/s)
Channel flow top width =     5.081(Ft.)
Flow Velocity =     3.02(Ft/s)
Travel time  =    0.77 min.
Time of concentration =    11.89 min.
Critical depth =      0.077(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =       3.168(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      0.542(CFS) for    0.380(Ac.)
Total runoff =      0.878(CFS)  Total area =        0.61(Ac.)


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Process from Point/Station      903.000 to Point/Station      902.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =     11.89 min.
Rainfall intensity =       3.168(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.326(CFS) for    0.930(Ac.)
Total runoff =      2.204(CFS)  Total area =        1.54(Ac.)


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Process from Point/Station      902.000 to Point/Station      905.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   320.000(Ft.)
Downstream point elevation =   299.000(Ft.)
Channel length thru subarea  =  1382.000(Ft.)
Channel base width       =    6.000(Ft.)
Slope or 'Z' of left channel bank =    1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =       6.440(CFS)
Manning's 'N'     = 0.025
Maximum depth of channel   =     2.000(Ft.)
Flow(q) thru subarea =      6.440(CFS)
Depth of flow =    0.317(Ft.), Average velocity =   3.214(Ft/s)
Channel flow top width =     6.634(Ft.)
Flow Velocity =     3.21(Ft/s)
Travel time  =    7.17 min.
Time of concentration =   19.06 min.
Critical depth =      0.324(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      2.635(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      7.020(CFS) for    5.920(Ac.)
Total runoff =      9.224(CFS)  Total area =        7.46(Ac.)


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Process from Point/Station      904.000 to Point/Station      905.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    19.06 min.
Rainfall intensity =      2.635(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =     10.021(CFS) for    8.450(Ac.)
Total runoff =     19.245(CFS)  Total area =       15.91(Ac.)


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Process from Point/Station      905.000 to Point/Station      908.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   299.000(Ft.)
Downstream point elevation =   240.000(Ft.)
Channel length thru subarea  =  2743.000(Ft.)
Channel base width      =    6.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =     42.440(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =     42.440(CFS)
Depth of flow =   0.774(Ft.), Average velocity =   8.095(Ft/s)
Channel flow top width =    7.548(Ft.)
Flow Velocity =    8.09(Ft/s)
Travel time  =    5.65 min.
Time of concentration =   24.71 min.
Critical depth =      1.078(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      2.334(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =     40.280(CFS) for   38.350(Ac.)
Total runoff =     59.525(CFS)  Total area =       54.26(Ac.)


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Process from Point/Station      907.000 to Point/Station      908.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
```


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```
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    24.71 min.
Rainfall intensity =      2.334(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      9.022(CFS) for    8.590(Ac.)
Total runoff =     68.548(CFS)  Total area =       62.85(Ac.)
End of computations, total study area =          62.850 (Ac.)
```

3

APPENDIX 3

Proposed Conditions 100-year Rational Method Computer Output

```
                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/03/18
------------------------------------------------------------------------
PROJECT CANTERA
PROPOSED CONDITIONS
1000P100

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

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


Program License Serial Number 4049

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

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


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Process from Point/Station     1023.000 to Point/Station     1024.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =    68.000(Ft.)
Highest elevation =  315.300(Ft.)
Lowest elevation =  314.500(Ft.)
Elevation difference =    0.800(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.11 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  68.000^.5)/(   1.176^(1/3)]=   2.11
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =       0.417(CFS)
Total initial stream area =        0.100(Ac.)


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Process from Point/Station     1024.000 to Point/Station     1004.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   314.500(Ft.)
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End of street segment elevation =   305.800(Ft.)
Length of street segment  =   782.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =       2.460(CFS)
Depth of flow =   0.308(Ft.), Average velocity =   2.048(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.629(Ft.)
Flow velocity =   2.05(Ft/s)
Travel time =     6.36 min.     TC =    11.36  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.222(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      2.999(CFS) for    0.980(Ac.)
Total runoff =       3.416(CFS)  Total area =        1.08(Ac.)
Street flow at end of street =       3.416(CFS)
Half street flow at end of street =       3.416(CFS)
Depth of flow =   0.338(Ft.), Average velocity =   2.212(Ft/s)
Flow width (from curb towards crown)=  12.136(Ft.)


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Process from Point/Station     1025.000 to Point/Station     1004.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                 ]
Time of concentration =     11.36 min.
Rainfall intensity =      3.222(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      0.762(CFS) for    0.430(Ac.)
Total runoff =       4.178(CFS)  Total area =        1.51(Ac.)


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Process from Point/Station     1026.000 to Point/Station     1004.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                 ]
Time of concentration =     11.36 min.
Rainfall intensity =      3.222(In/Hr) for a   100.0 year storm
```

```
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      0.851(CFS) for    0.480(Ac.)
Total runoff =      5.029(CFS)  Total area =        1.99(Ac.)


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Process from Point/Station     1005.000 to Point/Station     1004.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =     11.36 min.
Rainfall intensity =      3.222(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      1.967(CFS) for    1.110(Ac.)
Total runoff =      6.995(CFS)  Total area =        3.10(Ac.)


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Process from Point/Station     1004.000 to Point/Station     1003.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   305.500(Ft.)
Downstream point/station elevation =   302.500(Ft.)
Pipe length  =    24.50(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.995(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.995(CFS)
Normal flow depth in pipe =     6.43(In.)
Flow top width inside pipe =    11.97(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.33(Ft/s)
Travel time through pipe =     0.03 min.
Time of concentration (TC) =    11.39 min.


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Process from Point/Station     1004.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.100(Ac.)
Runoff from this stream =      6.995(CFS)
Time of concentration =    11.39 min.
Rainfall intensity =     3.219(In/Hr)


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Process from Point/Station     1001.000 to Point/Station     1002.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Initial subarea flow distance  =  267.000(Ft.)
Highest elevation =  322.500(Ft.)
Lowest elevation =  322.000(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
```



```
areas overland flow method (App X-C) =     7.71 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 267.000^.5)/( 0.187^(1/3)]=   7.71
Rainfall intensity (I) =      3.710(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.634(CFS)
Total initial stream area =        0.180(Ac.)


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Process from Point/Station     1002.000 to Point/Station     1003.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   322.000(Ft.)
End of street segment elevation =   303.000(Ft.)
Length of street segment  =   343.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.063
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0170
 Manning's N from gutter to grade break =  0.0170
 Manning's N from grade break to crown =  0.0170
Estimated mean flow rate at midpoint of street =      3.700(CFS)
Depth of flow =   0.297(Ft.), Average velocity =   4.333(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.528(Ft.)
Flow velocity =    4.33(Ft/s)
Travel time =    1.32 min.     TC =    9.03  min.
 Adding area flow to street
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
[MULTI - UNITS area type                    ]
Rainfall intensity =      3.501(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =      4.264(CFS) for    1.740(Ac.)
Total runoff =      4.899(CFS)  Total area =        1.92(Ac.)
Street flow at end of street =      4.899(CFS)
Half street flow at end of street =      4.899(CFS)
Depth of flow =   0.320(Ft.), Average velocity =   4.613(Ft/s)
Flow width (from curb towards crown)=   9.670(Ft.)


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Process from Point/Station     1002.000 to Point/Station     1003.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.920(Ac.)
Runoff from this stream =      4.899(CFS)
Time of concentration =    9.03 min.
Rainfall intensity =     3.501(In/Hr)
Summary of stream data:

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

```
1        6.995     11.39                3.219
2        4.899      9.03                3.501
Qmax(1) =
           1.000 *    1.000 *     6.995) +
           0.919 *    1.000 *     4.899) + =       11.500
Qmax(2) =
           1.000 *    0.793 *     6.995) +
           1.000 *    1.000 *     4.899) + =       10.446

Total of 2 streams to confluence:
Flow rates before confluence point:
       6.995       4.899
Maximum flow rates at confluence using above data:
       11.500       10.446
Area of streams before confluence:
        3.100        1.920
Results of confluence:
Total flow rate =      11.500(CFS)
Time of concentration =    11.387 min.
Effective stream area after confluence =      5.020(Ac.)


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Process from Point/Station     1003.000 to Point/Station     1020.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      5.020(Ac.)
Runoff from this stream =     11.500(CFS)
Time of concentration =   11.39 min.
Rainfall intensity =     3.219(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station     1010.000 to Point/Station     1013.000
**** 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
[MULTI - UNITS area type                   ]
Initial subarea flow distance  =  223.000(Ft.)
Highest elevation =  310.600(Ft.)
Lowest elevation =  309.000(Ft.)
Elevation difference =     1.600(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     12.01 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7000)*( 223.000^.5)/( 0.717^(1/3)]=  12.01
Rainfall intensity (I) =      3.157(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =      1.216(CFS)
Total initial stream area =        0.550(Ac.)


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Process from Point/Station     1013.000 to Point/Station     1014.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
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```
Top of street segment elevation =   309.000(Ft.)
End of street segment elevation =   303.000(Ft.)
Length of street segment  =   361.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  12.000(Ft.)
Distance from crown to crossfall grade break  =   1.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =       4.519(CFS)
Depth of flow =   0.356(Ft.), Average velocity =   3.138(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.461(Ft.)
Flow velocity =   3.14(Ft/s)
Travel time =    1.92 min.     TC =    13.93  min.
 Adding area flow to street
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
[MULTI - UNITS area type                   ]
Rainfall intensity =      2.988(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =      6.255(CFS) for    2.990(Ac.)
Total runoff =      7.470(CFS)  Total area =         3.54(Ac.)
Street flow at end of street =      7.470(CFS)
Half street flow at end of street =      7.470(CFS)
Depth of flow =   0.402(Ft.), Average velocity =   3.763(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  12.000(Ft.)


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Process from Point/Station     1015.000 to Point/Station     1014.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                      ]
Time of concentration =    13.93 min.
Rainfall intensity =      2.988(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =      2.210(CFS) for    0.870(Ac.)
Total runoff =      9.680(CFS)  Total area =        4.41(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1014.000 to Point/Station     1020.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.410(Ac.)
Runoff from this stream =      9.680(CFS)
Time of concentration =   13.93 min.
```

```
Rainfall intensity =     2.988(In/Hr)
Summary of stream data:

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


1       11.500     11.39                3.219
2        9.680     13.93                2.988
Qmax(1) =
           1.000 *    1.000 *    11.500) +
           1.000 *    0.818 *     9.680) + =       19.414
Qmax(2) =
           0.928 *    1.000 *    11.500) +
           1.000 *    1.000 *     9.680) + =       20.356

Total of 2 main streams to confluence:
Flow rates before confluence point:
      11.500        9.680
Maximum flow rates at confluence using above data:
       19.414       20.356
Area of streams before confluence:
        5.020        4.410


Results of confluence:
Total flow rate =      20.356(CFS)
Time of concentration =    13.927 min.
Effective stream area after confluence  =      9.430(Ac.)


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Process from Point/Station     1007.000 to Point/Station     1020.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    13.93 min.
Rainfall intensity =      2.988(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      0.713(CFS) for    0.530(Ac.)
Total runoff =     21.069(CFS)  Total area =        9.96(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1008.000 to Point/Station     1020.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                     ]
Time of concentration =    13.93 min.
Rainfall intensity =      2.988(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.483(CFS) for    0.170(Ac.)
Total runoff =     21.551(CFS)  Total area =       10.13(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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Process from Point/Station     1009.000 to Point/Station     1020.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    13.93 min.
Rainfall intensity =      2.988(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.775(CFS) for    1.320(Ac.)
Total runoff =     23.326(CFS)  Total area =       11.45(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1020.000 to Point/Station     1020.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    13.93 min.
Rainfall intensity =      2.988(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      0.941(CFS) for    0.700(Ac.)
Total runoff =     24.268(CFS)  Total area =       12.15(Ac.)
End of computations, total study area =         12.150 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/03/18
------------------------------------------------------------------------
PROJECT CANTERA
PROPOSED CONDITIONS
1230P100


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

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


Program License Serial Number 4049

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

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


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3010.000 to Point/Station     3010.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.430 given for subarea
Rainfall intensity (I) =      3.103(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.59 min.  Rain intensity =       3.10(In/Hr)
Total area =       13.980(Ac.)  Total runoff =    24.300(CFS)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3010.000 to Point/Station     1021.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    302.000(Ft.)
Downstream point/station elevation =    301.000(Ft.)
Pipe length  =     47.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    24.300(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    24.300(CFS)
Normal flow depth in pipe =    15.30(In.)
Flow top width inside pipe =   23.07(In.)
Critical Depth =   20.91(In.)
Pipe flow velocity =      11.48(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    12.66 min.
```



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+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1021.000 to Point/Station     1022.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    301.000(Ft.)
Downstream point/station elevation =    293.000(Ft.)
Pipe length  =    465.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    24.300(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    24.300(CFS)
Normal flow depth in pipe =    16.52(In.)
Flow top width inside pipe =   22.23(In.)
Critical Depth =   20.91(In.)
Pipe flow velocity =      10.54(Ft/s)
Travel time through pipe =    0.74 min.
Time of concentration (TC) =    13.39 min.


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1021.000 to Point/Station     1022.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =      13.980(Ac.)
Runoff from this stream =     24.300(CFS)
Time of concentration =    13.39 min.
Rainfall intensity =     3.033(In/Hr)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2012.000 to Point/Station     2012.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.510 given for subarea
Rainfall intensity (I) =      3.093(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  12.70 min.  Rain intensity =       3.09(In/Hr)
Total area =        8.810(Ac.)  Total runoff =    18.300(CFS)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2012.000 to Point/Station     1022.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    294.000(Ft.)
Downstream point/station elevation =    293.000(Ft.)
Pipe length  =     80.70(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.300(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    18.300(CFS)
Normal flow depth in pipe =    18.00(In.)
Flow top width inside pipe =   14.70(In.)
Critical Depth =   18.65(In.)
Pipe flow velocity =       8.33(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =    12.86 min.


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2012.000 to Point/Station     1022.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =       8.810(Ac.)
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Runoff from this stream =     18.300(CFS)
Time of concentration =   12.86 min.
Rainfall intensity =     3.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1020.000 to Point/Station     1020.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

User specified 'C' value of 0.520 given for subarea
Rainfall intensity (I) =       2.991(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =  13.90 min.  Rain intensity =        2.99(In/Hr)
Total area =       12.150(Ac.)  Total runoff =    24.300(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1020.000 to Point/Station     1022.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   294.000(Ft.)
Downstream point/station elevation =   293.000(Ft.)
Pipe length  =     62.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     24.300(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =     24.300(CFS)
Normal flow depth in pipe =   16.92(In.)
Flow top width inside pipe =   21.89(In.)
Critical Depth =   20.91(In.)
Pipe flow velocity =       10.26(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    14.00 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1020.000 to Point/Station     1022.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area =      12.150(Ac.)
Runoff from this stream =     24.300(CFS)
Time of concentration =   14.00 min.
Rainfall intensity =     2.982(In/Hr)
Summary of stream data:

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


1       24.300     13.39                 3.033
2       18.300     12.86                 3.079
3       24.300     14.00                 2.982
Qmax(1) =
          1.000 *    1.000 *    24.300) +
          0.985 *    1.000 *    18.300) +
          1.000 *    0.957 *    24.300) + =       65.573
Qmax(2) =
          1.000 *    0.960 *    24.300) +
          1.000 *    1.000 *    18.300) +
          1.000 *    0.919 *    24.300) + =       63.957
Qmax(3) =
          0.983 *    1.000 *    24.300) +
          0.969 *    1.000 *    18.300) +
          1.000 *    1.000 *    24.300) + =       65.927
```



```
Total of 3 streams to confluence:
Flow rates before confluence point:
     24.300      18.300      24.300
Maximum flow rates at confluence using above data:
      65.573       63.957       65.927
Area of streams before confluence:
      13.980        8.810       12.150
Results of confluence:
Total flow rate =      65.927(CFS)
Time of concentration =     14.001 min.
Effective stream area after confluence =      34.940(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     1022.000 to Point/Station     1000.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   293.000(Ft.)
Downstream point/station elevation =   289.500(Ft.)
Pipe length  =    545.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     65.927(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =     65.927(CFS)
Normal flow depth in pipe =   31.83(In.)
Flow top width inside pipe =   30.22(In.)
Critical Depth =   31.02(In.)
Pipe flow velocity =       9.09(Ft/s)
Travel time through pipe =    1.00 min.
Time of concentration (TC) =    15.00 min.
End of computations, total study area =          34.940 (Ac.)
```

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              San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/01/18
------------------------------------------------------------------------
PROJECT CANTERA
PROPOSED CONDITIONS
2000P100


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

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


Program License Serial Number 4049

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

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


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2001.000 to Point/Station     2002.000
**** 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
[MULTI - UNITS area type                          ]
Initial subarea flow distance  =  100.000(Ft.)
Highest elevation =  310.500(Ft.)
Lowest elevation =  310.000(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     9.07 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7000)*( 100.000^.5)/( 0.500^(1/3)]=   9.07
Rainfall intensity (I) =        3.495(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =      0.269(CFS)
Total initial stream area =        0.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2002.000 to Point/Station     2003.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
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Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                          ]
Time of concentration =     9.07 min.
Rainfall intensity =      3.495(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =      9.763(CFS) for    3.990(Ac.)
Total runoff =     10.032(CFS)  Total area =        4.10(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2003.000 to Point/Station     2012.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.100(Ac.)
Runoff from this stream =     10.032(CFS)
Time of concentration =    9.07 min.
Rainfall intensity =     3.495(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2000.000 to Point/Station     2009.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                             ]
Initial subarea flow distance  =   86.000(Ft.)
Highest elevation =  310.000(Ft.)
Lowest elevation =  308.000(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.89 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  86.000^.5)/(   2.326^(1/3)]=   1.89
Setting time of concentration to 5 minutes
Rainfall intensity (I) =        4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.417(CFS)
Total initial stream area =        0.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2009.000 to Point/Station     2010.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   308.000(Ft.)
End of street segment elevation =   300.600(Ft.)
Length of street segment  =   817.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
```

```
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      2.960(CFS)
Depth of flow =   0.334(Ft.), Average velocity =   1.977(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.941(Ft.)
Flow velocity =   1.98(Ft/s)
Travel time =    6.89 min.     TC =   11.89  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.169(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      3.673(CFS) for    1.220(Ac.)
Total runoff =      4.090(CFS)  Total area =        1.32(Ac.)
Street flow at end of street =      4.090(CFS)
Half street flow at end of street =       4.090(CFS)
Depth of flow =   0.367(Ft.), Average velocity =   2.135(Ft/s)
Flow width (from curb towards crown)=  13.581(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2010.000 to Point/Station     2012.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   300.600(Ft.)
Downstream point/station elevation =   294.000(Ft.)
Pipe length  =   347.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      4.090(CFS)
Nearest computed pipe diameter   =     12.00(In.)
Calculated individual pipe flow  =     4.090(CFS)
Normal flow depth in pipe =    8.37(In.)
Flow top width inside pipe =   11.03(In.)
Critical Depth =   10.27(In.)
Pipe flow velocity =      7.00(Ft/s)
Travel time through pipe =    0.83 min.
Time of concentration (TC) =    12.71 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2010.000 to Point/Station     2012.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.320(Ac.)
Runoff from this stream =       4.090(CFS)
Time of concentration =    12.71 min.
Rainfall intensity =      3.092(In/Hr)
Summary of stream data:

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


1       10.032       9.07                  3.495
2        4.090      12.71                  3.092
Qmax(1) =
           1.000 *    1.000 *     10.032) +
           1.000 *    0.714 *      4.090) + =       12.950
Qmax(2) =
           0.885 *    1.000 *     10.032) +
           1.000 *    1.000 *      4.090) + =       12.964
```



```
Total of 2 streams to confluence:
Flow rates before confluence point:
      10.032       4.090
Maximum flow rates at confluence using above data:
       12.950       12.964
Area of streams before confluence:
        4.100        1.320
Results of confluence:
Total flow rate =      12.964(CFS)
Time of concentration =     12.713 min.
Effective stream area after confluence =       5.420(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2012.000 to Point/Station     2012.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    12.71 min.
Rainfall intensity =      3.092(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.308(CFS) for    0.940(Ac.)
Total runoff =     14.272(CFS)  Total area =        6.36(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2013.000 to Point/Station     2012.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    12.71 min.
Rainfall intensity =      3.092(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.739(CFS) for    1.250(Ac.)
Total runoff =     16.011(CFS)  Total area =        7.61(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2014.000 to Point/Station     2012.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    12.71 min.
Rainfall intensity =      3.092(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.127(CFS) for    0.810(Ac.)
Total runoff =     17.138(CFS)  Total area =        8.42(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     2015.000 to Point/Station     2012.000
```

```
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =    12.71 min.
Rainfall intensity =      3.092(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.146(CFS) for    0.390(Ac.)
Total runoff =     18.283(CFS)  Total area =        8.81(Ac.)
End of computations, total study area =          8.810 (Ac.)
```

```
                    San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/03/18
------------------------------------------------------------------------
PROJECT CANTERA
PROPOSED CONDITIONS
3000P100

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


Program License Serial Number 4049
------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

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


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3021.000 to Point/Station     3022.000
**** 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
[SINGLE FAMILY area type                  ]
Initial subarea flow distance  =  128.000(Ft.)
Highest elevation =  325.000(Ft.)
Lowest elevation =  323.000(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      9.65 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*( 128.000^.5)/( 1.563^(1/3)]=    9.65
Rainfall intensity (I) =       3.418(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =       0.207(CFS)
Total initial stream area =        0.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3022.000 to Point/Station     3019.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   323.000(Ft.)
End of street segment elevation =   318.500(Ft.)
```



```
Length of street segment  =    253.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  10.000(Ft.)
Distance from crown to crossfall grade break  =   1.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =       0.930(CFS)
Depth of flow =   0.232(Ft.), Average velocity =   2.314(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =    5.249(Ft.)
Flow velocity =    2.31(Ft/s)
Travel time =    1.82 min.     TC =   11.47  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                  ]
Rainfall intensity =       3.210(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       1.359(CFS) for    0.770(Ac.)
Total runoff =       1.566(CFS)  Total area =          0.88(Ac.)
Street flow at end of street =       1.566(CFS)
Half street flow at end of street =       1.566(CFS)
Depth of flow =   0.266(Ft.), Average velocity =   2.548(Ft/s)
Flow width (from curb towards crown)=   6.987(Ft.)


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Process from Point/Station     3019.000 to Point/Station     3018.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   318.000(Ft.)
Downstream point/station elevation =   317.000(Ft.)
Pipe length  =    32.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      1.566(CFS)
Nearest computed pipe diameter  =       9.00(In.)
Calculated individual pipe flow  =      1.566(CFS)
Normal flow depth in pipe =     4.69(In.)
Flow top width inside pipe =     8.99(In.)
Critical Depth =     6.91(In.)
Pipe flow velocity =       6.73(Ft/s)
Travel time through pipe =     0.08 min.
Time of concentration (TC) =     11.55 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3020.000 to Point/Station     3018.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                  ]
Time of concentration =     11.55 min.
```

```
Rainfall intensity =      3.202(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       1.744(CFS) for     0.990(Ac.)
Total runoff =       3.310(CFS)  Total area =          1.87(Ac.)


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Process from Point/Station     3013.000 to Point/Station     3018.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                  ]
Time of concentration =     11.55 min.
Rainfall intensity =      3.202(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       0.793(CFS) for     0.450(Ac.)
Total runoff =       4.102(CFS)  Total area =          2.32(Ac.)


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Process from Point/Station     3014.000 to Point/Station     3018.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                  ]
Time of concentration =     11.55 min.
Rainfall intensity =      3.202(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       0.986(CFS) for     0.560(Ac.)
Total runoff =       5.089(CFS)  Total area =          2.88(Ac.)


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Process from Point/Station     3018.000 to Point/Station     3027.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    317.000(Ft.)
Downstream point/station elevation =    309.000(Ft.)
Pipe length   =    353.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow   =      5.089(CFS)
Nearest computed pipe diameter    =     12.00(In.)
Calculated individual pipe flow   =      5.089(CFS)
Normal flow depth in pipe =     9.33(In.)
Flow top width inside pipe =     9.98(In.)
Critical Depth =    11.05(In.)
Pipe flow velocity =       7.77(Ft/s)
Travel time through pipe =     0.76 min.
Time of concentration (TC) =    12.31 min.


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Process from Point/Station     3018.000 to Point/Station     3027.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =       2.880(Ac.)
Runoff from this stream =       5.089(CFS)
Time of concentration =    12.31 min.
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Rainfall intensity =      3.129(In/Hr)


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Process from Point/Station     3023.000 to Point/Station     3024.000
**** 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
[SINGLE FAMILY area type                  ]
Initial subarea flow distance  =    50.000(Ft.)
Highest elevation =  319.000(Ft.)
Lowest elevation =  318.500(Ft.)
Elevation difference =     0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =        7.00 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*(  50.000^.5)/( 1.000^(1/3)]=    7.00
Rainfall intensity (I) =        3.846(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =        0.106(CFS)
Total initial stream area =          0.050(Ac.)


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Process from Point/Station     3024.000 to Point/Station     3026.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =    318.500(Ft.)
End of street segment elevation =    310.000(Ft.)
Length of street segment   =    377.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =   10.000(Ft.)
Distance from crown to crossfall grade break  =    1.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =   12.000(Ft.)
Slope from curb to property line (v/hz) =    0.025
Gutter width =     2.000(Ft.)
Gutter hike from flowline =   2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =       0.156(CFS)
Depth of flow =    0.112(Ft.), Average velocity =    2.063(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =    2.000(Ft.)
Flow velocity =    2.06(Ft/s)
Travel time =     3.05 min.     TC =    10.05  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                  ]
Rainfall intensity =      3.369(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       1.760(CFS) for     0.950(Ac.)
Total runoff =       1.866(CFS)  Total area =          1.00(Ac.)
Street flow at end of street =       1.866(CFS)
Half street flow at end of street =       1.866(CFS)
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Depth of flow =   0.270(Ft.), Average velocity =   2.902(Ft/s)
Flow width (from curb towards crown)=   7.186(Ft.)


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Process from Point/Station     3026.000 to Point/Station     3027.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   309.500(Ft.)
Downstream point/station elevation =   308.000(Ft.)
Pipe length  =     25.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.866(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.866(CFS)
Normal flow depth in pipe =    4.30(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    7.49(In.)
Pipe flow velocity =       8.95(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    10.09 min.


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Process from Point/Station     3028.000 to Point/Station     3027.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =    10.09 min.
Rainfall intensity =      3.363(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      2.441(CFS) for    1.320(Ac.)
Total runoff =      4.307(CFS)  Total area =        2.32(Ac.)


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Process from Point/Station     3028.000 to Point/Station     3027.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.320(Ac.)
Runoff from this stream =      4.307(CFS)
Time of concentration =   10.09 min.
Rainfall intensity =     3.363(In/Hr)
Summary of stream data:

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


1        5.089     12.31                  3.129
2        4.307     10.09                  3.363
Qmax(1) =
          1.000 *    1.000 *    5.089) +
          0.930 *    1.000 *    4.307) + =        9.096
Qmax(2) =
          1.000 *    0.820 *    5.089) +
          1.000 *    1.000 *    4.307) + =        8.479

Total of 2 streams to confluence:
Flow rates before confluence point:
```



```
      5.089        4.307
Maximum flow rates at confluence using above data:
      9.096        8.479
Area of streams before confluence:
      2.880        2.320
Results of confluence:
Total flow rate =      9.096(CFS)
Time of concentration =    12.311 min.
Effective stream area after confluence =      5.200(Ac.)


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Process from Point/Station     3027.000 to Point/Station     3002.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   308.000(Ft.)
Downstream point/station elevation =   307.500(Ft.)
Pipe length  =     64.70(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.096(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     9.096(CFS)
Normal flow depth in pipe =   14.51(In.)
Flow top width inside pipe =   14.24(In.)
Critical Depth =   13.99(In.)
Pipe flow velocity =       5.96(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    12.49 min.


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Process from Point/Station     3027.000 to Point/Station     3002.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      5.200(Ac.)
Runoff from this stream =      9.096(CFS)
Time of concentration =   12.49 min.
Rainfall intensity =    3.112(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3011.000 to Point/Station     3012.000
**** 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
[SINGLE FAMILY area type                    ]
Initial subarea flow distance  =  155.000(Ft.)
Highest elevation =  336.000(Ft.)
Lowest elevation =  328.000(Ft.)
Elevation difference =    8.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      7.13 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*( 155.000^.5)/( 5.161^(1/3)]=    7.13
Rainfall intensity (I) =      3.819(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.546(CFS)
Total initial stream area =        0.260(Ac.)
```

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Process from Point/Station     3012.000 to Point/Station     3015.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   328.000(Ft.)
End of street segment elevation =   320.500(Ft.)
Length of street segment  =   388.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  10.000(Ft.)
Distance from crown to crossfall grade break  =   1.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      2.017(CFS)
Depth of flow =   0.282(Ft.), Average velocity =   2.775(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.746(Ft.)
Flow velocity =   2.77(Ft/s)
Travel time =    2.33 min.      TC =    9.46  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                ]
Rainfall intensity =       3.442(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       2.651(CFS) for    1.400(Ac.)
Total runoff =       3.197(CFS)  Total area =         1.66(Ac.)
Street flow at end of street =       3.197(CFS)
Half street flow at end of street =       3.197(CFS)
Depth of flow =   0.318(Ft.), Average velocity =   3.071(Ft/s)
Flow width (from curb towards crown)=   9.562(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3015.000 to Point/Station     3017.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   320.000(Ft.)
Downstream point/station elevation =   319.500(Ft.)
Pipe length  =     4.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.197(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.197(CFS)
Normal flow depth in pipe =    4.83(In.)
Flow top width inside pipe =    8.98(In.)
Critical depth could not be calculated.
Pipe flow velocity =      13.23(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =     9.47 min.


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Process from Point/Station     3016.000 to Point/Station     3017.000
**** SUBAREA FLOW ADDITION ****
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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
[SINGLE FAMILY area type                ]
Time of concentration =     9.47 min.
Rainfall intensity =       3.442(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       2.347(CFS) for    1.240(Ac.)
Total runoff =       5.544(CFS)  Total area =         2.90(Ac.)


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Process from Point/Station     3017.000 to Point/Station     3033.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   319.500(Ft.)
Downstream point/station elevation =   312.000(Ft.)
Pipe length  =    450.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.544(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.544(CFS)
Normal flow depth in pipe =    8.94(In.)
Flow top width inside pipe =   14.72(In.)
Critical Depth =    11.45(In.)
Pipe flow velocity =       7.27(Ft/s)
Travel time through pipe =    1.03 min.
Time of concentration (TC) =    10.50 min.


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Process from Point/Station     3008.000 to Point/Station     3033.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                ]
Time of concentration =    10.50 min.
Rainfall intensity =       3.315(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =       0.673(CFS) for    0.290(Ac.)
Total runoff =       6.217(CFS)  Total area =         3.19(Ac.)


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Process from Point/Station     3033.000 to Point/Station     3002.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   312.000(Ft.)
Downstream point/station elevation =   311.000(Ft.)
Pipe length  =     84.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.217(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.217(CFS)
Normal flow depth in pipe =   10.95(In.)
Flow top width inside pipe =   13.32(In.)
Critical Depth =    12.08(In.)
Pipe flow velocity =       6.48(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =    10.72 min.
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Process from Point/Station     3017.000 to Point/Station     3002.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =        3.190(Ac.)
Runoff from this stream =        6.217(CFS)
Time of concentration =   10.72 min.
Rainfall intensity =     3.291(In/Hr)
Summary of stream data:

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


1         9.096     12.49                3.112
2         6.217     10.72                3.291
Qmax(1) =
            1.000 *     1.000 *      9.096) +
            0.946 *     1.000 *      6.217) + =        14.975
Qmax(2) =
            1.000 *     0.858 *      9.096) +
            1.000 *     1.000 *      6.217) + =        14.019

Total of 2 main streams to confluence:
Flow rates before confluence point:
       9.096       6.217
Maximum flow rates at confluence using above data:
       14.975       14.019
Area of streams before confluence:
        5.200        3.190


Results of confluence:
Total flow rate =      14.975(CFS)
Time of concentration =    12.492 min.
Effective stream area after confluence  =        8.390(Ac.)


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Process from Point/Station     3002.000 to Point/Station     3032.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   311.000(Ft.)
Downstream point/station elevation =    303.000(Ft.)
Pipe length  =    68.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     14.975(CFS)
Nearest computed pipe diameter  =      15.00(In.)
Calculated individual pipe flow  =     14.975(CFS)
Normal flow depth in pipe =     9.04(In.)
Flow top width inside pipe =    14.68(In.)
Critical depth could not be calculated.
Pipe flow velocity =      19.39(Ft/s)
Travel time through pipe =     0.06 min.
Time of concentration (TC) =     12.55 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3031.000 to Point/Station     3032.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                         ]
Time of concentration =     12.55 min.
Rainfall intensity =       3.107(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       2.324(CFS) for     1.360(Ac.)
Total runoff =      17.298(CFS)  Total area =         9.75(Ac.)


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Process from Point/Station     3032.000 to Point/Station     3005.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   303.000(Ft.)
Downstream point/station elevation =    302.800(Ft.)
Pipe length  =     10.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     17.298(CFS)
Nearest computed pipe diameter  =      21.00(In.)
Calculated individual pipe flow  =     17.298(CFS)
Normal flow depth in pipe =    13.85(In.)
Flow top width inside pipe =    19.90(In.)
Critical Depth =    18.26(In.)
Pipe flow velocity =       10.28(Ft/s)
Travel time through pipe =     0.02 min.
Time of concentration (TC) =     12.57 min.


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Process from Point/Station     3032.000 to Point/Station     3005.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =       9.750(Ac.)
Runoff from this stream =       17.298(CFS)
Time of concentration =    12.57 min.
Rainfall intensity =      3.105(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3000.000 to Point/Station     3001.000
**** 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
[SINGLE FAMILY area type                         ]
Initial subarea flow distance  =     86.000(Ft.)
Highest elevation =  322.600(Ft.)
Lowest elevation =  320.600(Ft.)
Elevation difference =      2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      6.93 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*(  86.000^.5)/( 2.326^(1/3)]=    6.93
Rainfall intensity (I) =       3.861(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =       0.234(CFS)
Total initial stream area =         0.110(Ac.)


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Process from Point/Station     3001.000 to Point/Station     3005.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =    320.600(Ft.)
End of street segment elevation =    308.870(Ft.)
Length of street segment  =   729.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =   1.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  26.000(Ft.)
Slope from curb to property line (v/hz) =    0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      3.844(CFS)
Depth of flow =   0.342(Ft.), Average velocity =   2.985(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.776(Ft.)
Flow velocity =   2.98(Ft/s)
Travel time =    4.07 min.     TC =   11.00  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                    ]
Rainfall intensity =      3.260(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       6.096(CFS) for    3.400(Ac.)
Total runoff =      6.329(CFS)  Total area =        3.51(Ac.)
Street flow at end of street =      6.329(CFS)
Half street flow at end of street =      6.329(CFS)
Depth of flow =   0.392(Ft.), Average velocity =   3.356(Ft/s)
Flow width (from curb towards crown)=  13.264(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3001.000 to Point/Station     3005.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.510(Ac.)
Runoff from this stream =       6.329(CFS)
Time of concentration =   11.00 min.
Rainfall intensity =     3.260(In/Hr)
Summary of stream data:

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


1        17.298      12.57                   3.105
2         6.329      11.00                   3.260
Qmax(1) =
           1.000 *     1.000 *     17.298) +
           0.953 *     1.000 *      6.329) + =       23.327
Qmax(2) =
           1.000 *     0.875 *     17.298) +
           1.000 *     1.000 *      6.329) + =       21.471
```



```
Total of 2 streams to confluence:
Flow rates before confluence point:
     17.298        6.329
Maximum flow rates at confluence using above data:
       23.327        21.471
Area of streams before confluence:
        9.750         3.510
Results of confluence:
Total flow rate =      23.327(CFS)
Time of concentration =     12.567 min.
Effective stream area after confluence =      13.260(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3005.000 to Point/Station     3010.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   302.500(Ft.)
Downstream point/station elevation =   302.000(Ft.)
Pipe length  =     18.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     23.327(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     23.327(CFS)
Normal flow depth in pipe =   15.33(In.)
Flow top width inside pipe =   18.65(In.)
Critical Depth =   19.90(In.)
Pipe flow velocity =      12.39(Ft/s)
Travel time through pipe =     0.02 min.
Time of concentration (TC) =     12.59 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     3010.000 to Point/Station     3010.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    12.59 min.
Rainfall intensity =       3.103(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       1.005(CFS) for    0.720(Ac.)
Total runoff =      24.333(CFS)  Total area =       13.98(Ac.)
End of computations, total study area =        13.980 (Ac.)
```

```
San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 10/24/18
------------------------------------------------------------------------
PROJECT CANTERA
PROPOSED CONDITIONS
4200P100

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

Program License Serial Number 4049
------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

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

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4206.000 to Point/Station     4207.000
**** 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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =   93.940(Ft.)
Highest elevation =  435.000(Ft.)
Lowest elevation =  430.000(Ft.)
Elevation difference =    5.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     6.49 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*(  93.940^.5)/( 5.323^(1/3)]=    6.49
Rainfall intensity (I) =       3.957(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =       0.338(CFS)
Total initial stream area =        0.190(Ac.)

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4207.000 to Point/Station     4208.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   430.000(Ft.)
Downstream point elevation =   326.000(Ft.)
```



```
Channel length thru subarea  =   404.920(Ft.)
Channel base width        =   10.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =      1.638(CFS)
Manning's 'N'     = 0.015
Maximum depth of channel  =     2.000(Ft.)
Flow(q) thru subarea =      1.638(CFS)
Depth of flow =   0.032(Ft.), Average velocity =   5.066(Ft/s)
Channel flow top width =   10.064(Ft.)
Flow Velocity =     5.07(Ft/s)
Travel time  =    1.33 min.
Time of concentration =     7.83 min.
Critical depth =       0.094(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.689(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       2.424(CFS) for    1.460(Ac.)
Total runoff =      2.762(CFS)  Total area =        1.65(Ac.)

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4208.000 to Point/Station     4209.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   322.000(Ft.)
Downstream point/station elevation =   320.000(Ft.)
Pipe length  =    24.74(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     2.762(CFS)
Nearest computed pipe diameter  =     9.00(In.)
Calculated individual pipe flow  =     2.762(CFS)
Normal flow depth in pipe =     5.43(In.)
Flow top width inside pipe =    8.81(In.)
Critical Depth =     8.51(In.)
Pipe flow velocity =      9.91(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     7.87 min.

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4208.000 to Point/Station     4209.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.650(Ac.)
Runoff from this stream =      2.762(CFS)
Time of concentration =     7.87 min.
Rainfall intensity =     3.682(In/Hr)

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4200.000 to Point/Station     4201.000
**** 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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
```

```
Initial subarea flow distance  =  103.000(Ft.)
Highest elevation =  425.500(Ft.)
Lowest elevation =  425.000(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     15.11 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 103.000^.5)/( 0.485^(1/3)]=  15.11
Rainfall intensity (I) =       2.897(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =       0.300(CFS)
Total initial stream area =         0.230(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4201.000 to Point/Station     4202.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   425.000(Ft.)
Downstream point elevation =   384.000(Ft.)
Channel length thru subarea  =   281.000(Ft.)
Channel base width       =    5.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =       1.688(CFS)
Manning's 'N'     = 0.015
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.688(CFS)
Depth of flow =    0.059(Ft.), Average velocity =    5.655(Ft/s)
Channel flow top width =     5.118(Ft.)
Flow Velocity =      5.66(Ft/s)
Travel time  =    0.83 min.
Time of concentration =   15.94 min.
Critical depth =       0.150(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =       2.837(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       2.719(CFS) for    2.130(Ac.)
Total runoff =       3.019(CFS)  Total area =         2.36(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4202.000 to Point/Station     4204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     384.000(Ft.)
Downstream point/station elevation =     322.000(Ft.)
Pipe length  =    125.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      3.019(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =      3.019(CFS)
Normal flow depth in pipe =     3.93(In.)
Flow top width inside pipe =     5.71(In.)
Critical depth could not be calculated.
Pipe flow velocity =      22.17(Ft/s)
Travel time through pipe =     0.09 min.
Time of concentration (TC) =     16.03 min.
```



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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4203.000 to Point/Station     4204.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    16.03 min.
Rainfall intensity =       2.830(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       1.108(CFS) for    0.870(Ac.)
Total runoff =       4.127(CFS)  Total area =         3.23(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4204.000 to Point/Station     4209.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =     322.000(Ft.)
Downstream point/station elevation =     320.000(Ft.)
Pipe length  =    301.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      4.127(CFS)
Nearest computed pipe diameter  =      15.00(In.)
Calculated individual pipe flow  =      4.127(CFS)
Normal flow depth in pipe =    10.00(In.)
Flow top width inside pipe =    14.14(In.)
Critical Depth =     9.87(In.)
Pipe flow velocity =       4.75(Ft/s)
Travel time through pipe =     1.06 min.
Time of concentration (TC) =     17.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4204.000 to Point/Station     4209.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =       3.230(Ac.)
Runoff from this stream =       4.127(CFS)
Time of concentration =    17.09 min.
Rainfall intensity =       2.759(In/Hr)
Summary of stream data:

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


1         2.762      7.87                    3.682
2         4.127     17.09                    2.759
Qmax(1) =
           1.000 *    1.000 *     2.762) +
           1.000 *    0.461 *     4.127) + =        4.663
Qmax(2) =
           0.749 *    1.000 *     2.762) +
           1.000 *    1.000 *     4.127) + =        6.197

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.762        4.127
Maximum flow rates at confluence using above data:
       4.663        6.197
Area of streams before confluence:
```

```
        1.650        3.230
Results of confluence:
Total flow rate =      6.197(CFS)
Time of concentration =    17.087 min.
Effective stream area after confluence =      4.880(Ac.)
End of computations, total study area =          4.880 (Ac.)
```

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                 San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/23/18
------------------------------------------------------------------------
PROJECT CANTERA
PROPOSED CONDITIONS
4400P100

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

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


Program License Serial Number 4049

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

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


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4401.000 to Point/Station     4402.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                         ]
Initial subarea flow distance  =    86.230(Ft.)
Highest elevation =  259.000(Ft.)
Lowest elevation =  256.000(Ft.)
Elevation difference =    3.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      1.65 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  86.230^.5)/(   3.479^(1/3)]=   1.65
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       4.389(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =       0.417(CFS)
Total initial stream area =        0.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4402.000 to Point/Station     4403.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   256.000(Ft.)
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End of street segment elevation =   229.500(Ft.)
Length of street segment  =  1088.560(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =       3.127(CFS)
Depth of flow =    0.295(Ft.), Average velocity =    2.926(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =    9.988(Ft.)
Flow velocity =    2.93(Ft/s)
Travel time =     6.20 min.     TC =    11.20  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                         ]
Rainfall intensity =       3.238(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =       3.999(CFS) for    1.300(Ac.)
Total runoff =      4.416(CFS)  Total area =         1.40(Ac.)
Street flow at end of street =       4.416(CFS)
Half street flow at end of street =       4.416(CFS)
Depth of flow =    0.325(Ft.), Average velocity =    3.170(Ft/s)
Flow width (from curb towards crown)=  11.497(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4403.000 to Point/Station     4404.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    229.500(Ft.)
Downstream point/station elevation =    228.000(Ft.)
Pipe length  =     31.73(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =       4.416(CFS)
Nearest computed pipe diameter   =      12.00(In.)
Calculated individual pipe flow   =      4.416(CFS)
Normal flow depth in pipe =       7.10(In.)
Flow top width inside pipe =     11.80(In.)
Critical Depth =    10.57(In.)
Pipe flow velocity =        9.12(Ft/s)
Travel time through pipe =     0.06 min.
Time of concentration (TC) =     11.26 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4403.000 to Point/Station     4404.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =       1.400(Ac.)
Runoff from this stream =        4.416(CFS)
Time of concentration =    11.26 min.
Rainfall intensity =       3.232(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4405.000 to Point/Station     4406.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =   86.230(Ft.)
Highest elevation =  256.000(Ft.)
Lowest elevation =  254.500(Ft.)
Elevation difference =    1.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.08 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  86.230^.5)/(   1.740^(1/3)]=   2.08
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.417(CFS)
Total initial stream area =        0.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4406.000 to Point/Station     4407.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   254.500(Ft.)
End of street segment elevation =   229.400(Ft.)
Length of street segment  =  1107.270(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  40.000(Ft.)
Distance from crown to crossfall grade break  =  38.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  = 100.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  0.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      3.106(CFS)
Depth of flow =   0.119(Ft.), Average velocity =   2.616(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.960(Ft.)
Flow velocity =   2.62(Ft/s)
Travel time =    7.05 min.     TC =   12.05  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.153(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      3.864(CFS) for    1.290(Ac.)
Total runoff =      4.281(CFS)  Total area =        1.39(Ac.)
Street flow at end of street =      4.281(CFS)
Half street flow at end of street =      2.140(CFS)
```



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Depth of flow =   0.138(Ft.), Average velocity =   2.844(Ft/s)
Flow width (from curb towards crown)=   8.904(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4407.000 to Point/Station     4404.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   229.400(Ft.)
Downstream point/station elevation =   228.000(Ft.)
Pipe length  =    26.95(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     4.281(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.281(CFS)
Normal flow depth in pipe =    6.76(In.)
Flow top width inside pipe =   11.90(In.)
Critical Depth =   10.44(In.)
Pipe flow velocity =       9.40(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    12.10 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4407.000 to Point/Station     4404.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.390(Ac.)
Runoff from this stream =       4.281(CFS)
Time of concentration =   12.10 min.
Rainfall intensity =     3.148(In/Hr)
Summary of stream data:

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


1        4.416     11.26                3.232
2        4.281     12.10                3.148
Qmax(1) =
           1.000 *    1.000 *     4.416) +
           1.000 *    0.930 *     4.281) + =       8.399
Qmax(2) =
           0.974 *    1.000 *     4.416) +
           1.000 *    1.000 *     4.281) + =       8.583

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.416      4.281
Maximum flow rates at confluence using above data:
        8.399       8.583
Area of streams before confluence:
        1.400       1.390
Results of confluence:
Total flow rate =       8.583(CFS)
Time of concentration =    12.102 min.
Effective stream area after confluence =      2.790(Ac.)


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Process from Point/Station     4404.000 to Point/Station     4408.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   228.000(Ft.)
```

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Downstream point/station elevation =   199.300(Ft.)
Pipe length  =   614.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     8.583(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.583(CFS)
Normal flow depth in pipe =    9.33(In.)
Flow top width inside pipe =   14.55(In.)
Critical Depth =   13.68(In.)
Pipe flow velocity =     10.70(Ft/s)
Travel time through pipe =    0.96 min.
Time of concentration (TC) =    13.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4408.000 to Point/Station     4408.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =    13.06 min.
Rainfall intensity =      3.061(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      3.170(CFS) for    1.090(Ac.)
Total runoff =     11.753(CFS)  Total area =        3.88(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4409.000 to Point/Station     4408.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =    13.06 min.
Rainfall intensity =      3.061(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      2.763(CFS) for    0.950(Ac.)
Total runoff =     14.516(CFS)  Total area =        4.83(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4408.000 to Point/Station     4410.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   197.000(Ft.)
Downstream point/station elevation =   196.000(Ft.)
Pipe length  =    37.54(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =    14.516(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    14.516(CFS)
Normal flow depth in pipe =   14.39(In.)
Flow top width inside pipe =   14.41(In.)
Critical Depth =   16.73(In.)
Pipe flow velocity =      9.58(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    13.12 min.
End of computations, total study area =          4.830 (Ac.)
```

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              San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/25/18
------------------------------------------------------------------------
PROJECT CANTERA
PROPOSED CONDITIONS
4500P100


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

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


Program License Serial Number 4049
------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

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


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4500.000 to Point/Station     4501.000
**** 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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =   75.000(Ft.)
Highest elevation =  312.000(Ft.)
Lowest elevation =  288.000(Ft.)
Elevation difference =    24.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.19 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*(  75.000^.5)/(  32.000^(1/3)]=    3.19
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =        0.257(CFS)
Total initial stream area =        0.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4501.000 to Point/Station     4502.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =    288.000(Ft.)
```



```
Downstream point elevation =    220.000(Ft.)
Channel length thru subarea  =  1088.000(Ft.)
Channel base width      =      3.000(Ft.)
Slope or 'Z' of left channel bank =    1.000
Slope or 'Z' of right channel bank =    1.000
Estimated mean flow rate at midpoint of channel =       6.567(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =     1.000(Ft.)
Flow(q) thru subarea =      6.567(CFS)
Depth of flow =    0.234(Ft.), Average velocity =    8.665(Ft/s)
Channel flow top width =     3.469(Ft.)
Flow Velocity =     8.66(Ft/s)
Travel time  =    2.09 min.
Time of concentration =     7.09 min.
Critical depth =      0.500(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =        3.827(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      11.005(CFS) for     6.390(Ac.)
Total runoff =     11.262(CFS)  Total area =         6.52(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4503.000 to Point/Station     4502.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =     7.09 min.
Rainfall intensity =        3.827(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       4.116(CFS) for     2.390(Ac.)
Total runoff =     15.378(CFS)  Total area =         8.91(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4502.000 to Point/Station     4509.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    220.000(Ft.)
Downstream point/station elevation =    210.000(Ft.)
Pipe length  =    450.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     15.378(CFS)
Nearest computed pipe diameter  =      18.00(In.)
Calculated individual pipe flow  =     15.378(CFS)
Normal flow depth in pipe =    14.48(In.)
Flow top width inside pipe =    14.27(In.)
Critical Depth =    16.96(In.)
Pipe flow velocity =      10.10(Ft/s)
Travel time through pipe =    0.74 min.
Time of concentration (TC) =     7.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4502.000 to Point/Station     4509.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      8.910(Ac.)
Runoff from this stream =     15.378(CFS)
Time of concentration =    7.84 min.
Rainfall intensity =     3.688(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4504.000 to Point/Station     4505.000
**** 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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  129.000(Ft.)
Highest elevation =  375.000(Ft.)
Lowest elevation =  305.000(Ft.)
Elevation difference =    70.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      3.51 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 129.000^.5)/(  54.264^(1/3)]=    3.51
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       4.389(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =       0.612(CFS)
Total initial stream area =          0.310(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4505.000 to Point/Station     4506.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   305.000(Ft.)
Downstream point elevation =   210.000(Ft.)
Channel length thru subarea  =   366.000(Ft.)
Channel base width       =    3.000(Ft.)
Slope or 'Z' of left channel bank =    1.000
Slope or 'Z' of right channel bank =    1.000
Estimated mean flow rate at midpoint of channel =        3.614(CFS)
Manning's 'N'     = 0.015
Maximum depth of channel   =    1.000(Ft.)
Flow(q) thru subarea =      3.614(CFS)
Depth of flow =    0.107(Ft.), Average velocity =  10.903(Ft/s)
Channel flow top width =     3.213(Ft.)
Flow Velocity =    10.90(Ft/s)
Travel time   =    0.56 min.
Time of concentration =     5.56 min.
Critical depth =       0.344(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =       4.205(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =       5.753(CFS) for     3.040(Ac.)
Total runoff =       6.365(CFS)  Total area =          3.35(Ac.)
```



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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4506.000 to Point/Station     4508.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   210.000(Ft.)
Downstream point/station elevation =   208.000(Ft.)
Pipe length  =    198.00(Ft.)    Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      6.365(CFS)
Nearest computed pipe diameter   =      15.00(In.)
Calculated individual pipe flow  =      6.365(CFS)
Normal flow depth in pipe =    12.05(In.)
Flow top width inside pipe =    11.93(In.)
Critical Depth =    12.21(In.)
Pipe flow velocity =        6.03(Ft/s)
Travel time through pipe =     0.55 min.
Time of concentration (TC) =      6.11 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4506.000 to Point/Station     4508.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.350(Ac.)
Runoff from this stream =      6.365(CFS)
Time of concentration =     6.11 min.
Rainfall intensity =      4.053(In/Hr)
Summary of stream data:

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


1        15.378      7.84                3.688
2         6.365      6.11                4.053
Qmax(1) =
           1.000 *     1.000 *     15.378) +
           0.910 *     1.000 *      6.365) + =       21.170
Qmax(2) =
           1.000 *     0.779 *     15.378) +
           1.000 *     1.000 *      6.365) + =       18.351

Total of 2 streams to confluence:
Flow rates before confluence point:
     15.378       6.365
Maximum flow rates at confluence using above data:
      21.170       18.351
Area of streams before confluence:
        8.910        3.350
Results of confluence:
Total flow rate =       21.170(CFS)
Time of concentration =        7.835 min.
Effective stream area after confluence =       12.260(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     4508.000 to Point/Station     4509.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   208.000(Ft.)
Downstream point/station elevation =   200.000(Ft.)
Pipe length  =     83.00(Ft.)    Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     21.170(CFS)
Nearest computed pipe diameter   =      18.00(In.)
```

```
Calculated individual pipe flow  =     21.170(CFS)
Normal flow depth in pipe =   10.56(In.)
Flow top width inside pipe =   17.73(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.64(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     7.91 min.
End of computations, total study area =          12.260 (Ac.)
```

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                  San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 10/02/18
------------------------------------------------------------------------
PROJECT CANTERA
PROPOSED CONDITIONS
5000P100


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

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Program License Serial Number 4049

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

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


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     5044.000 to Point/Station     5045.000
**** 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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  156.000(Ft.)
Highest elevation =  380.000(Ft.)
Lowest elevation =  310.000(Ft.)
Elevation difference =   70.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     4.11 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 156.000^.5)/(  44.872^(1/3)]=   4.11
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      0.849(CFS)
Total initial stream area =        0.430(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     5045.000 to Point/Station     5052.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________

Top of street segment elevation =   308.000(Ft.)
```



```
End of street segment elevation =   302.200(Ft.)
Length of street segment  =   243.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  10.000(Ft.)
Distance from crown to crossfall grade break  =   1.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      4.641(CFS)
Depth of flow =   0.338(Ft.), Average velocity =   3.729(Ft/s)
Note:  depth of flow exceeds top of street crown.
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.000(Ft.)
Flow velocity =   3.73(Ft/s)
Travel time =     1.09 min.     TC =     6.09  min.
 Adding area flow to street
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
[MULTI - UNITS area type                    ]
Rainfall intensity =      4.058(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =     10.908(CFS) for    3.840(Ac.)
Total runoff =     11.757(CFS)  Total area =         4.27(Ac.)
Street flow at end of street =     11.757(CFS)
Half street flow at end of street =     11.757(CFS)
Depth of flow =   0.432(Ft.), Average velocity =   5.389(Ft/s)
Note:  depth of flow exceeds top of street crown.
Flow width (from curb towards crown)=  10.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     5052.000 to Point/Station     5053.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________

Upstream point/station elevation =   302.000(Ft.)
Downstream point/station elevation =   290.000(Ft.)
Pipe length  =    71.89(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.757(CFS)
Nearest computed pipe diameter   =    12.00(In.)
Calculated individual pipe flow  =    11.757(CFS)
Normal flow depth in pipe =    8.18(In.)
Flow top width inside pipe =   11.18(In.)
Critical depth could not be calculated.
Pipe flow velocity =    20.63(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     6.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     5050.000 to Point/Station     5053.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
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```
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                    ]
Time of concentration =     6.14 min.
Rainfall intensity =      4.043(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =      16.896(CFS) for    5.970(Ac.)
Total runoff =     28.654(CFS)  Total area =        10.24(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     5053.000 to Point/Station     5053.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =     6.14 min.
Rainfall intensity =      4.043(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.692(CFS) for    0.930(Ac.)
Total runoff =     30.346(CFS)  Total area =        11.17(Ac.)
End of computations, total study area =          11.170 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
        Rational Hydrology Study        Date: 12/20/18
------------------------------------------------------------------------
PROJECT CANTERA
PROPOSED CONDITIONS
6000P100


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

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


Program License Serial Number 4049

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

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


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6007.000 to Point/Station     6008.000
**** 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
[SINGLE FAMILY area type                    ]
Initial subarea flow distance  =   62.000(Ft.)
Highest elevation =  330.000(Ft.)
Lowest elevation =  328.000(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     5.28 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*(  62.000^.5)/( 3.226^(1/3)]=   5.28
Rainfall intensity (I) =      4.294(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.165(CFS)
Total initial stream area =        0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6008.000 to Point/Station     6010.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```



```
______________________________________________________________________
Top of street segment elevation =   328.000(Ft.)
End of street segment elevation =   324.000(Ft.)
Length of street segment  =   266.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      0.224(CFS)
Depth of flow =   0.150(Ft.), Average velocity =   1.523(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   2.754(Ft.)
Flow velocity =   1.52(Ft/s)
Travel time =    2.91 min.     TC =    8.19  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                    ]
Rainfall intensity =      3.629(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      1.417(CFS) for    0.710(Ac.)
Total runoff =      1.582(CFS)  Total area =        0.78(Ac.)
Street flow at end of street =      1.582(CFS)
Half street flow at end of street =      1.582(CFS)
Depth of flow =   0.261(Ft.), Average velocity =   2.081(Ft/s)
Flow width (from curb towards crown)=   8.302(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6010.000 to Point/Station     6011.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   324.000(Ft.)
Downstream point/station elevation =   323.500(Ft.)
Pipe length  =    24.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.582(CFS)
Nearest computed pipe diameter  =     9.00(In.)
Calculated individual pipe flow  =     1.582(CFS)
Normal flow depth in pipe =    5.37(In.)
Flow top width inside pipe =    8.83(In.)
Critical Depth =    6.95(In.)
Pipe flow velocity =      5.75(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     8.26 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6006.000 to Point/Station     6011.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =     8.26 min.
Rainfall intensity =      3.617(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      4.297(CFS) for    2.160(Ac.)
Total runoff =      5.880(CFS)  Total area =        2.94(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6011.000 to Point/Station     6012.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   323.000(Ft.)
Downstream point/station elevation =   322.500(Ft.)
Pipe length  =    42.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.880(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.880(CFS)
Normal flow depth in pipe =   10.48(In.)
Flow top width inside pipe =   13.77(In.)
Critical Depth =   11.78(In.)
Pipe flow velocity =      6.43(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     8.37 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6009.000 to Point/Station     6012.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =     8.37 min.
Rainfall intensity =      3.600(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      5.188(CFS) for    2.620(Ac.)
Total runoff =     11.067(CFS)  Total area =        5.56(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6012.000 to Point/Station     6018.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   322.200(Ft.)
Downstream point/station elevation =   317.800(Ft.)
Pipe length  =   212.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.067(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    11.067(CFS)
Normal flow depth in pipe =   11.44(In.)
Flow top width inside pipe =   17.33(In.)
Critical Depth =   15.29(In.)
Pipe flow velocity =      9.35(Ft/s)
Travel time through pipe =    0.38 min.
```



```
Time of concentration (TC) =     8.74 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6013.000 to Point/Station     6018.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =     8.74 min.
Rainfall intensity =      3.542(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.841(CFS) for    0.250(Ac.)
Total runoff =     11.909(CFS)  Total area =        5.81(Ac.)


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Process from Point/Station     6018.000 to Point/Station     6023.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   317.500(Ft.)
Downstream point/station elevation =   315.500(Ft.)
Pipe length  =   130.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.909(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    11.909(CFS)
Normal flow depth in pipe =   13.52(In.)
Flow top width inside pipe =   15.56(In.)
Critical Depth =   15.72(In.)
Pipe flow velocity =      8.36(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =     9.00 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6020.000 to Point/Station     6023.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =     9.00 min.
Rainfall intensity =      3.505(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.232(CFS) for    0.370(Ac.)
Total runoff =     13.141(CFS)  Total area =        6.18(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6022.000 to Point/Station     6023.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
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```
[INDUSTRIAL area type                        ]
Time of concentration =     9.00 min.
Rainfall intensity =      3.505(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.533(CFS) for    0.160(Ac.)
Total runoff =     13.673(CFS)  Total area =        6.34(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6023.000 to Point/Station     6054.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   315.500(Ft.)
Downstream point/station elevation =   314.500(Ft.)
Pipe length  =   327.36(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.673(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    13.673(CFS)
Normal flow depth in pipe =   18.26(In.)
Flow top width inside pipe =   25.27(In.)
Critical Depth =   15.42(In.)
Pipe flow velocity =      4.78(Ft/s)
Travel time through pipe =    1.14 min.
Time of concentration (TC) =    10.14 min.


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Process from Point/Station     6023.000 to Point/Station     6054.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      6.340(Ac.)
Runoff from this stream =     13.673(CFS)
Time of concentration =   10.14 min.
Rainfall intensity =     3.357(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station     6106.000 to Point/Station     6107.000
**** 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
[SINGLE FAMILY area type                     ]
Initial subarea flow distance  =   70.000(Ft.)
Highest elevation =  319.600(Ft.)
Lowest elevation =  319.200(Ft.)
Elevation difference =    0.400(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     9.98 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*(  70.000^.5)/( 0.571^(1/3)]=   9.98
Rainfall intensity (I) =      3.376(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.149(CFS)
Total initial stream area =        0.080(Ac.)
```



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Process from Point/Station     6107.000 to Point/Station     6019.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   319.200(Ft.)
End of street segment elevation =   318.200(Ft.)
Length of street segment  =    63.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      0.170(CFS)
Depth of flow =   0.124(Ft.), Average velocity =   1.848(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   1.500(Ft.)
Flow velocity =   1.85(Ft/s)
Travel time =    0.57 min.     TC =   10.55  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                     ]
Rainfall intensity =      3.309(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      0.528(CFS) for    0.290(Ac.)
Total runoff =      0.676(CFS)  Total area =        0.37(Ac.)
Street flow at end of street =      0.676(CFS)
Half street flow at end of street =      0.676(CFS)
Depth of flow =   0.206(Ft.), Average velocity =   1.779(Ft/s)
Flow width (from curb towards crown)=   5.558(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6019.000 to Point/Station     6021.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   318.000(Ft.)
Downstream point/station elevation =   317.800(Ft.)
Pipe length  =    12.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.676(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.676(CFS)
Normal flow depth in pipe =    4.59(In.)
Flow top width inside pipe =    5.08(In.)
Critical Depth =    4.99(In.)
Pipe flow velocity =      4.19(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    10.60 min.
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Process from Point/Station     6017.000 to Point/Station     6021.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                     ]
Time of concentration =    10.60 min.
Rainfall intensity =      3.304(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      0.618(CFS) for    0.340(Ac.)
Total runoff =      1.294(CFS)  Total area =        0.71(Ac.)


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Process from Point/Station     6021.000 to Point/Station     6112.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   317.800(Ft.)
Downstream point/station elevation =   316.800(Ft.)
Pipe length  =   205.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.294(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.294(CFS)
Normal flow depth in pipe =    6.14(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    5.77(In.)
Pipe flow velocity =      3.20(Ft/s)
Travel time through pipe =    1.07 min.
Time of concentration (TC) =    11.67 min.


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Process from Point/Station     6021.000 to Point/Station     6112.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.710(Ac.)
Runoff from this stream =      1.294(CFS)
Time of concentration =   11.67 min.
Rainfall intensity =     3.191(In/Hr)


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Process from Point/Station     6108.000 to Point/Station     6109.000
**** 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
[SINGLE FAMILY area type                     ]
Initial subarea flow distance  =   70.000(Ft.)
Highest elevation =  319.000(Ft.)
Lowest elevation =  318.600(Ft.)
Elevation difference =    0.400(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     9.98 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
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```
TC = [1.8*(1.1-0.5500)*(  70.000^.5)/( 0.571^(1/3)]=   9.98
Rainfall intensity (I) =      3.376(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.130(CFS)
Total initial stream area =        0.070(Ac.)


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Process from Point/Station     6109.000 to Point/Station     6110.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   318.600(Ft.)
End of street segment elevation =   317.300(Ft.)
Length of street segment  =   66.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  15.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      0.139(CFS)
Depth of flow =   0.110(Ft.), Average velocity =   1.906(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   1.500(Ft.)
Flow velocity =   1.91(Ft/s)
Travel time =    0.58 min.     TC =   10.56  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                     ]
Rainfall intensity =      3.308(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      0.255(CFS) for    0.140(Ac.)
Total runoff =      0.385(CFS)  Total area =        0.21(Ac.)
Street flow at end of street =      0.385(CFS)
Half street flow at end of street =      0.385(CFS)
Depth of flow =   0.171(Ft.), Average velocity =   1.779(Ft/s)
Flow width (from curb towards crown)=   3.808(Ft.)


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Process from Point/Station     6110.000 to Point/Station     6112.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   317.200(Ft.)
Downstream point/station elevation =   317.000(Ft.)
Pipe length  =    12.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.385(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.385(CFS)
Normal flow depth in pipe =    3.11(In.)
Flow top width inside pipe =    6.00(In.)
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Critical Depth =    3.78(In.)
Pipe flow velocity =      3.74(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    10.61 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6111.000 to Point/Station     6112.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =    10.61 min.
Rainfall intensity =      3.302(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      0.363(CFS) for    0.200(Ac.)
Total runoff =      0.748(CFS)  Total area =        0.41(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6111.000 to Point/Station     6112.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.410(Ac.)
Runoff from this stream =      0.748(CFS)
Time of concentration =   10.61 min.
Rainfall intensity =     3.302(In/Hr)
Summary of stream data:

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


1        1.294     11.67                3.191
2        0.748     10.61                3.302
Qmax(1) =
           1.000 *    1.000 *     1.294) +
           0.966 *    1.000 *     0.748) + =       2.017
Qmax(2) =
           1.000 *    0.910 *     1.294) +
           1.000 *    1.000 *     0.748) + =       1.925

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.294       0.748
Maximum flow rates at confluence using above data:
        2.017        1.925
Area of streams before confluence:
        0.710        0.410
Results of confluence:
Total flow rate =      2.017(CFS)
Time of concentration =    11.665 min.
Effective stream area after confluence =      1.120(Ac.)


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Process from Point/Station     6112.000 to Point/Station     6068.000
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**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   317.000(Ft.)
Downstream point/station elevation =   315.500(Ft.)
Pipe length  =    37.91(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.017(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.017(CFS)
Normal flow depth in pipe =    5.09(In.)
Flow top width inside pipe =    8.92(In.)
Critical Depth =    7.73(In.)
Pipe flow velocity =      7.82(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    11.75 min.


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Process from Point/Station     6112.000 to Point/Station     6068.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      1.120(Ac.)
Runoff from this stream =      2.017(CFS)
Time of concentration =   11.75 min.
Rainfall intensity =     3.183(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6113.000 to Point/Station     6114.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Initial subarea flow distance  =   54.000(Ft.)
Highest elevation =  314.800(Ft.)
Lowest elevation =  314.500(Ft.)
Elevation difference =    0.300(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.41 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  54.000^.5)/(   0.556^(1/3)]=   2.41
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.250(CFS)
Total initial stream area =        0.060(Ac.)


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Process from Point/Station     6114.000 to Point/Station     6115.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =   314.500(Ft.)
End of street segment elevation =   314.300(Ft.)
Length of street segment  =    28.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
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Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      0.259(CFS)
Depth of flow =   0.177(Ft.), Average velocity =   1.086(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   4.087(Ft.)
Flow velocity =   1.09(Ft/s)
Travel time =    0.43 min.     TC =    5.43  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                     ]
Rainfall intensity =      4.245(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      0.163(CFS) for    0.070(Ac.)
Total runoff =      0.414(CFS)  Total area =        0.13(Ac.)
Street flow at end of street =      0.414(CFS)
Half street flow at end of street =      0.414(CFS)
Depth of flow =   0.201(Ft.), Average velocity =   1.173(Ft/s)
Flow width (from curb towards crown)=   5.304(Ft.)


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Process from Point/Station     6115.000 to Point/Station     6117.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   318.000(Ft.)
Downstream point/station elevation =   317.700(Ft.)
Pipe length  =    10.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.414(CFS)
Nearest computed pipe diameter  =     6.00(In.)
Calculated individual pipe flow  =     0.414(CFS)
Normal flow depth in pipe =    2.74(In.)
Flow top width inside pipe =    5.98(In.)
Critical Depth =    3.93(In.)
Pipe flow velocity =      4.75(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     5.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6116.000 to Point/Station     6117.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                     ]
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Time of concentration =     5.46 min.
Rainfall intensity =      4.234(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      0.559(CFS) for    0.240(Ac.)
Total runoff =      0.973(CFS)  Total area =        0.37(Ac.)


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Process from Point/Station     6117.000 to Point/Station     6122.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   317.700(Ft.)
Downstream point/station elevation =   317.200(Ft.)
Pipe length  =   292.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.973(CFS)
Nearest computed pipe diameter  =    12.00(In.)
Calculated individual pipe flow  =     0.973(CFS)
Normal flow depth in pipe =    7.11(In.)
Flow top width inside pipe =   11.79(In.)
Critical Depth =    4.96(In.)
Pipe flow velocity =      2.00(Ft/s)
Travel time through pipe =    2.43 min.
Time of concentration (TC) =     7.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6120.000 to Point/Station     6122.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                     ]
Time of concentration =     7.89 min.
Rainfall intensity =      3.678(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      0.971(CFS) for    0.480(Ac.)
Total runoff =      1.944(CFS)  Total area =        0.85(Ac.)


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Process from Point/Station     6121.000 to Point/Station     6122.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                     ]
Time of concentration =     7.89 min.
Rainfall intensity =      3.678(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      1.194(CFS) for    0.590(Ac.)
Total runoff =      3.137(CFS)  Total area =        1.44(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6122.000 to Point/Station     6123.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
```

```
Upstream point/station elevation =   317.200(Ft.)
Downstream point/station elevation =   316.500(Ft.)
Pipe length  =   197.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.137(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     3.137(CFS)
Normal flow depth in pipe =   10.29(In.)
Flow top width inside pipe =   13.92(In.)
Critical Depth =    8.55(In.)
Pipe flow velocity =      3.50(Ft/s)
Travel time through pipe =    0.94 min.
Time of concentration (TC) =     8.83 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6122.000 to Point/Station     6123.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.440(Ac.)
Runoff from this stream =      3.137(CFS)
Time of concentration =    8.83 min.
Rainfall intensity =     3.530(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6063.000 to Point/Station     6064.000
**** 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
[SINGLE FAMILY area type                    ]
Initial subarea flow distance  =   69.000(Ft.)
Highest elevation =  317.000(Ft.)
Lowest elevation =  316.800(Ft.)
Elevation difference =    0.200(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =    12.43 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*(  69.000^.5)/( 0.290^(1/3)]=  12.43
Rainfall intensity (I) =      3.118(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.171(CFS)
Total initial stream area =        0.100(Ac.)


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Process from Point/Station     6064.000 to Point/Station     6099.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   316.800(Ft.)
End of street segment elevation =   312.300(Ft.)
Length of street segment  =   472.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
```



```
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      1.115(CFS)
Depth of flow =   0.252(Ft.), Average velocity =   1.612(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.874(Ft.)
Flow velocity =   1.61(Ft/s)
Travel time =    4.88 min.     TC =   17.30  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                    ]
Rainfall intensity =      2.745(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      1.660(CFS) for    1.100(Ac.)
Total runoff =      1.832(CFS)  Total area =        1.20(Ac.)
Street flow at end of street =      1.832(CFS)
Half street flow at end of street =      1.832(CFS)
Depth of flow =   0.289(Ft.), Average velocity =   1.803(Ft/s)
Flow width (from curb towards crown)=   9.719(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6099.000 to Point/Station     6101.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   318.000(Ft.)
Downstream point/station elevation =   317.700(Ft.)
Pipe length  =    12.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.832(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.832(CFS)
Normal flow depth in pipe =    5.55(In.)
Flow top width inside pipe =    8.75(In.)
Critical Depth =    7.43(In.)
Pipe flow velocity =      6.41(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    17.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6100.000 to Point/Station     6101.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =    17.34 min.
Rainfall intensity =      2.743(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      0.377(CFS) for    0.250(Ac.)
Total runoff =      2.209(CFS)  Total area =        1.45(Ac.)
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Process from Point/Station     6101.000 to Point/Station     6105.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   317.700(Ft.)
Downstream point/station elevation =   317.200(Ft.)
Pipe length  =   346.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.209(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     2.209(CFS)
Normal flow depth in pipe =   11.12(In.)
Flow top width inside pipe =   13.14(In.)
Critical Depth =    7.11(In.)
Pipe flow velocity =      2.26(Ft/s)
Travel time through pipe =    2.55 min.
Time of concentration (TC) =    19.88 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6103.000 to Point/Station     6105.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =    19.88 min.
Rainfall intensity =      2.587(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      1.437(CFS) for    1.010(Ac.)
Total runoff =      3.646(CFS)  Total area =        2.46(Ac.)


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Process from Point/Station     6104.000 to Point/Station     6105.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =    19.88 min.
Rainfall intensity =      2.587(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      0.996(CFS) for    0.700(Ac.)
Total runoff =      4.642(CFS)  Total area =        3.16(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6105.000 to Point/Station     6123.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   317.200(Ft.)
Downstream point/station elevation =   316.500(Ft.)
Pipe length  =   185.69(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.642(CFS)
Nearest computed pipe diameter  =     18.00(In.)
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Calculated individual pipe flow  =     4.642(CFS)
Normal flow depth in pipe =   11.31(In.)
Flow top width inside pipe =   17.40(In.)
Critical Depth =    9.93(In.)
Pipe flow velocity =      3.97(Ft/s)
Travel time through pipe =    0.78 min.
Time of concentration (TC) =    20.66 min.


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Process from Point/Station     6105.000 to Point/Station     6123.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      3.160(Ac.)
Runoff from this stream =      4.642(CFS)
Time of concentration =   20.66 min.
Rainfall intensity =     2.543(In/Hr)
Summary of stream data:

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


1        3.137      8.83                 3.530
2        4.642     20.66                 2.543
Qmax(1) =
           1.000 *    1.000 *     3.137) +
           1.000 *    0.427 *     4.642) + =       5.121
Qmax(2) =
           0.720 *    1.000 *     3.137) +
           1.000 *    1.000 *     4.642) + =       6.902

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.137       4.642
Maximum flow rates at confluence using above data:
        5.121        6.902
Area of streams before confluence:
        1.440        3.160
Results of confluence:
Total flow rate =      6.902(CFS)
Time of concentration =    20.662 min.
Effective stream area after confluence =      4.600(Ac.)


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Process from Point/Station     6123.000 to Point/Station     6068.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   316.500(Ft.)
Downstream point/station elevation =   315.500(Ft.)
Pipe length  =   155.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.902(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     6.902(CFS)
Normal flow depth in pipe =   12.38(In.)
Flow top width inside pipe =   16.69(In.)
Critical Depth =   12.19(In.)
Pipe flow velocity =      5.32(Ft/s)
Travel time through pipe =    0.49 min.
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Time of concentration (TC) =    21.15 min.


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Process from Point/Station     6123.000 to Point/Station     6068.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.600(Ac.)
Runoff from this stream =      6.902(CFS)
Time of concentration =   21.15 min.
Rainfall intensity =     2.516(In/Hr)
Summary of stream data:

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


1        2.017     11.75                 3.183
2        6.902     21.15                 2.516
Qmax(1) =
           1.000 *    1.000 *     2.017) +
           1.000 *    0.555 *     6.902) + =       5.851
Qmax(2) =
           0.791 *    1.000 *     2.017) +
           1.000 *    1.000 *     6.902) + =       8.497

Total of 2 main streams to confluence:
Flow rates before confluence point:
       2.017       6.902
Maximum flow rates at confluence using above data:
        5.851        8.497
Area of streams before confluence:
        1.120        4.600


Results of confluence:
Total flow rate =      8.497(CFS)
Time of concentration =    21.147 min.
Effective stream area after confluence  =      5.720(Ac.)


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Process from Point/Station     6068.000 to Point/Station     6054.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   315.500(Ft.)
Downstream point/station elevation =   314.500(Ft.)
Pipe length  =    91.38(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.497(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.497(CFS)
Normal flow depth in pipe =   11.88(In.)
Flow top width inside pipe =   17.05(In.)
Critical Depth =   13.54(In.)
Pipe flow velocity =      6.86(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =    21.37 min.
```



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Process from Point/Station     6068.000 to Point/Station     6054.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.720(Ac.)
Runoff from this stream =      8.497(CFS)
Time of concentration =   21.37 min.
Rainfall intensity =     2.504(In/Hr)
Summary of stream data:

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


1        2.017     11.75                 3.183
2        8.497     21.37                 2.504
Qmax(1) =
           1.000 *    1.000 *     2.017) +
           1.000 *    0.550 *     8.497) + =       6.688
Qmax(2) =
           0.787 *    1.000 *     2.017) +
           1.000 *    1.000 *     8.497) + =      10.084

Total of 2 main streams to confluence:
Flow rates before confluence point:
       2.017       8.497
Maximum flow rates at confluence using above data:
        6.688       10.084
Area of streams before confluence:
        1.120        5.720


Results of confluence:
Total flow rate =     10.084(CFS)
Time of concentration =    21.369 min.
Effective stream area after confluence  =      6.840(Ac.)


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Process from Point/Station     6054.000 to Point/Station     6078.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   314.500(Ft.)
Downstream point/station elevation =   304.500(Ft.)
Pipe length  =   346.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.084(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    10.084(CFS)
Normal flow depth in pipe =   11.32(In.)
Flow top width inside pipe =   12.91(In.)
Critical Depth =   14.23(In.)
Pipe flow velocity =     10.15(Ft/s)
Travel time through pipe =    0.57 min.
Time of concentration (TC) =    21.94 min.


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Process from Point/Station     6081.000 to Point/Station     6078.000
**** SUBAREA FLOW ADDITION ****
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```
________________________________________________________________________
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
[SINGLE FAMILY area type                     ]
Time of concentration =    21.94 min.
Rainfall intensity =      2.474(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      2.857(CFS) for    2.100(Ac.)
Total runoff =     12.941(CFS)  Total area =        8.94(Ac.)


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Process from Point/Station     6080.000 to Point/Station     6078.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                     ]
Time of concentration =    21.94 min.
Rainfall intensity =      2.474(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      4.000(CFS) for    2.940(Ac.)
Total runoff =     16.941(CFS)  Total area =       11.88(Ac.)


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Process from Point/Station     6078.000 to Point/Station     6060.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   304.500(Ft.)
Downstream point/station elevation =   300.500(Ft.)
Pipe length  =   113.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.941(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    16.941(CFS)
Normal flow depth in pipe =   12.83(In.)
Flow top width inside pipe =   16.29(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.57(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    22.09 min.


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Process from Point/Station     6078.000 to Point/Station     6060.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     11.880(Ac.)
Runoff from this stream =     16.941(CFS)
Time of concentration =   22.09 min.
Rainfall intensity =     2.466(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station     6030.000 to Point/Station     6031.000
**** 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
[SINGLE FAMILY area type                     ]
Initial subarea flow distance  =  108.000(Ft.)
Highest elevation =  326.000(Ft.)
Lowest elevation =  324.000(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     8.38 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*( 108.000^.5)/( 1.852^(1/3)]=   8.38
Rainfall intensity (I) =      3.598(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.297(CFS)
Total initial stream area =        0.150(Ac.)


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Process from Point/Station     6031.000 to Point/Station     6032.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =   324.000(Ft.)
End of street segment elevation =   318.500(Ft.)
Length of street segment  =   441.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =   8.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      1.346(CFS)
Depth of flow =   0.256(Ft.), Average velocity =   1.866(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.061(Ft.)
Flow velocity =   1.87(Ft/s)
Travel time =    3.94 min.     TC =   12.32  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                     ]
Rainfall intensity =      3.128(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      1.824(CFS) for    1.060(Ac.)
Total runoff =      2.121(CFS)  Total area =        1.21(Ac.)
Street flow at end of street =      2.121(CFS)
Half street flow at end of street =      2.121(CFS)
Depth of flow =   0.290(Ft.), Average velocity =   2.068(Ft/s)
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Flow width (from curb towards crown)=   9.768(Ft.)


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Process from Point/Station     6032.000 to Point/Station     6035.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   318.000(Ft.)
Downstream point/station elevation =   317.500(Ft.)
Pipe length  =    24.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.121(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.121(CFS)
Normal flow depth in pipe =    6.63(In.)
Flow top width inside pipe =    7.92(In.)
Critical Depth =    7.88(In.)
Pipe flow velocity =      6.08(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    12.38 min.


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Process from Point/Station     6034.000 to Point/Station     6035.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =    12.38 min.
Rainfall intensity =      3.122(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.919(CFS) for    0.310(Ac.)
Total runoff =      3.040(CFS)  Total area =       1.52(Ac.)


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Process from Point/Station     6035.000 to Point/Station     6040.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   317.500(Ft.)
Downstream point/station elevation =   313.800(Ft.)
Pipe length  =   217.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.040(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.040(CFS)
Normal flow depth in pipe =    7.07(In.)
Flow top width inside pipe =   11.81(In.)
Critical Depth =    8.97(In.)
Pipe flow velocity =      6.31(Ft/s)
Travel time through pipe =    0.57 min.
Time of concentration (TC) =    12.96 min.


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Process from Point/Station     6035.000 to Point/Station     6040.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.520(Ac.)
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Runoff from this stream =      3.040(CFS)
Time of concentration =   12.96 min.
Rainfall intensity =     3.070(In/Hr)
Summary of stream data:

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


1        3.137      8.83                 3.530
2        3.040     12.96                 3.070
Qmax(1) =
           1.000 *    1.000 *     3.137) +
           1.000 *    0.682 *     3.040) + =       5.209
Qmax(2) =
           0.870 *    1.000 *     3.137) +
           1.000 *    1.000 *     3.040) + =       5.769

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.137       3.040
Maximum flow rates at confluence using above data:
        5.209        5.769
Area of streams before confluence:
        1.440        1.520
Results of confluence:
Total flow rate =      5.769(CFS)
Time of concentration =    12.956 min.
Effective stream area after confluence =      2.960(Ac.)


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Process from Point/Station     6036.000 to Point/Station     6037.000
**** 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
[SINGLE FAMILY area type                     ]
Initial subarea flow distance  =   84.000(Ft.)
Highest elevation =  320.000(Ft.)
Lowest elevation =  318.000(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     6.80 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*(  84.000^.5)/( 2.381^(1/3)]=   6.80
Rainfall intensity (I) =      3.890(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.214(CFS)
Total initial stream area =        0.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6037.000 to Point/Station     6038.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   318.000(Ft.)
End of street segment elevation =   313.800(Ft.)
Length of street segment  =   211.000(Ft.)
```

```
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      0.727(CFS)
Depth of flow =   0.204(Ft.), Average velocity =   1.977(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   5.446(Ft.)
Flow velocity =   1.98(Ft/s)
Travel time =    1.78 min.     TC =    8.57  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                    ]
Rainfall intensity =      3.568(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      0.942(CFS) for    0.480(Ac.)
Total runoff =      1.156(CFS)  Total area =        0.58(Ac.)
Street flow at end of street =      1.156(CFS)
Half street flow at end of street =      1.156(CFS)
Depth of flow =   0.231(Ft.), Average velocity =   2.169(Ft/s)
Flow width (from curb towards crown)=   6.794(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6038.000 to Point/Station     6040.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   313.500(Ft.)
Downstream point/station elevation =   313.000(Ft.)
Pipe length  =    24.27(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.156(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.156(CFS)
Normal flow depth in pipe =    4.43(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    5.93(In.)
Pipe flow velocity =      5.34(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     8.65 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6039.000 to Point/Station     6040.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
```



```
[SINGLE FAMILY area type                    ]
Time of concentration =     8.65 min.
Rainfall intensity =      3.556(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      4.988(CFS) for    2.550(Ac.)
Total runoff =      6.144(CFS)  Total area =        3.13(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6039.000 to Point/Station     6040.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =     8.65 min.
Rainfall intensity =      3.556(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.507(CFS) for    0.150(Ac.)
Total runoff =      6.651(CFS)  Total area =        3.28(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6039.000 to Point/Station     6040.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      3.280(Ac.)
Runoff from this stream =      6.651(CFS)
Time of concentration =    8.65 min.
Rainfall intensity =     3.556(In/Hr)
Summary of stream data:

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


1        3.137      8.83                  3.530
2        6.651      8.65                  3.556
Qmax(1) =
           1.000 *    1.000 *     3.137) +
           0.992 *    1.000 *     6.651) + =       9.738
Qmax(2) =
           1.000 *    0.979 *     3.137) +
           1.000 *    1.000 *     6.651) + =       9.723

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.137       6.651
Maximum flow rates at confluence using above data:
        9.738        9.723
Area of streams before confluence:
        1.440        3.280
Results of confluence:
Total flow rate =      9.738(CFS)
Time of concentration =     8.831 min.
Effective stream area after confluence =      4.720(Ac.)
```

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Process from Point/Station     6040.000 to Point/Station     6046.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   313.000(Ft.)
Downstream point/station elevation =   305.000(Ft.)
Pipe length  =   240.90(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.738(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     9.738(CFS)
Normal flow depth in pipe =   10.41(In.)
Flow top width inside pipe =   13.83(In.)
Critical Depth =   14.12(In.)
Pipe flow velocity =     10.72(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =     9.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6045.000 to Point/Station     6046.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =     9.21 min.
Rainfall intensity =      3.477(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.408(CFS) for    0.900(Ac.)
Total runoff =     11.146(CFS)  Total area =        5.62(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6044.000 to Point/Station     6046.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =     9.21 min.
Rainfall intensity =      3.477(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      3.040(CFS) for    1.590(Ac.)
Total runoff =     14.186(CFS)  Total area =        7.21(Ac.)


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Process from Point/Station     6046.000 to Point/Station     6060.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   305.000(Ft.)
Downstream point/station elevation =   300.500(Ft.)
Pipe length  =   221.31(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.186(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    14.186(CFS)
Normal flow depth in pipe =   13.97(In.)
```



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Flow top width inside pipe =   15.01(In.)
Critical Depth =   16.64(In.)
Pipe flow velocity =      9.64(Ft/s)
Travel time through pipe =    0.38 min.
Time of concentration (TC) =     9.59 min.


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Process from Point/Station     6046.000 to Point/Station     6060.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      7.210(Ac.)
Runoff from this stream =     14.186(CFS)
Time of concentration =    9.59 min.
Rainfall intensity =     3.426(In/Hr)
Summary of stream data:

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


1       16.941     22.09                 2.466
2       14.186      9.59                 3.426
Qmax(1) =
           1.000 *    1.000 *    16.941) +
           0.720 *    1.000 *    14.186) + =      27.152
Qmax(2) =
           1.000 *    0.434 *    16.941) +
           1.000 *    1.000 *    14.186) + =      21.540

Total of 2 main streams to confluence:
Flow rates before confluence point:
      16.941      14.186
Maximum flow rates at confluence using above data:
       27.152       21.540
Area of streams before confluence:
       11.880        7.210


Results of confluence:
Total flow rate =     27.152(CFS)
Time of concentration =    22.087 min.
Effective stream area after confluence  =     19.090(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     6060.000 to Point/Station     6061.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   300.500(Ft.)
Downstream point/station elevation =   292.000(Ft.)
Pipe length  =   185.22(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    27.152(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    27.152(CFS)
Normal flow depth in pipe =   14.20(In.)
Flow top width inside pipe =   19.65(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.68(Ft/s)
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Travel time through pipe =    0.20 min.
Time of concentration (TC) =    22.28 min.


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Process from Point/Station     6062.000 to Point/Station     6061.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =    22.28 min.
Rainfall intensity =      2.456(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      1.513(CFS) for    1.120(Ac.)
Total runoff =     28.665(CFS)  Total area =       20.21(Ac.)


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Process from Point/Station     6056.000 to Point/Station     6061.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =    22.28 min.
Rainfall intensity =      2.456(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      1.931(CFS) for    1.430(Ac.)
Total runoff =     30.596(CFS)  Total area =       21.64(Ac.)


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Process from Point/Station     6061.000 to Point/Station     6096.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   293.000(Ft.)
Downstream point/station elevation =   265.000(Ft.)
Pipe length  =   161.70(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    30.596(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    30.596(CFS)
Normal flow depth in pipe =   11.10(In.)
Flow top width inside pipe =   17.50(In.)
Critical depth could not be calculated.
Pipe flow velocity =     26.76(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    22.38 min.


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Process from Point/Station     6095.000 to Point/Station     6096.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
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Decimal fraction soil group D = 1.000
[COMMERCIAL area type                       ]
Time of concentration =    22.38 min.
Rainfall intensity =      2.450(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =     10.226(CFS) for    4.910(Ac.)
Total runoff =     40.823(CFS)  Total area =       26.55(Ac.)


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Process from Point/Station     6096.000 to Point/Station     6096.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    22.38 min.
Rainfall intensity =      2.450(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      2.701(CFS) for    2.450(Ac.)
Total runoff =     43.524(CFS)  Total area =       29.00(Ac.)
End of computations, total study area =          34.300 (Ac.)
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San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study         Date: 10/03/18
------------------------------------------------------------------------
PROJECT CANTERA
PROPOSED CONDITIONS
7000P100


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


Program License Serial Number 4049

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

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


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Process from Point/Station     7050.000 to Point/Station     7051.000
**** 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
[SINGLE FAMILY area type                    ]
Initial subarea flow distance  =  186.000(Ft.)
Highest elevation =  333.300(Ft.)
Lowest elevation =  330.590(Ft.)
Elevation difference =    2.710(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =    11.91 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*( 186.000^.5)/( 1.457^(1/3)]=  11.91
Rainfall intensity (I) =      3.167(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =       0.592(CFS)
Total initial stream area =        0.340(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     7051.000 to Point/Station     7052.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =    330.590(Ft.)
End of street segment elevation =    321.000(Ft.)
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Length of street segment  =   238.460(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  15.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      1.115(CFS)
Depth of flow =   0.208(Ft.), Average velocity =   2.851(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   5.655(Ft.)
Flow velocity =   2.85(Ft/s)
Travel time =    1.39 min.     TC =   13.30  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                    ]
Rainfall intensity =      3.040(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       1.003(CFS) for    0.600(Ac.)
Total runoff =      1.595(CFS)  Total area =          0.94(Ac.)
Street flow at end of street =       1.595(CFS)
Half street flow at end of street =       1.595(CFS)
Depth of flow =   0.229(Ft.), Average velocity =   3.064(Ft/s)
Flow width (from curb towards crown)=   6.704(Ft.)


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Process from Point/Station     7052.000 to Point/Station     7054.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   319.000(Ft.)
Downstream point/station elevation =   318.500(Ft.)
Pipe length  =    20.75(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.595(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.595(CFS)
Normal flow depth in pipe =     5.13(In.)
Flow top width inside pipe =    8.91(In.)
Critical Depth =    6.97(In.)
Pipe flow velocity =       6.12(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    13.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     7053.000 to Point/Station     7054.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =    13.36 min.
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Rainfall intensity =      3.035(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      0.985(CFS) for    0.590(Ac.)
Total runoff =      2.580(CFS)  Total area =        1.53(Ac.)


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Process from Point/Station     7054.000 to Point/Station     7020.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
Upstream point/station elevation =   318.500(Ft.)
Downstream point/station elevation =   306.000(Ft.)
Pipe length  =   273.62(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.580(CFS)
Nearest computed pipe diameter  =     9.00(In.)
Calculated individual pipe flow  =     2.580(CFS)
Normal flow depth in pipe =    5.71(In.)
Flow top width inside pipe =    8.67(In.)
Critical Depth =    8.37(In.)
Pipe flow velocity =      8.74(Ft/s)
Travel time through pipe =    0.52 min.
Time of concentration (TC) =    13.88 min.


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Process from Point/Station     7016.000 to Point/Station     7020.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =    13.88 min.
Rainfall intensity =      2.992(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.711(CFS) for    0.250(Ac.)
Total runoff =      3.291(CFS)  Total area =        1.78(Ac.)


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Process from Point/Station     7020.000 to Point/Station     7022.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
Upstream point/station elevation =   306.000(Ft.)
Downstream point/station elevation =   305.000(Ft.)
Pipe length  =    63.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.291(CFS)
Nearest computed pipe diameter  =    12.00(In.)
Calculated individual pipe flow  =     3.291(CFS)
Normal flow depth in pipe =    7.63(In.)
Flow top width inside pipe =   11.55(In.)
Critical Depth =    9.32(In.)
Pipe flow velocity =      6.24(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    14.05 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     7021.000 to Point/Station     7022.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
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Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                 ]
Time of concentration =    14.05 min.
Rainfall intensity =      2.978(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      3.129(CFS) for    1.910(Ac.)
Total runoff =      6.420(CFS)  Total area =        3.69(Ac.)


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Process from Point/Station     7022.000 to Point/Station     7026.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
Upstream point/station elevation =   305.000(Ft.)
Downstream point/station elevation =   302.000(Ft.)
Pipe length  =   195.96(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.420(CFS)
Nearest computed pipe diameter  =    15.00(In.)
Calculated individual pipe flow  =     6.420(CFS)
Normal flow depth in pipe =   10.17(In.)
Flow top width inside pipe =   14.02(In.)
Critical Depth =   12.26(In.)
Pipe flow velocity =      7.24(Ft/s)
Travel time through pipe =    0.45 min.
Time of concentration (TC) =    14.50 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     7023.000 to Point/Station     7026.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =    14.50 min.
Rainfall intensity =      2.943(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.202(CFS) for    0.430(Ac.)
Total runoff =      7.622(CFS)  Total area =        4.12(Ac.)


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Process from Point/Station     7025.000 to Point/Station     7026.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =    14.50 min.
Rainfall intensity =      2.943(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.643(CFS) for    0.230(Ac.)
Total runoff =      8.265(CFS)  Total area =        4.35(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     7026.000 to Point/Station     7012.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
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Upstream point/station elevation =   302.000(Ft.)
Downstream point/station elevation =    301.000(Ft.)
Pipe length  =   147.62(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.265(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.265(CFS)
Normal flow depth in pipe =   14.09(In.)
Flow top width inside pipe =   14.85(In.)
Critical Depth =    13.36(In.)
Pipe flow velocity =      5.57(Ft/s)
Travel time through pipe =    0.44 min.
Time of concentration (TC) =    14.94 min.


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Process from Point/Station     7026.000 to Point/Station     7012.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________

Along Main Stream number: 1 in normal stream number 1
Stream flow area =      4.350(Ac.)
Runoff from this stream =      8.265(CFS)
Time of concentration =   14.94 min.
Rainfall intensity =     2.909(In/Hr)


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Process from Point/Station     7005.000 to Point/Station     7006.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =   33.000(Ft.)
Highest elevation =  306.000(Ft.)
Lowest elevation =  305.800(Ft.)
Elevation difference =    0.200(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.83 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  33.000^.5)/(   0.606^(1/3)]=   1.83
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.125(CFS)
Total initial stream area =        0.030(Ac.)


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Process from Point/Station     7006.000 to Point/Station     7007.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________

Top of street segment elevation =   305.800(Ft.)
End of street segment elevation =   305.600(Ft.)
Length of street segment  =    73.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  15.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
```



```
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      0.130(CFS)
Depth of flow =   0.166(Ft.), Average velocity =   0.657(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   3.561(Ft.)
Flow velocity =   0.66(Ft/s)
Travel time =    1.85 min.     TC =    6.85  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.877(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.295(CFS) for    0.080(Ac.)
Total runoff =      0.420(CFS)  Total area =        0.11(Ac.)
Street flow at end of street =      0.420(CFS)
Half street flow at end of street =      0.420(CFS)
Depth of flow =   0.230(Ft.), Average velocity =   0.801(Ft/s)
Flow width (from curb towards crown)=   6.728(Ft.)


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Process from Point/Station     7007.000 to Point/Station     7010.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________

Upstream point/station elevation =   303.500(Ft.)
Downstream point/station elevation =    303.400(Ft.)
Pipe length  =     4.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.420(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.420(CFS)
Normal flow depth in pipe =    2.96(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    3.96(In.)
Pipe flow velocity =      4.36(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     6.87 min.


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Process from Point/Station     7009.000 to Point/Station     7010.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     6.87 min.
Rainfall intensity =      3.874(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.288(CFS) for    0.350(Ac.)
Total runoff =      1.708(CFS)  Total area =        0.46(Ac.)


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Process from Point/Station     7010.000 to Point/Station     7012.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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Upstream point/station elevation =   303.400(Ft.)
Downstream point/station elevation =   301.000(Ft.)
Pipe length  =    44.42(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.708(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.708(CFS)
Normal flow depth in pipe =    4.20(In.)
Flow top width inside pipe =    8.98(In.)
Critical Depth =    7.20(In.)
Pipe flow velocity =      8.45(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     6.96 min.


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Process from Point/Station     7010.000 to Point/Station     7012.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.460(Ac.)
Runoff from this stream =       1.708(CFS)
Time of concentration =    6.96 min.
Rainfall intensity =     3.855(In/Hr)


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Process from Point/Station     7000.000 to Point/Station     7001.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =   57.000(Ft.)
Highest elevation =  323.500(Ft.)
Lowest elevation =  315.000(Ft.)
Elevation difference =    8.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =       0.83 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  57.000^.5)/(  14.912^(1/3)]=    0.83
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =       0.375(CFS)
Total initial stream area =        0.090(Ac.)


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Process from Point/Station     7001.000 to Point/Station     7002.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   315.000(Ft.)
End of street segment elevation =   308.000(Ft.)
Length of street segment  =   481.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  20.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.017
Slope from grade break to crown (v/hz)  =   0.017
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
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Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0170
 Manning's N from gutter to grade break =  0.0170
 Manning's N from grade break to crown =  0.0170
Estimated mean flow rate at midpoint of street =      0.540(CFS)
Depth of flow =   0.212(Ft.), Average velocity =   1.705(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   4.656(Ft.)
Flow velocity =   1.70(Ft/s)
Travel time =    4.70 min.      TC =    9.70  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.411(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      2.852(CFS) for    0.880(Ac.)
Total runoff =      3.227(CFS)  Total area =          0.97(Ac.)
Street flow at end of street =       3.227(CFS)
Half street flow at end of street =       3.227(CFS)
Depth of flow =   0.335(Ft.), Average velocity =   2.410(Ft/s)
Flow width (from curb towards crown)=  11.914(Ft.)


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Process from Point/Station     7002.000 to Point/Station     7004.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   307.800(Ft.)
Downstream point/station elevation =   307.500(Ft.)
Pipe length  =    37.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.227(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     3.227(CFS)
Normal flow depth in pipe =    7.99(In.)
Flow top width inside pipe =   14.97(In.)
Critical Depth =    8.68(In.)
Pipe flow velocity =      4.85(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     9.83 min.


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Process from Point/Station     7017.000 to Point/Station     7004.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                 ]
Time of concentration =      9.83 min.
Rainfall intensity =      3.395(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      6.816(CFS) for    3.650(Ac.)
Total runoff =     10.043(CFS)  Total area =          4.62(Ac.)


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Process from Point/Station     7003.000 to Point/Station     7004.000
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**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =       9.83 min.
Rainfall intensity =      3.395(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =       1.709(CFS) for     0.530(Ac.)
Total runoff =      11.752(CFS)  Total area =         5.15(Ac.)


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Process from Point/Station     7004.000 to Point/Station     7012.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   306.000(Ft.)
Downstream point/station elevation =   301.000(Ft.)
Pipe length  =   111.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.752(CFS)
Nearest computed pipe diameter   =     15.00(In.)
Calculated individual pipe flow   =    11.752(CFS)
Normal flow depth in pipe =   10.69(In.)
Flow top width inside pipe =   13.58(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.56(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     9.98 min.


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Process from Point/Station     7004.000 to Point/Station     7012.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 3
Stream flow area =       5.150(Ac.)
Runoff from this stream =      11.752(CFS)
Time of concentration =     9.98 min.
Rainfall intensity =     3.377(In/Hr)
Summary of stream data:

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


1        8.265     14.94                  2.909
2        1.708      6.96                  3.855
3       11.752      9.98                  3.377
Qmax(1) =
           1.000 *     1.000 *      8.265) +
           0.755 *     1.000 *      1.708) +
           0.862 *     1.000 *     11.752) + =        19.678
Qmax(2) =
           1.000 *     0.466 *      8.265) +
           1.000 *     1.000 *      1.708) +
           1.000 *     0.697 *     11.752) + =        13.749
Qmax(3) =
           1.000 *     0.668 *      8.265) +
           0.876 *     1.000 *      1.708) +
           1.000 *     1.000 *     11.752) + =        18.767

Total of 3 streams to confluence:
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Flow rates before confluence point:
      8.265        1.708       11.752
Maximum flow rates at confluence using above data:
      19.678        13.749        18.767
Area of streams before confluence:
       4.350         0.460         5.150
Results of confluence:
Total flow rate =      19.678(CFS)
Time of concentration =     14.943 min.
Effective stream area after confluence =       9.960(Ac.)


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Process from Point/Station     7012.000 to Point/Station     7029.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   301.000(Ft.)
Downstream point/station elevation =   294.000(Ft.)
Pipe length  =   429.57(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    19.678(CFS)
Nearest computed pipe diameter   =     21.00(In.)
Calculated individual pipe flow   =    19.678(CFS)
Normal flow depth in pipe =   16.73(In.)
Flow top width inside pipe =   16.90(In.)
Critical Depth =   19.08(In.)
Pipe flow velocity =        9.58(Ft/s)
Travel time through pipe =    0.75 min.
Time of concentration (TC) =    15.69 min.


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Process from Point/Station     7012.000 to Point/Station     7029.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =       9.960(Ac.)
Runoff from this stream =      19.678(CFS)
Time of concentration =    15.69 min.
Rainfall intensity =     2.855(In/Hr)


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Process from Point/Station     7002.000 to Point/Station     7011.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =    67.000(Ft.)
Highest elevation =  308.000(Ft.)
Lowest elevation =  306.500(Ft.)
Elevation difference =      1.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =       1.69 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  67.000^.5)/(    2.239^(1/3)]=    1.69
Setting time of concentration to 5 minutes
Rainfall intensity (I) =        4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =       0.417(CFS)
Total initial stream area =          0.100(Ac.)
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Process from Point/Station     7011.000 to Point/Station     7027.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   306.500(Ft.)
End of street segment elevation =   296.000(Ft.)
Length of street segment  =   414.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  15.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      1.251(CFS)
Depth of flow =   0.228(Ft.), Average velocity =   2.427(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   6.664(Ft.)
Flow velocity =   2.43(Ft/s)
Travel time =    2.84 min.     TC =    7.84  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =       3.687(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.401(CFS) for    0.400(Ac.)
Total runoff =      1.818(CFS)  Total area =        0.50(Ac.)
Street flow at end of street =      1.818(CFS)
Half street flow at end of street =      1.818(CFS)
Depth of flow =   0.252(Ft.), Average velocity =   2.630(Ft/s)
Flow width (from curb towards crown)=   7.874(Ft.)


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Process from Point/Station     7027.000 to Point/Station     7029.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   295.600(Ft.)
Downstream point/station elevation =   294.000(Ft.)
Pipe length  =    37.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.818(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.818(CFS)
Normal flow depth in pipe =    4.66(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =     7.40(In.)
Pipe flow velocity =       7.87(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     7.92 min.


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Process from Point/Station     7028.000 to Point/Station     7029.000
**** SUBAREA FLOW ADDITION ****
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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     7.92 min.
Rainfall intensity =      3.673(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.919(CFS) for    0.550(Ac.)
Total runoff =      3.737(CFS)  Total area =        1.05(Ac.)


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Process from Point/Station     7028.000 to Point/Station     7029.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.050(Ac.)
Runoff from this stream =      3.737(CFS)
Time of concentration =    7.92 min.
Rainfall intensity =     3.673(In/Hr)
Summary of stream data:

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


1       19.678     15.69                 2.855
2        3.737      7.92                 3.673
Qmax(1) =
          1.000 *    1.000 *    19.678) +
          0.777 *    1.000 *     3.737) + =       22.583
Qmax(2) =
          1.000 *    0.505 *    19.678) +
          1.000 *    1.000 *     3.737) + =       13.672

Total of 2 streams to confluence:
Flow rates before confluence point:
      19.678       3.737
Maximum flow rates at confluence using above data:
      22.583       13.672
Area of streams before confluence:
       9.960        1.050
Results of confluence:
Total flow rate =      22.583(CFS)
Time of concentration =     15.691 min.
Effective stream area after confluence =     11.010(Ac.)


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Process from Point/Station     7029.000 to Point/Station     7032.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   294.000(Ft.)
Downstream point/station elevation =   284.000(Ft.)
Pipe length  =   337.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.583(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    22.583(CFS)
Normal flow depth in pipe =   14.58(In.)
Flow top width inside pipe =   19.35(In.)
Critical Depth =    19.77(In.)
Pipe flow velocity =      12.68(Ft/s)
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Travel time through pipe =    0.44 min.
Time of concentration (TC) =    16.13 min.


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Process from Point/Station     7031.000 to Point/Station     7032.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    16.13 min.
Rainfall intensity =      2.823(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      3.430(CFS) for     2.700(Ac.)
Total runoff =     26.013(CFS)  Total area =       13.71(Ac.)


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Process from Point/Station     7032.000 to Point/Station     7035.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   284.000(Ft.)
Downstream point/station elevation =   270.000(Ft.)
Pipe length  =   334.26(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.013(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    26.013(CFS)
Normal flow depth in pipe =   14.23(In.)
Flow top width inside pipe =   19.63(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.98(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =    16.51 min.


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Process from Point/Station     7033.000 to Point/Station     7035.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                  ]
Time of concentration =    16.51 min.
Rainfall intensity =      2.798(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.834(CFS) for     0.690(Ac.)
Total runoff =     27.847(CFS)  Total area =       14.40(Ac.)


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Process from Point/Station     7034.000 to Point/Station     7035.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                  ]
Time of concentration =    16.51 min.
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Rainfall intensity =      2.798(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.728(CFS) for     0.650(Ac.)
Total runoff =     29.575(CFS)  Total area =       15.05(Ac.)


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Process from Point/Station     7035.000 to Point/Station     7043.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   270.000(Ft.)
Downstream point/station elevation =   264.000(Ft.)
Pipe length  =    66.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.575(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    29.575(CFS)
Normal flow depth in pipe =   13.78(In.)
Flow top width inside pipe =   15.25(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.36(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    16.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     7035.000 to Point/Station     7043.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     15.050(Ac.)
Runoff from this stream =     29.575(CFS)
Time of concentration =   16.56 min.
Rainfall intensity =      2.794(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     7038.000 to Point/Station     7039.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                  ]
Initial subarea flow distance  =   62.000(Ft.)
Highest elevation =  273.600(Ft.)
Lowest elevation =  273.200(Ft.)
Elevation difference =    0.400(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      2.46 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  62.000^.5)/(   0.645^(1/3)]=    2.46
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.167(CFS)
Total initial stream area =       0.040(Ac.)


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Process from Point/Station     7039.000 to Point/Station     7041.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
```

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Top of street segment elevation =   273.200(Ft.)
End of street segment elevation =   269.600(Ft.)
Length of street segment  =   361.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      0.193(CFS)
Depth of flow =   0.153(Ft.), Average velocity =   1.238(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   2.905(Ft.)
Flow velocity =   1.24(Ft/s)
Travel time =    4.86 min.      TC =    9.86  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                   ]
Rainfall intensity =       3.391(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =       0.999(CFS) for    0.310(Ac.)
Total runoff =      1.166(CFS)  Total area =        0.35(Ac.)
Street flow at end of street =      1.166(CFS)
Half street flow at end of street =      1.166(CFS)
Depth of flow =   0.254(Ft.), Average velocity =   1.657(Ft/s)
Flow width (from curb towards crown)=   7.950(Ft.)


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Process from Point/Station     7041.000 to Point/Station     7042.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   267.000(Ft.)
Downstream point/station elevation =   266.500(Ft.)
Pipe length  =    26.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.166(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.166(CFS)
Normal flow depth in pipe =    4.56(In.)
Flow top width inside pipe =    9.00(In.)
Critical Depth =    5.96(In.)
Pipe flow velocity =       5.19(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     9.94 min.


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Process from Point/Station     7040.000 to Point/Station     7042.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
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Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                   ]
Time of concentration =      9.94 min.
Rainfall intensity =       3.381(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =       1.895(CFS) for    0.590(Ac.)
Total runoff =      3.060(CFS)  Total area =        0.94(Ac.)


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Process from Point/Station     7042.000 to Point/Station     7043.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   266.500(Ft.)
Downstream point/station elevation =   264.000(Ft.)
Pipe length  =    86.19(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.060(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.060(CFS)
Normal flow depth in pipe =    6.03(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    8.99(In.)
Pipe flow velocity =       7.74(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    10.13 min.


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Process from Point/Station     7042.000 to Point/Station     7043.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.940(Ac.)
Runoff from this stream =      3.060(CFS)
Time of concentration =   10.13 min.
Rainfall intensity =     3.358(In/Hr)
Summary of stream data:

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


1       29.575     16.56                    2.794
2        3.060     10.13                    3.358
Qmax(1) =
           1.000 *     1.000 *    29.575) +
           0.832 *     1.000 *     3.060) + =       32.121
Qmax(2) =
           1.000 *     0.612 *    29.575) +
           1.000 *     1.000 *     3.060) + =       21.153

Total of 2 main streams to confluence:
Flow rates before confluence point:
      29.575       3.060
Maximum flow rates at confluence using above data:
       32.121      21.153
Area of streams before confluence:
       15.050       0.940


Results of confluence:
Total flow rate =      32.121(CFS)
Time of concentration =     16.559 min.
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Effective stream area after confluence  =     15.990(Ac.)


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Process from Point/Station     7043.000 to Point/Station     7044.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   264.000(Ft.)
Downstream point/station elevation =   263.500(Ft.)
Pipe length  =   135.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     32.121(CFS)
Nearest computed pipe diameter  =      33.00(In.)
Calculated individual pipe flow  =     32.121(CFS)
Normal flow depth in pipe =   27.00(In.)
Flow top width inside pipe =   25.46(In.)
Critical Depth =   22.61(In.)
Pipe flow velocity =      6.18(Ft/s)
Travel time through pipe =    0.36 min.
Time of concentration (TC) =    16.92 min.


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Process from Point/Station     7044.000 to Point/Station     7048.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   263.500(Ft.)
Downstream point/station elevation =   260.000(Ft.)
Pipe length  =    61.54(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     32.121(CFS)
Nearest computed pipe diameter  =      21.00(In.)
Calculated individual pipe flow  =     32.121(CFS)
Normal flow depth in pipe =   14.88(In.)
Flow top width inside pipe =   19.08(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.64(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    16.98 min.


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Process from Point/Station     7058.000 to Point/Station     7048.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =    16.98 min.
Rainfall intensity =      2.766(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      3.100(CFS) for    1.180(Ac.)
Total runoff =     35.221(CFS)  Total area =       17.17(Ac.)


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Process from Point/Station     7048.000 to Point/Station     7048.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
```



```
Time of concentration =    16.98 min.
Rainfall intensity =      2.766(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      0.909(CFS) for    0.730(Ac.)
Total runoff =     36.130(CFS)  Total area =       17.90(Ac.)
End of computations, total study area =         17.900 (Ac.)
```

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                San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003 Version 6.3

Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
       Rational Hydrology Study        Date: 10/10/18
------------------------------------------------------------------------
PROJECT CANTERA
PROPOSED CONDITIONS
8000P100


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

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


Program License Serial Number 4049

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

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


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Process from Point/Station     8005.000 to Point/Station     8006.000
**** 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
[SINGLE FAMILY area type                  ]
Initial subarea flow distance  =   51.000(Ft.)
Highest elevation =  322.500(Ft.)
Lowest elevation =  321.800(Ft.)
Elevation difference =    0.700(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     6.36 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*( 51.000^.5)/( 1.373^(1/3)]=   6.36
Rainfall intensity (I) =      3.989(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.285(CFS)
Total initial stream area =        0.130(Ac.)


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Process from Point/Station     8006.000 to Point/Station     8011.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   321.800(Ft.)
End of street segment elevation =   314.600(Ft.)
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```
Length of street segment  =   327.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      3.214(CFS)
Depth of flow =   0.301(Ft.), Average velocity =   2.833(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.312(Ft.)
Flow velocity =   2.83(Ft/s)
Travel time =    1.92 min.     TC =    8.29  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                  ]
Rainfall intensity =      3.613(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      5.305(CFS) for    2.670(Ac.)
Total runoff =      5.591(CFS)  Total area =         2.80(Ac.)
Street flow at end of street =      5.591(CFS)
Half street flow at end of street =      5.591(CFS)
Depth of flow =   0.353(Ft.), Average velocity =   3.226(Ft/s)
Flow width (from curb towards crown)=  12.891(Ft.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     8011.000 to Point/Station     8014.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   314.600(Ft.)
Downstream point/station elevation =   314.200(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.591(CFS)
Nearest computed pipe diameter   =    18.00(In.)
Calculated individual pipe flow   =     5.591(CFS)
Normal flow depth in pipe =   10.24(In.)
Flow top width inside pipe =   17.83(In.)
Critical Depth =   10.94(In.)
Pipe flow velocity =      5.39(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =     8.45 min.


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Process from Point/Station     8011.000 to Point/Station     8014.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      2.800(Ac.)
Runoff from this stream =      5.591(CFS)
Time of concentration =     8.45 min.
Rainfall intensity =     3.586(In/Hr)
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     8009.000 to Point/Station     8022.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =   46.000(Ft.)
Highest elevation =  318.000(Ft.)
Lowest elevation =  317.000(Ft.)
Elevation difference =     1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      1.41 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 46.000^.5)/(   2.174^(1/3)]=   1.41
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.125(CFS)
Total initial stream area =         0.030(Ac.)


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Process from Point/Station     8022.000 to Point/Station     8013.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =    317.000(Ft.)
End of street segment elevation =    314.300(Ft.)
Length of street segment  =    172.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =   1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =       0.134(CFS)
Depth of flow =   0.114(Ft.), Average velocity =   1.735(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   1.500(Ft.)
Flow velocity =   1.74(Ft/s)
Travel time =    1.65 min.       TC =    6.65  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.921(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.559(CFS) for    0.150(Ac.)
Total runoff =      0.684(CFS)  Total area =        0.18(Ac.)
Street flow at end of street =       0.684(CFS)
Half street flow at end of street =       0.684(CFS)
Depth of flow =   0.207(Ft.), Average velocity =   1.775(Ft/s)
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Flow width (from curb towards crown)=   5.604(Ft.)


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Process from Point/Station     8013.000 to Point/Station     8013.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =      6.65 min.
Rainfall intensity =      3.921(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.639(CFS) for    0.440(Ac.)
Total runoff =      2.323(CFS)  Total area =        0.62(Ac.)


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Process from Point/Station     8013.000 to Point/Station     8014.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    314.200(Ft.)
Downstream point/station elevation =    314.000(Ft.)
Pipe length  =    21.44(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.323(CFS)
Nearest computed pipe diameter  =    12.00(In.)
Calculated individual pipe flow  =     2.323(CFS)
Normal flow depth in pipe =     7.22(In.)
Flow top width inside pipe =   11.75(In.)
Critical Depth =    7.83(In.)
Pipe flow velocity =      4.70(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     6.73 min.


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Process from Point/Station     8013.000 to Point/Station     8014.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.620(Ac.)
Runoff from this stream =       2.323(CFS)
Time of concentration =     6.73 min.
Rainfall intensity =     3.905(In/Hr)
Summary of stream data:

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


1        5.591      8.45                    3.586
2        2.323      6.73                    3.905
Qmax(1) =
          1.000 *    1.000 *     5.591) +
          0.919 *    1.000 *     2.323) + =        7.724
Qmax(2) =
          1.000 *    0.796 *     5.591) +
          1.000 *    1.000 *     2.323) + =        6.773

Total of 2 streams to confluence:
Flow rates before confluence point:
      5.591       2.323
```

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Maximum flow rates at confluence using above data:
        7.724       6.773
Area of streams before confluence:
        2.800       0.620
Results of confluence:
Total flow rate =      7.724(CFS)
Time of concentration =     8.453 min.
Effective stream area after confluence =      3.420(Ac.)


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Process from Point/Station     8014.000 to Point/Station     8021.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   314.000(Ft.)
Downstream point/station elevation =   313.800(Ft.)
Pipe length  =   256.42(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.724(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =     7.724(CFS)
Normal flow depth in pipe =   19.90(In.)
Flow top width inside pipe =   23.77(In.)
Critical Depth =   11.43(In.)
Pipe flow velocity =      2.46(Ft/s)
Travel time through pipe =   1.74 min.
Time of concentration (TC) =    10.19 min.


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Process from Point/Station     8014.000 to Point/Station     8021.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.420(Ac.)
Runoff from this stream =      7.724(CFS)
Time of concentration =    10.19 min.
Rainfall intensity =     3.351(In/Hr)


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Process from Point/Station     8015.000 to Point/Station     8016.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =   93.000(Ft.)
Highest elevation =  328.500(Ft.)
Lowest elevation =  326.000(Ft.)
Elevation difference =    2.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.87 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  93.000^.5)/(   2.688^(1/3)]=   1.87
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.917(CFS)
Total initial stream area =       0.220(Ac.)


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Process from Point/Station     8016.000 to Point/Station     8017.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   326.000(Ft.)
End of street segment elevation =   320.000(Ft.)
Length of street segment  =   378.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    1.500(Ft.)
Gutter hike from flowline =   1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =       2.564(CFS)
Depth of flow =    0.296(Ft.), Average velocity =    2.371(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   10.052(Ft.)
Flow velocity =    2.37(Ft/s)
Travel time =    2.66 min.     TC =     7.66  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Rainfall intensity =       3.719(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      2.791(CFS) for    0.790(Ac.)
Total runoff =      3.709(CFS)  Total area =        1.01(Ac.)
Street flow at end of street =       3.709(CFS)
Half street flow at end of street =       3.709(CFS)
Depth of flow =    0.329(Ft.), Average velocity =    2.584(Ft/s)
Flow width (from curb towards crown)=  11.680(Ft.)


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Process from Point/Station     8017.000 to Point/Station     8020.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   319.800(Ft.)
Downstream point/station elevation =   319.600(Ft.)
Pipe length  =     9.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.709(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.709(CFS)
Normal flow depth in pipe =    7.45(In.)
Flow top width inside pipe =   11.64(In.)
Critical Depth =    9.84(In.)
Pipe flow velocity =      7.23(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     7.68 min.


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Process from Point/Station     8020.000 to Point/Station     8021.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   319.600(Ft.)
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Downstream point/station elevation =   313.800(Ft.)
Pipe length  =    64.50(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.709(CFS)
Nearest computed pipe diameter  =     9.00(In.)
Calculated individual pipe flow  =     3.709(CFS)
Normal flow depth in pipe =    5.80(In.)
Flow top width inside pipe =    8.62(In.)
Critical depth could not be calculated.
Pipe flow velocity =      12.31(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     7.77 min.


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Process from Point/Station     8020.000 to Point/Station     8021.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.010(Ac.)
Runoff from this stream =      3.709(CFS)
Time of concentration =     7.77 min.
Rainfall intensity =     3.700(In/Hr)
Summary of stream data:

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


1         7.724     10.19                    3.351
2         3.709      7.77                    3.700
Qmax(1) =
          1.000 *     1.000 *      7.724) +
          0.906 *     1.000 *      3.709) + =      11.083
Qmax(2) =
          1.000 *     0.762 *      7.724) +
          1.000 *     1.000 *      3.709) + =       9.595

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.724       3.709
Maximum flow rates at confluence using above data:
      11.083       9.595
Area of streams before confluence:
       3.420       1.010
Results of confluence:
Total flow rate =     11.083(CFS)
Time of concentration =     10.190 min.
Effective stream area after confluence =       4.430(Ac.)


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Process from Point/Station     8021.000 to Point/Station     8036.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   313.800(Ft.)
Downstream point/station elevation =   313.200(Ft.)
Pipe length  =   267.14(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.083(CFS)
Nearest computed pipe diameter  =    24.00(In.)
Calculated individual pipe flow  =    11.083(CFS)
Normal flow depth in pipe =   20.48(In.)
Flow top width inside pipe =   16.97(In.)
Critical Depth =   14.33(In.)
Pipe flow velocity =       3.88(Ft/s)
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Travel time through pipe =    1.15 min.
Time of concentration (TC) =    11.34 min.


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Process from Point/Station     8021.000 to Point/Station     8036.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      4.430(Ac.)
Runoff from this stream =     11.083(CFS)
Time of concentration =   11.34 min.
Rainfall intensity =     3.224(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station     8021.000 to Point/Station     8023.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                               ]
Initial subarea flow distance  =   62.000(Ft.)
Highest elevation =  319.000(Ft.)
Lowest elevation =  318.000(Ft.)
Elevation difference =     1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.81 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  62.000^.5)/(   1.613^(1/3)]=   1.81
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.292(CFS)
Total initial stream area =        0.070(Ac.)


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Process from Point/Station     8023.000 to Point/Station     8024.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   318.000(Ft.)
End of street segment elevation =   316.000(Ft.)
Length of street segment  =   229.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =       0.368(CFS)
Depth of flow =    0.190(Ft.), Average velocity =   1.248(Ft/s)
Streetflow hydraulics at midpoint of street travel:
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```
Halfstreet flow width =   4.726(Ft.)
Flow velocity =   1.25(Ft/s)
Travel time =    3.06 min.      TC =    8.06  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Rainfall intensity =      3.650(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.803(CFS) for    0.520(Ac.)
Total runoff =      2.095(CFS)  Total area =        0.59(Ac.)
Street flow at end of street =      2.095(CFS)
Half street flow at end of street =      2.095(CFS)
Depth of flow =   0.304(Ft.), Average velocity =   1.798(Ft/s)
Flow width (from curb towards crown)=  10.458(Ft.)


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Process from Point/Station     8024.000 to Point/Station     8036.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
Upstream point/station elevation =   315.800(Ft.)
Downstream point/station elevation =   315.600(Ft.)
Pipe length  =     8.60(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.095(CFS)
Nearest computed pipe diameter  =     9.00(In.)
Calculated individual pipe flow  =     2.095(CFS)
Normal flow depth in pipe =    6.26(In.)
Flow top width inside pipe =    8.28(In.)
Critical Depth =    7.85(In.)
Pipe flow velocity =     6.39(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     8.08 min.


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Process from Point/Station     8024.000 to Point/Station     8036.000
**** CONFLUENCE OF MAIN STREAMS ****

______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.590(Ac.)
Runoff from this stream =      2.095(CFS)
Time of concentration =    8.08 min.
Rainfall intensity =     3.646(In/Hr)
Program is now starting with Main Stream No. 3


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Process from Point/Station     8027.000 to Point/Station     8028.000
**** 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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  127.000(Ft.)
Highest elevation =  428.000(Ft.)
Lowest elevation =  426.000(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
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areas overland flow method (App X-C) =      11.33 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 127.000^.5)/( 1.575^(1/3)]=  11.33
Rainfall intensity (I) =       3.225(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      0.392(CFS)
Total initial stream area =        0.270(Ac.)


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Process from Point/Station     8028.000 to Point/Station     8029.000
**** IMPROVED CHANNEL TRAVEL TIME ****

______________________________________________________________________
Upstream point elevation =   426.000(Ft.)
Downstream point elevation =   354.000(Ft.)
Channel length thru subarea  =   483.000(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =      2.104(CFS)
Manning's 'N'    = 0.200
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.104(CFS)
Depth of flow =   0.318(Ft.), Average velocity =   1.246(Ft/s)
Channel flow top width =    5.635(Ft.)
Flow Velocity =    1.25(Ft/s)
Travel time  =    6.46 min.
Time of concentration =   17.79 min.
Critical depth =      0.174(Ft.)
 Adding area flow to channel
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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      2.713(In/Hr) for a    100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      2.881(CFS) for    2.360(Ac.)
Total runoff =      3.273(CFS)  Total area =        2.63(Ac.)


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Process from Point/Station     8029.000 to Point/Station     8032.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
Upstream point/station elevation =   354.000(Ft.)
Downstream point/station elevation =   318.000(Ft.)
Pipe length  =    73.42(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.273(CFS)
Nearest computed pipe diameter  =     6.00(In.)
Calculated individual pipe flow  =     3.273(CFS)
Normal flow depth in pipe =    4.18(In.)
Flow top width inside pipe =    5.51(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.39(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    17.85 min.


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Process from Point/Station     8030.000 to Point/Station     8032.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    17.85 min.
Rainfall intensity =     2.710(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.805(CFS) for    1.480(Ac.)
Total runoff =      5.078(CFS)  Total area =        4.11(Ac.)


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Process from Point/Station     8032.000 to Point/Station     8035.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    318.000(Ft.)
Downstream point/station elevation =    316.000(Ft.)
Pipe length  =     8.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.078(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     5.078(CFS)
Normal flow depth in pipe =    5.14(In.)
Flow top width inside pipe =    8.91(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.44(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    17.86 min.


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Process from Point/Station     8032.000 to Point/Station     8035.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 3 in normal stream number 1
Stream flow area =      4.110(Ac.)
Runoff from this stream =       5.078(CFS)
Time of concentration =    17.86 min.
Rainfall intensity =     2.709(In/Hr)


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Process from Point/Station     8015.000 to Point/Station     8034.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Initial subarea flow distance  =  108.000(Ft.)
Highest elevation =  328.000(Ft.)
Lowest elevation =  325.000(Ft.)
Elevation difference =    3.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =       2.00 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 108.000^.5)/(   2.778^(1/3)]=    2.00
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.500(CFS)
Total initial stream area =          0.120(Ac.)
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Process from Point/Station     8034.000 to Point/Station     8035.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =    325.000(Ft.)
End of street segment elevation =    316.000(Ft.)
Length of street segment  =    704.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =       2.606(CFS)
Depth of flow =    0.307(Ft.), Average velocity =    2.190(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.577(Ft.)
Flow velocity =    2.19(Ft/s)
Travel time =     5.36 min.     TC =    10.36  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Rainfall intensity =       3.331(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      3.197(CFS) for    1.010(Ac.)
Total runoff =      3.697(CFS)  Total area =        1.13(Ac.)
Street flow at end of street =      3.697(CFS)
Half street flow at end of street =      3.697(CFS)
Depth of flow =    0.339(Ft.), Average velocity =    2.377(Ft/s)
Flow width (from curb towards crown)=  12.182(Ft.)


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Process from Point/Station     8034.000 to Point/Station     8035.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 3 in normal stream number 2
Stream flow area =      1.130(Ac.)
Runoff from this stream =       3.697(CFS)
Time of concentration =    10.36 min.
Rainfall intensity =     3.331(In/Hr)
Summary of stream data:

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


1        5.078     17.86                  2.709
2        3.697     10.36                  3.331
Qmax(1) =
          1.000 *     1.000 *     5.078) +
          0.813 *     1.000 *     3.697) + =       8.084
Qmax(2) =
          1.000 *     0.580 *     5.078) +
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          1.000 *    1.000 *     3.697) + =        6.643

Total of 2 streams to confluence:
Flow rates before confluence point:
      5.078       3.697
Maximum flow rates at confluence using above data:
       8.084       6.643
Area of streams before confluence:
       4.110       1.130
Results of confluence:
Total flow rate =      8.084(CFS)
Time of concentration =    17.855 min.
Effective stream area after confluence =      5.240(Ac.)


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Process from Point/Station     8035.000 to Point/Station     8036.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   316.000(Ft.)
Downstream point/station elevation =   315.700(Ft.)
Pipe length  =    76.75(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.084(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     8.084(CFS)
Normal flow depth in pipe =   14.41(In.)
Flow top width inside pipe =   19.49(In.)
Critical Depth =   12.65(In.)
Pipe flow velocity =      4.59(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =    18.13 min.


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Process from Point/Station     8035.000 to Point/Station     8036.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      5.240(Ac.)
Runoff from this stream =      8.084(CFS)
Time of concentration =   18.13 min.
Rainfall intensity =     2.692(In/Hr)
Summary of stream data:

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


1       11.083     11.34                 3.224
2        2.095      8.08                 3.646
3        8.084     18.13                 2.692
Qmax(1) =
          1.000 *    1.000 *    11.083) +
          0.884 *    1.000 *     2.095) +
          1.000 *    0.625 *     8.084) + =       17.991
Qmax(2) =
          1.000 *    0.713 *    11.083) +
          1.000 *    1.000 *     2.095) +
          1.000 *    0.446 *     8.084) + =       13.596
Qmax(3) =
          0.835 *    1.000 *    11.083) +
          0.738 *    1.000 *     2.095) +
          1.000 *    1.000 *     8.084) + =       18.884
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Total of 3 main streams to confluence:
Flow rates before confluence point:
     11.083       2.095       8.084
Maximum flow rates at confluence using above data:
      17.991      13.596      18.884
Area of streams before confluence:
       4.430       0.590       5.240


Results of confluence:
Total flow rate =     18.884(CFS)
Time of concentration =    18.134 min.
Effective stream area after confluence  =     10.260(Ac.)


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Process from Point/Station     8036.000 to Point/Station     8049.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   315.700(Ft.)
Downstream point/station elevation =   310.000(Ft.)
Pipe length  =   615.95(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.884(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    18.884(CFS)
Normal flow depth in pipe =   17.27(In.)
Flow top width inside pipe =   21.56(In.)
Critical Depth =   18.77(In.)
Pipe flow velocity =      7.80(Ft/s)
Travel time through pipe =    1.32 min.
Time of concentration (TC) =    19.45 min.


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Process from Point/Station     8036.000 to Point/Station     8049.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     10.260(Ac.)
Runoff from this stream =     18.884(CFS)
Time of concentration =   19.45 min.
Rainfall intensity =     2.612(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station     8022.000 to Point/Station     8037.000
**** 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
[SINGLE FAMILY area type                              ]
Initial subarea flow distance  =    75.000(Ft.)
Highest elevation =  315.700(Ft.)
Lowest elevation =  315.500(Ft.)
Elevation difference =    0.200(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =    13.32 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*(  75.000^.5)/( 0.267^(1/3)]=  13.32
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Rainfall intensity (I) =        3.039(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.100(CFS)
Total initial stream area =         0.060(Ac.)


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Process from Point/Station      8037.000 to Point/Station     8038.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =    315.500(Ft.)
End of street segment elevation =    308.000(Ft.)
Length of street segment  =    512.000(Ft.)
Height of curb above gutter flowline  =      6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    1.500(Ft.)
Gutter hike from flowline =   1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =       0.182(CFS)
Depth of flow =   0.137(Ft.), Average velocity =   1.566(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =    2.113(Ft.)
Flow velocity =    1.57(Ft/s)
Travel time =     5.45 min.      TC =    18.77  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                ]
Rainfall intensity =        2.653(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       2.364(CFS) for    1.620(Ac.)
Total runoff =       2.464(CFS)  Total area =          1.68(Ac.)
Street flow at end of street =       2.464(CFS)
Half street flow at end of street =        2.464(CFS)
Depth of flow =   0.296(Ft.), Average velocity =   2.278(Ft/s)
Flow width (from curb towards crown)=  10.053(Ft.)


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Process from Point/Station      8038.000 to Point/Station     8040.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    308.000(Ft.)
Downstream point/station elevation =    307.800(Ft.)
Pipe length   =     11.25(Ft.)    Manning's N = 0.013
No. of pipes = 1  Required pipe flow   =     2.464(CFS)
Nearest computed pipe diameter   =     12.00(In.)
Calculated individual pipe flow   =     2.464(CFS)
Normal flow depth in pipe =     6.13(In.)
Flow top width inside pipe =    12.00(In.)
Critical Depth =     8.07(In.)
Pipe flow velocity =       6.10(Ft/s)
Travel time through pipe =     0.03 min.
Time of concentration (TC) =     18.80 min.
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Process from Point/Station      8039.000 to Point/Station     8040.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                   ]
Time of concentration =     18.80 min.
Rainfall intensity =       2.651(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =       0.453(CFS) for    0.180(Ac.)
Total runoff =       2.917(CFS)  Total area =          1.86(Ac.)


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Process from Point/Station      8040.000 to Point/Station     8045.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =    307.800(Ft.)
Downstream point/station elevation =    302.000(Ft.)
Pipe length   =    466.00(Ft.)    Manning's N = 0.013
No. of pipes = 1  Required pipe flow   =     2.917(CFS)
Nearest computed pipe diameter   =     12.00(In.)
Calculated individual pipe flow   =     2.917(CFS)
Normal flow depth in pipe =     7.64(In.)
Flow top width inside pipe =    11.54(In.)
Critical Depth =     8.78(In.)
Pipe flow velocity =       5.53(Ft/s)
Travel time through pipe =     1.40 min.
Time of concentration (TC) =     20.20 min.


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Process from Point/Station      8040.000 to Point/Station     8045.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.860(Ac.)
Runoff from this stream =       2.917(CFS)
Time of concentration =    20.20 min.
Rainfall intensity =      2.569(In/Hr)


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Process from Point/Station      8041.000 to Point/Station     8042.000
**** 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
[SINGLE FAMILY area type                ]
Initial subarea flow distance  =    98.000(Ft.)
Highest elevation =  310.000(Ft.)
Lowest elevation =  308.800(Ft.)
Elevation difference =      1.200(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      9.16 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*(  98.000^.5)/( 1.224^(1/3)]=    9.16
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Rainfall intensity (I) =      3.483(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =       0.326(CFS)
Total initial stream area =        0.170(Ac.)


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Process from Point/Station     8042.000 to Point/Station     8043.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   308.800(Ft.)
End of street segment elevation =   305.000(Ft.)
Length of street segment  =   392.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      0.929(CFS)
Depth of flow =   0.240(Ft.), Average velocity =   1.560(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.241(Ft.)
Flow velocity =   1.56(Ft/s)
Travel time =    4.19 min.      TC =   13.35  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                      ]
Rainfall intensity =      3.036(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       1.052(CFS) for    0.630(Ac.)
Total runoff =       1.378(CFS)  Total area =        0.80(Ac.)
Street flow at end of street =      1.378(CFS)
Half street flow at end of street =       1.378(CFS)
Depth of flow =   0.267(Ft.), Average velocity =   1.701(Ft/s)
Flow width (from curb towards crown)=   8.594(Ft.)


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Process from Point/Station     8043.000 to Point/Station     8045.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   305.000(Ft.)
Downstream point/station elevation =   304.800(Ft.)
Pipe length  =    11.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      1.378(CFS)
Nearest computed pipe diameter  =       9.00(In.)
Calculated individual pipe flow  =      1.378(CFS)
Normal flow depth in pipe =     5.15(In.)
Flow top width inside pipe =     8.91(In.)
Critical Depth =     6.49(In.)
Pipe flow velocity =        5.27(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    13.38 min.
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Process from Point/Station     8044.000 to Point/Station     8045.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =    13.38 min.
Rainfall intensity =      3.033(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =       0.692(CFS) for    0.240(Ac.)
Total runoff =       2.069(CFS)  Total area =        1.04(Ac.)


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Process from Point/Station     8044.000 to Point/Station     8045.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.040(Ac.)
Runoff from this stream =       2.069(CFS)
Time of concentration =    13.38 min.
Rainfall intensity =     3.033(In/Hr)
Summary of stream data:

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


1        2.917     20.20                2.569
2        2.069     13.38                3.033
Qmax(1) =
           1.000 *     1.000 *     2.917) +
           0.847 *     1.000 *     2.069) + =       4.670
Qmax(2) =
           1.000 *     0.662 *     2.917) +
           1.000 *     1.000 *     2.069) + =       4.002

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.917       2.069
Maximum flow rates at confluence using above data:
        4.670        4.002
Area of streams before confluence:
        1.860        1.040
Results of confluence:
Total flow rate =      4.670(CFS)
Time of concentration =     20.204 min.
Effective stream area after confluence =      2.900(Ac.)


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Process from Point/Station     8045.000 to Point/Station     8047.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   304.800(Ft.)
Downstream point/station elevation =   304.600(Ft.)
Pipe length  =    94.95(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      4.670(CFS)
Nearest computed pipe diameter  =      18.00(In.)
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Calculated individual pipe flow  =      4.670(CFS)
Normal flow depth in pipe =   14.27(In.)
Flow top width inside pipe =   14.59(In.)
Critical Depth =    9.97(In.)
Pipe flow velocity =      3.11(Ft/s)
Travel time through pipe =    0.51 min.
Time of concentration (TC) =    20.71 min.


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Process from Point/Station     8045.000 to Point/Station     8047.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.900(Ac.)
Runoff from this stream =      4.670(CFS)
Time of concentration =   20.71 min.
Rainfall intensity =     2.540(In/Hr)


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Process from Point/Station     8024.000 to Point/Station     8046.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                  ]
Initial subarea flow distance  =   63.000(Ft.)
Highest elevation =  315.600(Ft.)
Lowest elevation =  315.000(Ft.)
Elevation difference =    0.600(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      2.18 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  63.000^.5)/(   0.952^(1/3)]=   2.18
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.334(CFS)
Total initial stream area =        0.080(Ac.)


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Process from Point/Station     8046.000 to Point/Station     8047.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   315.000(Ft.)
End of street segment elevation =   310.000(Ft.)
Length of street segment  =   557.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
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Estimated mean flow rate at midpoint of street =      0.554(CFS)
Depth of flow =   0.211(Ft.), Average velocity =   1.360(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   5.795(Ft.)
Flow velocity =   1.36(Ft/s)
Travel time =     6.83 min.     TC =   11.83  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                  ]
Rainfall intensity =      3.175(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      3.982(CFS) for    1.320(Ac.)
Total runoff =      4.315(CFS)  Total area =        1.40(Ac.)
Street flow at end of street =      4.315(CFS)
Half street flow at end of street =      4.315(CFS)
Depth of flow =   0.373(Ft.), Average velocity =   2.155(Ft/s)
Flow width (from curb towards crown)=  13.896(Ft.)


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Process from Point/Station     8046.000 to Point/Station     8047.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.400(Ac.)
Runoff from this stream =      4.315(CFS)
Time of concentration =   11.83 min.
Rainfall intensity =     3.175(In/Hr)
Summary of stream data:

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


1        4.670     20.71                 2.540
2        4.315     11.83                 3.175
Qmax(1) =
          1.000 *    1.000 *     4.670) +
          0.800 *    1.000 *     4.315) + =       8.122
Qmax(2) =
          1.000 *    0.571 *     4.670) +
          1.000 *    1.000 *     4.315) + =       6.981

Total of 2 streams to confluence:
Flow rates before confluence point:
      4.670       4.315
Maximum flow rates at confluence using above data:
       8.122       6.981
Area of streams before confluence:
       2.900       1.400
Results of confluence:
Total flow rate =      8.122(CFS)
Time of concentration =    20.713 min.
Effective stream area after confluence =      4.300(Ac.)


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Process from Point/Station     8047.000 to Point/Station     8049.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   302.000(Ft.)
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Downstream point/station elevation =   301.500(Ft.)
Pipe length  =      9.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      8.122(CFS)
Nearest computed pipe diameter  =      12.00(In.)
Calculated individual pipe flow  =      8.122(CFS)
Normal flow depth in pipe =     9.63(In.)
Flow top width inside pipe =     9.55(In.)
Critical depth could not be calculated.
Pipe flow velocity =      12.02(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    20.73 min.


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Process from Point/Station     8047.000 to Point/Station     8049.000
**** CONFLUENCE OF MAIN STREAMS ****

______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.300(Ac.)
Runoff from this stream =      8.122(CFS)
Time of concentration =   20.73 min.
Rainfall intensity =     2.540(In/Hr)
Summary of stream data:

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


1       18.884     19.45                 2.612
2        8.122     20.73                 2.540
Qmax(1) =
           1.000 *    1.000 *    18.884) +
           1.000 *    0.938 *     8.122) + =       26.507
Qmax(2) =
           0.972 *    1.000 *    18.884) +
           1.000 *    1.000 *     8.122) + =       26.480

Total of 2 main streams to confluence:
Flow rates before confluence point:
      18.884       8.122
Maximum flow rates at confluence using above data:
       26.507       26.480
Area of streams before confluence:
       10.260        4.300


Results of confluence:
Total flow rate =      26.507(CFS)
Time of concentration =    19.450 min.
Effective stream area after confluence  =      14.560(Ac.)


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Process from Point/Station     8049.000 to Point/Station     8055.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
Upstream point/station elevation =   301.500(Ft.)
Downstream point/station elevation =   301.000(Ft.)
Pipe length  =     48.73(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     26.507(CFS)
Nearest computed pipe diameter  =      27.00(In.)
Calculated individual pipe flow  =     26.507(CFS)
Normal flow depth in pipe =    19.03(In.)
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Flow top width inside pipe =    24.63(In.)
Critical Depth =    21.54(In.)
Pipe flow velocity =      8.85(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    19.54 min.


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Process from Point/Station     8049.000 to Point/Station     8055.000
**** CONFLUENCE OF MINOR STREAMS ****

______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      14.560(Ac.)
Runoff from this stream =      26.507(CFS)
Time of concentration =    19.54 min.
Rainfall intensity =     2.607(In/Hr)


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Process from Point/Station     8050.000 to Point/Station     8051.000
**** 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
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Initial subarea flow distance  =  178.000(Ft.)
Highest elevation =  425.000(Ft.)
Lowest elevation =  422.000(Ft.)
Elevation difference =    3.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      13.12 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4500)*( 178.000^.5)/( 1.685^(1/3)]=  13.12
Rainfall intensity (I) =      3.056(In/Hr) for a    100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      0.289(CFS)
Total initial stream area =        0.210(Ac.)


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Process from Point/Station     8051.000 to Point/Station     8052.000
**** IMPROVED CHANNEL TRAVEL TIME ****

______________________________________________________________________
Upstream point elevation =   422.000(Ft.)
Downstream point elevation =   312.000(Ft.)
Channel length thru subarea  =   707.000(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank =   1.000
Estimated mean flow rate at midpoint of channel =       1.630(CFS)
Manning's 'N'    = 0.020
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.630(CFS)
Depth of flow =    0.067(Ft.), Average velocity =   4.775(Ft/s)
Channel flow top width =    5.135(Ft.)
Flow Velocity =    4.77(Ft/s)
Travel time  =    2.47 min.
Time of concentration =   15.58 min.
Critical depth =      0.146(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
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Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      2.862(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      2.511(CFS) for    1.950(Ac.)
Total runoff =      2.800(CFS)  Total area =        2.16(Ac.)


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Process from Point/Station     8052.000 to Point/Station     8054.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   312.000(Ft.)
Downstream point/station elevation =   311.000(Ft.)
Pipe length  =    15.77(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.800(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.800(CFS)
Normal flow depth in pipe =    5.40(In.)
Flow top width inside pipe =    8.82(In.)
Critical Depth =    8.53(In.)
Pipe flow velocity =     10.11(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    15.61 min.


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Process from Point/Station     8054.000 to Point/Station     8054.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    15.61 min.
Rainfall intensity =      2.860(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      1.545(CFS) for    1.200(Ac.)
Total runoff =      4.345(CFS)  Total area =        3.36(Ac.)


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Process from Point/Station     8053.000 to Point/Station     8054.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                ]
Time of concentration =    15.61 min.
Rainfall intensity =      2.860(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      2.473(CFS) for    0.910(Ac.)
Total runoff =      6.817(CFS)  Total area =        4.27(Ac.)


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Process from Point/Station     8054.000 to Point/Station     8055.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   311.000(Ft.)
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Downstream point/station elevation =   302.000(Ft.)
Pipe length  =    77.23(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.817(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.817(CFS)
Normal flow depth in pipe =    6.42(In.)
Flow top width inside pipe =   11.97(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.92(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    15.69 min.


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Process from Point/Station     8054.000 to Point/Station     8055.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      4.270(Ac.)
Runoff from this stream =      6.817(CFS)
Time of concentration =   15.69 min.
Rainfall intensity =     2.854(In/Hr)
Summary of stream data:

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


1       26.507     19.54                  2.607
2        6.817     15.69                  2.854
Qmax(1) =
           1.000 *    1.000 *    26.507) +
           0.913 *    1.000 *     6.817) + =      32.733
Qmax(2) =
           1.000 *    0.803 *    26.507) +
           1.000 *    1.000 *     6.817) + =      28.102

Total of 2 streams to confluence:
Flow rates before confluence point:
     26.507      6.817
Maximum flow rates at confluence using above data:
      32.733      28.102
Area of streams before confluence:
      14.560       4.270
Results of confluence:
Total flow rate =     32.733(CFS)
Time of concentration =    19.542 min.
Effective stream area after confluence =      18.830(Ac.)


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Process from Point/Station     8055.000 to Point/Station     8067.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   302.000(Ft.)
Downstream point/station elevation =   299.000(Ft.)
Pipe length  =   534.67(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    32.733(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    32.733(CFS)
Normal flow depth in pipe =   27.00(In.)
Flow top width inside pipe =   18.00(In.)
Critical Depth =   23.37(In.)
Pipe flow velocity =      7.04(Ft/s)
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Travel time through pipe =    1.27 min.
Time of concentration (TC) =    20.81 min.


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Process from Point/Station     8055.000 to Point/Station     8067.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =     18.830(Ac.)
Runoff from this stream =     32.733(CFS)
Time of concentration =   20.81 min.
Rainfall intensity =     2.535(In/Hr)


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Process from Point/Station     8054.000 to Point/Station     8065.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =  144.000(Ft.)
Highest elevation =  310.000(Ft.)
Lowest elevation =  308.000(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      2.90 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 144.000^.5)/(   1.389^(1/3)]=   2.90
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.709(CFS)
Total initial stream area =        0.170(Ac.)


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Process from Point/Station     8065.000 to Point/Station     8066.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   308.000(Ft.)
End of street segment elevation =   300.000(Ft.)
Length of street segment  =   397.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      1.897(CFS)
Depth of flow =   0.264(Ft.), Average velocity =   2.428(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =    8.428(Ft.)
Flow velocity =   2.43(Ft/s)
```



```
Travel time =    2.73 min.     TC =    7.73  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Rainfall intensity =      3.707(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      2.007(CFS) for    0.570(Ac.)
Total runoff =      2.716(CFS)  Total area =        0.74(Ac.)
Street flow at end of street =      2.716(CFS)
Half street flow at end of street =      2.716(CFS)
Depth of flow =   0.291(Ft.), Average velocity =   2.634(Ft/s)
Flow width (from curb towards crown)=   9.799(Ft.)


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Process from Point/Station     8066.000 to Point/Station     8067.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   300.000(Ft.)
Downstream point/station elevation =   299.500(Ft.)
Pipe length  =     77.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.716(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.716(CFS)
Normal flow depth in pipe =    9.32(In.)
Flow top width inside pipe =   10.00(In.)
Critical Depth =    8.48(In.)
Pipe flow velocity =      4.15(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =     8.04 min.


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Process from Point/Station     8064.000 to Point/Station     8067.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =     8.04 min.
Rainfall intensity =      3.654(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      4.547(CFS) for    1.310(Ac.)
Total runoff =      7.263(CFS)  Total area =        2.05(Ac.)


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Process from Point/Station     8064.000 to Point/Station     8067.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.050(Ac.)
Runoff from this stream =      7.263(CFS)
Time of concentration =    8.04 min.
Rainfall intensity =     3.654(In/Hr)
Summary of stream data:

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

```
1       32.733     20.81                 2.535
2        7.263      8.04                 3.654
Qmax(1) =
           1.000 *    1.000 *    32.733) +
           0.694 *    1.000 *     7.263) + =      37.772
Qmax(2) =
           1.000 *    0.386 *    32.733) +
           1.000 *    1.000 *     7.263) + =      19.904

Total of 2 streams to confluence:
Flow rates before confluence point:
      32.733      7.263
Maximum flow rates at confluence using above data:
       37.772      19.904
Area of streams before confluence:
       18.830       2.050
Results of confluence:
Total flow rate =      37.772(CFS)
Time of concentration =    20.808 min.
Effective stream area after confluence =     20.880(Ac.)


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Process from Point/Station     8067.000 to Point/Station     8068.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   299.000(Ft.)
Downstream point/station elevation =   298.500(Ft.)
Pipe length  =    62.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    37.772(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    37.772(CFS)
Normal flow depth in pipe =  25.31(In.)
Flow top width inside pipe =  21.79(In.)
Critical Depth =   24.94(In.)
Pipe flow velocity =       8.54(Ft/s)
Travel time through pipe =   0.12 min.
Time of concentration (TC) =    20.93 min.


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Process from Point/Station     8067.000 to Point/Station     8068.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     20.880(Ac.)
Runoff from this stream =     37.772(CFS)
Time of concentration =   20.93 min.
Rainfall intensity =      2.528(In/Hr)


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Process from Point/Station     8056.000 to Point/Station     8057.000
**** 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
[SINGLE FAMILY area type                  ]
Initial subarea flow distance  =    77.000(Ft.)
Highest elevation =  305.600(Ft.)
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Lowest elevation =  305.000(Ft.)
Elevation difference =    0.600(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     9.44 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*( 77.000^.5)/( 0.779^(1/3)]=   9.44
Rainfall intensity (I) =       3.445(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.189(CFS)
Total initial stream area =        0.100(Ac.)


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Process from Point/Station     8057.000 to Point/Station     8058.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   305.000(Ft.)
End of street segment elevation =   299.000(Ft.)
Length of street segment  =   544.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      0.824(CFS)
Depth of flow =   0.228(Ft.), Average velocity =   1.600(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   6.662(Ft.)
Flow velocity =   1.60(Ft/s)
Travel time =    5.67 min.     TC =   15.11  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                  ]
Rainfall intensity =      2.897(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      1.068(CFS) for    0.670(Ac.)
Total runoff =      1.257(CFS)  Total area =         0.77(Ac.)
Street flow at end of street =      1.257(CFS)
Half street flow at end of street =      1.257(CFS)
Depth of flow =   0.256(Ft.), Average velocity =   1.753(Ft/s)
Flow width (from curb towards crown)=   8.038(Ft.)


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Process from Point/Station     8058.000 to Point/Station     8060.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   299.000(Ft.)
Downstream point/station elevation =   298.500(Ft.)
Pipe length  =    11.55(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.257(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.257(CFS)
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Normal flow depth in pipe =    3.76(In.)
Flow top width inside pipe =    8.88(In.)
Critical Depth =    6.19(In.)
Pipe flow velocity =        7.18(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    15.13 min.


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Process from Point/Station     8059.000 to Point/Station     8060.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =    15.13 min.
Rainfall intensity =       2.895(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =       2.484(CFS) for     1.560(Ac.)
Total runoff =       3.741(CFS)  Total area =        2.33(Ac.)


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Process from Point/Station     8060.000 to Point/Station     8061.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   298.500(Ft.)
Downstream point/station elevation =   298.000(Ft.)
Pipe length  =    45.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.741(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.741(CFS)
Normal flow depth in pipe =    9.80(In.)
Flow top width inside pipe =    9.29(In.)
Critical Depth =    9.88(In.)
Pipe flow velocity =       5.45(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    15.27 min.


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Process from Point/Station     8072.000 to Point/Station     8061.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =    15.27 min.
Rainfall intensity =       2.885(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =       0.521(CFS) for     0.190(Ac.)
Total runoff =       4.262(CFS)  Total area =        2.52(Ac.)


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Process from Point/Station     8061.000 to Point/Station     8089.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   298.000(Ft.)
Downstream point/station elevation =   297.500(Ft.)
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Pipe length  =   106.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.262(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.262(CFS)
Normal flow depth in pipe =   11.79(In.)
Flow top width inside pipe =   12.31(In.)
Critical Depth =   10.03(In.)
Pipe flow velocity =       4.12(Ft/s)
Travel time through pipe =    0.43 min.
Time of concentration (TC) =    15.70 min.


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Process from Point/Station     8069.000 to Point/Station     8089.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =    15.70 min.
Rainfall intensity =       2.854(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =       0.298(CFS) for     0.110(Ac.)
Total runoff =       4.560(CFS)  Total area =        2.63(Ac.)


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Process from Point/Station     8069.000 to Point/Station     8089.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =    15.70 min.
Rainfall intensity =       2.854(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =       0.190(CFS) for     0.070(Ac.)
Total runoff =       4.750(CFS)  Total area =        2.70(Ac.)


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Process from Point/Station     8070.000 to Point/Station     8089.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Time of concentration =    15.70 min.
Rainfall intensity =       2.854(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =       0.298(CFS) for     0.110(Ac.)
Total runoff =       5.048(CFS)  Total area =        2.81(Ac.)


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Process from Point/Station     8070.000 to Point/Station     8089.000
**** SUBAREA FLOW ADDITION ****
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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =    15.70 min.
Rainfall intensity =      2.854(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.461(CFS) for     0.170(Ac.)
Total runoff =      5.509(CFS)  Total area =        2.98(Ac.)


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Process from Point/Station     8089.000 to Point/Station     8068.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   297.800(Ft.)
Downstream point/station elevation =   297.300(Ft.)
Pipe length  =    92.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.509(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     5.509(CFS)
Normal flow depth in pipe =   11.21(In.)
Flow top width inside pipe =   17.45(In.)
Critical Depth =   10.86(In.)
Pipe flow velocity =      4.76(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =    16.02 min.


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Process from Point/Station     8089.000 to Point/Station     8068.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.980(Ac.)
Runoff from this stream =      5.509(CFS)
Time of concentration =   16.02 min.
Rainfall intensity =     2.831(In/Hr)
Summary of stream data:

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


1       37.772     20.93                  2.528
2        5.509     16.02                  2.831
Qmax(1) =
           1.000 *    1.000 *    37.772) +
           0.893 *    1.000 *     5.509) + =      42.692
Qmax(2) =
           1.000 *    0.766 *    37.772) +
           1.000 *    1.000 *     5.509) + =      34.425

Total of 2 streams to confluence:
Flow rates before confluence point:
      37.772       5.509
Maximum flow rates at confluence using above data:
       42.692      34.425
Area of streams before confluence:
       20.880        2.980
Results of confluence:
Total flow rate =     42.692(CFS)
Time of concentration =    20.929 min.
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Effective stream area after confluence =      23.860(Ac.)


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Process from Point/Station     8068.000 to Point/Station     8079.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   297.500(Ft.)
Downstream point/station elevation =   291.000(Ft.)
Pipe length  =   328.50(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     42.692(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =     42.692(CFS)
Normal flow depth in pipe =   21.66(In.)
Flow top width inside pipe =   21.52(In.)
Critical Depth =   25.46(In.)
Pipe flow velocity =     12.49(Ft/s)
Travel time through pipe =    0.44 min.
Time of concentration (TC) =    21.37 min.


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Process from Point/Station     8068.000 to Point/Station     8079.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =     23.860(Ac.)
Runoff from this stream =     42.692(CFS)
Time of concentration =   21.37 min.
Rainfall intensity =     2.504(In/Hr)


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Process from Point/Station     8066.000 to Point/Station     8074.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =  113.000(Ft.)
Highest elevation =  300.000(Ft.)
Lowest elevation =  297.500(Ft.)
Elevation difference =     2.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.20 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 113.000^.5)/(   2.212^(1/3)]=    2.20
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.417(CFS)
Total initial stream area =       0.100(Ac.)


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Process from Point/Station     8074.000 to Point/Station     8075.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   297.500(Ft.)
End of street segment elevation =   291.500(Ft.)
Length of street segment  =   321.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
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Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      1.397(CFS)
Depth of flow =   0.245(Ft.), Average velocity =   2.204(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.501(Ft.)
Flow velocity =   2.20(Ft/s)
Travel time =    2.43 min.      TC =    7.43  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                         ]
Rainfall intensity =       3.762(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      1.680(CFS) for     0.470(Ac.)
Total runoff =      2.097(CFS)  Total area =        0.57(Ac.)
Street flow at end of street =      2.097(CFS)
Half street flow at end of street =       2.097(CFS)
Depth of flow =   0.274(Ft.), Average velocity =   2.411(Ft/s)
Flow width (from curb towards crown)=   8.934(Ft.)


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Process from Point/Station     8075.000 to Point/Station     8079.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   291.500(Ft.)
Downstream point/station elevation =   290.500(Ft.)
Pipe length  =    77.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      2.097(CFS)
Nearest computed pipe diameter  =      12.00(In.)
Calculated individual pipe flow  =      2.097(CFS)
Normal flow depth in pipe =     6.12(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    7.42(In.)
Pipe flow velocity =        5.21(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =     7.68 min.


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Process from Point/Station     8078.000 to Point/Station     8079.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                         ]
Time of concentration =     7.68 min.
Rainfall intensity =       3.716(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
```



```
Subarea runoff =      2.365(CFS) for     0.670(Ac.)
Total runoff =      4.462(CFS)  Total area =        1.24(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     8078.000 to Point/Station     8079.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.240(Ac.)
Runoff from this stream =      4.462(CFS)
Time of concentration =     7.68 min.
Rainfall intensity =     3.716(In/Hr)
Summary of stream data:

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


1       42.692     21.37                   2.504
2        4.462      7.68                   3.716
Qmax(1) =
           1.000 *    1.000 *    42.692) +
           0.674 *    1.000 *     4.462) + =       45.699
Qmax(2) =
           1.000 *    0.359 *    42.692) +
           1.000 *    1.000 *     4.462) + =       19.797

Total of 2 streams to confluence:
Flow rates before confluence point:
     42.692       4.462
Maximum flow rates at confluence using above data:
      45.699       19.797
Area of streams before confluence:
      23.860        1.240
Results of confluence:
Total flow rate =      45.699(CFS)
Time of concentration =    21.367 min.
Effective stream area after confluence =     25.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     8079.000 to Point/Station     8085.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   290.500(Ft.)
Downstream point/station elevation =   283.000(Ft.)
Pipe length  =   695.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     45.699(CFS)
Nearest computed pipe diameter  =      33.00(In.)
Calculated individual pipe flow  =     45.699(CFS)
Normal flow depth in pipe =    22.97(In.)
Flow top width inside pipe =   30.36(In.)
Critical Depth =    26.86(In.)
Pipe flow velocity =       10.34(Ft/s)
Travel time through pipe =    1.12 min.
Time of concentration (TC) =    22.49 min.


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Process from Point/Station     8079.000 to Point/Station     8085.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
```

```
Stream flow area =      25.100(Ac.)
Runoff from this stream =      45.699(CFS)
Time of concentration =    22.49 min.
Rainfall intensity =      2.445(In/Hr)


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Process from Point/Station     8075.000 to Point/Station     8080.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Initial subarea flow distance  =  101.000(Ft.)
Highest elevation =  292.000(Ft.)
Lowest elevation =  291.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      2.72 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 101.000^.5)/(   0.990^(1/3)]=   2.72
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.417(CFS)
Total initial stream area =        0.100(Ac.)


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Process from Point/Station     8080.000 to Point/Station     8081.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   291.000(Ft.)
End of street segment elevation =   284.000(Ft.)
Length of street segment  =   644.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      2.231(CFS)
Depth of flow =   0.300(Ft.), Average velocity =   1.985(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.260(Ft.)
Flow velocity =   1.98(Ft/s)
Travel time =    5.41 min.      TC =    10.41  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Rainfall intensity =      3.326(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
```



```
Subarea runoff =      2.749(CFS) for    0.870(Ac.)
Total runoff =      3.166(CFS)  Total area =       0.97(Ac.)
Street flow at end of street =      3.166(CFS)
Half street flow at end of street =      3.166(CFS)
Depth of flow =   0.332(Ft.), Average velocity =   2.154(Ft/s)
Flow width (from curb towards crown)=  11.826(Ft.)


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Process from Point/Station     8081.000 to Point/Station     8085.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   284.000(Ft.)
Downstream point/station elevation =   283.500(Ft.)
Pipe length  =     31.75(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.166(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.166(CFS)
Normal flow depth in pipe =     7.45(In.)
Flow top width inside pipe =    11.64(In.)
Critical Depth =    9.14(In.)
Pipe flow velocity =      6.17(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    10.49 min.


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Process from Point/Station     8084.000 to Point/Station     8085.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =    10.49 min.
Rainfall intensity =      3.316(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      5.198(CFS) for    1.650(Ac.)
Total runoff =      8.363(CFS)  Total area =       2.62(Ac.)


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Process from Point/Station     8084.000 to Point/Station     8085.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.620(Ac.)
Runoff from this stream =      8.363(CFS)
Time of concentration =    10.49 min.
Rainfall intensity =     3.316(In/Hr)
Summary of stream data:

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


1       45.699     22.49                  2.445
2        8.363     10.49                  3.316
Qmax(1) =
           1.000 *    1.000 *    45.699) +
           0.737 *    1.000 *     8.363) + =      51.866
Qmax(2) =
           1.000 *    0.467 *    45.699) +
```

```
          1.000 *    1.000 *     8.363) + =      29.689

Total of 2 streams to confluence:
Flow rates before confluence point:
      45.699       8.363
Maximum flow rates at confluence using above data:
       51.866       29.689
Area of streams before confluence:
       25.100        2.620
Results of confluence:
Total flow rate =     51.866(CFS)
Time of concentration =    22.487 min.
Effective stream area after confluence =     27.720(Ac.)


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Process from Point/Station     8085.000 to Point/Station     8088.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   283.500(Ft.)
Downstream point/station elevation =   282.000(Ft.)
Pipe length  =     73.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     51.866(CFS)
Nearest computed pipe diameter   =      30.00(In.)
Calculated individual pipe flow  =      51.866(CFS)
Normal flow depth in pipe =   21.89(In.)
Flow top width inside pipe =   26.65(In.)
Critical Depth =    27.87(In.)
Pipe flow velocity =      13.52(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    22.58 min.


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Process from Point/Station     8085.000 to Point/Station     8088.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     27.720(Ac.)
Runoff from this stream =      51.866(CFS)
Time of concentration =   22.58 min.
Rainfall intensity =     2.440(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station     8090.000 to Point/Station     8082.000
**** 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
[SINGLE FAMILY area type                     ]
Initial subarea flow distance  =   75.000(Ft.)
Highest elevation =  296.000(Ft.)
Lowest elevation =  295.000(Ft.)
Elevation difference =    1.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     7.79 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5500)*(  75.000^.5)/( 1.333^(1/3)]=   7.79
Rainfall intensity (I) =      3.696(In/Hr) for a   100.0 year storm
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Effective runoff coefficient used for area (Q=KCIA) is C = 0.550
Subarea runoff =      0.183(CFS)
Total initial stream area =       0.090(Ac.)


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Process from Point/Station     8082.000 to Point/Station     8073.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   295.000(Ft.)
End of street segment elevation =   290.500(Ft.)
Length of street segment  =   357.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      0.282(CFS)
Depth of flow =   0.167(Ft.), Average velocity =   1.410(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   3.586(Ft.)
Flow velocity =   1.41(Ft/s)
Travel time =    4.22 min.     TC =   12.01  min.
 Adding area flow to street
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
[SINGLE FAMILY area type                     ]
Rainfall intensity =      3.157(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      1.875(CFS) for    1.080(Ac.)
Total runoff =      2.058(CFS)  Total area =        1.17(Ac.)
Street flow at end of street =      2.058(CFS)
Half street flow at end of street =      2.058(CFS)
Depth of flow =   0.288(Ft.), Average velocity =   2.062(Ft/s)
Flow width (from curb towards crown)=   9.627(Ft.)


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Process from Point/Station     8073.000 to Point/Station     8093.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   290.200(Ft.)
Downstream point/station elevation =   290.000(Ft.)
Pipe length  =     11.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      2.058(CFS)
Nearest computed pipe diameter   =      9.00(In.)
Calculated individual pipe flow  =      2.058(CFS)
Normal flow depth in pipe =    6.82(In.)
Flow top width inside pipe =    7.71(In.)
Critical Depth =     7.80(In.)
Pipe flow velocity =      5.73(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    12.04 min.
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Process from Point/Station     8071.000 to Point/Station     8093.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[SINGLE FAMILY area type                    ]
Time of concentration =    12.04 min.
Rainfall intensity =      3.154(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.550
Subarea runoff =      2.238(CFS) for    1.290(Ac.)
Total runoff =      4.296(CFS)  Total area =        2.46(Ac.)


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Process from Point/Station     8093.000 to Point/Station     8096.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   290.000(Ft.)
Downstream point/station elevation =   280.000(Ft.)
Pipe length  =   498.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.296(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.296(CFS)
Normal flow depth in pipe =    8.51(In.)
Flow top width inside pipe =   10.90(In.)
Critical Depth =   10.45(In.)
Pipe flow velocity =      7.22(Ft/s)
Travel time through pipe =    1.15 min.
Time of concentration (TC) =    13.19 min.


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Process from Point/Station     8093.000 to Point/Station     8096.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.460(Ac.)
Runoff from this stream =      4.296(CFS)
Time of concentration =   13.19 min.
Rainfall intensity =     3.050(In/Hr)


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Process from Point/Station     8092.000 to Point/Station     8093.000
**** 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
[MULTI - UNITS area type                    ]
Initial subarea flow distance  =  239.000(Ft.)
Highest elevation =  292.000(Ft.)
Lowest elevation =  288.000(Ft.)
Elevation difference =     4.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     9.38 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7000)*( 239.000^.5)/( 1.674^(1/3)]=   9.38
Rainfall intensity (I) =      3.454(In/Hr) for a   100.0 year storm
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Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =      1.306(CFS)
Total initial stream area =        0.540(Ac.)


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Process from Point/Station     8093.000 to Point/Station     8094.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =   288.000(Ft.)
End of street segment elevation =   282.000(Ft.)
Length of street segment  =   406.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =       4.956(CFS)
Depth of flow =   0.361(Ft.), Average velocity =   2.693(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.301(Ft.)
Flow velocity =   2.69(Ft/s)
Travel time =    2.51 min.     TC =   11.89  min.
 Adding area flow to street
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
[MULTI - UNITS area type                    ]
Rainfall intensity =      3.169(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =      6.699(CFS) for    3.020(Ac.)
Total runoff =      8.005(CFS)  Total area =        3.56(Ac.)
Street flow at end of street =      8.005(CFS)
Half street flow at end of street =      8.005(CFS)
Depth of flow =   0.416(Ft.), Average velocity =   3.021(Ft/s)
Flow width (from curb towards crown)=  16.056(Ft.)


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Process from Point/Station     8094.000 to Point/Station     8096.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   282.000(Ft.)
Downstream point/station elevation =   281.800(Ft.)
Pipe length  =    11.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.005(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.005(CFS)
Normal flow depth in pipe =   11.32(In.)
Flow top width inside pipe =   12.91(In.)
Critical Depth =   13.38(In.)
Pipe flow velocity =      8.05(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =    11.91 min.
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Process from Point/Station     8095.000 to Point/Station     8096.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                    ]
Time of concentration =     11.91 min.
Rainfall intensity =      3.167(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =       5.741(CFS) for    2.590(Ac.)
Total runoff =     13.746(CFS)  Total area =        6.15(Ac.)


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Process from Point/Station     8095.000 to Point/Station     8096.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area =       6.150(Ac.)
Runoff from this stream =     13.746(CFS)
Time of concentration =    11.91 min.
Rainfall intensity =     3.167(In/Hr)
Summary of stream data:

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


1        4.296     13.19                  3.050
2       13.746     11.91                  3.167
Qmax(1) =
           1.000 *    1.000 *     4.296) +
           0.963 *    1.000 *    13.746) + =      17.534
Qmax(2) =
           1.000 *    0.903 *     4.296) +
           1.000 *    1.000 *    13.746) + =      17.625

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.296      13.746
Maximum flow rates at confluence using above data:
       17.534       17.625
Area of streams before confluence:
        2.460        6.150
Results of confluence:
Total flow rate =       17.625(CFS)
Time of concentration =     11.911 min.
Effective stream area after confluence =       8.610(Ac.)


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Process from Point/Station     8096.000 to Point/Station     8088.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   281.800(Ft.)
Downstream point/station elevation =    281.000(Ft.)
Pipe length  =   372.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     17.625(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =     17.625(CFS)
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Normal flow depth in pipe =    22.83(In.)
Flow top width inside pipe =    25.59(In.)
Critical Depth =    17.04(In.)
Pipe flow velocity =       4.40(Ft/s)
Travel time through pipe =     1.41 min.
Time of concentration (TC) =     13.32 min.


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Process from Point/Station     8096.000 to Point/Station     8088.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =       8.610(Ac.)
Runoff from this stream =     17.625(CFS)
Time of concentration =    13.32 min.
Rainfall intensity =     3.039(In/Hr)
Summary of stream data:

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


1       51.866     22.58                  2.440
2       17.625     13.32                  3.039
Qmax(1) =
           1.000 *    1.000 *    51.866) +
           0.803 *    1.000 *    17.625) + =      66.019
Qmax(2) =
           1.000 *    0.590 *    51.866) +
           1.000 *    1.000 *    17.625) + =      48.224

Total of 2 main streams to confluence:
Flow rates before confluence point:
      51.866      17.625
Maximum flow rates at confluence using above data:
       66.019       48.224
Area of streams before confluence:
       27.720        8.610


Results of confluence:
Total flow rate =       66.019(CFS)
Time of concentration =     22.577 min.
Effective stream area after confluence  =     36.330(Ac.)


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Process from Point/Station     8088.000 to Point/Station     8110.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   282.000(Ft.)
Downstream point/station elevation =    279.000(Ft.)
Pipe length  =   315.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     66.019(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =     66.019(CFS)
Normal flow depth in pipe =    30.00(In.)
Flow top width inside pipe =    26.83(In.)
Critical Depth =    31.19(In.)
Pipe flow velocity =      10.49(Ft/s)
Travel time through pipe =     0.50 min.
Time of concentration (TC) =     23.08 min.
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Process from Point/Station     8031.000 to Point/Station     8110.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =    23.08 min.
Rainfall intensity =      2.415(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.573(CFS) for    0.250(Ac.)
Total runoff =     66.593(CFS)  Total area =       36.58(Ac.)


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Process from Point/Station     8031.000 to Point/Station     8110.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Time of concentration =    23.08 min.
Rainfall intensity =      2.415(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      0.505(CFS) for    0.220(Ac.)
Total runoff =     67.097(CFS)  Total area =       36.80(Ac.)


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Process from Point/Station     8110.000 to Point/Station     8118.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   279.000(Ft.)
Downstream point/station elevation =   278.800(Ft.)
Pipe length  =    80.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    67.097(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =    67.097(CFS)
Normal flow depth in pipe =   36.75(In.)
Flow top width inside pipe =   40.67(In.)
Critical Depth =   29.66(In.)
Pipe flow velocity =       6.49(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =    23.28 min.


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Process from Point/Station     8110.000 to Point/Station     8118.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area =     36.800(Ac.)
Runoff from this stream =     67.097(CFS)
Time of concentration =    23.28 min.
Rainfall intensity =     2.404(In/Hr)


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Process from Point/Station     8087.000 to Point/Station     8107.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                    ]
Initial subarea flow distance  =  190.000(Ft.)
Highest elevation =  282.000(Ft.)
Lowest elevation =  279.500(Ft.)
Elevation difference =    2.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      3.40 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 190.000^.5)/(   1.316^(1/3)]=   3.40
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      1.209(CFS)
Total initial stream area =        0.290(Ac.)


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Process from Point/Station     8107.000 to Point/Station     8118.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   279.200(Ft.)
Downstream point/station elevation =   279.000(Ft.)
Pipe length  =     24.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      1.209(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =      1.209(CFS)
Normal flow depth in pipe =    6.09(In.)
Flow top width inside pipe =    8.42(In.)
Critical Depth =    6.07(In.)
Pipe flow velocity =       3.80(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     5.11 min.


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Process from Point/Station     8107.000 to Point/Station     8118.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.290(Ac.)
Runoff from this stream =      1.209(CFS)
Time of concentration =     5.11 min.
Rainfall intensity =     4.352(In/Hr)
Summary of stream data:

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


1       67.097     23.28                 2.404
2        1.209      5.11                 4.352
Qmax(1) =
           1.000 *    1.000 *    67.097) +
           0.552 *    1.000 *     1.209) + =       67.765
Qmax(2) =
           1.000 *    0.219 *    67.097) +
           1.000 *    1.000 *     1.209) + =       15.922
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
     67.097       1.209
Maximum flow rates at confluence using above data:
      67.765       15.922
Area of streams before confluence:
      36.800        0.290
Results of confluence:
Total flow rate =      67.765(CFS)
Time of concentration =     23.283 min.
Effective stream area after confluence =     37.090(Ac.)


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Process from Point/Station     8108.000 to Point/Station     8118.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =    23.28 min.
Rainfall intensity =       2.404(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      2.010(CFS) for    0.880(Ac.)
Total runoff =     69.775(CFS)  Total area =       37.97(Ac.)


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Process from Point/Station     8108.000 to Point/Station     8118.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     37.970(Ac.)
Runoff from this stream =      69.775(CFS)
Time of concentration =   23.28 min.
Rainfall intensity =     2.404(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station     8097.000 to Point/Station     8098.000
**** 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
[MULTI - UNITS area type                     ]
Initial subarea flow distance  =  214.000(Ft.)
Highest elevation =  280.000(Ft.)
Lowest elevation =  277.000(Ft.)
Elevation difference =     3.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     9.41 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7000)*( 214.000^.5)/( 1.402^(1/3)]=   9.41
Rainfall intensity (I) =      3.449(In/Hr) for a  100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =      0.797(CFS)
Total initial stream area =        0.330(Ac.)
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Process from Point/Station     8098.000 to Point/Station     8114.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =    277.000(Ft.)
End of street segment elevation =    273.500(Ft.)
Length of street segment  =    220.000(Ft.)
Height of curb above gutter flowline  =     6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =    0.020
Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =    1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =       1.968(CFS)
Depth of flow =    0.275(Ft.), Average velocity =   2.233(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =    8.999(Ft.)
Flow velocity =   2.23(Ft/s)
Travel time =    1.64 min.     TC =   11.05  min.
 Adding area flow to street
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
[MULTI - UNITS area type                     ]
Rainfall intensity =       3.254(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =      2.210(CFS) for    0.970(Ac.)
Total runoff =      3.006(CFS)  Total area =        1.30(Ac.)
Street flow at end of street =      3.006(CFS)
Half street flow at end of street =      3.006(CFS)
Depth of flow =    0.309(Ft.), Average velocity =   2.462(Ft/s)
Flow width (from curb towards crown)=  10.723(Ft.)


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Process from Point/Station     8114.000 to Point/Station     8116.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   273.500(Ft.)
Downstream point/station elevation =   273.000(Ft.)
Pipe length   =    10.80(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.006(CFS)
Nearest computed pipe diameter   =     9.00(In.)
Calculated individual pipe flow   =     3.006(CFS)
Normal flow depth in pipe =    6.34(In.)
Flow top width inside pipe =    8.21(In.)
Critical depth could not be calculated.
Pipe flow velocity =      9.03(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =    11.07 min.


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Process from Point/Station     8115.000 to Point/Station     8116.000
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**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                    ]
Time of concentration =    11.07 min.
Rainfall intensity =      3.252(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =      3.096(CFS) for    1.360(Ac.)
Total runoff =      6.102(CFS)  Total area =        2.66(Ac.)


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Process from Point/Station     8116.000 to Point/Station     8117.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   273.000(Ft.)
Downstream point/station elevation =   271.500(Ft.)
Pipe length  =   460.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.102(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     6.102(CFS)
Normal flow depth in pipe =   12.63(In.)
Flow top width inside pipe =   20.56(In.)
Critical Depth =   10.93(In.)
Pipe flow velocity =      4.04(Ft/s)
Travel time through pipe =    1.90 min.
Time of concentration (TC) =    12.97 min.


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Process from Point/Station     8103.000 to Point/Station     8117.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                    ]
Time of concentration =    12.97 min.
Rainfall intensity =      3.069(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =      1.826(CFS) for    0.850(Ac.)
Total runoff =      7.928(CFS)  Total area =        3.51(Ac.)


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Process from Point/Station     8104.000 to Point/Station     8117.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                    ]
Time of concentration =    12.97 min.
Rainfall intensity =      3.069(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.700
Subarea runoff =      2.170(CFS) for    1.010(Ac.)
Total runoff =     10.098(CFS)  Total area =        4.52(Ac.)
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Process from Point/Station     8117.000 to Point/Station     8113.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   271.000(Ft.)
Downstream point/station elevation =   270.600(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.098(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    10.098(CFS)
Normal flow depth in pipe =   14.37(In.)
Flow top width inside pipe =   19.52(In.)
Critical Depth =   14.19(In.)
Pipe flow velocity =      5.76(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    13.16 min.


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Process from Point/Station     8117.000 to Point/Station     8113.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 1
Stream flow area =      4.520(Ac.)
Runoff from this stream =     10.098(CFS)
Time of concentration =   13.16 min.
Rainfall intensity =     3.053(In/Hr)


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Process from Point/Station     8081.000 to Point/Station     8110.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                       ]
Initial subarea flow distance  =  228.000(Ft.)
Highest elevation =  285.000(Ft.)
Lowest elevation =  281.000(Ft.)
Elevation difference =    4.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     3.38 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*( 228.000^.5)/(   1.754^(1/3)]=   3.38
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      3.753(CFS)
Total initial stream area =        0.900(Ac.)


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Process from Point/Station     8110.000 to Point/Station     8113.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation =   281.000(Ft.)
End of street segment elevation =   272.000(Ft.)
Length of street segment  =   850.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  26.000(Ft.)
Distance from crown to crossfall grade break  =  10.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
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Slope from grade break to crown (v/hz)  =    0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  15.000(Ft.)
Slope from curb to property line (v/hz) =    0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  1.500(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0180
 Manning's N from grade break to crown =  0.0180
Estimated mean flow rate at midpoint of street =      7.401(CFS)
Depth of flow =    0.427(Ft.), Average velocity =   2.613(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  16.618(Ft.)
Flow velocity =   2.61(Ft/s)
Travel time =    5.42 min.     TC =   10.42  min.
 Adding area flow to street
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                      ]
Rainfall intensity =      3.324(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.950
Subarea runoff =      5.526(CFS) for     1.750(Ac.)
Total runoff =      9.279(CFS)  Total area =        2.65(Ac.)
Street flow at end of street =      9.279(CFS)
Half street flow at end of street =      9.279(CFS)
Depth of flow =    0.458(Ft.), Average velocity =   2.760(Ft/s)
Flow width (from curb towards crown)=  18.140(Ft.)


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Process from Point/Station     8110.000 to Point/Station     8113.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.650(Ac.)
Runoff from this stream =      9.279(CFS)
Time of concentration =   10.42 min.
Rainfall intensity =     3.324(In/Hr)
Summary of stream data:

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


1       10.098     13.16                  3.053
2        9.279     10.42                  3.324
Qmax(1) =
           1.000 *    1.000 *    10.098) +
           0.918 *    1.000 *     9.279) + =      18.619
Qmax(2) =
           1.000 *    0.792 *    10.098) +
           1.000 *    1.000 *     9.279) + =      17.276

Total of 2 streams to confluence:
Flow rates before confluence point:
      10.098       9.279
Maximum flow rates at confluence using above data:
       18.619       17.276
Area of streams before confluence:
        4.520        2.650
Results of confluence:
Total flow rate =     18.619(CFS)
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Time of concentration =    13.160 min.
Effective stream area after confluence =      7.170(Ac.)


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Process from Point/Station     8113.000 to Point/Station     8118.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   270.000(Ft.)
Downstream point/station elevation =   269.800(Ft.)
Pipe length  =      9.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.619(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    18.619(CFS)
Normal flow depth in pipe =    14.20(In.)
Flow top width inside pipe =   19.65(In.)
Critical Depth =   18.75(In.)
Pipe flow velocity =     10.76(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =    13.17 min.


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Process from Point/Station     8113.000 to Point/Station     8118.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      7.170(Ac.)
Runoff from this stream =     18.619(CFS)
Time of concentration =   13.17 min.
Rainfall intensity =     3.051(In/Hr)
Summary of stream data:

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


1       69.775     23.28                  2.404
2       18.619     13.17                  3.051
Qmax(1) =
           1.000 *    1.000 *    69.775) +
           0.788 *    1.000 *    18.619) + =      84.446
Qmax(2) =
           1.000 *    0.566 *    69.775) +
           1.000 *    1.000 *    18.619) + =      58.100

Total of 2 main streams to confluence:
Flow rates before confluence point:
     69.775      18.619
Maximum flow rates at confluence using above data:
      84.446       58.100
Area of streams before confluence:
      37.970        7.170


Results of confluence:
Total flow rate =     84.446(CFS)
Time of concentration =    23.283 min.
Effective stream area after confluence  =     45.140(Ac.)


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Process from Point/Station     8118.000 to Point/Station     8122.000
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**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =   269.800(Ft.)
Downstream point/station elevation =   264.000(Ft.)
Pipe length  =   372.62(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    84.446(CFS)
Nearest computed pipe diameter  =    36.00(In.)
Calculated individual pipe flow  =    84.446(CFS)
Normal flow depth in pipe =   30.00(In.)
Flow top width inside pipe =   26.83(In.)
Critical Depth =   33.69(In.)
Pipe flow velocity =     13.41(Ft/s)
Travel time through pipe =    0.46 min.
Time of concentration (TC) =    23.75 min.


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Process from Point/Station     8119.000 to Point/Station     8122.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    23.75 min.
Rainfall intensity =      2.381(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      5.357(CFS) for    5.000(Ac.)
Total runoff =     89.803(CFS)  Total area =       50.14(Ac.)


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Process from Point/Station     8120.000 to Point/Station     8122.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration =    23.75 min.
Rainfall intensity =      2.381(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =     30.837(CFS) for   28.780(Ac.)
Total runoff =    120.641(CFS)  Total area =       78.92(Ac.)
End of computations, total study area =         78.920 (Ac.)
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                    San Diego County Rational Hydrology Program

          CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2003
Version 6.3

          Rational method hydrology  program based on
          San Diego County Flood Control Division 1985 hydrology manual
                 Rational Hydrology Study         Date: 01/31/19

----------------------------------------------------------------------
          PROJECT CANTERA
          PROPOSED CONDITIONS
          9000P100

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

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

          Program License Serial Number 4049

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

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

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          Process from Point/Station     9000.000 to Point/Station
9001.000
          **** 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
          [MULTI - UNITS area type                       ]
          Initial subarea flow distance  =  134.000(Ft.)
          Highest elevation =  314.200(Ft.)
          Lowest elevation =  313.000(Ft.)
          Elevation difference =    1.200(Ft.)
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          Time of concentration calculated by the urban
          areas overland flow method (App X-C) =     8.65 min.
          TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
          TC = [1.8*(1.1-0.7000)*( 134.000^.5)/( 0.896^(1/3)]=    8.65
          Rainfall intensity (I) =      3.557(In/Hr) for a   100.0 year
storm
          Effective runoff coefficient used for area (Q=KCIA) is C =
0.700
          Subarea runoff =      0.473(CFS)
          Total initial stream area =       0.190(Ac.)

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          Process from Point/Station     9001.000 to Point/Station
9006.000
          **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

______________________________________________________________________
          Top of street segment elevation =   313.000(Ft.)
          End of street segment elevation =   309.000(Ft.)
          Length of street segment  =   320.000(Ft.)
          Height of curb above gutter flowline  =    6.0(In.)
          Width of half street (curb to crown)  =  20.000(Ft.)
          Distance from crown to crossfall grade break  =  18.000(Ft.)
          Slope from gutter to grade break (v/hz) =    0.063
          Slope from grade break to crown (v/hz)  =    0.020
          Street flow is on [1] side(s) of the street
          Distance from curb to property line  =  10.000(Ft.)
          Slope from curb to property line (v/hz) =    0.020
          Gutter width =   2.000(Ft.)
          Gutter hike from flowline =  2.000(In.)
           Manning's N in gutter =  0.0170
           Manning's N from gutter to grade break =  0.0170
           Manning's N from grade break to crown =  0.0170
          Estimated mean flow rate at midpoint of street =
2.403(CFS)
          Depth of flow =   0.323(Ft.), Average velocity =   2.208(Ft/s)
          Streetflow hydraulics at midpoint of street travel:
          Halfstreet flow width =   9.807(Ft.)
          Flow velocity =   2.21(Ft/s)
          Travel time =    2.42 min.      TC =    11.06  min.
           Adding area flow to street
          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
          [MULTI - UNITS area type                  ]
          Rainfall intensity =      3.253(In/Hr) for a   100.0 year
storm
          Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.700
          Subarea runoff =      3.530(CFS) for    1.550(Ac.)
          Total runoff =      4.003(CFS)  Total area =        1.74(Ac.)
          Street flow at end of street =      4.003(CFS)
          Half street flow at end of street =      4.003(CFS)
```

```
        Depth of flow =   0.370(Ft.), Average velocity =   2.485(Ft/s)
        Flow width (from curb towards crown)=  12.182(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9006.000 to Point/Station
9008.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =   308.800(Ft.)
        Downstream point/station elevation =   308.600(Ft.)
        Pipe length  =    10.50(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =     4.003(CFS)
        Nearest computed pipe diameter  =     12.00(In.)
        Calculated individual pipe flow  =     4.003(CFS)
        Normal flow depth in pipe =    8.23(In.)
        Flow top width inside pipe =   11.14(In.)
        Critical Depth =    10.17(In.)
        Pipe flow velocity =      6.98(Ft/s)
        Travel time through pipe =    0.03 min.
        Time of concentration (TC) =    11.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9007.000 to Point/Station
9008.000
        **** SUBAREA FLOW ADDITION ****

______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [MULTI - UNITS area type                    ]
        Time of concentration =    11.09 min.
        Rainfall intensity =      3.250(In/Hr) for a   100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.700
        Subarea runoff =      3.390(CFS) for    1.490(Ac.)
        Total runoff =      7.393(CFS)  Total area =        3.23(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9008.000 to Point/Station
9016.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =   307.000(Ft.)
        Downstream point/station elevation =   291.500(Ft.)
        Pipe length  =   590.00(Ft.)   Manning's N = 0.013
```



```
        No. of pipes = 1  Required pipe flow  =     7.393(CFS)
        Nearest computed pipe diameter  =     15.00(In.)
        Calculated individual pipe flow  =     7.393(CFS)
        Normal flow depth in pipe =    9.30(In.)
        Flow top width inside pipe =   14.56(In.)
        Critical Depth =    13.00(In.)
        Pipe flow velocity =      9.25(Ft/s)
        Travel time through pipe =    1.06 min.
        Time of concentration (TC) =    12.15 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9014.000 to Point/Station
9016.000
        **** SUBAREA FLOW ADDITION ****

______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [MULTI - UNITS area type                    ]
        Time of concentration =    12.15 min.
        Rainfall intensity =      3.144(In/Hr) for a   100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.700
        Subarea runoff =      3.851(CFS) for    1.750(Ac.)
        Total runoff =     11.244(CFS)  Total area =        4.98(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9015.000 to Point/Station
9016.000
        **** SUBAREA FLOW ADDITION ****

______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [MULTI - UNITS area type                    ]
        Time of concentration =    12.15 min.
        Rainfall intensity =      3.144(In/Hr) for a   100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.700
        Subarea runoff =      4.951(CFS) for    2.250(Ac.)
        Total runoff =     16.195(CFS)  Total area =        7.23(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9016.000 to Point/Station
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9021.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

____________________________________________________________
        Upstream point/station elevation =   291.500(Ft.)
        Downstream point/station elevation =   288.800(Ft.)
        Pipe length   =    230.00(Ft.)    Manning's N = 0.013
        No. of pipes = 1  Required pipe flow   =      16.195(CFS)
        Nearest computed pipe diameter   =       21.00(In.)
        Calculated individual pipe flow   =      16.195(CFS)
        Normal flow depth in pipe =    16.22(In.)
        Flow top width inside pipe =    17.61(In.)
        Critical Depth =    17.80(In.)
        Pipe flow velocity =       8.12(Ft/s)
        Travel time through pipe =     0.47 min.
        Time of concentration (TC) =    12.62 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9016.000 to Point/Station
9021.000
        **** CONFLUENCE OF MINOR STREAMS ****

____________________________________________________________
        Along Main Stream number: 1 in normal stream number 1
        Stream flow area =        7.230(Ac.)
        Runoff from this stream =      16.195(CFS)
        Time of concentration =    12.62 min.
        Rainfall intensity =      3.100(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9017.000 to Point/Station
9018.000
        **** INITIAL AREA EVALUATION ****

____________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [INDUSTRIAL area type                    ]
        Initial subarea flow distance   =    59.000(Ft.)
        Highest elevation =  296.000(Ft.)
        Lowest elevation =  295.200(Ft.)
        Elevation difference =      0.800(Ft.)
        Time of concentration calculated by the urban
        areas overland flow method (App X-C) =      1.87 min.
        TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
        TC = [1.8*(1.1-0.9500)*(  59.000^.5)/(   1.356^(1/3)]=    1.87
        Setting time of concentration to 5 minutes
        Rainfall intensity (I) =       4.389(In/Hr) for a    100.0 year
storm
        Effective runoff coefficient used for area (Q=KCIA) is C =
```



```
0.950
        Subarea runoff =       0.292(CFS)
        Total initial stream area =        0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9018.000 to Point/Station
9019.000
        **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

____________________________________________________________
        Top of street segment elevation =    295.200(Ft.)
        End of street segment elevation =    289.000(Ft.)
        Length of street segment   =    343.000(Ft.)
        Height of curb above gutter flowline   =     6.0(In.)
        Width of half street (curb to crown)   =  26.000(Ft.)
        Distance from crown to crossfall grade break   =   10.000(Ft.)
        Slope from gutter to grade break (v/hz) =     0.020
        Slope from grade break to crown (v/hz)   =    0.020
        Street flow is on [1] side(s) of the street
        Distance from curb to property line   =  15.000(Ft.)
        Slope from curb to property line (v/hz) =    0.020
        Gutter width =    1.500(Ft.)
        Gutter hike from flowline =    1.500(In.)
         Manning's N in gutter =   0.0150
         Manning's N from gutter to grade break =   0.0180
         Manning's N from grade break to crown =   0.0180
        Estimated mean flow rate at midpoint of street =
0.344(CFS)
        Depth of flow =    0.168(Ft.), Average velocity =    1.692(Ft/s)
        Streetflow hydraulics at midpoint of street travel:
        Halfstreet flow width =    3.638(Ft.)
        Flow velocity =     1.69(Ft/s)
        Travel time =     3.38 min.      TC =      8.38  min.
         Adding area flow to street
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [INDUSTRIAL area type                    ]
        Rainfall intensity =       3.598(In/Hr) for a    100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
        Subarea runoff =       1.231(CFS) for     0.360(Ac.)
        Total runoff =       1.522(CFS)  Total area =         0.43(Ac.)
        Street flow at end of street =       1.522(CFS)
        Half street flow at end of street =        1.522(CFS)
        Depth of flow =    0.252(Ft.), Average velocity =    2.216(Ft/s)
        Flow width (from curb towards crown)=     7.846(Ft.)


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        Process from Point/Station     9055.000 to Point/Station
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9019.000
       **** SUBAREA FLOW ADDITION ****

______________________________________________________________________
       Decimal fraction soil group A = 0.000
       Decimal fraction soil group B = 0.000
       Decimal fraction soil group C = 0.000
       Decimal fraction soil group D = 1.000
       [INDUSTRIAL area type              ]
       Time of concentration =     8.38 min.
       Rainfall intensity =     3.598(In/Hr) for a   100.0 year
storm
       Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
       Subarea runoff =      1.196(CFS) for    0.350(Ac.)
       Total runoff =      2.719(CFS)  Total area =        0.78(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
       Process from Point/Station     9019.000 to Point/Station
9021.000
       **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
       Upstream point/station elevation =   288.900(Ft.)
       Downstream point/station elevation =   288.700(Ft.)
       Pipe length  =    22.00(Ft.)   Manning's N = 0.013
       No. of pipes = 1  Required pipe flow  =     2.719(CFS)
       Nearest computed pipe diameter  =     12.00(In.)
       Calculated individual pipe flow  =     2.719(CFS)
       Normal flow depth in pipe =    8.12(In.)
       Flow top width inside pipe =   11.23(In.)
       Critical Depth =    8.48(In.)
       Pipe flow velocity =     4.81(Ft/s)
       Travel time through pipe =    0.08 min.
       Time of concentration (TC) =     8.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
       Process from Point/Station     9020.000 to Point/Station
9021.000
       **** SUBAREA FLOW ADDITION ****

______________________________________________________________________
       Decimal fraction soil group A = 0.000
       Decimal fraction soil group B = 0.000
       Decimal fraction soil group C = 0.000
       Decimal fraction soil group D = 1.000
       [INDUSTRIAL area type              ]
       Time of concentration =     8.46 min.
       Rainfall intensity =     3.586(In/Hr) for a   100.0 year
storm
       Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
```



```
       Subarea runoff =      1.192(CFS) for    0.350(Ac.)
       Total runoff =      3.911(CFS)  Total area =        1.13(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
       Process from Point/Station     9020.000 to Point/Station
9021.000
       **** CONFLUENCE OF MINOR STREAMS ****

______________________________________________________________________
       Along Main Stream number: 1 in normal stream number 2
       Stream flow area =      1.130(Ac.)
       Runoff from this stream =      3.911(CFS)
       Time of concentration =    8.46 min.
       Rainfall intensity =     3.586(In/Hr)
       Summary of stream data:

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


       1       16.195     12.62                  3.100
       2        3.911      8.46                  3.586
       Qmax(1) =
                  1.000 *    1.000 *    16.195) +
                  0.864 *    1.000 *     3.911) + =      19.576
       Qmax(2) =
                  1.000 *    0.670 *    16.195) +
                  1.000 *    1.000 *     3.911) + =      14.759

       Total of 2 streams to confluence:
       Flow rates before confluence point:
            16.195       3.911
       Maximum flow rates at confluence using above data:
             19.576       14.759
       Area of streams before confluence:
              7.230       1.130
       Results of confluence:
       Total flow rate =     19.576(CFS)
       Time of concentration =    12.623 min.
       Effective stream area after confluence =      8.360(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
       Process from Point/Station     9021.000 to Point/Station
9054.000
       **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
       Upstream point/station elevation =   288.600(Ft.)
       Downstream point/station elevation =   288.500(Ft.)
       Pipe length  =    81.00(Ft.)   Manning's N = 0.013
       No. of pipes = 1  Required pipe flow  =    19.576(CFS)
       Nearest computed pipe diameter  =     33.00(In.)
```

```
Calculated individual pipe flow   =     19.576(CFS)
Normal flow depth in pipe =   28.97(In.)
Flow top width inside pipe =   21.61(In.)
Critical Depth =    17.51(In.)
Pipe flow velocity =       3.54(Ft/s)
Travel time through pipe =     0.38 min.
Time of concentration (TC) =     13.00 min.


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9025.000 to Point/Station
9054.000
        **** SUBAREA FLOW ADDITION ****

______________________________________________________________________
        User specified 'C' value of 0.500 given for subarea
        Time of concentration =     13.00 min.
        Rainfall intensity =      3.066(In/Hr) for a    100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.500
        Subarea runoff =      11.590(CFS) for     7.560(Ac.)
        Total runoff =      31.166(CFS)  Total area =        15.92(Ac.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9054.000 to Point/Station
9056.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =    288.500(Ft.)
        Downstream point/station elevation =    288.200(Ft.)
        Pipe length  =    22.00(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow   =     31.166(CFS)
        Nearest computed pipe diameter   =      27.00(In.)
        Calculated individual pipe flow   =     31.166(CFS)
        Normal flow depth in pipe =    19.34(In.)
        Flow top width inside pipe =    24.35(In.)
        Critical Depth =    23.12(In.)
        Pipe flow velocity =      10.23(Ft/s)
        Travel time through pipe =      0.04 min.
        Time of concentration (TC) =     13.04 min.


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9054.000 to Point/Station
9056.000
        **** CONFLUENCE OF MAIN STREAMS ****

______________________________________________________________________
        The following data inside Main Stream is listed:
        In Main Stream number: 1
```



```
        Stream flow area =      15.920(Ac.)
        Runoff from this stream =      31.166(CFS)
        Time of concentration =    13.04 min.
        Rainfall intensity =      3.063(In/Hr)
        Program is now starting with Main Stream No. 2


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9042.000 to Point/Station
9044.000
        **** INITIAL AREA EVALUATION ****

______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [INDUSTRIAL area type                    ]
        Initial subarea flow distance   =    31.000(Ft.)
        Highest elevation =  291.000(Ft.)
        Lowest elevation =  290.800(Ft.)
        Elevation difference =     0.200(Ft.)
        Time of concentration calculated by the urban
        areas overland flow method (App X-C) =      1.74 min.
        TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
        TC = [1.8*(1.1-0.9500)*(  31.000^.5)/(   0.645^(1/3)]=    1.74
        Setting time of concentration to 5 minutes
        Rainfall intensity (I) =       4.389(In/Hr) for a    100.0 year
storm
        Effective runoff coefficient used for area (Q=KCIA) is C =
0.950
        Subarea runoff =       0.167(CFS)
        Total initial stream area =        0.040(Ac.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9044.000 to Point/Station
9049.000
        **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

______________________________________________________________________
        Top of street segment elevation =    290.800(Ft.)
        End of street segment elevation =    290.500(Ft.)
        Length of street segment   =   120.000(Ft.)
        Height of curb above gutter flowline   =     6.0(In.)
        Width of half street (curb to crown)   =  26.000(Ft.)
        Distance from crown to crossfall grade break   =  10.000(Ft.)
        Slope from gutter to grade break (v/hz) =    0.020
        Slope from grade break to crown (v/hz)   =    0.020
        Street flow is on [1] side(s) of the street
        Distance from curb to property line   =  15.000(Ft.)
        Slope from curb to property line (v/hz) =    0.020
        Gutter width =    1.500(Ft.)
        Gutter hike from flowline =   1.500(In.)
```

```
        Manning's N in gutter =  0.0150
        Manning's N from gutter to grade break =  0.0180
        Manning's N from grade break to crown =  0.0180
       Estimated mean flow rate at midpoint of street =
0.179(CFS)
       Depth of flow =   0.185(Ft.), Average velocity =   0.658(Ft/s)
       Streetflow hydraulics at midpoint of street travel:
       Halfstreet flow width =   4.487(Ft.)
       Flow velocity =   0.66(Ft/s)
       Travel time =   3.04 min.     TC =    8.04  min.
        Adding area flow to street
       Decimal fraction soil group A = 0.000
       Decimal fraction soil group B = 0.000
       Decimal fraction soil group C = 0.000
       Decimal fraction soil group D = 1.000
       [INDUSTRIAL area type                    ]
       Rainfall intensity =     3.653(In/Hr) for a   100.0 year
storm
       Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
       Subarea runoff =     0.521(CFS) for    0.150(Ac.)
       Total runoff =     0.687(CFS)  Total area =       0.19(Ac.)
       Street flow at end of street =     0.687(CFS)
       Half street flow at end of street =     0.687(CFS)
       Depth of flow =   0.266(Ft.), Average velocity =   0.860(Ft/s)
       Flow width (from curb towards crown)=   8.530(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
       Process from Point/Station     9049.000 to Point/Station
9052.000
       **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
       Upstream point/station elevation =   290.300(Ft.)
       Downstream point/station elevation =   290.000(Ft.)
       Pipe length  =    51.25(Ft.)   Manning's N = 0.013
       No. of pipes = 1  Required pipe flow  =     0.687(CFS)
       Nearest computed pipe diameter  =     9.00(In.)
       Calculated individual pipe flow  =     0.687(CFS)
       Normal flow depth in pipe =    4.73(In.)
       Flow top width inside pipe =    8.99(In.)
       Critical Depth =    4.52(In.)
       Pipe flow velocity =     2.92(Ft/s)
       Travel time through pipe =    0.29 min.
       Time of concentration (TC) =    8.33 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
       Process from Point/Station     9051.000 to Point/Station
9052.000
       **** SUBAREA FLOW ADDITION ****

______________________________________________________________________
```



```
       Decimal fraction soil group A = 0.000
       Decimal fraction soil group B = 0.000
       Decimal fraction soil group C = 0.000
       Decimal fraction soil group D = 1.000
       [INDUSTRIAL area type                    ]
       Time of concentration =     8.33 min.
       Rainfall intensity =     3.605(In/Hr) for a   100.0 year
storm
       Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
       Subarea runoff =     0.548(CFS) for    0.160(Ac.)
       Total runoff =     1.235(CFS)  Total area =       0.35(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
       Process from Point/Station     9052.000 to Point/Station
9053.000
       **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
       Upstream point/station elevation =   290.000(Ft.)
       Downstream point/station elevation =   289.600(Ft.)
       Pipe length  =   178.00(Ft.)   Manning's N = 0.013
       No. of pipes = 1  Required pipe flow  =     1.235(CFS)
       Nearest computed pipe diameter  =    12.00(In.)
       Calculated individual pipe flow  =     1.235(CFS)
       Normal flow depth in pipe =    7.62(In.)
       Flow top width inside pipe =   11.56(In.)
       Critical Depth =    5.63(In.)
       Pipe flow velocity =     2.35(Ft/s)
       Travel time through pipe =    1.26 min.
       Time of concentration (TC) =    9.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
       Process from Point/Station     9053.000 to Point/Station
9056.000
       **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
       Upstream point/station elevation =   289.500(Ft.)
       Downstream point/station elevation =   288.200(Ft.)
       Pipe length  =   240.80(Ft.)   Manning's N = 0.013
       No. of pipes = 1  Required pipe flow  =     1.235(CFS)
       Nearest computed pipe diameter  =    12.00(In.)
       Calculated individual pipe flow  =     1.235(CFS)
       Normal flow depth in pipe =    5.80(In.)
       Flow top width inside pipe =   11.99(In.)
       Critical Depth =    5.63(In.)
       Pipe flow velocity =     3.28(Ft/s)
       Travel time through pipe =    1.22 min.
       Time of concentration (TC) =   10.82 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9053.000 to Point/Station
9056.000
        **** CONFLUENCE OF MAIN STREAMS ****

______________________________________________________________________
        The following data inside Main Stream is listed:
        In Main Stream number: 2
        Stream flow area =      0.350(Ac.)
        Runoff from this stream =       1.235(CFS)
        Time of concentration =   10.82 min.
        Rainfall intensity =     3.280(In/Hr)
        Summary of stream data:

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


        1       31.166     13.04                  3.063
        2        1.235     10.82                  3.280
        Qmax(1) =
                 1.000 *     1.000 *    31.166) +
                 0.934 *     1.000 *     1.235) + =       32.319
        Qmax(2) =
                 1.000 *     0.830 *    31.166) +
                 1.000 *     1.000 *     1.235) + =       27.089

        Total of 2 main streams to confluence:
        Flow rates before confluence point:
              31.166       1.235
        Maximum flow rates at confluence using above data:
               32.319        27.089
        Area of streams before confluence:
               15.920         0.350


        Results of confluence:
        Total flow rate =       32.319(CFS)
        Time of concentration =    13.040 min.
        Effective stream area after confluence  =       16.270(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9056.000 to Point/Station
9064.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =    288.200(Ft.)
        Downstream point/station elevation =    273.800(Ft.)
        Pipe length   =    402.44(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow   =     32.319(CFS)
        Nearest computed pipe diameter   =     24.00(In.)
        Calculated individual pipe flow   =     32.319(CFS)
```



```
        Normal flow depth in pipe =    15.59(In.)
        Flow top width inside pipe =    22.90(In.)
        Critical Depth =    22.71(In.)
        Pipe flow velocity =     14.97(Ft/s)
        Travel time through pipe =    0.45 min.
        Time of concentration (TC) =    13.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9056.000 to Point/Station
9064.000
        **** CONFLUENCE OF MINOR STREAMS ****

______________________________________________________________________
        Along Main Stream number: 1 in normal stream number 1
        Stream flow area =      16.270(Ac.)
        Runoff from this stream =       32.319(CFS)
        Time of concentration =   13.49 min.
        Rainfall intensity =     3.025(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9057.000 to Point/Station
9058.000
        **** 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
        [COMMERCIAL area type                    ]
        Initial subarea flow distance  =    52.000(Ft.)
        Highest elevation =  292.000(Ft.)
        Lowest elevation =  285.800(Ft.)
        Elevation difference =     6.200(Ft.)
        Time of concentration calculated by the urban
        areas overland flow method (App X-C) =      1.42 min.
        TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
        TC = [1.8*(1.1-0.8500)*(  52.000^.5)/(  11.923^(1/3)]=    1.42
        Setting time of concentration to 5 minutes
        Rainfall intensity (I) =       4.389(In/Hr) for a   100.0 year
storm
        Effective runoff coefficient used for area (Q=KCIA) is C =
0.850
        Subarea runoff =       0.336(CFS)
        Total initial stream area =         0.090(Ac.)


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        Process from Point/Station     9058.000 to Point/Station
9060.000
        **** IMPROVED CHANNEL TRAVEL TIME ****
```

```
Covered channel
Upstream point elevation =   285.800(Ft.)
Downstream point elevation =   278.000(Ft.)
Channel length thru subarea  =   510.000(Ft.)
Channel base width      =    0.090(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Estimated mean flow rate at midpoint of channel =
8.413(CFS)
Manning's 'N'     = 0.005
Maximum depth of channel  =    0.100(Ft.)
Flow(q) thru subarea =     8.413(CFS)
Pressure flow condition in covered channel:
Wetted perimeter =    0.38(Ft.)  Flow area =    0.01(Sq.Ft)
Hydraulic grade line required at box inlet = 1225279.370(Ft.)
Friction loss = 1204981.053(Ft.)
Minor Friction loss =  20306.117(Ft.)   K-Factor =  1.500
Flow Velocity =  933.71(Ft/s)
Travel time  =    0.01 min.
Time of concentration =     5.01 min.
 Adding area flow to channel
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
[COMMERCIAL area type                        ]
Rainfall intensity =      4.386(In/Hr) for a   100.0 year
storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.850
Subarea runoff =     16.142(CFS) for    4.330(Ac.)
Total runoff =     16.478(CFS)  Total area =        4.42(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     9060.000 to Point/Station
9062.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   277.800(Ft.)
Downstream point/station elevation =   273.500(Ft.)
Pipe length  =    26.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.478(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    16.478(CFS)
Normal flow depth in pipe =    8.64(In.)
Flow top width inside pipe =   14.83(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.52(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     5.03 min.
```



```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     9020.000 to Point/Station
9062.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.03 min.
Rainfall intensity =      4.379(In/Hr) for a   100.0 year
storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
Subarea runoff =      1.456(CFS) for    0.350(Ac.)
Total runoff =     17.934(CFS)  Total area =        4.77(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     9062.000 to Point/Station
9064.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation =   273.500(Ft.)
Downstream point/station elevation =   273.200(Ft.)
Pipe length  =    26.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.934(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    17.934(CFS)
Normal flow depth in pipe =   15.39(In.)
Flow top width inside pipe =   23.02(In.)
Critical Depth =    18.32(In.)
Pipe flow velocity =      8.43(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     5.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station     9063.000 to Point/Station
9064.000
**** SUBAREA FLOW ADDITION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[INDUSTRIAL area type                        ]
Time of concentration =     5.08 min.
```

```
        Rainfall intensity =      4.361(In/Hr)  for a    100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
        Subarea runoff =       2.237(CFS) for     0.540(Ac.)
        Total runoff =      20.171(CFS)  Total area =         5.31(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9063.000 to Point/Station
9064.000
        **** CONFLUENCE OF MINOR STREAMS ****

______________________________________________________________________
        Along Main Stream number: 1 in normal stream number 2
        Stream flow area =       5.310(Ac.)
        Runoff from this stream =      20.171(CFS)
        Time of concentration =      5.08 min.
        Rainfall intensity =      4.361(In/Hr)
        Summary of stream data:

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


        1        32.319      13.49                   3.025
        2        20.171       5.08                   4.361
        Qmax(1) =
                     1.000 *    1.000 *     32.319) +
                     0.694 *    1.000 *     20.171) + =       46.310
        Qmax(2) =
                     1.000 *    0.377 *     32.319) +
                     1.000 *    1.000 *     20.171) + =       32.344

        Total of 2 streams to confluence:
        Flow rates before confluence point:
              32.319       20.171
        Maximum flow rates at confluence using above data:
               46.310        32.344
        Area of streams before confluence:
               16.270         5.310
        Results of confluence:
        Total flow rate =      46.310(CFS)
        Time of concentration =      13.488 min.
        Effective stream area after confluence =       21.580(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9064.000 to Point/Station
9066.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =      273.200(Ft.)
```



```
        Downstream point/station elevation =      272.700(Ft.)
        Pipe length  =     41.15(Ft.)    Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =     46.310(CFS)
        Nearest computed pipe diameter  =      30.00(In.)
        Calculated individual pipe flow  =      46.310(CFS)
        Normal flow depth in pipe =    25.31(In.)
        Flow top width inside pipe =    21.79(In.)
        Critical Depth =    26.98(In.)
        Pipe flow velocity =      10.48(Ft/s)
        Travel time through pipe =     0.07 min.
        Time of concentration (TC) =     13.55 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9066.000 to Point/Station
9069.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =      272.700(Ft.)
        Downstream point/station elevation =      268.000(Ft.)
        Pipe length  =    482.00(Ft.)    Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =     46.310(CFS)
        Nearest computed pipe diameter  =      33.00(In.)
        Calculated individual pipe flow  =      46.310(CFS)
        Normal flow depth in pipe =    24.19(In.)
        Flow top width inside pipe =    29.20(In.)
        Critical Depth =    27.02(In.)
        Pipe flow velocity =       9.93(Ft/s)
        Travel time through pipe =     0.81 min.
        Time of concentration (TC) =     14.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9066.000 to Point/Station
9069.000
        **** CONFLUENCE OF MINOR STREAMS ****

______________________________________________________________________
        Along Main Stream number: 1 in normal stream number 1
        Stream flow area =       21.580(Ac.)
        Runoff from this stream =      46.310(CFS)
        Time of concentration =     14.36 min.
        Rainfall intensity =      2.954(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station      9059.000 to Point/Station
9061.000
        **** 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
        [COMMERCIAL area type                    ]
        Initial subarea flow distance  =   60.500(Ft.)
        Highest elevation =  290.000(Ft.)
        Lowest elevation =  286.000(Ft.)
        Elevation difference =     4.000(Ft.)
        Time of concentration calculated by the urban
        areas overland flow method (App X-C) =     1.86 min.
        TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
        TC = [1.8*(1.1-0.8500)*(  60.500^.5)/(   6.612^(1/3)]=   1.86
        Setting time of concentration to 5 minutes
        Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year
storm
        Effective runoff coefficient used for area (Q=KCIA) is C =
0.850
        Subarea runoff =      0.410(CFS)
        Total initial stream area =        0.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9061.000 to Point/Station
9065.000
        **** IMPROVED CHANNEL TRAVEL TIME ****

______________________________________________________________________
        Upstream point elevation =   286.000(Ft.)
        Downstream point elevation =   274.000(Ft.)
        Channel length thru subarea  =   467.000(Ft.)
        Channel base width      =    5.000(Ft.)
        Slope or 'Z' of left channel bank =    1.000
        Slope or 'Z' of right channel bank =    1.000
        Estimated mean flow rate at midpoint of channel =
7.946(CFS)
        Manning's 'N'     = 0.020
        Maximum depth of channel  =    1.000(Ft.)
        Flow(q) thru subarea =      7.946(CFS)
        Depth of flow =    0.300(Ft.), Average velocity =   4.998(Ft/s)
        Channel flow top width =     5.600(Ft.)
        Flow Velocity =     5.00(Ft/s)
        Travel time  =    1.56 min.
        Time of concentration =     6.56 min.
        Critical depth =       0.414(Ft.)
         Adding area flow to channel
        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
        [COMMERCIAL area type                    ]
        Rainfall intensity =      3.943(In/Hr) for a   100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.850
        Subarea runoff =      13.540(CFS) for    4.040(Ac.)
```



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        Total runoff =     13.951(CFS)  Total area =        4.15(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9065.000 to Point/Station
9067.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =   273.800(Ft.)
        Downstream point/station elevation =   268.000(Ft.)
        Pipe length  =     60.00(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =     13.951(CFS)
        Nearest computed pipe diameter  =     15.00(In.)
        Calculated individual pipe flow  =     13.951(CFS)
        Normal flow depth in pipe =    9.20(In.)
        Flow top width inside pipe =    14.61(In.)
        Critical depth could not be calculated.
        Pipe flow velocity =     17.68(Ft/s)
        Travel time through pipe =    0.06 min.
        Time of concentration (TC) =     6.61 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9064.000 to Point/Station
9067.000
        **** SUBAREA FLOW ADDITION ****

______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [INDUSTRIAL area type                    ]
        Time of concentration =     6.61 min.
        Rainfall intensity =      3.930(In/Hr) for a   100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
        Subarea runoff =      1.083(CFS) for    0.290(Ac.)
        Total runoff =     15.033(CFS)  Total area =        4.44(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9067.000 to Point/Station
9069.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =   268.000(Ft.)
        Downstream point/station elevation =   267.800(Ft.)
        Pipe length  =      6.25(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =     15.033(CFS)
```

```
        Nearest computed pipe diameter  =     18.00(In.)
        Calculated individual pipe flow  =    15.033(CFS)
        Normal flow depth in pipe =   12.19(In.)
        Flow top width inside pipe =   16.83(In.)
        Critical Depth =   16.87(In.)
        Pipe flow velocity =      11.82(Ft/s)
        Travel time through pipe =    0.01 min.
        Time of concentration (TC) =     6.62 min.


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9067.000 to Point/Station
9069.000
        **** CONFLUENCE OF MINOR STREAMS ****

______________________________________________________________________
        Along Main Stream number: 1 in normal stream number 2
        Stream flow area =       4.440(Ac.)
        Runoff from this stream =      15.033(CFS)
        Time of concentration =      6.62 min.
        Rainfall intensity =     3.928(In/Hr)
        Summary of stream data:

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


        1       46.310     14.36                  2.954
        2       15.033      6.62                  3.928
        Qmax(1) =
                     1.000 *     1.000 *     46.310) +
                     0.752 *     1.000 *     15.033) + =       57.614
        Qmax(2) =
                     1.000 *     0.461 *     46.310) +
                     1.000 *     1.000 *     15.033) + =       36.387

        Total of 2 streams to confluence:
        Flow rates before confluence point:
              46.310      15.033
        Maximum flow rates at confluence using above data:
               57.614       36.387
        Area of streams before confluence:
               21.580        4.440
        Results of confluence:
        Total flow rate =      57.614(CFS)
        Time of concentration =     14.363 min.
        Effective stream area after confluence =      26.020(Ac.)


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        Process from Point/Station     9069.000 to Point/Station
9068.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```



```
______________________________________________________________________
        Upstream point/station elevation =    267.800(Ft.)
        Downstream point/station elevation =    267.600(Ft.)
        Pipe length   =     26.25(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =     57.614(CFS)
        Nearest computed pipe diameter  =     36.00(In.)
        Calculated individual pipe flow  =    57.614(CFS)
        Normal flow depth in pipe =   29.16(In.)
        Flow top width inside pipe =   28.25(In.)
        Critical Depth =   29.50(In.)
        Pipe flow velocity =      9.39(Ft/s)
        Travel time through pipe =    0.05 min.
        Time of concentration (TC) =    14.41 min.


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9064.000 to Point/Station
9068.000
        **** SUBAREA FLOW ADDITION ****

______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [INDUSTRIAL area type                    ]
        Time of concentration =    14.41 min.
        Rainfall intensity =      2.950(In/Hr)  for a    100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
        Subarea runoff =      0.813(CFS)  for    0.290(Ac.)
        Total runoff =     58.427(CFS)  Total area =       26.31(Ac.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9068.000 to Point/Station
9102.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =    267.500(Ft.)
        Downstream point/station elevation =    248.000(Ft.)
        Pipe length   =     75.00(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =     58.427(CFS)
        Nearest computed pipe diameter  =     21.00(In.)
        Calculated individual pipe flow  =    58.427(CFS)
        Normal flow depth in pipe =   13.24(In.)
        Flow top width inside pipe =   20.27(In.)
        Critical depth could not be calculated.
        Pipe flow velocity =      36.60(Ft/s)
        Travel time through pipe =    0.03 min.
        Time of concentration (TC) =    14.44 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9068.000 to Point/Station
9102.000
        **** CONFLUENCE OF MAIN STREAMS ****

______________________________________________________________________
        The following data inside Main Stream is listed:
        In Main Stream number: 1
        Stream flow area =      26.310(Ac.)
        Runoff from this stream =      58.427(CFS)
        Time of concentration =   14.44 min.
        Rainfall intensity =     2.947(In/Hr)
        Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9077.000 to Point/Station
9078.000
        **** INITIAL AREA EVALUATION ****

______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [INDUSTRIAL area type                    ]
        Initial subarea flow distance  =  108.000(Ft.)
        Highest elevation =  272.000(Ft.)
        Lowest elevation =  271.000(Ft.)
        Elevation difference =     1.000(Ft.)
        Time of concentration calculated by the urban
        areas overland flow method (App X-C) =     2.88 min.
        TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
        TC = [1.8*(1.1-0.9500)*( 108.000^.5)/(   0.926^(1/3)]=   2.88
        Setting time of concentration to 5 minutes
        Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year
storm
        Effective runoff coefficient used for area (Q=KCIA) is C =
0.950
        Subarea runoff =       0.542(CFS)
        Total initial stream area =        0.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9078.000 to Point/Station
9081.000
        **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

______________________________________________________________________
        Top of street segment elevation =   271.000(Ft.)
        End of street segment elevation =   264.000(Ft.)
        Length of street segment  =   759.000(Ft.)
```


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```
        Height of curb above gutter flowline  =    6.0(In.)
        Width of half street (curb to crown)  =  26.000(Ft.)
        Distance from crown to crossfall grade break  =  10.000(Ft.)
        Slope from gutter to grade break (v/hz) =    0.020
        Slope from grade break to crown (v/hz)  =    0.020
        Street flow is on [1] side(s) of the street
        Distance from curb to property line  =  15.000(Ft.)
        Slope from curb to property line (v/hz) =   0.020
        Gutter width =   1.500(Ft.)
        Gutter hike from flowline =  1.500(In.)
         Manning's N in gutter =  0.0150
         Manning's N from gutter to grade break =  0.0180
         Manning's N from grade break to crown =  0.0180
        Estimated mean flow rate at midpoint of street =
2.356(CFS)
        Depth of flow =   0.312(Ft.), Average velocity =   1.887(Ft/s)
        Streetflow hydraulics at midpoint of street travel:
        Halfstreet flow width =  10.849(Ft.)
        Flow velocity =    1.89(Ft/s)
        Travel time =     6.70 min.      TC =   11.70  min.
         Adding area flow to street
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [INDUSTRIAL area type                    ]
        Rainfall intensity =      3.187(In/Hr) for a   100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
        Subarea runoff =       2.634(CFS) for    0.870(Ac.)
        Total runoff =      3.176(CFS)  Total area =         1.00(Ac.)
        Street flow at end of street =      3.176(CFS)
        Half street flow at end of street =      3.176(CFS)
        Depth of flow =   0.340(Ft.), Average velocity =   2.024(Ft/s)
        Flow width (from curb towards crown)=  12.238(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9081.000 to Point/Station
9082.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =   263.800(Ft.)
        Downstream point/station elevation =   263.500(Ft.)
        Pipe length  =    26.00(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =     3.176(CFS)
        Nearest computed pipe diameter   =     12.00(In.)
        Calculated individual pipe flow  =     3.176(CFS)
        Normal flow depth in pipe =    8.34(In.)
        Flow top width inside pipe =   11.05(In.)
        Critical Depth =    9.16(In.)
        Pipe flow velocity =      5.45(Ft/s)
        Travel time through pipe =    0.08 min.
```

```
        Time of concentration (TC) =    11.78 min.


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9079.000 to Point/Station
 9082.000
        **** SUBAREA FLOW ADDITION ****

 ______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [INDUSTRIAL area type                   ]
        Time of concentration =    11.78 min.
        Rainfall intensity =      3.179(In/Hr) for a    100.0 year
 storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
 C = 0.950
        Subarea runoff =       2.809(CFS) for    0.930(Ac.)
        Total runoff =      5.985(CFS)  Total area =        1.93(Ac.)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9082.000 to Point/Station
 9084.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

 ______________________________________________________________________
        Upstream point/station elevation =   263.500(Ft.)
        Downstream point/station elevation =   263.200(Ft.)
        Pipe length  =    10.25(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =     5.985(CFS)
        Nearest computed pipe diameter  =     12.00(In.)
        Calculated individual pipe flow  =     5.985(CFS)
        Normal flow depth in pipe =    9.64(In.)
        Flow top width inside pipe =    9.53(In.)
        Critical depth could not be calculated.
        Pipe flow velocity =      8.85(Ft/s)
        Travel time through pipe =    0.02 min.
        Time of concentration (TC) =    11.80 min.


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9083.000 to Point/Station
 9084.000
        **** SUBAREA FLOW ADDITION ****

 ______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
```



```
        [INDUSTRIAL area type                   ]
        Time of concentration =    11.80 min.
        Rainfall intensity =      3.177(In/Hr) for a    100.0 year
 storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
 C = 0.950
        Subarea runoff =       3.532(CFS) for    1.170(Ac.)
        Total runoff =      9.517(CFS)  Total area =        3.10(Ac.)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9084.000 to Point/Station
 9085.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

 ______________________________________________________________________
        Upstream point/station elevation =   263.200(Ft.)
        Downstream point/station elevation =   262.500(Ft.)
        Pipe length  =    76.00(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =     9.517(CFS)
        Nearest computed pipe diameter  =     18.00(In.)
        Calculated individual pipe flow  =     9.517(CFS)
        Normal flow depth in pipe =   13.92(In.)
        Flow top width inside pipe =   15.07(In.)
        Critical Depth =   14.30(In.)
        Pipe flow velocity =      6.49(Ft/s)
        Travel time through pipe =    0.20 min.
        Time of concentration (TC) =    12.00 min.


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9084.000 to Point/Station
 9085.000
        **** CONFLUENCE OF MINOR STREAMS ****

 ______________________________________________________________________
        Along Main Stream number: 2 in normal stream number 1
        Stream flow area =      3.100(Ac.)
        Runoff from this stream =        9.517(CFS)
        Time of concentration =   12.00 min.
        Rainfall intensity =      3.158(In/Hr)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9071.000 to Point/Station
 9072.000
        **** INITIAL AREA EVALUATION ****

 ______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
```

```
        [INDUSTRIAL area type                    ]
        Initial subarea flow distance  =   20.000(Ft.)
        Highest elevation =  271.000(Ft.)
        Lowest elevation =  270.700(Ft.)
        Elevation difference =    0.300(Ft.)
        Time of concentration calculated by the urban
        areas overland flow method (App X-C) =     1.05 min.
        TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
        TC = [1.8*(1.1-0.9500)*(  20.000^.5)/(   1.500^(1/3)]=   1.05
        Setting time of concentration to 5 minutes
        Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year
storm
        Effective runoff coefficient used for area (Q=KCIA) is C =
0.950
        Subarea runoff =       0.083(CFS)
        Total initial stream area =        0.020(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9072.000 to Point/Station
9074.000
        **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

______________________________________________________________________
        Top of street segment elevation =   270.700(Ft.)
        End of street segment elevation =   261.400(Ft.)
        Length of street segment  =   333.000(Ft.)
        Height of curb above gutter flowline  =    6.0(In.)
        Width of half street (curb to crown)  =  26.000(Ft.)
        Distance from crown to crossfall grade break  =  10.000(Ft.)
        Slope from gutter to grade break (v/hz) =    0.020
        Slope from grade break to crown (v/hz)  =    0.020
        Street flow is on [1] side(s) of the street
        Distance from curb to property line  =  15.000(Ft.)
        Slope from curb to property line (v/hz) =   0.020
        Gutter width =   1.500(Ft.)
        Gutter hike from flowline =   1.500(In.)
         Manning's N in gutter =  0.0150
         Manning's N from gutter to grade break =  0.0180
         Manning's N from grade break to crown =  0.0180
        Estimated mean flow rate at midpoint of street =
0.097(CFS)
        Depth of flow =   0.090(Ft.), Average velocity =   1.986(Ft/s)
        Streetflow hydraulics at midpoint of street travel:
        Halfstreet flow width =   1.500(Ft.)
        Flow velocity =   1.99(Ft/s)
        Travel time =    2.79 min.     TC =     7.79  min.
         Adding area flow to street
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [INDUSTRIAL area type                    ]
        Rainfall intensity =      3.695(In/Hr) for a   100.0 year
storm
```



```
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
        Subarea runoff =      1.158(CFS) for    0.330(Ac.)
        Total runoff =      1.242(CFS)  Total area =        0.35(Ac.)
        Street flow at end of street =       1.242(CFS)
        Half street flow at end of street =       1.242(CFS)
        Depth of flow =   0.225(Ft.), Average velocity =   2.518(Ft/s)
        Flow width (from curb towards crown)=   6.496(Ft.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9074.000 to Point/Station
9076.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =   261.200(Ft.)
        Downstream point/station elevation =   261.000(Ft.)
        Pipe length  =   34.75(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =     1.242(CFS)
        Nearest computed pipe diameter  =      9.00(In.)
        Calculated individual pipe flow  =     1.242(CFS)
        Normal flow depth in pipe =     7.29(In.)
        Flow top width inside pipe =     7.06(In.)
        Critical Depth =     6.15(In.)
        Pipe flow velocity =      3.24(Ft/s)
        Travel time through pipe =    0.18 min.
        Time of concentration (TC) =     7.97 min.

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9075.000 to Point/Station
9076.000
        **** SUBAREA FLOW ADDITION ****

______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [INDUSTRIAL area type                    ]
        Time of concentration =     7.97 min.
        Rainfall intensity =      3.664(In/Hr) for a   100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
        Subarea runoff =      1.949(CFS) for    0.560(Ac.)
        Total runoff =      3.191(CFS)  Total area =        0.91(Ac.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9076.000 to Point/Station
9085.000
```

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     **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

_______________________________________________________________________
     Upstream point/station elevation =   261.000(Ft.)
     Downstream point/station elevation =   260.800(Ft.)
     Pipe length  =   145.00(Ft.)   Manning's N = 0.013
     No. of pipes = 1  Required pipe flow  =     3.191(CFS)
     Nearest computed pipe diameter   =    18.00(In.)
     Calculated individual pipe flow  =    3.191(CFS)
     Normal flow depth in pipe =   12.38(In.)
     Flow top width inside pipe =   16.69(In.)
     Critical Depth =    8.16(In.)
     Pipe flow velocity =      2.46(Ft/s)
     Travel time through pipe =    0.98 min.
     Time of concentration (TC) =     8.96 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
     Process from Point/Station     9076.000 to Point/Station
9085.000
     **** CONFLUENCE OF MINOR STREAMS ****

_______________________________________________________________________
     Along Main Stream number: 2 in normal stream number 2
     Stream flow area =       0.910(Ac.)
     Runoff from this stream =      3.191(CFS)
     Time of concentration =    8.96 min.
     Rainfall intensity =     3.512(In/Hr)
     Summary of stream data:

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


     1        9.517      12.00                 3.158
     2        3.191       8.96                 3.512
     Qmax(1) =
                1.000 *     1.000 *      9.517) +
                0.899 *     1.000 *      3.191) + =      12.387
     Qmax(2) =
                1.000 *     0.746 *      9.517) +
                1.000 *     1.000 *      3.191) + =      10.295

     Total of 2 streams to confluence:
     Flow rates before confluence point:
           9.517        3.191
     Maximum flow rates at confluence using above data:
           12.387        10.295
     Area of streams before confluence:
            3.100         0.910
     Results of confluence:
     Total flow rate =     12.387(CFS)
     Time of concentration =     11.997 min.
     Effective stream area after confluence =      4.010(Ac.)
```



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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
     Process from Point/Station     9085.000 to Point/Station
9092.000
     **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

_______________________________________________________________________
     Upstream point/station elevation =   260.800(Ft.)
     Downstream point/station elevation =   255.500(Ft.)
     Pipe length  =   514.00(Ft.)   Manning's N = 0.013
     No. of pipes = 1  Required pipe flow  =    12.387(CFS)
     Nearest computed pipe diameter   =    21.00(In.)
     Calculated individual pipe flow  =    12.387(CFS)
     Normal flow depth in pipe =   13.83(In.)
     Flow top width inside pipe =   19.92(In.)
     Critical Depth =   15.73(In.)
     Pipe flow velocity =      7.38(Ft/s)
     Travel time through pipe =    1.16 min.
     Time of concentration (TC) =    13.16 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
     Process from Point/Station     9085.000 to Point/Station
9092.000
     **** CONFLUENCE OF MINOR STREAMS ****

_______________________________________________________________________
     Along Main Stream number: 2 in normal stream number 1
     Stream flow area =      4.010(Ac.)
     Runoff from this stream =     12.387(CFS)
     Time of concentration =   13.16 min.
     Rainfall intensity =     3.053(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
     Process from Point/Station     9083.000 to Point/Station
9088.000
     **** INITIAL AREA EVALUATION ****

_______________________________________________________________________
     Decimal fraction soil group A = 0.000
     Decimal fraction soil group B = 0.000
     Decimal fraction soil group C = 0.000
     Decimal fraction soil group D = 1.000
     [INDUSTRIAL area type                       ]
     Initial subarea flow distance  =   65.000(Ft.)
     Highest elevation =  264.000(Ft.)
     Lowest elevation =  263.000(Ft.)
     Elevation difference =    1.000(Ft.)
     Time of concentration calculated by the urban
     areas overland flow method (App X-C) =     1.89 min.
     TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
     TC = [1.8*(1.1-0.9500)*(  65.000^.5)/(   1.538^(1/3)]=   1.89
```

```
        Setting time of concentration to 5 minutes
        Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year
storm
        Effective runoff coefficient used for area (Q=KCIA) is C =
0.950
        Subarea runoff =      0.459(CFS)
        Total initial stream area =        0.110(Ac.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9088.000 to Point/Station
9091.000
        **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

______________________________________________________________________
        Top of street segment elevation =    263.000(Ft.)
        End of street segment elevation =    257.000(Ft.)
        Length of street segment  =   527.000(Ft.)
        Height of curb above gutter flowline  =     6.0(In.)
        Width of half street (curb to crown)  =  26.000(Ft.)
        Distance from crown to crossfall grade break  =  10.000(Ft.)
        Slope from gutter to grade break (v/hz) =   0.020
        Slope from grade break to crown (v/hz)  =   0.020
        Street flow is on [1] side(s) of the street
        Distance from curb to property line  =  15.000(Ft.)
        Slope from curb to property line (v/hz) =   0.020
        Gutter width =    1.500(Ft.)
        Gutter hike from flowline =  1.500(In.)
         Manning's N in gutter =  0.0150
         Manning's N from gutter to grade break =  0.0180
         Manning's N from grade break to crown =  0.0180
        Estimated mean flow rate at midpoint of street =
2.001(CFS)
        Depth of flow =    0.289(Ft.), Average velocity =   1.970(Ft/s)
        Streetflow hydraulics at midpoint of street travel:
        Halfstreet flow width =   9.718(Ft.)
        Flow velocity =    1.97(Ft/s)
        Travel time =     4.46 min.      TC =     9.46  min.
         Adding area flow to street
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [INDUSTRIAL area type                         ]
        Rainfall intensity =      3.443(In/Hr) for a   100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
        Subarea runoff =      2.420(CFS) for    0.740(Ac.)
        Total runoff =      2.879(CFS)  Total area =        0.85(Ac.)
        Street flow at end of street =       2.879(CFS)
        Half street flow at end of street =       2.879(CFS)
        Depth of flow =    0.321(Ft.), Average velocity =   2.144(Ft/s)
        Flow width (from curb towards crown)=  11.276(Ft.)
```



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+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9091.000 to Point/Station
9092.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =    256.500(Ft.)
        Downstream point/station elevation =    256.000(Ft.)
        Pipe length  =     30.75(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =      2.879(CFS)
        Nearest computed pipe diameter  =      12.00(In.)
        Calculated individual pipe flow  =      2.879(CFS)
        Normal flow depth in pipe =     6.94(In.)
        Flow top width inside pipe =    11.85(In.)
        Critical Depth =     8.73(In.)
        Pipe flow velocity =       6.12(Ft/s)
        Travel time through pipe =     0.08 min.
        Time of concentration (TC) =      9.54 min.


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9089.000 to Point/Station
9092.000
        **** SUBAREA FLOW ADDITION ****

______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [INDUSTRIAL area type                         ]
        Time of concentration =      9.54 min.
        Rainfall intensity =      3.432(In/Hr) for a   100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
        Subarea runoff =      4.173(CFS) for    1.280(Ac.)
        Total runoff =      7.052(CFS)  Total area =        2.13(Ac.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9090.000 to Point/Station
9092.000
        **** SUBAREA FLOW ADDITION ****

______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [INDUSTRIAL area type                         ]
        Time of concentration =      9.54 min.
```

```
        Rainfall intensity =      3.432(In/Hr) for a   100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
        Subarea runoff =      1.858(CFS) for    0.570(Ac.)
        Total runoff =      8.911(CFS)  Total area =       2.70(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9090.000 to Point/Station
9092.000
        **** CONFLUENCE OF MINOR STREAMS ****

______________________________________________________________________
        Along Main Stream number: 2 in normal stream number 2
        Stream flow area =      2.700(Ac.)
        Runoff from this stream =      8.911(CFS)
        Time of concentration =    9.54 min.
        Rainfall intensity =     3.432(In/Hr)
        Summary of stream data:

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


        1       12.387     13.16                3.053
        2        8.911      9.54                3.432
        Qmax(1) =
                   1.000 *    1.000 *    12.387) +
                   0.889 *    1.000 *     8.911) + =      20.313
        Qmax(2) =
                   1.000 *    0.725 *    12.387) +
                   1.000 *    1.000 *     8.911) + =      17.893

        Total of 2 streams to confluence:
        Flow rates before confluence point:
              12.387      8.911
        Maximum flow rates at confluence using above data:
               20.313      17.893
        Area of streams before confluence:
                4.010        2.700
        Results of confluence:
        Total flow rate =     20.313(CFS)
        Time of concentration =    13.158 min.
        Effective stream area after confluence =      6.710(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9092.000 to Point/Station
9101.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =    256.000(Ft.)
```



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        Downstream point/station elevation =    251.500(Ft.)
        Pipe length  =    422.00(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =    20.313(CFS)
        Nearest computed pipe diameter  =     24.00(In.)
        Calculated individual pipe flow  =     20.313(CFS)
        Normal flow depth in pipe =   17.30(In.)
        Flow top width inside pipe =   21.54(In.)
        Critical Depth =    19.41(In.)
        Pipe flow velocity =       8.38(Ft/s)
        Travel time through pipe =    0.84 min.
        Time of concentration (TC) =    14.00 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9092.000 to Point/Station
9101.000
        **** CONFLUENCE OF MINOR STREAMS ****

______________________________________________________________________
        Along Main Stream number: 2 in normal stream number 1
        Stream flow area =      6.710(Ac.)
        Runoff from this stream =     20.313(CFS)
        Time of concentration =    14.00 min.
        Rainfall intensity =     2.983(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9073.000 to Point/Station
9093.000
        **** 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
        [COMMERCIAL area type                    ]
        Initial subarea flow distance  =   84.000(Ft.)
        Highest elevation =  270.200(Ft.)
        Lowest elevation =  269.000(Ft.)
        Elevation difference =     1.200(Ft.)
        Time of concentration calculated by the urban
        areas overland flow method (App X-C) =     3.66 min.
        TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
        TC = [1.8*(1.1-0.8500)*(  84.000^.5)/(   1.429^(1/3)]=   3.66
        Setting time of concentration to 5 minutes
        Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year
storm
        Effective runoff coefficient used for area (Q=KCIA) is C =
0.850
        Subarea runoff =      1.194(CFS)
        Total initial stream area =        0.320(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9093.000 to Point/Station
9097.000
        **** IMPROVED CHANNEL TRAVEL TIME ****

______________________________________________________________________
        Upstream point elevation =   269.000(Ft.)
        Downstream point elevation =   256.000(Ft.)
        Channel length thru subarea  =  1014.000(Ft.)
        Channel base width      =    5.000(Ft.)
        Slope or 'Z' of left channel bank =   1.000
        Slope or 'Z' of right channel bank =   1.000
        Estimated mean flow rate at midpoint of channel =
20.855(CFS)
        Manning's 'N'    = 0.018
        Maximum depth of channel  =    1.000(Ft.)
        Flow(q) thru subarea =     20.855(CFS)
        Depth of flow =   0.618(Ft.), Average velocity =   6.004(Ft/s)
        Channel flow top width =    6.237(Ft.)
        Flow Velocity =    6.00(Ft/s)
        Travel time  =    2.81 min.
        Time of concentration =    7.81 min.
        Critical depth =      0.773(Ft.)
         Adding area flow to channel
        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
        [COMMERCIAL area type                    ]
        Rainfall intensity =       3.691(In/Hr) for a   100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.850
        Subarea runoff =      33.071(CFS) for    10.540(Ac.)
        Total runoff =     34.265(CFS)  Total area =       10.86(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9097.000 to Point/Station
9098.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =   255.000(Ft.)
        Downstream point/station elevation =   251.800(Ft.)
        Pipe length  =    33.62(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =    34.265(CFS)
        Nearest computed pipe diameter  =     21.00(In.)
        Calculated individual pipe flow  =    34.265(CFS)
        Normal flow depth in pipe =   12.96(In.)
        Flow top width inside pipe =   20.42(In.)
        Critical depth could not be calculated.
        Pipe flow velocity =     22.00(Ft/s)
        Travel time through pipe =    0.03 min.
```



```
        Time of concentration (TC) =     7.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9089.000 to Point/Station
9098.000
        **** SUBAREA FLOW ADDITION ****

______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [INDUSTRIAL area type                    ]
        Time of concentration =     7.84 min.
        Rainfall intensity =      3.687(In/Hr) for a    100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
        Subarea runoff =      4.098(CFS) for    1.170(Ac.)
        Total runoff =     38.363(CFS)  Total area =       12.03(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9098.000 to Point/Station
9101.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =   251.800(Ft.)
        Downstream point/station elevation =   251.600(Ft.)
        Pipe length  =    27.25(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =    38.363(CFS)
        Nearest computed pipe diameter  =     33.00(In.)
        Calculated individual pipe flow  =    38.363(CFS)
        Normal flow depth in pipe =   23.30(In.)
        Flow top width inside pipe =   30.07(In.)
        Critical Depth =   24.72(In.)
        Pipe flow velocity =      8.56(Ft/s)
        Travel time through pipe =    0.05 min.
        Time of concentration (TC) =     7.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9092.000 to Point/Station
9101.000
        **** SUBAREA FLOW ADDITION ****

______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
```

```
        [INDUSTRIAL area type                    ]
        Time of concentration =    7.89 min.
        Rainfall intensity =     3.678(In/Hr) for a   100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
        Subarea runoff =      3.494(CFS) for    1.000(Ac.)
        Total runoff =     41.857(CFS)  Total area =       13.03(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9100.000 to Point/Station
9101.000
        **** SUBAREA FLOW ADDITION ****

______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [INDUSTRIAL area type                    ]
        Time of concentration =    7.89 min.
        Rainfall intensity =     3.678(In/Hr) for a   100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.950
        Subarea runoff =      3.878(CFS) for    1.110(Ac.)
        Total runoff =     45.736(CFS)  Total area =       14.14(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9100.000 to Point/Station
9101.000
        **** CONFLUENCE OF MINOR STREAMS ****

______________________________________________________________________
        Along Main Stream number: 2 in normal stream number 2
        Stream flow area =     14.140(Ac.)
        Runoff from this stream =     45.736(CFS)
        Time of concentration =    7.89 min.
        Rainfall intensity =     3.678(In/Hr)
        Summary of stream data:

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


        1       20.313     14.00                 2.983
        2       45.736      7.89                 3.678
        Qmax(1) =
                     1.000 *     1.000 *     20.313) +
                     0.811 *     1.000 *     45.736) + =       57.404
        Qmax(2) =
                     1.000 *     0.564 *     20.313) +
```



```
                     1.000 *     1.000 *     45.736) + =       57.190

        Total of 2 streams to confluence:
        Flow rates before confluence point:
             20.313        45.736
        Maximum flow rates at confluence using above data:
              57.404        57.190
        Area of streams before confluence:
               6.710        14.140
        Results of confluence:
        Total flow rate =     57.404(CFS)
        Time of concentration =    13.998 min.
        Effective stream area after confluence =     20.850(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9101.000 to Point/Station
9102.000
        **** PIPEFLOW TRAVEL TIME (Program estimated size) ****

______________________________________________________________________
        Upstream point/station elevation =   251.500(Ft.)
        Downstream point/station elevation =   248.000(Ft.)
        Pipe length   =    155.00(Ft.)   Manning's N = 0.013
        No. of pipes = 1  Required pipe flow  =     57.404(CFS)
        Nearest computed pipe diameter  =     30.00(In.)
        Calculated individual pipe flow  =     57.404(CFS)
        Normal flow depth in pipe =    22.92(In.)
        Flow top width inside pipe =   25.47(In.)
        Critical Depth =    28.48(In.)
        Pipe flow velocity =      14.26(Ft/s)
        Travel time through pipe =    0.18 min.
        Time of concentration (TC) =    14.18 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9101.000 to Point/Station
9102.000
        **** CONFLUENCE OF MAIN STREAMS ****

______________________________________________________________________
        The following data inside Main Stream is listed:
        In Main Stream number: 2
        Stream flow area =     20.850(Ac.)
        Runoff from this stream =     57.404(CFS)
        Time of concentration =    14.18 min.
        Rainfall intensity =     2.968(In/Hr)
        Summary of stream data:

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


        1       58.427     14.44                 2.947
```

```
        2        57.404      14.18                 2.968
        Qmax(1) =
                    1.000 *     1.000 *     58.427) +
                    0.993 *     1.000 *     57.404) + =      115.429
        Qmax(2) =
                    1.000 *     0.982 *     58.427) +
                    1.000 *     1.000 *     57.404) + =      114.762

        Total of 2 main streams to confluence:
        Flow rates before confluence point:
              58.427       57.404
        Maximum flow rates at confluence using above data:
              115.429      114.762
        Area of streams before confluence:
               26.310       20.850


        Results of confluence:
        Total flow rate =    115.429(CFS)
        Time of concentration =    14.443 min.
        Effective stream area after confluence  =     47.160(Ac.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        Process from Point/Station     9102.000 to Point/Station
9102.000
        **** SUBAREA FLOW ADDITION ****

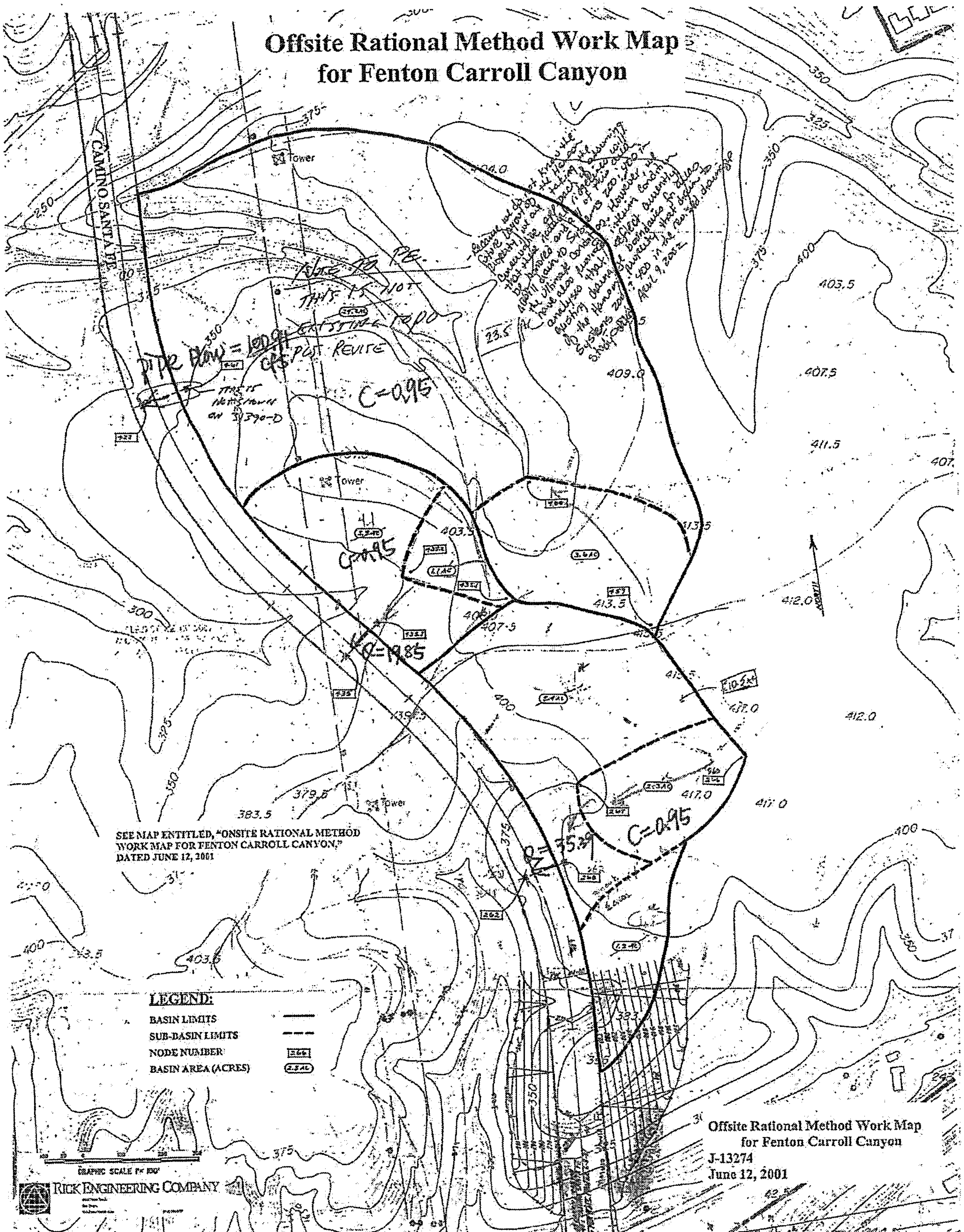
______________________________________________________________________
        Decimal fraction soil group A = 0.000
        Decimal fraction soil group B = 0.000
        Decimal fraction soil group C = 0.000
        Decimal fraction soil group D = 1.000
        [RURAL(greater than 0.5 Ac, 0.2 ha) area type]
        Time of concentration =    14.44 min.
        Rainfall intensity =      2.947(In/Hr) for a   100.0 year
storm
        Runoff coefficient used for sub-area, Rational method,Q=KCIA,
C = 0.450
        Subarea runoff =      2.494(CFS) for    1.880(Ac.)
        Total runoff =    117.923(CFS)  Total area =       49.04(Ac.)
        End of computations, total study area =          49.040 (Ac.)
```

4

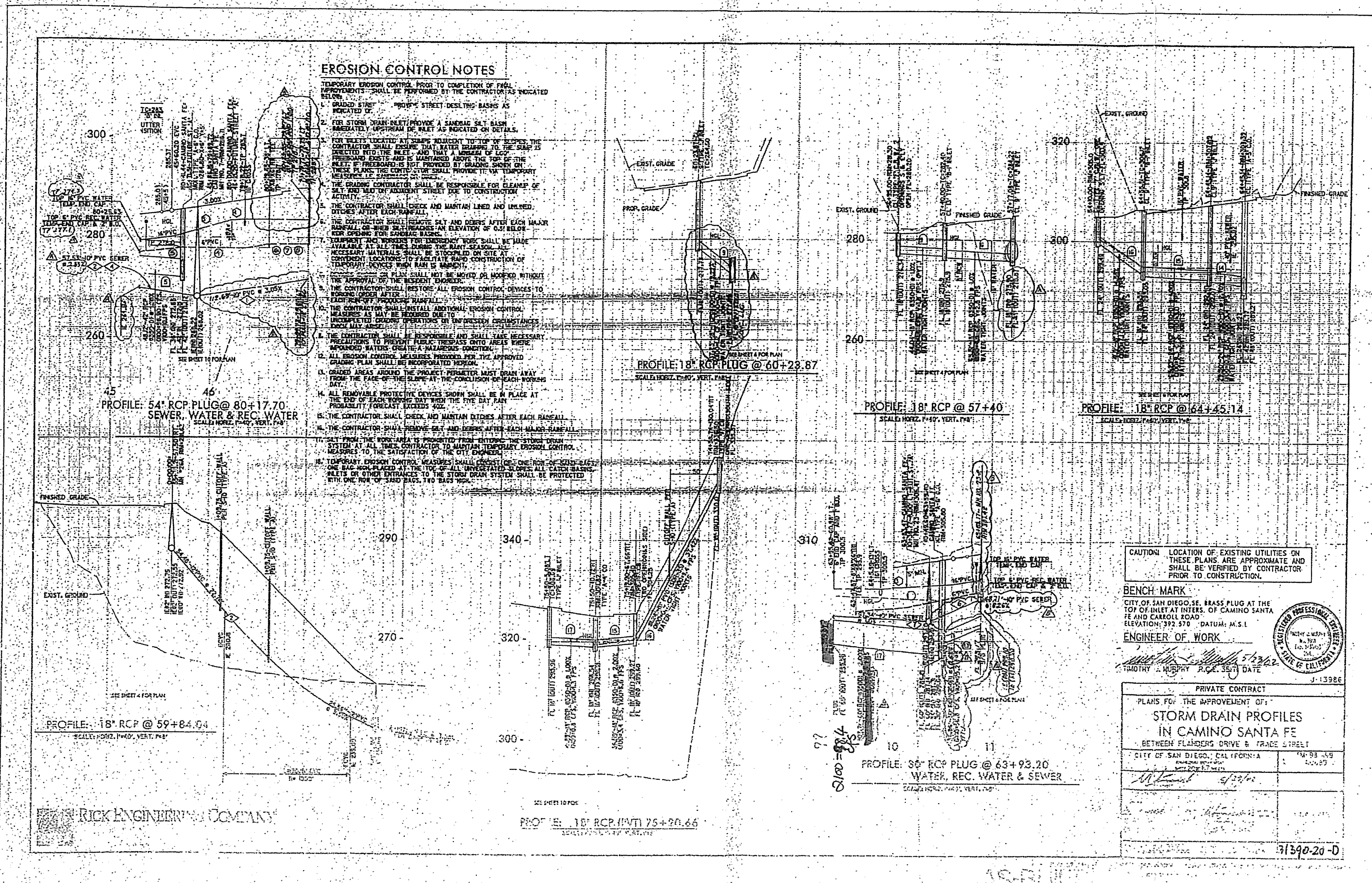
APPENDIX 4

Rick Engineering Drainage Report & As-builts

- **Report Excerpts**
- **Backbone Stormdrain As-builts**
- **CD of Approved Study**



Offsite Rational Method Work Map
for Fenton Carroll Canyon
CAMINO SANTA FE
Tower
C=0.95
THIS IS NOT EXISTING TOPO
C=0.95
Q=19.85
C=0.95
Q=35.29
SEE MAP ENTITLED, "ONSITE RATIONAL METHOD WORK MAP FOR FENTON CARROLL CANYON," DATED JUNE 12, 2001
LEGEND:
BASIN LIMITS
SUB-BASIN LIMITS
NODE NUMBER
BASIN AREA (ACRES)
GRAPHIC SCALE 1"= 100'
RICK ENGINEERING COMPANY
Offsite Rational Method Work Map
for Fenton Carroll Canyon
J-13274
June 12, 2001



EROSION CONTROL NOTES

TEMPORARY EROSION CONTROL PRIOR TO COMPLETION OF FINAL IMPROVEMENTS SHALL BE PERFORMED BY THE CONTRACTOR AS INDICATED BELOW:

1. GRADED STREET . PROVIDE STREET DESILTING BASINS AS INDICATED OF.
2. FOR STORM DRAIN INLET PROVIDE A SANDBAG SILT BASIN IMMEDIATELY UPSTREAM OF INLET AS INDICATED ON DETAILS.
3. FOR INLETS LOCATED AT SUMPS ADJACENT TO TOP OF SLOPES, THE CONTRACTOR SHALL ENSURE THAT WATER DRAINING TO THE SUMP IS DIRECTED INTO THE INLET, AND THAT A MINIMUM OF 1.0' FREEBOARD EXISTS AND IS MAINTAINED ABOVE THE TOP OF THE INLET. IF FREEBOARD IS NOT PROVIDED BY GRADING SHOWN ON THESE PLANS, THE CONTRACTOR SHALL PROVIDE IT VIA TEMPORARY MEASURES I.E. SANDBAGS OR DIKES.
4. THE GRADING CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANUP OF SILT AND MUD ON ADJACENT STREET DUE TO CONSTRUCTION ACTIVITY.
5. THE CONTRACTOR SHALL CHECK AND MAINTAIN LINED AND UNLINED DITCHES AFTER EACH RAINFALL.
6. THE CONTRACTOR SHALL REMOVE SILT AND DEBRIS AFTER EACH MAJOR RAINFALL OR WHEN SILT REACHES AN ELEVATION OF 0.5' BELOW WEIR OPENING FOR SANDBAG BASINS.
7. EQUIPMENT AND WORKERS FOR EMERGENCY WORK SHALL BE MADE AVAILABLE AT ALL TIMES DURING THE RAINY SEASON. ALL NECESSARY MATERIALS SHALL BE STOCKPILED ON SITE AT CONVENIENT LOCATIONS TO FACILITATE RAPID CONSTRUCTION OF TEMPORARY DEVICES WHEN RAIN IS IMMINENT.
8. DEVICES SHOWN ON PLAN SHALL NOT BE MOVED OR MODIFIED WITHOUT THE APPROVAL OF THE RESIDENT ENGINEER.
9. THE CONTRACTOR SHALL RESTORE ALL EROSION CONTROL DEVICES TO WORKING ORDER AFTER EACH RUN-OFF PRODUCING RAINFALL.
10. THE CONTRACTOR SHALL INSTALL ADDITIONAL EROSION CONTROL MEASURES AS MAY BE REQUIRED DUE TO UNCOMPLETED GRADING OPERATIONS OR UNFORESEEN CIRCUMSTANCES WHICH MAY ARISE.
11. THE CONTRACTOR SHALL BE RESPONSIBLE AND SHALL TAKE NECESSARY PRECAUTIONS TO PREVENT PUBLIC TRESPASS ONTO AREAS WHERE IMPOUNDED WATERS CREATE A HAZARDOUS CONDITION.
12. ALL EROSION CONTROL MEASURES PROVIDED PER THE APPROVED GRADING PLAN SHALL BE INCORPORATED HEREON.
13. GRADED AREAS AROUND THE PROJECT PERIMETER MUST DRAIN AWAY FROM THE FACE OF THE SLOPE AT THE CONCLUSION OF EACH WORKING DAY.
14. ALL REMOVABLE PROTECTIVE DEVICES SHOWN SHALL BE IN PLACE AT THE END OF EACH WORKING DAY WHEN THE FIVE DAY RAIN PROBABILITY FORECAST EXCEEDS 40%.
15. THE CONTRACTOR SHALL CHECK AND MAINTAIN DITCHES AFTER EACH RAINFALL.
16. THE CONTRACTOR SHALL REMOVE SILT AND DEBRIS AFTER EACH MAJOR RAINFALL.
17. SILT FROM THE WORK AREA IS PROHIBITED FROM ENTERING THE STORM DRAIN SYSTEM AT ALL TIMES. CONTRACTOR TO MAINTAIN TEMPORARY EROSION CONTROL MEASURES TO THE SATISFACTION OF THE CITY ENGINEER.
18. TEMPORARY EROSION CONTROL MEASURES SHALL CONSIST OF: ONE ROW OF SAND BAGS, ONE BAG HIGH, PLACED AT THE TOE OF ALL UNVEGETATED SLOPES. ALL CATCH BASINS, INLETS OR OTHER ENTRANCES TO THE STORM DRAIN SYSTEM SHALL BE PROTECTED WITH ONE ROW OF SAND BAGS, TWO BAGS HIGH.

CAUTION! LOCATION OF EXISTING UTILITIES ON THESE PLANS ARE APPROXIMATE AND SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.

BENCH MARK

CITY OF SAN DIEGO, SE. BRASS PLUG AT THE TOP OF INLET AT INTERS. OF CAMINO SANTA FE AND CARROLL ROAD
ELEVATION: 392.570 DATUM: M.S.L

ENGINEER OF WORK

5/23/02
TIMOTHY J. MURPHY R.C.E. 35110 DATE

J-13986

PRIVATE CONTRACT

PLANS FOR THE IMPROVEMENT OF:

STORM DRAIN PROFILES IN CAMINO SANTA FE

BETWEEN FLANDERS DRIVE & TRADE STREET

CITY OF SAN DIEGO, CALIFORNIA

5/23/02

31390-20-D

CENTERLINE DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	Δ=30°52'03"	1300.00'	700.36'	

CURB DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
	Δ=20°16'18"	1249.00'	441.91'	6" TYPE "H"
3	Δ=4°46'09"	1249.00'	103.96'	6" TYPE "H"
4	Δ=18°24'01"	1253.00'	415.24'	6" TYPE "B-2"
5	Δ=17°08'15"	200.00'	59.82'	6" TYPE "B-2"
6	Δ=161°19'59"	2.00'	5.63'	6" TYPE "B-2"
7	Δ=10°44'05"	1301.00'	243.75'	6" TYPE "B-2"
8	Δ=6°02'45"	500.00'	52.76'	6" TYPE "B-2"
9	N8°14'39"W		12.49'	6" TYPE "B-2"
10	Δ=11°18'32"	280.00'	55.27'	6" TYPE "B-2"
11	Δ=4°59'53"	1311.00'	114.36'	6" TYPE "B-2"
12	Δ=5°03'25"	1313.00'	115.85'	6" TYPE "B-2"
13	Δ=180°00'00"	2.00'	6.28'	6" TYPE "B-2"
14	Δ=5°03'25"	1317.00'	116.24'	6" TYPE "B-2"
15	Δ=20°40'17"	1355.00'	488.86'	6" TYPE "H"
16	Δ=86°28'30"	30.00'	45.28'	6" TYPE "H" *
17	Δ=4°43'13"	1361.00'	112.13'	6" TYPE "H"
18	Δ=87°01'55"	30.00'	45.57'	6" TYPE "H" *
19	Δ=5°49'51"	1249.00'	127.11'	6" AC BERM

* SEE SHEET 7 FOR PROFILES.

STORM DRAIN DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT.
	N15°21'08"E		146.07'	24" RCP (1600-D)	7
6	N1°38'27"E		14.00'	24" RCP (1600-D)	17 (PVT.)
7	S°55'05"W		23.69'	24" PVC (SDR-35)	17 (PVT.)
8	Δ=10°47'42"E	200.00'	37.68'	24" HDPE	17 (PVT.)
9	N65°36'51"W		37.23'	18" RCP (1600-D)	20
* 10	Δ=8°50'10"	343.00'	207.11'	60" RCP (1750-D)	7
* 11	N17°50'49"W		88.98'	54" RCP (1350-D)	7
* 12	Δ=4°32'12"	349.00'	106.81'	42" RCP (1350-D)	7
13	N73°49'41"E		36.86'	30" RCP (1350-D)	20
14	N70°46'01"E		29.50'	24" RCP (1350-D)	20
15	N79°33'52"E		65.23'	24" RCP (1350-D)	20
** 16	N2°22'24"W		41.90'	18" RCP (1350-D)	20 (PVT.)
17	N74°32'35"E		107.71'	60" RCP (1350-D)	20
18	Δ=6°50'26"	343.00'	160.34'	60" RCP (1350-D)	7
19	N81°34'16"E		38.97'	18" RCP (1350-D)	7

** FOR PVT. STORM DRAIN IN PUBLIC R/W SEE EMRA NO. 40883-2, 410625-11, 410609-12

* WATER TIGHT JOINTS

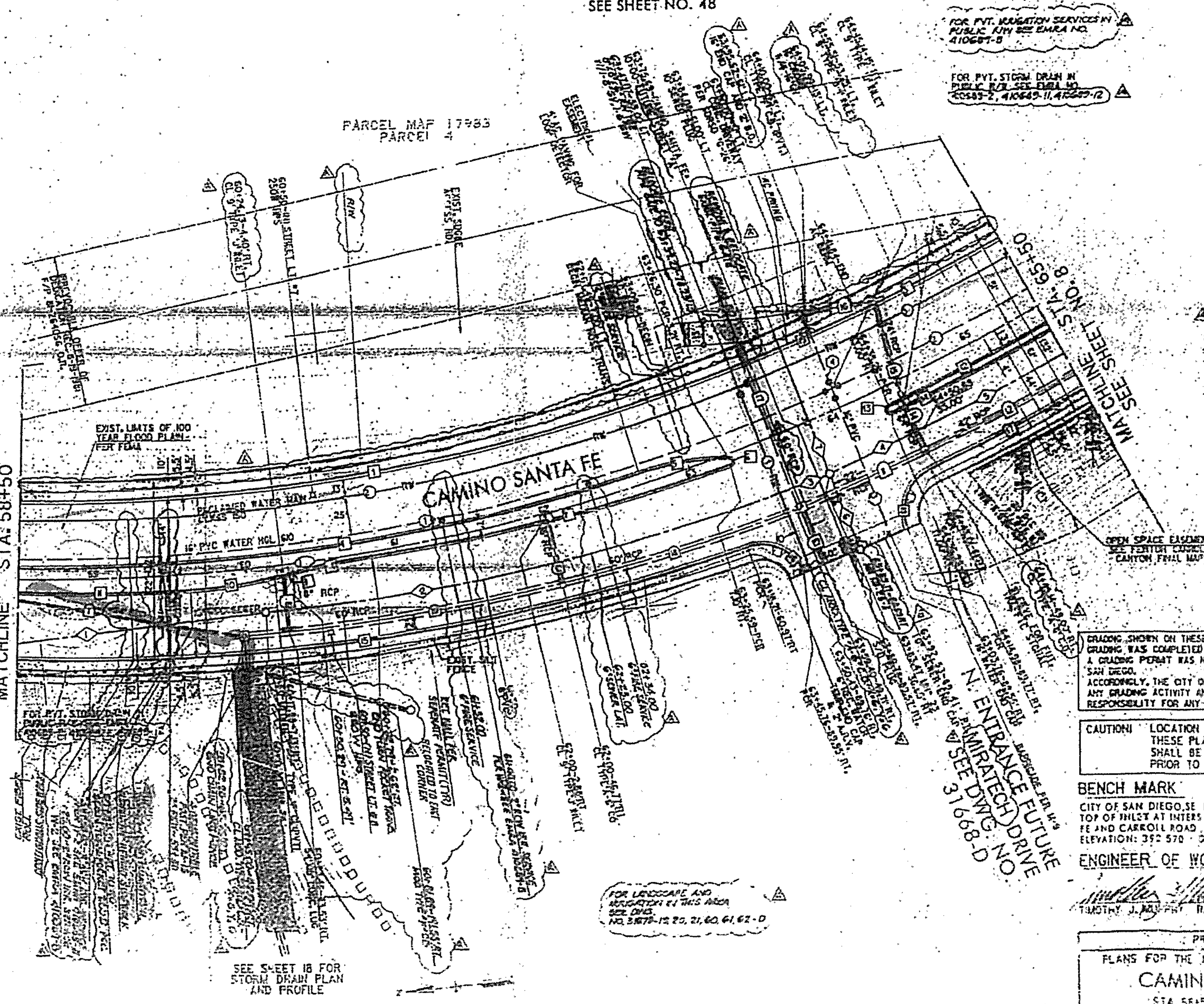
WATER DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT.
1	Δ=24°31'07"	287.00'	550.75'	16" C905 PVC(235PSI)	7
2	Δ=6°20'49"	287.00'	142.57'	16" C905 PVC(235PSI)	7
3	N73°49'40"E		102.59'	16" C905 PVC(235PSI)	20
4	N73°49'40"E		40.01'	16" C905 PVC(235PSI)	20

SEWER DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	N0°44'19"W		164.65'	10" PVC	7
2	Δ=14°42'37"	1329.00'	341.21'	10" PVC	7
3	N13°43'13"W		41.74'	10" PVC	7
4	N15°28'11"W		69.29'	10" PVC	7
5	Δ=4°22'07"	1335.00'	101.79'	10" PVC	7
6	N73°49'40"E		52.42'	10" PVC	20
7	N73°49'40"E		57.60'	10" PVC	20

RECYCLED WATER DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	N73°49'40"E		127.75'	8" PVC (CL-150)	20
2	Δ=13°02'02"	1287.00'	482.32'	8" PVC (CL-150)	7
3	Δ=[illegible]°43'04"	1260.00	184.22'	8" PVC (CL-150)	7

STORM DRAIN DATA CONT'D					
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT.
[illegible]	N15°35'43"W		[illegible]	[illegible]	[illegible]
[illegible]	N70°07'50"W		[illegible]	[illegible]	[illegible]

RICK ENGINEERING COMPANY



GRADING SHOWN ON THESE PLANS IS FOR REFERENCE ONLY. GRADING WAS COMPLETED UNDER A STATE MINING PERMIT. A GRADING PERMIT WAS NOT OBTAINED FROM THE CITY OF SAN DIEGO.
ACCORDINGLY, THE CITY OF SAN DIEGO DID NOT OBSERVE ANY GRADING ACTIVITY AND THEREFORE ASSUMES NO RESPONSIBILITY FOR ANY FAILURES.

CAUTION! LOCATION OF EXISTING UTILITIES ON THESE PLANS ARE APPROXIMATE AND SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.

BENCH MARK

CITY OF SAN DIEGO, SE BRASS PLUG AT THE TOP OF INLET AT INTERS. OF CAMINO SANTA FE AND CARROLL ROAD
ELEVATION: 392.570 DATUM M.S.L.

ENGINEER OF WORK

5/23/02

TIMOTHY J. MURPHY R.C.E. 35811 DATE

PRIVATE CONTRACT

PLANS FOR THE IMPROVEMENT OF:

CAMINO SANTA FE

STA. 58+50 TO STA. 65+50

BETWEEN FLANDERS DRIVE & TRADE STREET

CITY OF SAN DIEGO, CALIFORNIA

T.M. 96-93 17983

6

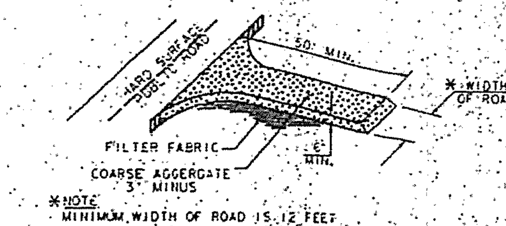
CAMINO SANTA FE

STA. 58+50 TO STA. 65+50

GRAPHIC SCALE 1"= 40'

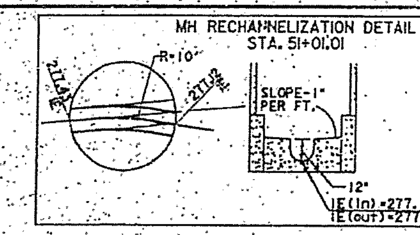
CURB DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	Δ=16°42'02"	1951.00'	568.68'	6" TYPE "H"
2	N10°06'00"E		174.04'	6" TYPE "H"
3	Δ=3°06'12"	1249.00'	67.65'	6" TYPE "H"
4	Δ=16°42'02"	1907.00'	555.85'	6" TYPE "B-2"
5	Δ=16°42'02"	1907.00'	555.85'	6" TYPE "B-2"
6	N10°06'00"E		174.04'	6" TYPE "B-2"
7	Δ=3°06'12"	1293.00'	70.04'	6" TYPE "B-2"
8	Δ=16°42'02"	1893.00'	551.77'	6" TYPE "B-2"
9	N10°06'00"E		174.99'	6" TYPE "B-2"
10	Δ=3°03'17"	1311.00'	69.89'	6" TYPE "B-2"
11	Δ=16°42'02"	1849.00'	538.94'	6" TYPE "H"
12	N10°06'00"E		174.22'	6" TYPE "H"
13	Δ=3°05'20"	1355.00'	73.05'	6" TYPE "H"
14	N6°36'01"W		7.70'	6" TYPE "H"
15	N6°36'01"W		128.73'	6" TYPE "B-2"
16	N6°36'01"W		128.73'	6" TYPE "B-2"

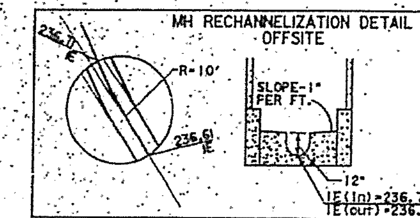
CENTERLINE DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	Δ=16°42'02"	1900.00'	553.81'	
2	N10°06'00"E		174.04'	
3	Δ=3°0[illegible]'1[illegible]"	1300.00'	70.42'	

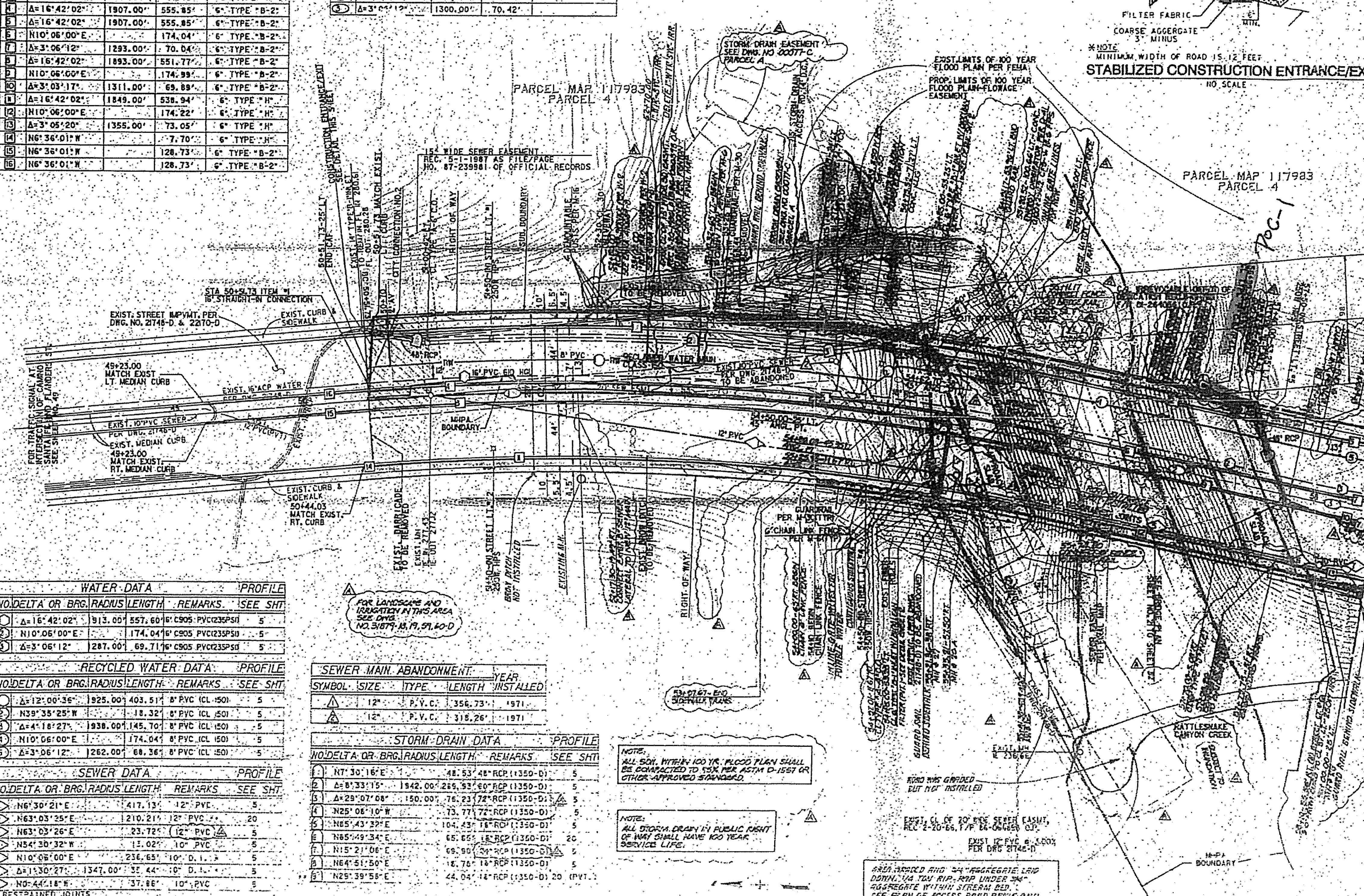


*NOTE
MINIMUM WIDTH OF ROAD IS 12 FEET

STABILIZED CONSTRUCTION ENTRANCE/EXIT
NO SCALE



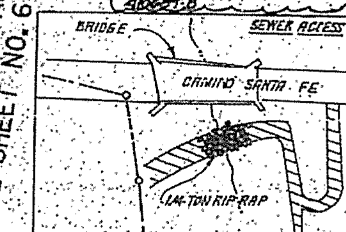




FOR PVT. STORM DRAIN IN PUBLIC R/W SEE EMRA NO. 40589-11, 410689-12.

FOR CONSTRUCTION ON HANSON AGGREGATES WEST PROPERTY SEE LETTER OF PERMISSION BY HANSON AGGREGATES WEST DATED: 7/16/02.

FOR PVT. IRRIGATION SERVICES IN PUBLIC R/W SEE EMRA NO.



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ACCORDINGLY, THE CITY OF SAN DIEGO DID NOT OBSERVE ANY GRADING ACTIVITY AND THEREFORE ASSUMES NO RESPONSIBILITY FOR ANY FAILURES.

CAUTION! LOCATION OF EXISTING UTILITIES ON THESE PLANS ARE APPROXIMATE AND SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.

WATER DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	Δ=16°42'02"	1913.00'	557.60'	6" C905 PVC(235PSI)	5
2	N10°06'00"E		174.04'	6" C905 PVC(235PSI)	5
3	Δ=3°06'12"	1287.00'	69.71'	6" C905 PVC(235PSI)	5

RECYCLED WATER DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	Δ=12°00'36"	1925.00'	403.51'	8" PVC (CL 150)	5
2	N39°35'25"W		18.32'	8" PVC (CL 150)	5
3	Δ=4°18'27"	1938.00'	145.70'	8" PVC (CL 150)	5
4	N10°06'00"E		174.04'	8" PVC (CL 150)	5
5	Δ=3°06'12"	1262.00'	68.36'	8" PVC (CL 150)	5

SEWER DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	N6°30'21"E		417.13'	12" PVC	5
2	N63°03'25"E		210.21'	12" PVC **	20
3	N63°03'26"E		23.72'	12" PVC	5
4	N54°30'32"W		13.02'	10" PVC	5
5	N10°06'00"E		236.65'	10" D.I. *	5
6	Δ=1°30'27"	1347.00'	35.44'	10" D.I. *	5
7	N0°44'18"W		37.86'	10" PVC	5

* RESTRAINED JOINTS
** TRENCH TO BE LINED WITH GEOTEXTILE FILTER FABRIC (MIRAFI 140NL, SUPAC 4NP, OR APPROVED EQUAL, SEE DETAIL SHEET 3)

SEWER MAIN ABANDONMENT				
SYMBOL	SIZE	TYPE	LENGTH	YEAR INSTALLED
1	12"	P.V.C.	356.73'	1971
2	12"	P.V.C.	318.26'	1971

STORM DRAIN DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	N7°30'16"E		48.53'	48" RCP (1350-D)	5
2	Δ=8°33'15"	1942.00'	289.93'	60" RCP (1350-D)	5
3	Δ=29°07'08"	150.00'	76.23'	72" RCP (1350-D)	5
4	N25°06'10"W		73.77'	72" RCP (1350-D)	5
5	N85°43'32"E		104.43'	18" RCP (1350-D)	5
6	N85°49'34"E		65.65'	18" RCP (1350-D)	20
7	N15°21'06"E		69.90'	24" RCP (1350-D)	5
8	N64°51'50"E		18.78'	18" RCP (1350-D)	5
** 9	N29°39'58"E		44.04'	18" RCP (1350-D)	20 (PVT.)

** FOR PRIVATE STORM DRAIN IN PUBLIC RIGHT-OF-WAY SEE EMRA NO. 410689-11, 410689-12
* WATER TIGHT JOINTS

NOTE:
ALL SOIL WITHIN 100 YR. FLOOD PLAIN SHALL BE COMPACTED TO 95% PER ASTM D-1557 OR OTHER APPROVED STANDARD.

NOTE:
ALL STORM DRAIN IN PUBLIC RIGHT OF WAY SHALL HAVE 100 YEAR SERVICE LIFE.

AREA GRADED AND 3/4" AGGREGATE LAID DOWN. 1/4 TON RIP-RAP UNDER 3/4" AGGREGATE WITHIN STREAM BED. SEE PLAN OF ACCESS ROAD ABOVE AND TO THE RIGHT.

ALL ONSITE PRIVATE IMPROVEMENTS SHOWN ON THIS DRAWING ARE FOR INFORMATION ONLY. THE CITY ENGINEER'S APPROVAL OF THIS DRAWING IN NO WAY CONSTITUTES AN APPROVAL OF THE PRIVATE IMPROVEMENTS. A SEPARATE PERMIT FOR THE IMPROVEMENTS MAY BE REQUIRED.

RICK ENGINEERING COMPANY

CAMINO SANTA FE
STA.50+51.73 TO STA. 58+50

GRAPHIC SCALE 1"= 40'

BENCH MARK
CITY OF SAN DIEGO, SE. BRASS PLUG AT THE TOP OF INLET AT INTERS. OF CAMINO SANTA FE AND CARROLL ROAD
ELEVATION: 392.570 DATUM: M.S.L.

ENGINEER OF WORK
5/23/02
TIMOTHY J. MURPHY R.C.E. 35711 DATE

REGISTERED PROFESSIONAL ENGINEER
TIMOTHY J. MURPHY
No. 35711
Exp. 3/30/03
CIVIL
STATE OF CALIFORNIA

J-13986

PRIVATE CONTRACT
PLANS FOR THE IMPROVEMENT OF:
CAMINO SANTA FE
STA.50+51.73 TO STA. 58+50
BETWEEN FLANDERS DRIVE & TRADE STREET

CITY OF SAN DIEGO, CALIFORNIA
SHEET 4 OF [illegible] SHEETS
TM-98-1199
410689
5/29/02
904-6275
264-175
31390-4-D

AS-BUILT

REVISED WATER TABLE, SD CALLOUT, SHOW MHPA BOUNDARY, ... REVISED SEWER DATA TABLE, ... FENCES, ADDED RCH RR, SERVICES ... ACCESS ROAD

CENTERLINE DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	Δ=36°14'00"	1300.00'	622.11'	

CURB DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	N44°02'07"W		77.89'	6" TYPE "H"
2	Δ=26°57'56"	1351.00'	635.65'	6" TYPE "H"
3	Δ=87°20'38"	30.00'	45.73'	6" TYPE "H" *
4	Δ=87°30'36"	30.00'	45.82'	6" TYPE "H" *
5	Δ=4°07'15"	1351.00'	97.17'	6" TYPE "H"
6	N44°02'07"W		77.89'	6" TYPE "H"
7	Δ=0°53'16"	1249.00'	19.35'	6" TYPE "H"
8	Δ=5°35'24"	1010.00'	98.72'	6" TYPE "H"
9	Δ=21°06'35"	1245.00'	458.70'	6" TYPE "H"
10	Δ=93°46'28"	30.00'	49.10'	6" TYPE "H" *
11	Δ=91°39'54"	30.00'	48.00'	6" TYPE "H" *
12	Δ=3°18'52"	1239.00'	71.67'	6" TYPE "H"
13	N44°02'08"W		77.89'	6" TYPE "B-2"
14	Δ=24°14'38"	1307.00'	553.04'	6" TYPE "B-2"
15	Δ=19°41'28"	200.00'	68.73'	6" TYPE "B-2"
16	Δ=164°27'42"	2.00'	5.74'	6" TYPE "B-2"
17	Δ=10°59'43"	1299.00'	249.28'	6" TYPE "B-2"
18	Δ=10°08'57"	200.00'	35.43'	6" TYPE "B-2"
19	N36°58'07"W		31.12'	6" TYPE "B-2"
20	Δ=5°04'15"	550.00'	48.68'	6" TYPE "B-2"
21	Δ=5°35'35"	1289.00'	125.83'	6" TYPE "B-2"
22	Δ=5°39'24"	1054.00'	104.06'	6" TYPE "B-2"
23	Δ=0°53'16"	1293.00'	20.03'	6" TYPE "B-2"
24	N44°02'07"W		77.89'	6" TYPE "B-2"
25	Δ=4°04'56"	1287.00'	91.69'	6" TYPE "B-2"
26	Δ=180°08'34"	2.00'	6.29'	6" TYPE "B-2"
27	Δ=4°04'56"	1283.00'	91.41'	6" TYPE "B-2"

* SEE SHEET NO. 11 FOR PROFILES

STORM DRAIN DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
* 1	N71°56'29"E		46.42'	36" RCP (1350-D)	11
2	N71°58'40"E		9.64'	18" RCP (1350-D)	11
** 3	N40°21'28"E		35.00'	18" RCP (1350-D)	11 (PVT.)
4	Δ=4°11'00"	251.00'	91.34'	36" RCP (1350-D)	11
5	Δ=43°11'29"	50.00'	37.69'	42" RCP (1350-D)	20
				REMOVED	
7	Δ=5°42'59"	251.00'	124.81'	42" RCP (1350-D)	11
8	N10°07'30"W		56.79'	18" RCP (1350-D)	11
9	Δ=5°17'25"	258.00'	116.16'	18" RCP (1350-D)	11
10	Δ=3°13'33"	258.00'	70.82'	18" RCP (1350-D)	11
11	N15°36'37"W		40.00'	18" RCP (1350-D)	11
** 12	[illegible]		[illegible]	30" RCP (1350-D)	11 (PVT.)
13	N67°48'15"E		45.43'	18" RCP (1350-D)	11
14	N62°18'17"E		44.16'	18" RCP (1350-D)	17
15	N84°14'40"W		81.00'	18" RCP (1350-D)	20 (PVT)
** 16	N75°50'59"W		36.83'	18" RCP (1350-D)	20 (PVT)
17	N55°45'14"E		41.89'	18" RCP (1350-D)	20
18	Δ=20°02'05"	200.00'	69.93'	18" RCP (1350-D)	11
19	Δ=5°19'02"	258.00'	119.74'	18" RCP (1350-D)	11

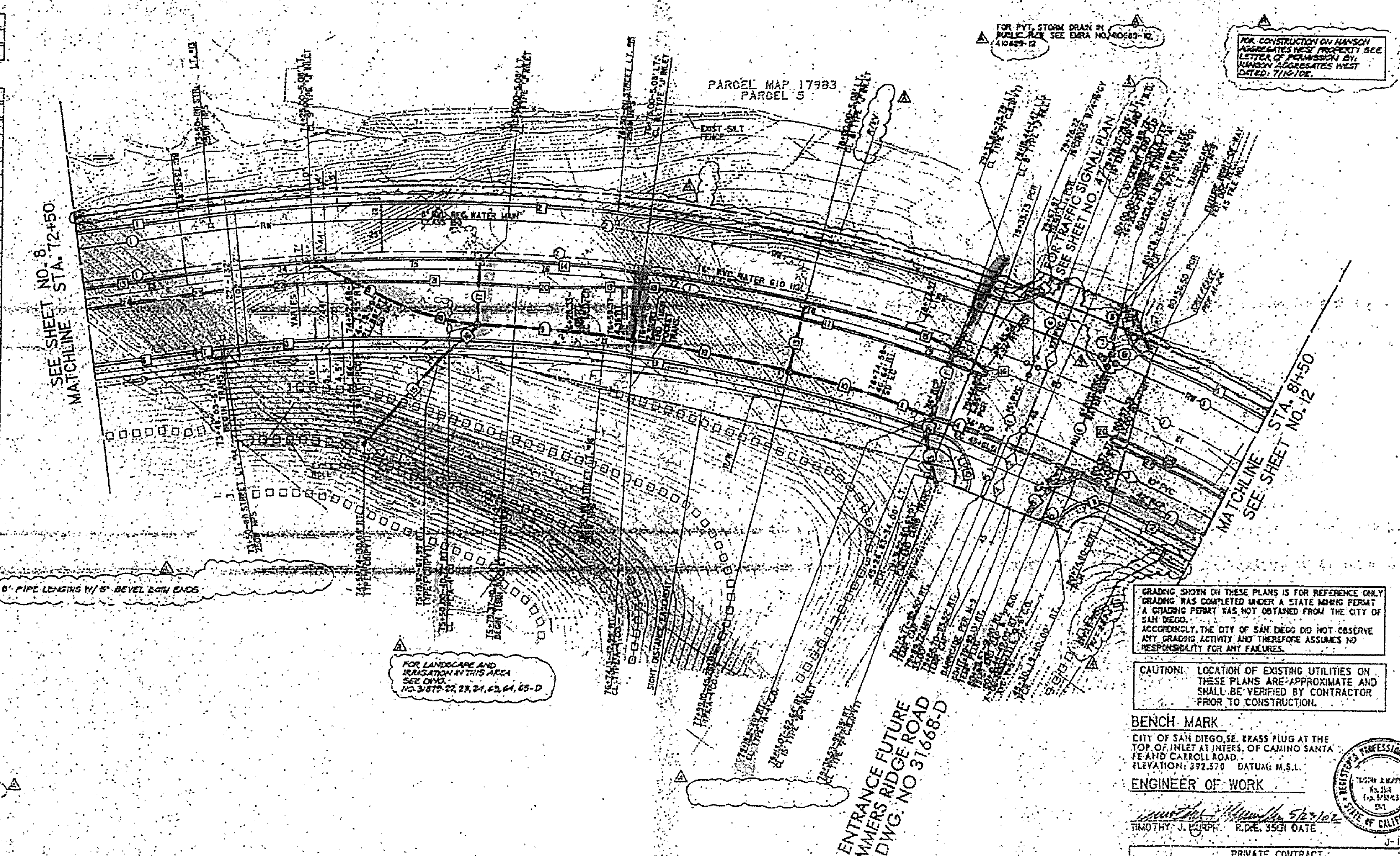
** FOR PVT. STORM DRAIN IN PUBLIC R/W SEE DWG NO. 40689-10, 410689-12
* WATER TIGHT JOINTS

RECLAIMED WATER DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	N44°02'07"W		77.58'	8" PVC (CLASS 150)	11
2	Δ=30°55'45"	1335.00'	722.27'	8" PVC (CLASS 150)	11
3	Δ=5°18'15"	1336.00'	123.67'	8" PVC (CLASS 200)	11
4	N76°53'37"E		123.10'	8" PVC (CLASS 150)	20
5	Δ=[illegible]°20'26"	1[illegible].00'	[illegible].70'	8" PVC (CLASS 150)	20

SEWER DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	N75°[illegible]'E		114.63'	10" PVC	20
2	N75°35'13"E		24.83'	10" PVC	20
3	Δ=1°53'50"	12[illegible].00'	155.56'	10" PVC	11
4	Δ=1°43'45"	1090.00'	33.88'	10" PVC	20

RICK ENGINEERING COMPANY

WATER DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	N44°02'05"W		77.89'	[illegible]	
2	Δ=28°39'44"	1313.00'	656.93'	[illegible]	
3	Δ=7°34'16"	[illegible]	173.50'	[illegible]	
4	N75°35'13"E		72.53'	[illegible]	
5	[illegible]	[illegible]	32.02'	[illegible]	
6	N72°48'45"E		[illegible]	[illegible]	



CAMINO SANTA FE
STA. 72+50 TO STA. 81+50
GRAPHIC SCALE 1" = 40'

GRADING SHOWN ON THESE PLANS IS FOR REFERENCE ONLY. GRADING WAS COMPLETED UNDER A STATE MINING PERMIT. A GRADING PERMIT WAS NOT OBTAINED FROM THE CITY OF SAN DIEGO.
ACCORDINGLY, THE CITY OF SAN DIEGO DID NOT OBSERVE ANY GRADING ACTIVITY AND THEREFORE ASSUMES NO RESPONSIBILITY FOR ANY FAILURES.

CAUTION! LOCATION OF EXISTING UTILITIES ON THESE PLANS ARE APPROXIMATE AND SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.

BENCH MARK

CITY OF SAN DIEGO, SE. BRASS PLUG AT THE TOP OF INLET AT INTERS. OF CAMINO SANTA FE AND CARROLL ROAD.
ELEVATION: 392.570 DATUM: M.S.L.

ENGINEER OF WORK

5/23/02
TIMOTHY J. MURPHY R.C.E. 35[illegible] DATE

REGISTERED PROFESSIONAL ENGINEER · STATE OF CALIFORNIA

J-13986

PRIVATE CONTRACT

PLANS FOR THE IMPROVEMENT OF:

CAMINO SANTA FE

STA. 72+50 TO STA. 81+50
BETWEEN FLANDERS DRIVE & TRADE STREET

CITY OF SAN DIEGO, CALIFORNIA
TM-98-1199
410689
5/29/02
1904-6275
31370-10-D

FOR TRAFFIC SIGNAL PLAN SEE SHEET NO. 46

CENTERLINE DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	N10°41'35"E		22.43'	
2	Δ=18°07'10"	1900.00'	600.86'	
3	N7°25'35"W		16.35'	

CURB DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	Δ=92°06'11"	30.00'	48.23'	6" TYPE "H" *
2	Δ=91°13'30"	30.00'	47.77'	6" TYPE "H" *
3	N10°41'35"E		7.88'	6" TYPE "B-2"
4	Δ=181°17'26"	2.00'	6.33'	6" TYPE "B-2"
5	N10°41'36"E		7.88'	6" TYPE "B-2"
6	Δ=180°10'00"	2.00'	6.29'	6" TYPE "B-2"
7	Δ=7°00'27"	1915.00'	233.97'	6" TYPE "B-2"
8	Δ=19°05'45"	70.00'	23.26'	6" TYPE "B-2"
9	N18°57'36"W		15.86'	6" TYPE "B-2"
10	Δ=15°59'42"	260.00'	72.58'	6" TYPE "B-2"
11	Δ=4°51'56"	1893.00'	160.75'	6" TYPE "B-2"
12	N7°49'50"W		121.09'	6" TYPE "B-2"
13	Δ=5°18'00"	1186.00'	175.26'	6" TYPE "B-2"
14	Δ=6°32'19"	1917.00'	218.77'	6" TYPE "B-2"
15	Δ=88°52'03"	30.00'	46.53'	6" TYPE "H" *
16	Δ=87°43'34"	30.00'	45.93'	6" TYPE "H" *
17	Δ=5°33'48"	1961.00'	190.41'	6" TYPE "H"
18	Δ=9°33'13"	1240.00'	206.76'	6" TYPE "H"
19	N7°49'50"W		121.09'	6" TYPE "H"
20	Δ=4°47'24"E	200.00'	16.72'	6" TYPE "H"
21	N5°54'11"E	1849.00'	283.12'	6" TYPE "H"
22	Δ=4°35'50"	1849.00'	148.36'	6" TYPE "H"
23	N8°19'49"W		16.34'	6" TYPE "H"
24	N9°10'28"E		28.00'	6" AC BERM
25	Δ=5°42'27"	1837.00'	182.99'	6" TYPE "H"
26	N40°24'40"W		33.28'	6" AC BERM
27	Δ=1°34'56"	1283.00'	52.00'	6" AC BERM
28	Δ=35°29'55"	150.00'	92.93'	6" AC BERM
29	N60°44'42"E		17.56'	6" AC BERM
30	N60°44'43"E		36.07'	6" AC BERM
31	Δ=26°42'07"	220.00'	102.53'	6" AC BERM
32	N87°26'50"E		72.03'	6" AC BERM

* SEE SHEET NO. 15 FOR PROFILES

WATER DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	N10°41'35"E		28.35	6" C905 PVC(235PSI)	15
2	Δ=18°07'10"	870.00	591.38	6" C905 PVC(235PSI)	15
3	N7°25'35"W		16.01	6" C905 PVC(235PSI)	15
4	N10°41'35"E		28.35	6" C905 PVC(235PSI)	17
5	Δ=1°30'38"	850.00	49.05	6" C905 PVC(235PSI)	17
6	N60°26'23"W		38.16	6" C905 PVC(235PSI)	17
7	N60°26'23"W		112.75	6" C905 PVC(235PSI)	17

RECLAIMED WATER DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	N10°41'35"E		22.43	8" PVC CL 200	15
2	Δ=0°58'29"	862.00	31.67	8" PVC CL 200	15
3	Δ=17°08'41"	862.00	557.17	8" PVC CL 200	15
4	N7°25'35"W		21.27	8" PVC CL 200	15
5	N80°16'54"W		127.59	8" PVC CL 200	15

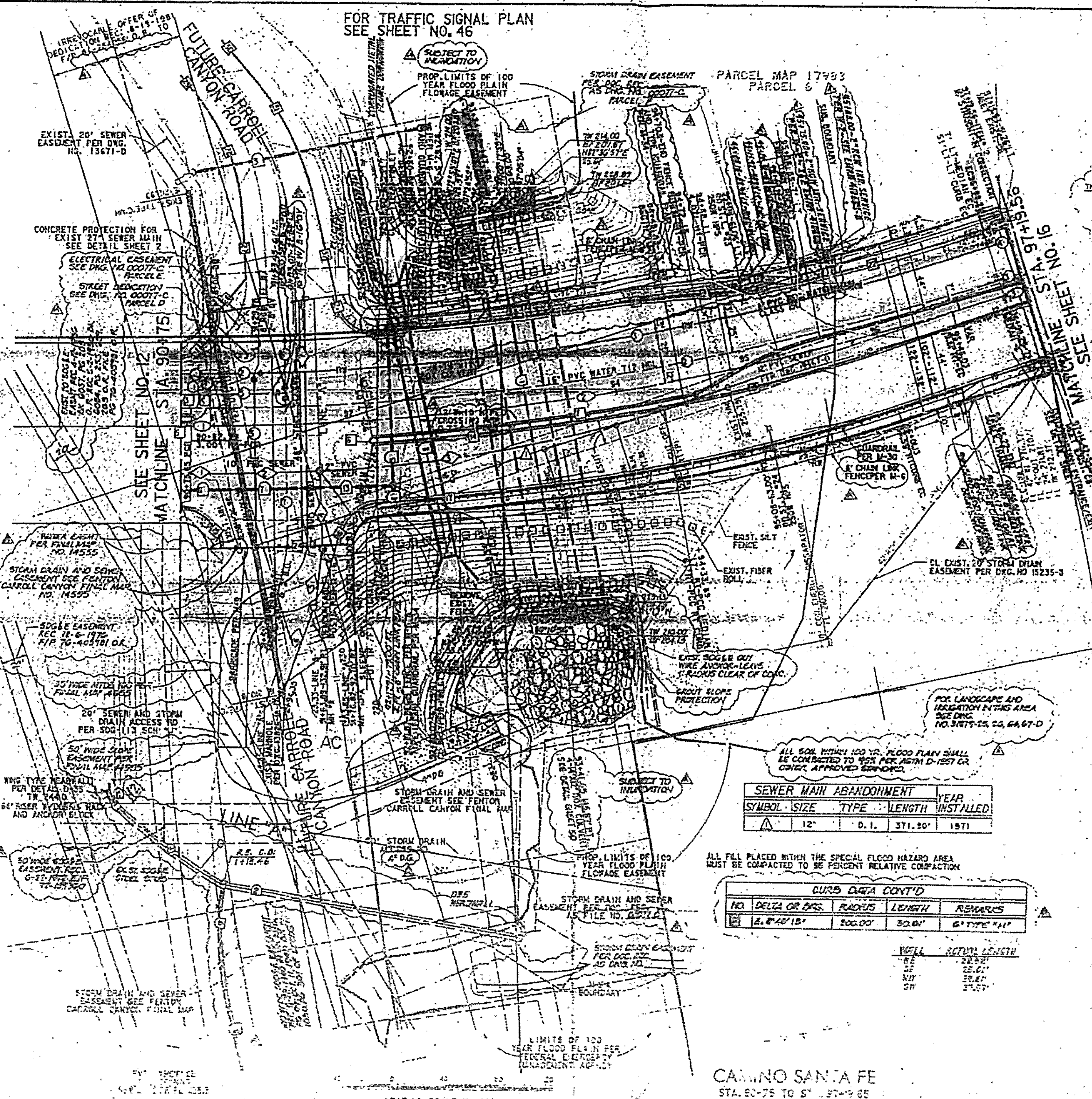
STORM DRAIN DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	N89°42'01"W		264.40	[illegible]	19
** 2	N20°41'53"E		223.70'	54"RCP(1350-D)	19 (PVT.)
** 3	N0°00'00"W		166.67'	18"RCP(1350-D)	7 (PVT.)
4	N81°42'55"W		10.31'	18"RCP(1350-D)	19
5	N81°42'54"W		110.24'	18"RCP(1350-D)	3
*** 6	N10°41'35"E		27.43'	18"RCP(1350-D)	5
*** 7	Δ=1°35'51"	[illegible]	41.92'	18"RCP(1350-D)	15
8	N35°15'5[illegible]"W		61.15'	18"RCP(1350-D)	8 (PVT.)
*** 9	Δ=20°31'50"	200.00'	71.64'	18"RCP(1350-D)	5 (PVT.)
** 10	Δ=13°41'54"	400.00'	95.65'	54"RCP(1350-D)	8 (PVT.)
11	N88°11'27"E		264.00'	2" W.I.C'H PED.X-ING	7
** 12	N41°25'14"E		10.00'	30"RCP(1350-D)	8 (PVT.)
*** 13	N8°15'59"E		85.65'	18"RCP(1350-D)	5

FOR PVT. STORM DRAIN IN PUBLIC SEWER & DRAINAGE EASEMENT SEE DWG. 41081-D

Δ = PROVIDE LIGHTS PER CALTRANS STD. DWG. ES-3T SEE DETAIL SHEET 3

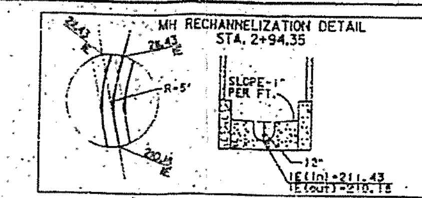
*** REFERS TO ...

RICK ENGINEERING COMPANY

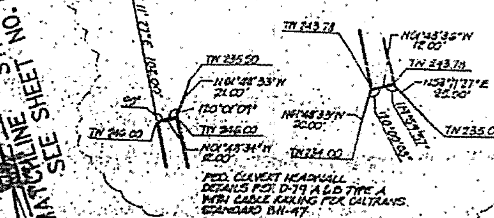


SEWER MAIN ABANDONMENT				YEAR
SYMBOL	SIZE	TYPE	LENGTH	INSTALLED
Δ	12"	D.I.	371.50'	1971

CURB DATA CONT'D				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
33	Δ=8°48'15"	200.00'	30.64'	6" TYPE "H"



FOR CONSTRUCTION ON HANSON AGGREGATES WEST PROPERTY SEE LETTER OF PERMISSION BY HANSON AGGREGATES WEST, DATED: 7/10/02.



SEWER DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	N10°41'35"E		22.43	10" PVC	15
2	Δ=2°23'51"	935.00	80.96	10" PVC	15
3	Δ=17°53'44"	1000.00	312.33	12" PVC	15
4	N81°35'11"W		57.70	12" DR-18 PVC **	15
5	N62°41'50"W		42.48	12" DR-18 PVC **	15
6	N64°25'40"E		68.02	12" DR-18 PVC	15
7	N40°26'22"W		180.54	18" STEEL SLEEVE	15

** TRENCH TO BE LINED WITH GEOTEXTILE FILTER FABRIC (MIRAFI 140NL, SUPAC 4NP, OR APPROVED EQUAL. SEE DETAIL SHEET 31

GRADING SHOWN ON THESE PLANS IS FOR REFERENCE ONLY. GRADING WAS COMPLETED UNDER A STATE MINING PERMIT. A GRADING PERMIT WAS NOT OBTAINED FROM THE CITY OF SAN DIEGO. ACCORDINGLY, THE CITY OF SAN DIEGO DID NOT OBSERVE ANY GRADING ACTIVITY AND THEREFORE ASSUMES NO RESPONSIBILITY FOR ANY FAILURES.

CAUTION! LOCATION OF EXISTING UTILITIES ON THESE PLANS ARE APPROXIMATE AND SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.

BENCH MARK

CITY OF SAN DIEGO, SE. BRASS PLUG AT THE TOP OF INLET AT INTERS. OF CAMINO SANTA FE AND CARROLL ROAD
ELEVATION: 392.570 DATUM: M.S.L.

ENGINEER OF WORK

TIMOTHY J. MURPHY R.C.E. 35171 DATE

REGISTERED PROFESSIONAL ENGINEER STATE OF CALIFORNIA

J-13986

WELL	ACTUAL LENGTH
NE	28.0'
SE	28.0'
NW	26.6'
SW	27.5'

PRIVATE CONTRACT

PLANS FOR THE IMPROVEMENT OF:

CAMINO SANTA FE

STA. 90+75 TO STA. 97+19.65

BETWEEN FLANDERS DRIVE & TRADE STREET

CITY OF SAN DIEGO, CALIFORNIA

TM-98-1159

5/29/02

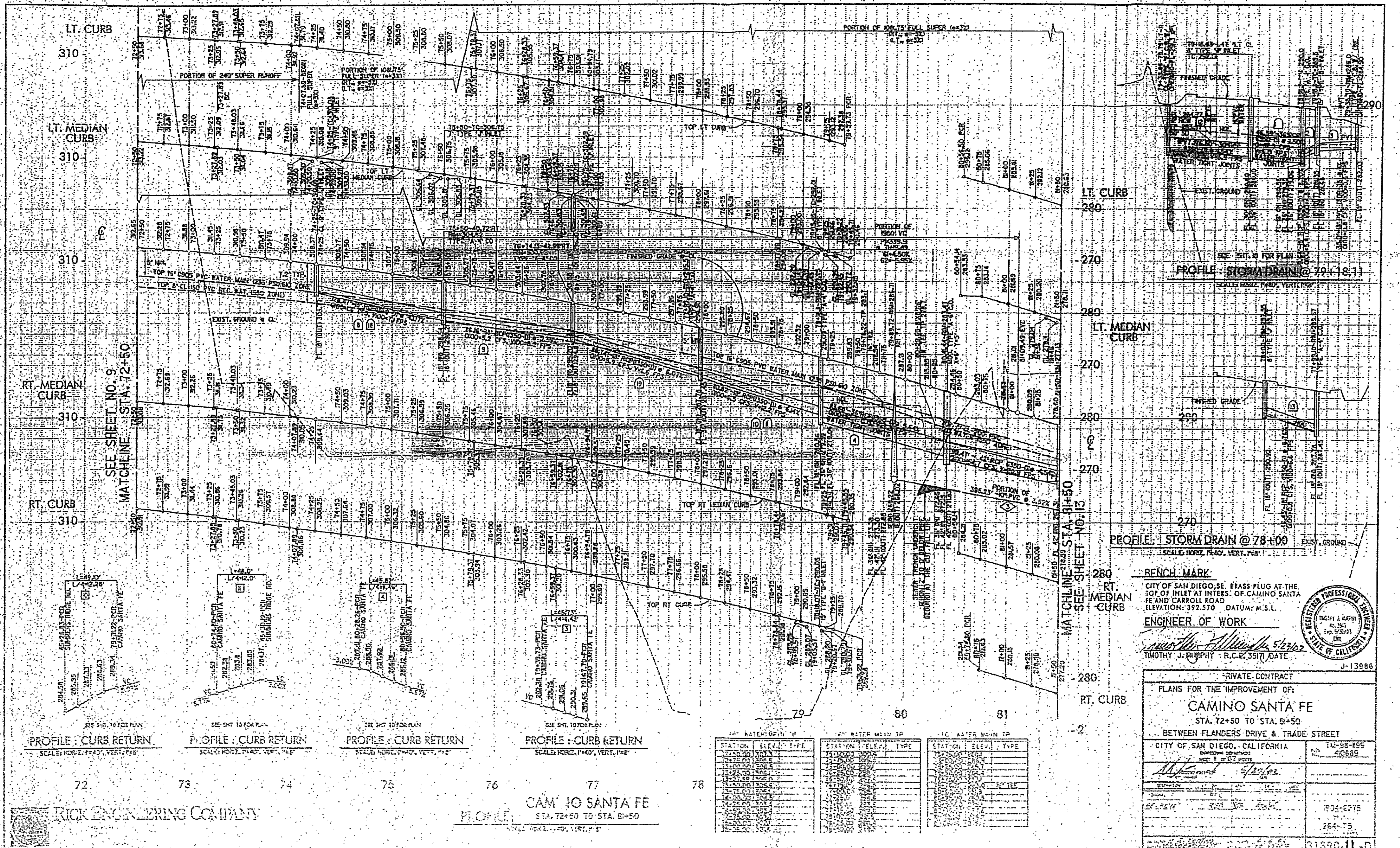
1606-6275

264-1716

31390-14-D

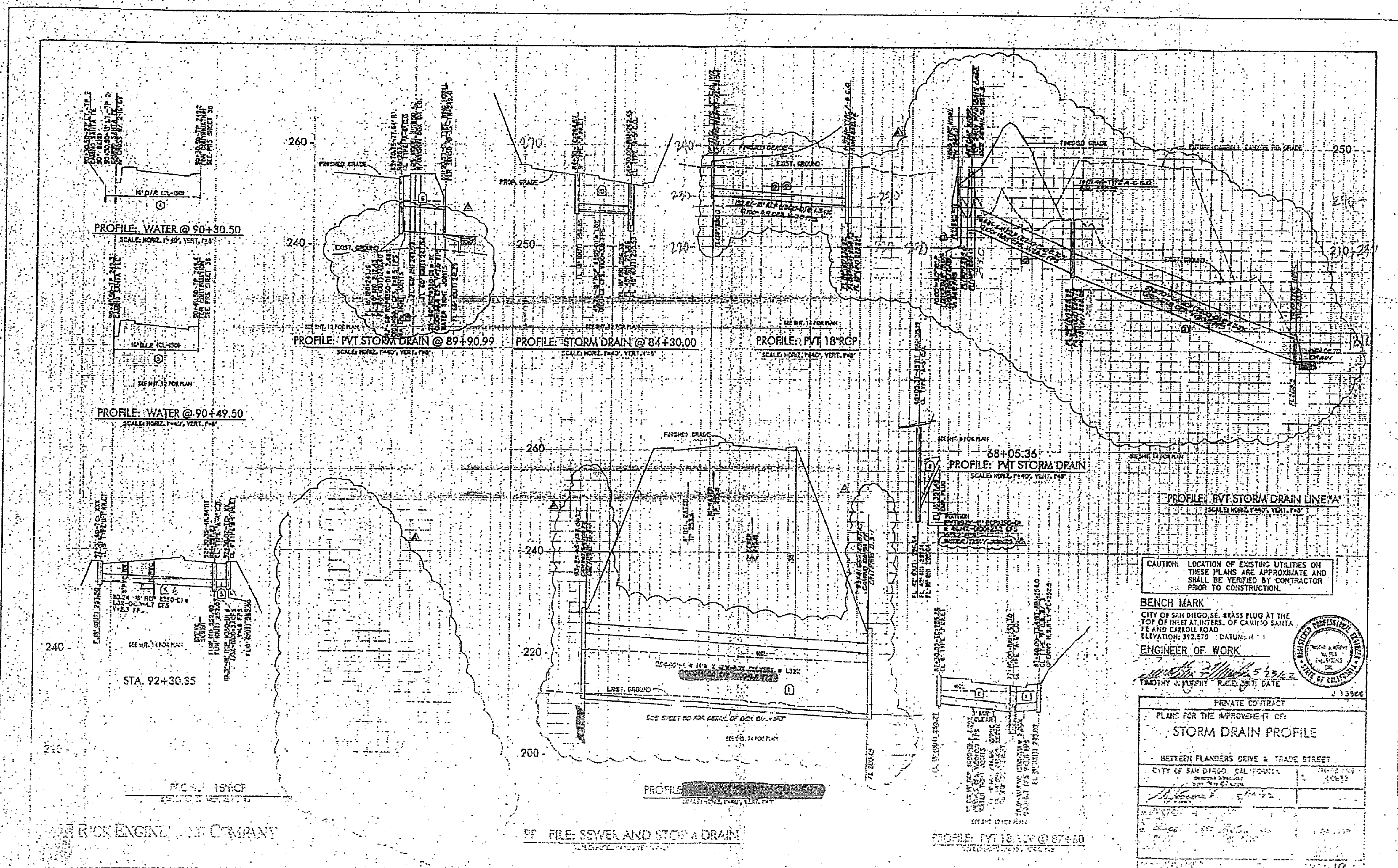
CAMINO SANTA FE
STA. 90+75 TO STA. 97+19.65

AS-BUILT

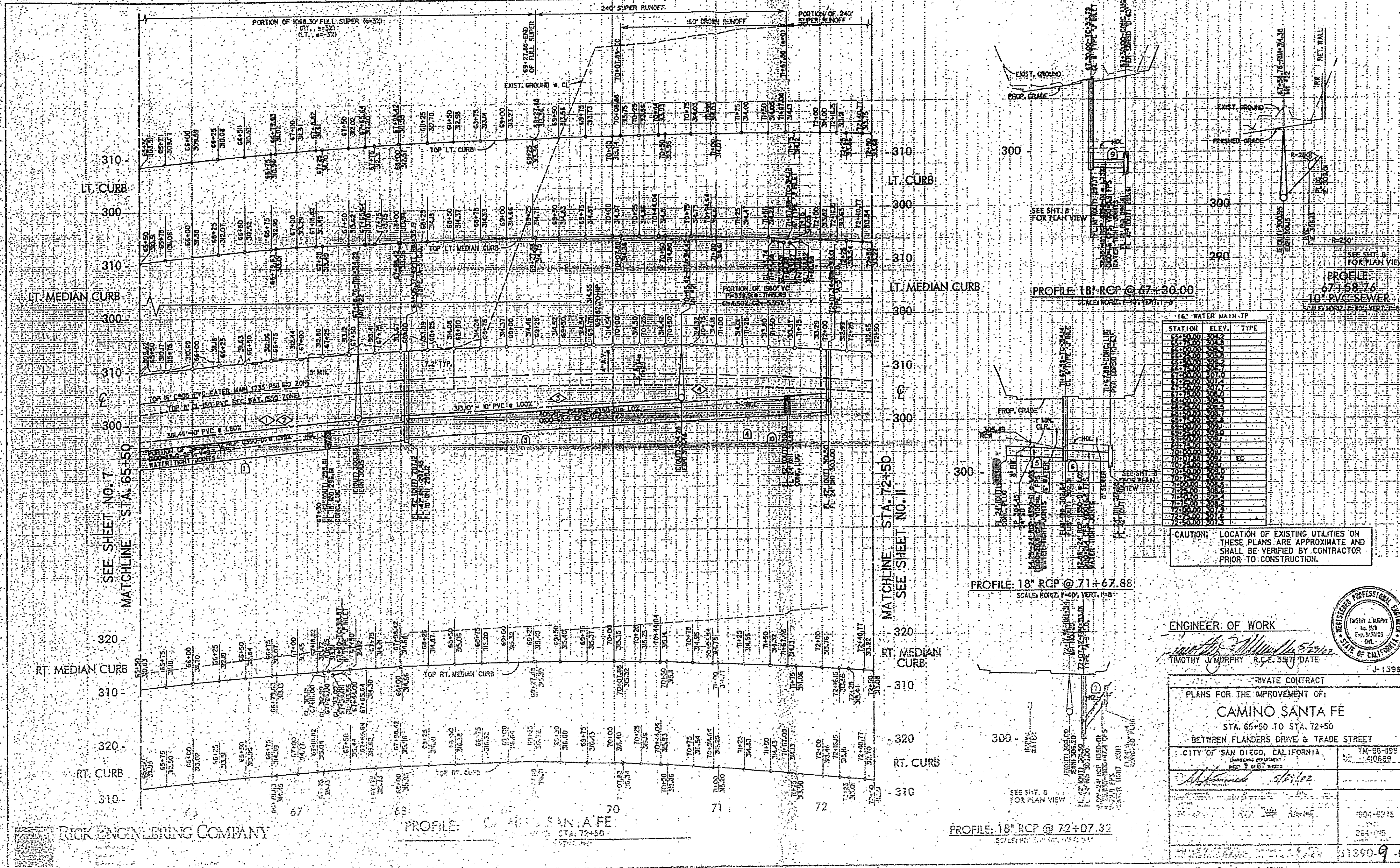


LT. CURB
LT. MEDIAN CURB
RT. MEDIAN CURB
RT. CURB
SEE SHEET NO. 9
MATCHLINE STA. 72+50
MATCHLINE STA. 81+50
SEE SHEET NO. 13
PORTION OF 240' SUPER RUNOFF
TOP LT CURB
TOP RT MEDIAN CURB
TOP RT CURB
FINISHED GRADE
EXIST. GROUND @ CL
PROFILE : STORM DRAIN @ 79+18.11
PROFILE : STORM DRAIN @ 78+09
SCALE: HORIZ. 1"=40', VERT. 1"=8'
EXIST. GROUND
PROFILE : CURB RETURN
PROFILE : CURB RETURN
PROFILE : CURB RETURN
PROFILE : CURB RETURN
PROFILE
CAMINO SANTA FE
STA. 72+50 TO STA. 81+50
RICK ENGINEERING COMPANY
BENCH MARK:
CITY OF SAN DIEGO, SE. BRASS PLUG AT THE TOP OF INLET AT INTERS. OF CAMINO SANTA FE AND CARROLL ROAD
ELEVATION: 392.570 DATUM: M.S.L.
ENGINEER OF WORK
5/23/02
TIMOTHY J. MURPHY R.C.E. 35171 DATE
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA
J-13986
PRIVATE CONTRACT
PLANS FOR THE IMPROVEMENT OF:
CAMINO SANTA FE
STA. 72+50 TO STA. 81+50
BETWEEN FLANDERS DRIVE & TRADE STREET
CITY OF SAN DIEGO, CALIFORNIA
TM-98-899
40689
5/29/02
264-1675
31390-11-D

AS-BUILT



PROFILE: WATER @ 90+30.50
PROFILE: WATER @ 90+49.50
PROFILE: PVT STORM DRAIN @ 89+90.99
PROFILE: STORM DRAIN @ 84+30.00
PROFILE: PVT 18"RCP
68+05.36
PROFILE: PVT STORM DRAIN
PROFILE: PVT STORM DRAIN LINE "A"
STA. 92+30.35
FINISHED GRADE
EXIST. GROUND
PROP. GRADE
CAUTION: LOCATION OF EXISTING UTILITIES ON THESE PLANS ARE APPROXIMATE AND SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.
BENCH MARK
CITY OF SAN DIEGO, SE. BRASS PLUG AT THE TOP OF INLET AT INTERS. OF CAMINO SANTA FE AND CARROLL ROAD
ENGINEER OF WORK
TIMOTHY J. MURPHY
PRIVATE CONTRACT
PLANS FOR THE IMPROVEMENT OF:
STORM DRAIN PROFILE
BETWEEN FLANDERS DRIVE & TRADE STREET
CITY OF SAN DIEGO, CALIFORNIA
RICK ENGINEERING COMPANY
PROFILE: SEWER AND STORM DRAIN
PROFILE: PVT 18"RCP @ 87+60
SEE SHEET 20 FOR DETAIL OF RCB CULVERT
19
AS-BUILT



CAUTION! LOCATION OF EXISTING UTILITIES ON THESE PLANS ARE APPROXIMATE AND SHALL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.

ENGINEER OF WORK

TIMOTHY J. MURPHY R.C.E. 35171 DATE 5/29/02

J-13986

PRIVATE CONTRACT

PLANS FOR THE IMPROVEMENT OF:

CAMINO SANTA FE

STA. 65+50 TO STA. 72+50

BETWEEN FLANDERS DRIVE & TRADE STREET

CITY OF SAN DIEGO, CALIFORNIA

SHEET 9 OF 67 SHEETS

TM-98-1199

410669

5/29/02

1904-6275

264-015

31390-9-D

AS-BUILT

Type "J" inlet

CENTERLINE DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	Δ=20°10'02"	1300.00'	457.58'	
2	N44°02'08"W		242.12'	

CURB DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	Δ=20°10'22"	1249.00'	439.75'	6" TYPE "H"
2	N44°02'08"W		242.12'	6" TYPE "H"
3	Δ=5°41'55"	1313.00'	130.59'	6" TYPE "B-2"
4	Δ=16°21'21"	140.00'	39.96'	6" TYPE "B-2"
5	N45°55'26"W		48.15'	6" TYPE "B-2"
6	Δ=11°07'14"	170.00'	33.00'	6" TYPE "B-2"
7	Δ=9°13'55"	1293.00'	208.34'	6" TYPE "B-2"
8	N44°02'08"W		242.12'	6" TYPE "B-2"
9	Δ=10°52'14"	1317.00'	249.87'	6" TYPE "B-2"
10	Δ=17°40'55"	1196.00'	369.10'	6" TYPE "B-2"
11	Δ=2°08'35"	1354.00'	50.65'	6" TYPE "B-2"
12	N45°04'37"W		121.53'	6" TYPE "B-2"
13	Δ=1°02'30"	1354.00'	24.61'	6" TYPE "B-2"
14	N44°02'08"W		9.23'	6" TYPE "B-2"
15	Δ=5°39'50"	1361.00'	134.54'	6" TYPE "H"
16	Δ=17°40'55"	1240.00'	382.67'	6" TYPE "H"
17	Δ=2°08'35"	1310.00'	49.00'	6" TYPE "H"
18	N45°04'37"W		121.53'	6" TYPE "H"
19	Δ=1°02'30"	1310.00'	23.81'	6" TYPE "H"
20	N44°02'08"W		9.23'	6" TYPE "H"

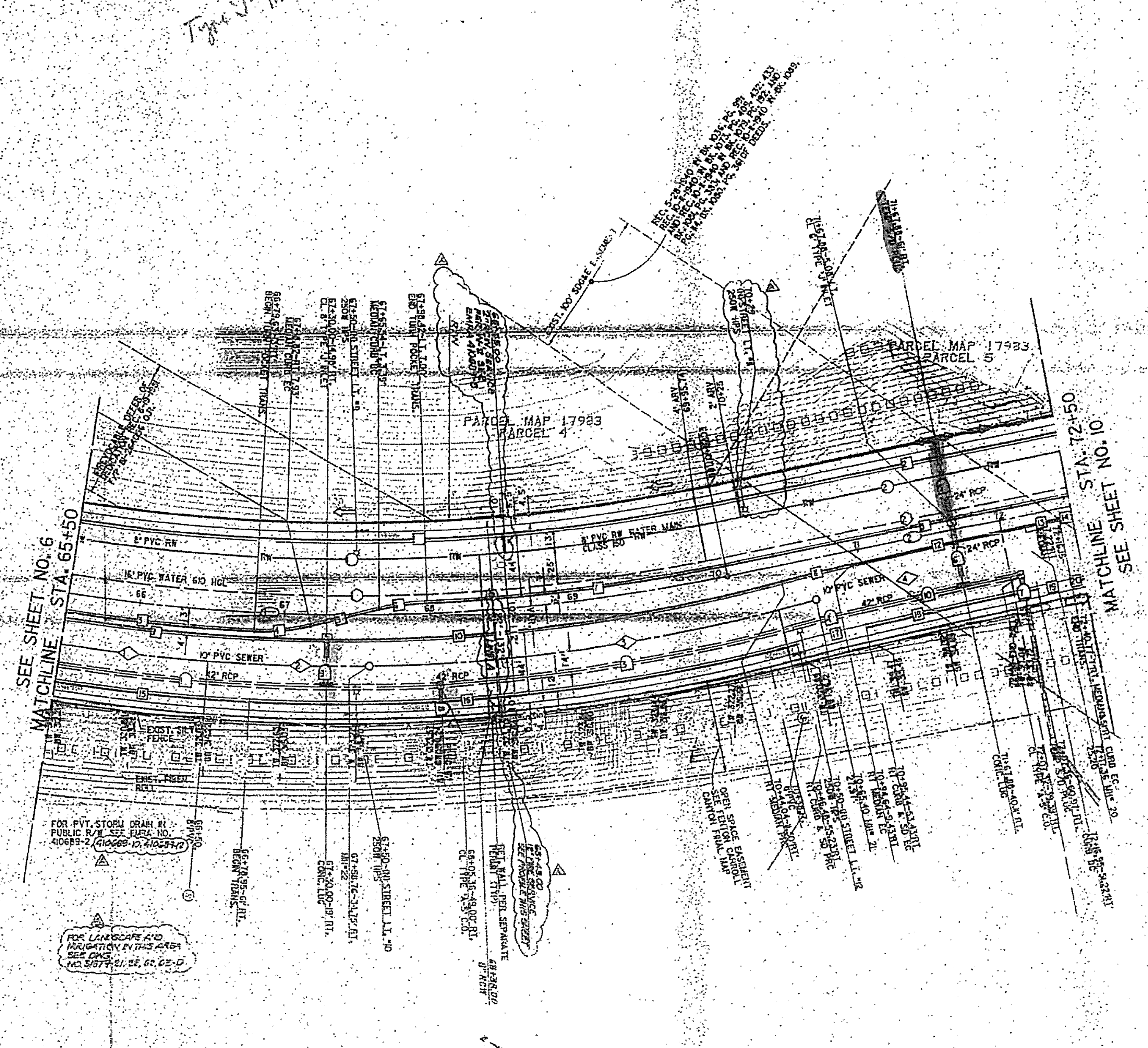
STORM DRAIN DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	Δ=9°30'04"	349.00'	223.70'	42"RCP(1350-D)	9
3	Δ=11°57'36"	228.00'	256.34'	42"RCP(1350-D)	9
4	Δ=2°08'35"	1322.00'	49.45'	42"RCP(1350-D)	9
** 5	N45°57'52"E		54.25'	24"RCP(1350-D)	9 (PVT)
6	N45°57'51"E		42.86'	24"RCP(1350-D)	9
** 7	N45°57'52"E		19.97'	24"RCP(1350-D)*	9 (PVT)
** 8	N53°45'05"E		18.87'	18"RCP(1350-D)*	19 (PVT)
9	N58°12'43"E		32.35'	18"RCP(1350-D)	9
10	N45°04'37"W		110.13'	42"RCP(1350-D)	9

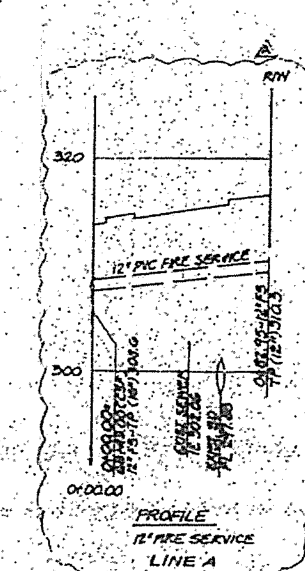
** FOR PVT. STORM DRAIN IN PUBLIC R/W SEE EMRA NO. 410689-2, 410689-10, 410689-12

WATER DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	Δ=20°10'07"	1287.00'	453.03'	16" C905 PVC(235PSI)	9
2	N44°02'08"W		242.12'	16" C905 PVC(235PSI)	9

SEWER DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	Δ=5°39'59"	1335.00'	132.03'	10" P.V.C.	9
2	Δ=3°52'05"	1214.00'	81.96'	10" P.V.C.	9
3	Δ=14°46'37"	1214.00'	313.10'	10" P.V.C.	9
4	N45°04'37"W		151.98'	10" P.V.C.	9
5	N56°56'39"E		36.00'	10" P.V.C.	9

RECYCLED WATER DATA					PROFILE
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS	SEE SHT
1	Δ=20°10'18"	1262.00'	444.29'	8" PVC (CL 150)	9
2	N44°02'08"W		242.12'	8" PVC (CL 150)	9





FOR PVT. IRRIGATION SERVICES IN PUBLIC R/W SEE EMRA NO. 40689-8

GRADING SHOWN ON THESE PLANS IS FOR REFERENCE ONLY
GRADING WAS COMPLETED UNDER A STATE MINING PERMIT
A GRADING PERMIT WAS NOT OBTAINED FROM THE CITY OF SAN DIEGO.
ACCORDINGLY, THE CITY OF SAN DIEGO DID NOT OBSERVE ANY GRADING ACTIVITY AND THEREFORE ASSUMES NO RESPONSIBILITY FOR ANY FAILURES.

BENCH MARK

CITY OF SAN DIEGO, SE. BRASS PLUG AT THE TOP OF INLET AT INTERS. OF CAMINO SANTA FE AND CARROLL ROAD
ELEVATION: 392.570 DATUM: M.S.L.

ENGINEER OF WORK

5/23/02
TIMOTHY J. MURPHY R.C.E. 35171 DATE

REGISTERED PROFESSIONAL ENGINEER * STATE OF CALIFORNIA *

J-13986

PRIVATE CONTRACT

PLANS FOR THE IMPROVEMENT OF:

CAMINO SANTA FE

STA. 65+50 TO STA. 72+50

BETWEEN FLANDERS DRIVE & TRADE STREET

CITY OF SAN DIEGO, CALIFORNIA — TM-98-495, 40689

5/25/02

31399-8-D

AS-BUILT

CAMINO SANTA FE
STA. 65+50 TO STA. 72+50

GRAPHIC SCALE 1"= 40'

RICK ENGINEERING COMPANY


Verbatim
CD-R
COMPACT disc Recordable
700 MB Mo
52x speed vitesse
80 min
DRAINAGE STUDY FOR
FENTON CARROL CANYON
RICK ENG.
2001

5

APPENDIX 5

Detention Basin Routing Analysis

RATIONAL METHOD HYDROGRAPH PROGRAM

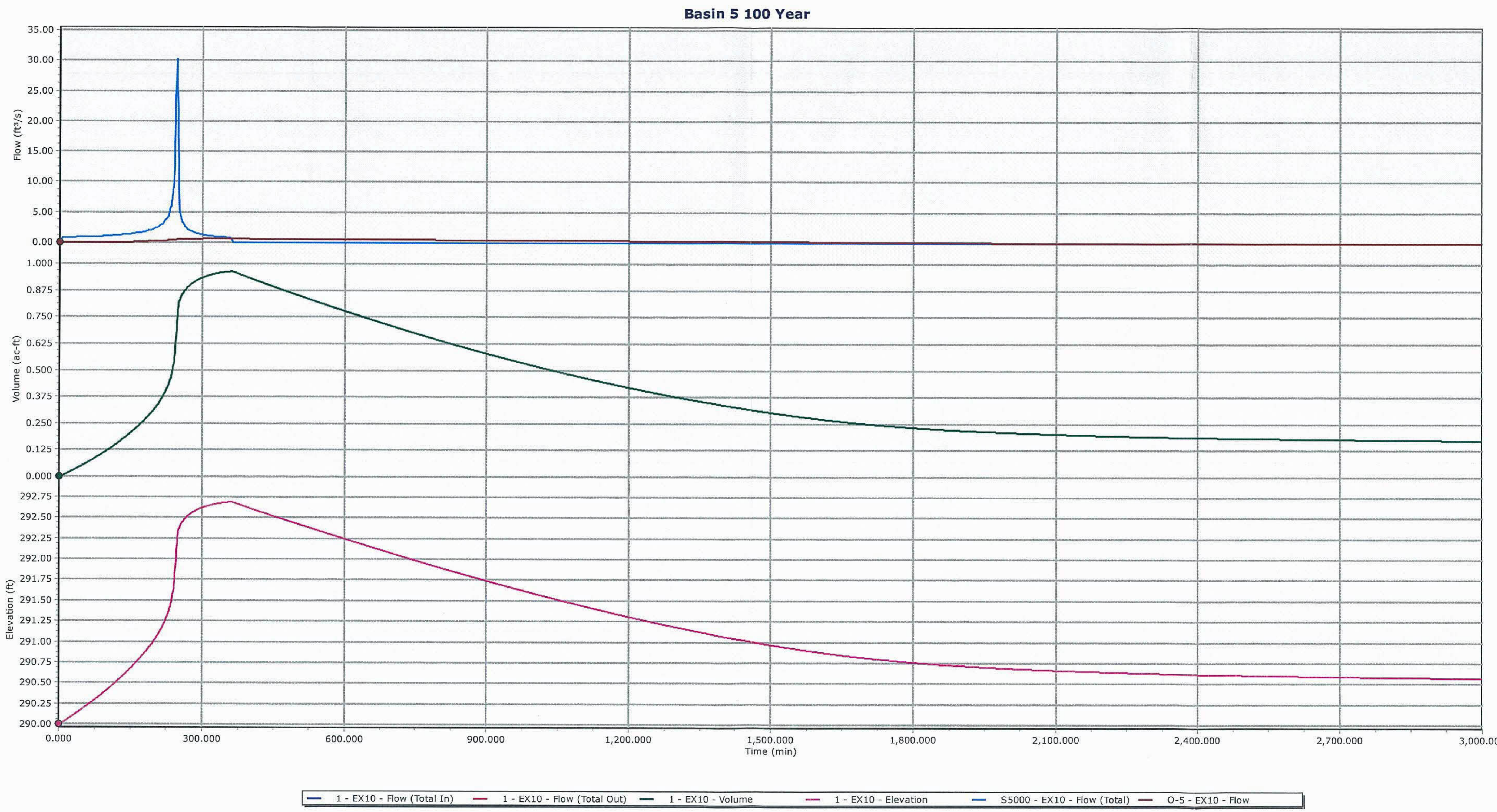
RUN DATE 10/11/2018
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 6 MIN.
6 HOUR RAINFALL 2.8 INCHES
BASIN AREA 11.2 ACRES
RUNOFF COEFFICIENT 0.42
PEAK DISCHARGE 30.3 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 6	DISCHARGE (CFS) = 0.8
TIME (MIN) = 12	DISCHARGE (CFS) = 0.8
TIME (MIN) = 18	DISCHARGE (CFS) = 0.8
TIME (MIN) = 24	DISCHARGE (CFS) = 0.8
TIME (MIN) = 30	DISCHARGE (CFS) = 0.8
TIME (MIN) = 36	DISCHARGE (CFS) = 0.9
TIME (MIN) = 42	DISCHARGE (CFS) = 0.9
TIME (MIN) = 48	DISCHARGE (CFS) = 0.9
TIME (MIN) = 54	DISCHARGE (CFS) = 0.9
TIME (MIN) = 60	DISCHARGE (CFS) = 0.9
TIME (MIN) = 66	DISCHARGE (CFS) = 0.9
TIME (MIN) = 72	DISCHARGE (CFS) = 1
TIME (MIN) = 78	DISCHARGE (CFS) = 1
TIME (MIN) = 84	DISCHARGE (CFS) = 1
TIME (MIN) = 90	DISCHARGE (CFS) = 1
TIME (MIN) = 96	DISCHARGE (CFS) = 1.1
TIME (MIN) = 102	DISCHARGE (CFS) = 1.1
TIME (MIN) = 108	DISCHARGE (CFS) = 1.1
TIME (MIN) = 114	DISCHARGE (CFS) = 1.2
TIME (MIN) = 120	DISCHARGE (CFS) = 1.2
TIME (MIN) = 126	DISCHARGE (CFS) = 1.2
TIME (MIN) = 132	DISCHARGE (CFS) = 1.3
TIME (MIN) = 138	DISCHARGE (CFS) = 1.3
TIME (MIN) = 144	DISCHARGE (CFS) = 1.4
TIME (MIN) = 150	DISCHARGE (CFS) = 1.4
TIME (MIN) = 156	DISCHARGE (CFS) = 1.5
TIME (MIN) = 162	DISCHARGE (CFS) = 1.6
TIME (MIN) = 168	DISCHARGE (CFS) = 1.6
TIME (MIN) = 174	DISCHARGE (CFS) = 1.7
TIME (MIN) = 180	DISCHARGE (CFS) = 1.8
TIME (MIN) = 186	DISCHARGE (CFS) = 2
TIME (MIN) = 192	DISCHARGE (CFS) = 2
TIME (MIN) = 198	DISCHARGE (CFS) = 2.3
TIME (MIN) = 204	DISCHARGE (CFS) = 2.4
TIME (MIN) = 210	DISCHARGE (CFS) = 2.8
TIME (MIN) = 216	DISCHARGE (CFS) = 3
TIME (MIN) = 222	DISCHARGE (CFS) = 3.7
TIME (MIN) = 228	DISCHARGE (CFS) = 4.2
TIME (MIN) = 234	DISCHARGE (CFS) = 6.1
TIME (MIN) = 240	DISCHARGE (CFS) = 9.2
TIME (MIN) = 246	DISCHARGE (CFS) = 30.3
TIME (MIN) = 252	DISCHARGE (CFS) = 4.9
TIME (MIN) = 258	DISCHARGE (CFS) = 3.3
TIME (MIN) = 264	DISCHARGE (CFS) = 2.6
TIME (MIN) = 270	DISCHARGE (CFS) = 2.1
TIME (MIN) = 276	DISCHARGE (CFS) = 1.9
TIME (MIN) = 282	DISCHARGE (CFS) = 1.7
TIME (MIN) = 288	DISCHARGE (CFS) = 1.5
TIME (MIN) = 294	DISCHARGE (CFS) = 1.4
TIME (MIN) = 300	DISCHARGE (CFS) = 1.3
TIME (MIN) = 306	DISCHARGE (CFS) = 1.2
TIME (MIN) = 312	DISCHARGE (CFS) = 1.1
TIME (MIN) = 318	DISCHARGE (CFS) = 1.1
TIME (MIN) = 324	DISCHARGE (CFS) = 1
TIME (MIN) = 330	DISCHARGE (CFS) = 1
TIME (MIN) = 336	DISCHARGE (CFS) = 0.9
TIME (MIN) = 342	DISCHARGE (CFS) = 0.9
TIME (MIN) = 348	DISCHARGE (CFS) = 0.9
TIME (MIN) = 354	DISCHARGE (CFS) = 0.8
TIME (MIN) = 360	DISCHARGE (CFS) = 0.8
TIME (MIN) = 366	DISCHARGE (CFS) = 0

RATIONAL METHOD HYDROGRAPH PROGRAM

RUN DATE 1/10/2019
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 15 MIN.
6 HOUR RAINFALL 2.8 INCHES
BASIN AREA 49.1 ACRES
RUNOFF COEFFICIENT 0.57
PEAK DISCHARGE 107.6 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 15	DISCHARGE (CFS) = 4.7
TIME (MIN) = 30	DISCHARGE (CFS) = 4.8
TIME (MIN) = 45	DISCHARGE (CFS) = 5.1
TIME (MIN) = 60	DISCHARGE (CFS) = 5.3
TIME (MIN) = 75	DISCHARGE (CFS) = 5.7
TIME (MIN) = 90	DISCHARGE (CFS) = 5.9
TIME (MIN) = 105	DISCHARGE (CFS) = 6.4
TIME (MIN) = 120	DISCHARGE (CFS) = 6.7
TIME (MIN) = 135	DISCHARGE (CFS) = 7.5
TIME (MIN) = 150	DISCHARGE (CFS) = 7.9
TIME (MIN) = 165	DISCHARGE (CFS) = 9.1
TIME (MIN) = 180	DISCHARGE (CFS) = 9.8
TIME (MIN) = 195	DISCHARGE (CFS) = 12
TIME (MIN) = 210	DISCHARGE (CFS) = 13.7
TIME (MIN) = 225	DISCHARGE (CFS) = 20.1
TIME (MIN) = 240	DISCHARGE (CFS) = 22.4
TIME (MIN) = 255	DISCHARGE (CFS) = 107.6
TIME (MIN) = 270	DISCHARGE (CFS) = 16.1
TIME (MIN) = 285	DISCHARGE (CFS) = 10.8
TIME (MIN) = 300	DISCHARGE (CFS) = 8.5
TIME (MIN) = 315	DISCHARGE (CFS) = 7.1
TIME (MIN) = 330	DISCHARGE (CFS) = 6.2
TIME (MIN) = 345	DISCHARGE (CFS) = 5.5
TIME (MIN) = 360	DISCHARGE (CFS) = 5
TIME (MIN) = 375	DISCHARGE (CFS) = 0



Basin 5 100 Year
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Flow (ft³/s)
1.000
0.875
0.750
0.625
0.500
0.375
0.250
0.125
0.000
Volume (ac-ft)
292.75
292.50
292.25
292.00
291.75
291.50
291.25
291.00
290.75
290.50
290.25
290.00
Elevation (ft)
0.000
300.000
600.000
900.000
1,200.000
1,500.000
1,800.000
2,100.000
2,400.000
2,700.000
3,000.000
Time (min)
1 - EX10 - Flow (Total In)
1 - EX10 - Flow (Total Out)
1 - EX10 - Volume
1 - EX10 - Elevation
S5000 - EX10 - Flow (Total)
O-5 - EX10 - Flow

Basin 5

Project Summary	
Title	Basin 5
Engineer	PDC
Company	PDC
Date	7/9/2018

Notes

Basin 5

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft³/s)
S5000	EX10	0	1.093	246.000	30.30

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft³/s)
O-5	EX10	0	0.921	361.000	0.63

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
1 (IN)	EX10	0	1.093	246.000	30.30	(N/A)	(N/A)
1 (OUT)	EX10	0	0.921	361.000	0.63	292.69	0.964

Basin 5

Subsection: Read Hydrograph | Return Event: 100 years
Label: S5000 | Storm Event:

Peak Discharge	30.30 ft³/s
Time to Peak	246.000 min
Hydrograph Volume	1.093 ac-ft

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 6.000 min
Time on left represents time for first value in each row.

Time (min)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
0.000	0.00	0.80	0.80	0.80	0.80
30.000	0.80	0.90	0.90	0.90	0.90
60.000	0.90	0.90	1.00	1.00	1.00
90.000	1.00	1.10	1.10	1.10	1.20
120.000	1.20	1.20	1.30	1.30	1.40
150.000	1.40	1.50	1.60	1.60	1.70
180.000	1.80	2.00	2.00	2.30	2.40
210.000	2.80	3.00	3.70	4.20	6.10
240.000	9.20	30.30	4.90	3.30	2.60
270.000	2.10	1.90	1.70	1.50	1.40
300.000	1.30	1.20	1.10	1.10	1.00
330.000	1.00	0.90	0.90	0.90	0.80
360.000	0.80	0.00	(N/A)	(N/A)	(N/A)

Basin 5

Subsection: Elevation-Area Volume Curve

Label: 1

Return Event: 100 years

Storm Event:

Elevation (ft)	Planimeter (ft^2)	Area (ft^2)	A1+A2+sqr (A1*A2) (ft^2)	Volume (ac-ft)	Volume (Total) (ac-ft)
290.00	0.0	12,590.000	0.000	0.000	0.000
296.00	0.0	28,268.000	59,723.156	2.742	2.742

Basin 5

Subsection: Volume Equations | Return Event: 100 years
Label: 1 | Storm Event:

Pond Volume Equations
*** Incremental volume computed by the Conic Method for Reservoir Volumes.**

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Basin 5

Subsection: Outlet Input Data
Label: Basin Outlet 1

Return Event: 100 years
Storm Event:

Requested Pond Water Surface Elevations	
Minimum (Headwater)	290.00 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	296.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	LF2.0	Forward	TW	292.50	296.00
Orifice-Circular	MF1	Forward	TW	293.00	296.00
Stand Pipe	Riser - 1	Forward	TW	293.50	296.00
Orifice-Circular	LF1.0	Forward	TW	290.50	296.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Basin 5

Subsection: Outlet Input Data | Return Event: 100 years
Label: Basin Outlet 1 | Storm Event:

Structure ID: Riser - 1 Structure Type: Stand Pipe	
Number of Openings	1
Elevation	293.50 ft
Diameter	24.0 in
Orifice Area	3.1 ft²
Orifice Coefficient	0.600
Weir Length	6.28 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	True
Orifice H to crest	True

Structure ID: MF1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	293.00 ft
Orifice Diameter	4.0 in
Orifice Coefficient	0.600

Structure ID: LF1.0 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	290.50 ft
Orifice Diameter	4.0 in
Orifice Coefficient	0.600

Structure ID: LF2.0 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	292.50 ft
Orifice Diameter	2.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	100

Basin 5

Subsection: Outlet Input Data
Label: Basin Outlet 1

Return Event: 100 years
Storm Event:

Convergence Tolerances	
Tailwater Tolerance (Minimum)	0.00 ft
Tailwater Tolerance (Maximum)	0.10 ft
Headwater Tolerance (Minimum)	0.00 ft
Headwater Tolerance (Maximum)	0.10 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	1.000 ft³/s

Basin 5

Subsection: Composite Rating Curve
Label: Basin Outlet 1

Return Event: 100 years
Storm Event:

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
290.00	0.00	(N/A)	0.00
290.10	0.00	(N/A)	0.00
290.20	0.00	(N/A)	0.00
290.30	0.00	(N/A)	0.00
290.40	0.00	(N/A)	0.00
290.50	0.00	(N/A)	0.00
290.60	0.02	(N/A)	0.00
290.70	0.07	(N/A)	0.00
290.80	0.14	(N/A)	0.00
290.90	0.20	(N/A)	0.00
291.00	0.24	(N/A)	0.00
291.10	0.28	(N/A)	0.00
291.20	0.31	(N/A)	0.00
291.30	0.33	(N/A)	0.00
291.40	0.36	(N/A)	0.00
291.50	0.38	(N/A)	0.00
291.60	0.41	(N/A)	0.00
291.70	0.43	(N/A)	0.00
291.80	0.45	(N/A)	0.00
291.90	0.47	(N/A)	0.00
292.00	0.48	(N/A)	0.00
292.10	0.50	(N/A)	0.00
292.20	0.52	(N/A)	0.00
292.30	0.54	(N/A)	0.00
292.40	0.55	(N/A)	0.00
292.50	0.57	(N/A)	0.00
292.60	0.60	(N/A)	0.00
292.70	0.63	(N/A)	0.00
292.80	0.66	(N/A)	0.00
292.90	0.69	(N/A)	0.00
293.00	0.71	(N/A)	0.00
293.10	0.75	(N/A)	0.00
293.20	0.82	(N/A)	0.00
293.30	0.91	(N/A)	0.00
293.40	0.99	(N/A)	0.00
293.50	1.05	(N/A)	0.00
293.60	1.70	(N/A)	0.00
293.70	2.84	(N/A)	0.00
293.80	4.29	(N/A)	0.00
293.90	6.00	(N/A)	0.00
294.00	7.94	(N/A)	0.00
294.10	10.07	(N/A)	0.00
294.20	12.39	(N/A)	0.00

Basin 5

Subsection: Composite Rating Curve
Label: Basin Outlet 1

Return Event: 100 years
Storm Event:

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
294.30	14.87	(N/A)	0.00
294.40	15.76	(N/A)	0.00
294.50	16.57	(N/A)	0.00
294.60	17.34	(N/A)	0.00
294.70	18.08	(N/A)	0.00
294.80	18.79	(N/A)	0.00
294.90	19.47	(N/A)	0.00
295.00	20.13	(N/A)	0.00
295.10	20.76	(N/A)	0.00
295.20	21.38	(N/A)	0.00
295.30	21.98	(N/A)	0.00
295.40	22.56	(N/A)	0.00
295.50	23.13	(N/A)	0.00
295.60	23.68	(N/A)	0.00
295.70	24.22	(N/A)	0.00
295.80	24.75	(N/A)	0.00
295.90	25.27	(N/A)	0.00
296.00	25.78	(N/A)	0.00

Contributing Structures
None Contributing
None Contributing
None Contributing
None Contributing
None Contributing
None Contributing
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0

Basin 5

Subsection: Composite Rating Curve
Label: Basin Outlet 1

Return Event: 100 years
Storm Event:

Composite Outflow Summary

Contributing Structures
LF1.0
LF1.0
LF1.0
LF2.0 + LF1.0
LF2.0 + LF1.0
LF2.0 + LF1.0
LF2.0 + LF1.0
LF2.0 + LF1.0
LF2.0 + MF1 + LF1.0
LF2.0 + MF1 + LF1.0
LF2.0 + MF1 + LF1.0
LF2.0 + MF1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + MF1 + Riser - 1 + LF1.0

Basin 5

Subsection: Elevation-Volume-Flow Table (Pond) Return Event: 100 years
Label: 1 Storm Event:

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	290.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	1.000 min

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
290.00	0.00	0.000	12,590.000	0.00	0.00	0.00
290.10	0.00	0.029	12,800.041	0.00	0.00	42.32
290.20	0.00	0.059	13,011.819	0.00	0.00	85.34
290.30	0.00	0.089	13,225.335	0.00	0.00	129.06
290.40	0.00	0.119	13,440.588	0.00	0.00	173.51
290.50	0.00	0.151	13,657.579	0.00	0.00	218.67
290.60	0.02	0.182	13,876.308	0.00	0.02	264.58
290.70	0.07	0.214	14,096.774	0.00	0.07	311.25
290.80	0.14	0.247	14,318.978	0.00	0.14	358.68
290.90	0.20	0.280	14,542.920	0.00	0.20	406.84
291.00	0.24	0.314	14,768.599	0.00	0.24	455.74
291.10	0.28	0.348	14,996.016	0.00	0.28	505.38
291.20	0.31	0.383	15,225.170	0.00	0.31	555.78
291.30	0.33	0.418	15,456.062	0.00	0.33	606.94
291.40	0.36	0.454	15,688.691	0.00	0.36	658.87
291.50	0.38	0.490	15,923.059	0.00	0.38	711.58
291.60	0.41	0.527	16,159.163	0.00	0.41	765.07
291.70	0.43	0.564	16,397.006	0.00	0.43	819.35
291.80	0.45	0.602	16,636.586	0.00	0.45	874.43
291.90	0.47	0.640	16,877.903	0.00	0.47	930.31
292.00	0.48	0.679	17,120.958	0.00	0.48	986.99
292.10	0.50	0.719	17,365.751	0.00	0.50	1,044.48
292.20	0.52	0.759	17,612.281	0.00	0.52	1,102.80
292.30	0.54	0.800	17,860.549	0.00	0.54	1,161.94
292.40	0.55	0.841	18,110.555	0.00	0.55	1,221.90
292.50	0.57	0.883	18,362.298	0.00	0.57	1,282.71
292.60	0.60	0.925	18,615.779	0.00	0.60	1,344.36
292.70	0.63	0.968	18,870.997	0.00	0.63	1,406.88
292.80	0.66	1.012	19,127.953	0.00	0.66	1,470.24

Basin 5

Subsection: Elevation-Volume-Flow Table (Pond) Return Event: 100 years
Label: 1 Storm Event:

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (ft^2)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
292.90	0.69	1.056	19,386.647	0.00	0.69	1,534.45
293.00	0.71	1.101	19,647.078	0.00	0.71	1,599.53
293.10	0.75	1.147	19,909.247	0.00	0.75	1,665.50
293.20	0.82	1.193	20,173.153	0.00	0.82	1,732.37
293.30	0.91	1.239	20,438.797	0.00	0.91	1,800.15
293.40	0.99	1.286	20,706.179	0.00	0.99	1,868.80
293.50	1.05	1.334	20,975.298	0.00	1.05	1,938.33
293.60	1.70	1.383	21,246.155	0.00	1.70	2,009.35
293.70	2.84	1.432	21,518.749	0.00	2.84	2,081.76
293.80	4.29	1.481	21,793.081	0.00	4.29	2,155.40
293.90	6.00	1.532	22,069.151	0.00	6.00	2,230.22
294.00	7.94	1.583	22,346.958	0.00	7.94	2,306.18
294.10	10.07	1.634	22,626.503	0.00	10.07	2,383.27
294.20	12.39	1.687	22,907.786	0.00	12.39	2,461.47
294.30	14.87	1.740	23,190.806	0.00	14.87	2,540.79
294.40	15.76	1.793	23,475.563	0.00	15.76	2,619.46
294.50	16.57	1.847	23,762.059	0.00	16.57	2,698.99
294.60	17.34	1.902	24,050.291	0.00	17.34	2,779.45
294.70	18.08	1.958	24,340.262	0.00	18.08	2,860.84
294.80	18.79	2.014	24,631.970	0.00	18.79	2,943.17
294.90	19.47	2.071	24,925.416	0.00	19.47	3,026.44
295.00	20.13	2.128	25,220.599	0.00	20.13	3,110.67
295.10	20.76	2.187	25,517.520	0.00	20.76	3,195.87
295.20	21.38	2.246	25,816.178	0.00	21.38	3,282.05
295.30	21.98	2.305	26,116.574	0.00	21.98	3,369.20
295.40	22.56	2.366	26,418.708	0.00	22.56	3,457.34
295.50	23.13	2.427	26,722.579	0.00	23.13	3,546.48
295.60	23.68	2.488	27,028.188	0.00	23.68	3,636.62
295.70	24.22	2.551	27,335.535	0.00	24.22	3,727.76
295.80	24.75	2.614	27,644.619	0.00	24.75	3,819.93
295.90	25.27	2.678	27,955.441	0.00	25.27	3,913.11
296.00	25.78	2.742	28,268.000	0.00	25.78	4,007.32

Basin 5

Subsection: Pond Inflow Summary
Label: 1 (IN)

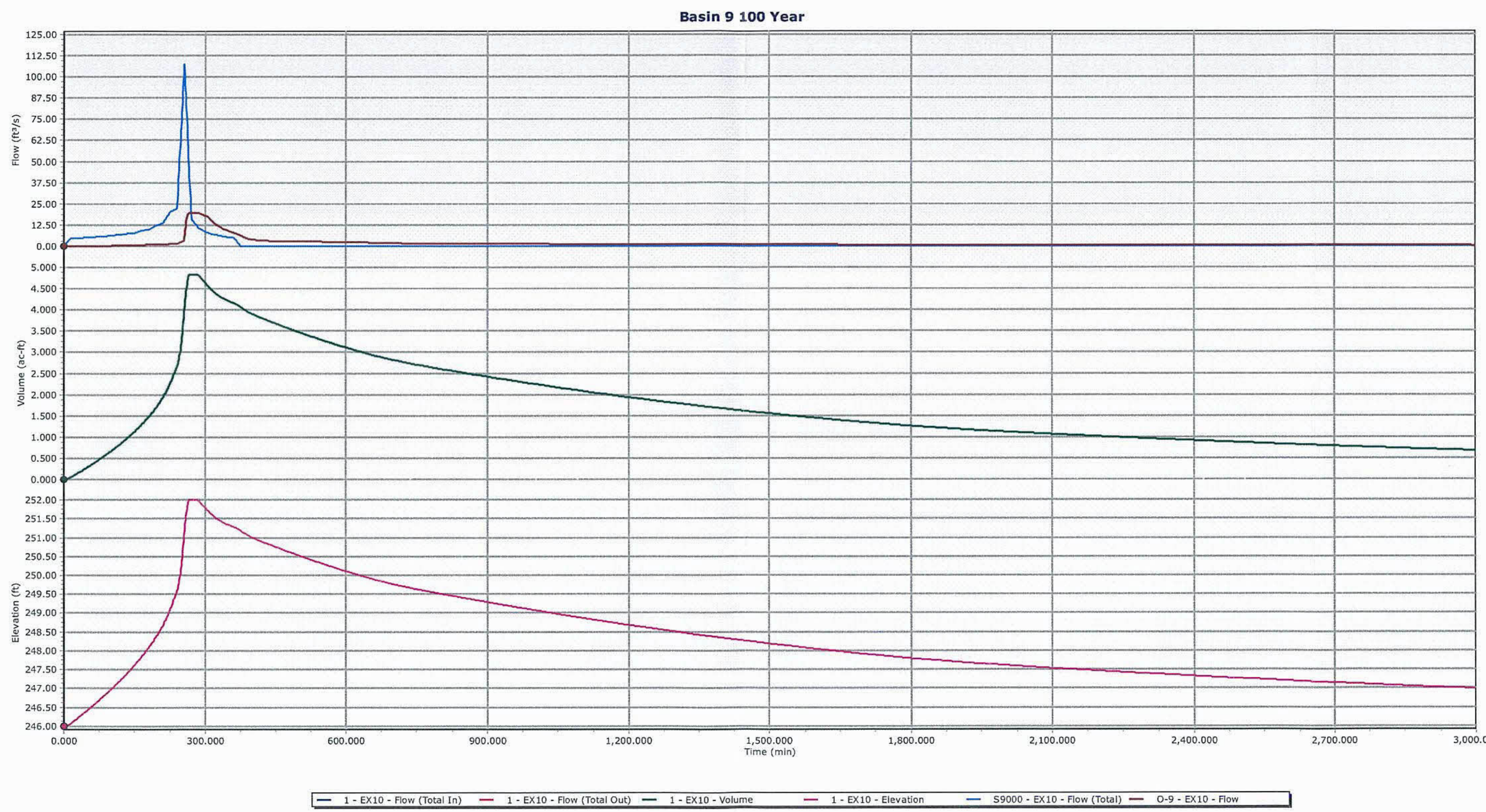
Return Event: 100 years
Storm Event:

Summary for Hydrograph Addition at '1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	S5000

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (min)	Flow (Peak) (ft^3/s)
Flow (From)	S5000	1.093	246.000	30.30
Flow (In)	1	1.093	246.000	30.30


Basin 9 100 Year
Flow (ft³/s)
Volume (ac-ft)
Elevation (ft)
Time (min)
1 - EX10 - Flow (Total In)
1 - EX10 - Flow (Total Out)
1 - EX10 - Volume
1 - EX10 - Elevation
S9000 - EX10 - Flow (Total)
O-9 - EX10 - Flow

Basin 9

Project Summary	
Title	Basin 4
Engineer	PDC
Company	PDC
Date	8/7/2017

Notes

Basin 9

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft^3/s)
S9000	EX10	0	7.417	252.000	117.90

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft^3/s)
O-9	EX10	0	6.869	255.000	19.82

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
1 (IN)	EX10	0	7.417	252.000	117.90	(N/A)	(N/A)
1 (OUT)	EX10	0	6.869	255.000	19.82	252.00	4.836

Basin 9

Subsection: Read Hydrograph | Return Event: 100 years
Label: S9000 | Storm Event:

Peak Discharge	117.90 ft³/s
Time to Peak	252.000 min
Hydrograph Volume	7.417 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 14.000 min
Time on left represents time for first value in each row.

Time (min)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	0.00	5.30	5.60	5.80	6.10
70.000	6.30	6.80	7.00	7.70	8.00
140.000	8.90	9.40	10.80	11.70	14.30
210.000	16.30	24.00	36.90	117.90	19.20
280.000	12.90	10.10	8.40	7.30	6.50
350.000	5.90	5.50	0.00	(N/A)	(N/A)

Basin 9

Subsection: Elevation-Area Volume Curve — Return Event: 100 years

Label: 1 — Storm Event:

Elevation (ft)	Planimeter (ft²)	Area (ft²)	A1+A2+sqr (A1*A2) (ft²)	Volume (ac-ft)	Volume (Total) (ac-ft)
246.00	0.0	28,525.000	0.000	0.000	0.000
248.00	0.0	32,879.000	92,028.720	1.408	1.408
252.00	0.0	41,957.000	111,977.677	3.428	4.836

Basin 9

Subsection: Volume Equations
Label: 1

Return Event: 100 years
Storm Event:

Pond Volume Equations
*** Incremental volume computed by the Conic Method for Reservoir Volumes.**

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Basin 9

Subsection: Outlet Input Data
Label: Basin Outlet 1

Return Event: 100 years
Storm Event:

Requested Pond Water Surface Elevations	
Minimum (Headwater)	246.00 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	252.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	LF2.0	Forward	TW	247.50	252.00
Orifice-Circular	LF3.0	Forward	TW	248.50	252.00
Orifice-Circular	MF1	Forward	TW	249.50	252.00
Stand Pipe	Riser - 1	Forward	TW	250.90	252.00
Orifice-Circular	LF1.0	Forward	TW	246.50	252.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Basin 9

Subsection: Outlet Input Data
Label: Basin Outlet 1

Return Event: 100 years
Storm Event:

Structure ID: Riser - 1 Structure Type: Stand Pipe	
Number of Openings	1
Elevation	250.90 ft
Diameter	24.0 in
Orifice Area	3.1 ft²
Orifice Coefficient	0.600
Weir Length	6.28 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	True
Orifice H to crest	True

Structure ID: MF1 Structure Type: Orifice-Circular	
Number of Openings	3
Elevation	249.50 ft
Orifice Diameter	4.0 in
Orifice Coefficient	0.600

Structure ID: LF1.0 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	246.50 ft
Orifice Diameter	4.0 in
Orifice Coefficient	0.600

Structure ID: LF2.0 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	247.50 ft
Orifice Diameter	4.0 in
Orifice Coefficient	0.600

Structure ID: LF3.0 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	248.50 ft
Orifice Diameter	2.0 in
Orifice Coefficient	0.600

Basin 9

Subsection: Outlet Input Data
Label: Basin Outlet 1

Return Event: 100 years
Storm Event:

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	100
Tailwater Tolerance (Minimum)	0.00 ft
Tailwater Tolerance (Maximum)	0.10 ft
Headwater Tolerance (Minimum)	0.00 ft
Headwater Tolerance (Maximum)	0.10 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	1.000 ft³/s

Basin 9

Subsection: Composite Rating Curve
Label: Basin Outlet 1

Return Event: 100 years
Storm Event:

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
246.00	0.00	(N/A)	0.00
246.10	0.00	(N/A)	0.00
246.20	0.00	(N/A)	0.00
246.30	0.00	(N/A)	0.00
246.40	0.00	(N/A)	0.00
246.50	0.00	(N/A)	0.00
246.60	0.02	(N/A)	0.00
246.70	0.07	(N/A)	0.00
246.80	0.14	(N/A)	0.00
246.90	0.20	(N/A)	0.00
247.00	0.24	(N/A)	0.00
247.10	0.28	(N/A)	0.00
247.20	0.31	(N/A)	0.00
247.30	0.33	(N/A)	0.00
247.40	0.36	(N/A)	0.00
247.50	0.38	(N/A)	0.00
247.60	0.42	(N/A)	0.00
247.70	0.50	(N/A)	0.00
247.80	0.59	(N/A)	0.00
247.90	0.67	(N/A)	0.00
248.00	0.73	(N/A)	0.00
248.10	0.78	(N/A)	0.00
248.20	0.83	(N/A)	0.00
248.30	0.87	(N/A)	0.00
248.40	0.91	(N/A)	0.00
248.50	0.95	(N/A)	0.00
248.60	1.00	(N/A)	0.00
248.70	1.06	(N/A)	0.00
248.80	1.11	(N/A)	0.00
248.90	1.15	(N/A)	0.00
249.00	1.19	(N/A)	0.00
249.10	1.23	(N/A)	0.00
249.20	1.27	(N/A)	0.00
249.30	1.31	(N/A)	0.00
249.40	1.34	(N/A)	0.00
249.50	1.38	(N/A)	0.00
249.60	1.47	(N/A)	0.00
249.70	1.65	(N/A)	0.00
249.80	1.89	(N/A)	0.00
249.90	2.11	(N/A)	0.00
250.00	2.26	(N/A)	0.00
250.10	2.39	(N/A)	0.00
250.20	2.51	(N/A)	0.00

Basin 9

Subsection: Composite Rating Curve
Label: Basin Outlet 1

Return Event: 100 years
Storm Event:

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
250.30	2.62	(N/A)	0.00
250.40	2.73	(N/A)	0.00
250.50	2.82	(N/A)	0.00
250.60	2.92	(N/A)	0.00
250.70	3.01	(N/A)	0.00
250.80	3.10	(N/A)	0.00
250.90	3.18	(N/A)	0.00
251.00	3.86	(N/A)	0.00
251.10	5.02	(N/A)	0.00
251.20	6.51	(N/A)	0.00
251.30	8.26	(N/A)	0.00
251.40	10.22	(N/A)	0.00
251.50	12.39	(N/A)	0.00
251.60	14.74	(N/A)	0.00
251.70	17.26	(N/A)	0.00
251.80	18.18	(N/A)	0.00
251.90	19.02	(N/A)	0.00
252.00	19.82	(N/A)	0.00

Contributing Structures
None Contributing
None Contributing
None Contributing
None Contributing
None Contributing
None Contributing
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF1.0
LF2.0 + LF1.0
LF2.0 + LF1.0
LF2.0 + LF1.0
LF2.0 + LF1.0
LF2.0 + LF1.0
LF2.0 + LF1.0
LF2.0 + LF1.0

Basin 9

Subsection: Composite Rating Curve | Return Event: 100 years
Label: Basin Outlet 1 | Storm Event:

Composite Outflow Summary

Contributing Structures
LF2.0 + LF1.0
LF2.0 + LF1.0
LF2.0 + LF1.0
LF2.0 + LF3.0 + LF1.0
LF2.0 + LF3.0 + LF1.0
LF2.0 + LF3.0 + LF1.0
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LF2.0 + LF3.0 + LF1.0
LF2.0 + LF3.0 + LF1.0
LF2.0 + LF3.0 + MF1 + LF1.0
LF2.0 + LF3.0 + MF1 + LF1.0
LF2.0 + LF3.0 + MF1 + LF1.0
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LF2.0 + LF3.0 + MF1 + LF1.0
LF2.0 + LF3.0 + MF1 + LF1.0
LF2.0 + LF3.0 + MF1 + LF1.0
LF2.0 + LF3.0 + MF1 + LF1.0
LF2.0 + LF3.0 + MF1 + LF1.0
LF2.0 + LF3.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + LF3.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + LF3.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + LF3.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + LF3.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + LF3.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + LF3.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + LF3.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + LF3.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + LF3.0 + MF1 + Riser - 1 + LF1.0

Basin 9

Subsection: Composite Rating Curve
Label: Basin Outlet 1

Return Event: 100 years
Storm Event:

Composite Outflow Summary

Contributing Structures
LF2.0 + LF3.0 + MF1 + Riser - 1 + LF1.0
LF2.0 + LF3.0 + MF1 + Riser - 1 + LF1.0

Basin 9

Subsection: Elevation-Volume-Flow Table (Pond)
Label: 1

Return Event: 100 years
Storm Event:

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	246.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	1.000 min

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
246.00	0.00	0.000	28,525.000	0.00	0.00	0.00
246.10	0.00	0.066	28,735.358	0.00	0.00	95.43
246.20	0.00	0.132	28,946.490	0.00	0.00	191.57
246.30	0.00	0.199	29,158.394	0.00	0.00	288.41
246.40	0.00	0.266	29,371.070	0.00	0.00	385.96
246.50	0.00	0.333	29,584.520	0.00	0.00	484.22
246.60	0.02	0.402	29,798.742	0.00	0.02	583.21
246.70	0.07	0.470	30,013.738	0.00	0.07	682.95
246.80	0.14	0.539	30,229.506	0.00	0.14	783.42
246.90	0.20	0.609	30,446.046	0.00	0.20	884.61
247.00	0.24	0.679	30,663.360	0.00	0.24	986.50
247.10	0.28	0.750	30,881.446	0.00	0.28	1,089.11
247.20	0.31	0.821	31,100.306	0.00	0.31	1,192.44
247.30	0.33	0.893	31,319.938	0.00	0.33	1,296.50
247.40	0.36	0.965	31,540.342	0.00	0.36	1,401.30
247.50	0.38	1.037	31,761.520	0.00	0.38	1,506.82
247.60	0.42	1.111	31,983.470	0.00	0.42	1,613.10
247.70	0.50	1.184	32,206.194	0.00	0.50	1,720.16
247.80	0.59	1.259	32,429.690	0.00	0.59	1,827.98
247.90	0.67	1.333	32,653.958	0.00	0.67	1,936.53
248.00	0.73	1.408	32,879.000	0.00	0.73	2,045.81
248.10	0.78	1.484	33,092.479	0.00	0.78	2,155.81
248.20	0.83	1.560	33,306.649	0.00	0.83	2,266.53
248.30	0.87	1.637	33,521.510	0.00	0.87	2,377.95
248.40	0.91	1.714	33,737.062	0.00	0.91	2,490.09
248.50	0.95	1.792	33,953.304	0.00	0.95	2,602.95
248.60	1.00	1.870	34,170.238	0.00	1.00	2,716.54
248.70	1.06	1.949	34,387.862	0.00	1.06	2,830.86
248.80	1.11	2.028	34,606.177	0.00	1.11	2,945.90

Basin 9

Subsection: Elevation-Volume-Flow Table (Pond) Return Event: 100 years
Label: 1 Storm Event:

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
248.90	1.15	2.108	34,825.183	0.00	1.15	3,061.66
249.00	1.19	2.188	35,044.879	0.00	1.19	3,178.15
249.10	1.23	2.269	35,265.266	0.00	1.23	3,295.37
249.20	1.27	2.350	35,486.345	0.00	1.27	3,413.33
249.30	1.31	2.432	35,708.113	0.00	1.31	3,532.02
249.40	1.34	2.514	35,930.573	0.00	1.34	3,651.46
249.50	1.38	2.597	36,153.724	0.00	1.38	3,771.63
249.60	1.47	2.680	36,377.565	0.00	1.47	3,892.60
249.70	1.65	2.764	36,602.097	0.00	1.65	4,014.42
249.80	1.89	2.848	36,827.320	0.00	1.89	4,137.04
249.90	2.11	2.933	37,053.234	0.00	2.11	4,260.40
250.00	2.26	3.018	37,279.839	0.00	2.26	4,384.44
250.10	2.39	3.104	37,507.134	0.00	2.39	4,509.21
250.20	2.51	3.190	37,735.120	0.00	2.51	4,634.74
250.30	2.62	3.277	37,963.797	0.00	2.62	4,761.01
250.40	2.73	3.365	38,193.165	0.00	2.73	4,888.04
250.50	2.82	3.452	38,423.224	0.00	2.82	5,015.84
250.60	2.92	3.541	38,653.973	0.00	2.92	5,144.39
250.70	3.01	3.630	38,885.413	0.00	3.01	5,273.71
250.80	3.10	3.719	39,117.545	0.00	3.10	5,403.80
250.90	3.18	3.810	39,350.366	0.00	3.18	5,534.67
251.00	3.86	3.900	39,583.879	0.00	3.86	5,666.90
251.10	5.02	3.991	39,818.083	0.00	5.02	5,800.41
251.20	6.51	4.083	40,052.977	0.00	6.51	5,935.01
251.30	8.26	4.175	40,288.562	0.00	8.26	6,070.66
251.40	10.22	4.268	40,524.838	0.00	10.22	6,207.32
251.50	12.39	4.361	40,761.804	0.00	12.39	6,344.96
251.60	14.74	4.455	40,999.462	0.00	14.74	6,483.58
251.70	17.26	4.550	41,237.810	0.00	17.26	6,623.16
251.80	18.18	4.644	41,476.849	0.00	18.18	6,761.94
251.90	19.02	4.740	41,716.579	0.00	19.02	6,901.43
252.00	19.82	4.836	41,957.000	0.00	19.82	7,041.69

Basin 9

Subsection: Pond Inflow Summary — Return Event: 100 years

Label: 1 (IN) — Storm Event:

Summary for Hydrograph Addition at '1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	S9000

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (min)	Flow (Peak) (ft^3/s)
Flow (From)	S9000	7.417	252.000	117.90
Flow (In)	1	7.417	252.000	117.90

6

APPENDIX 6

Exhibits

LEGEND

DRAINAGE SUBAREA	
HYDROLOGY NODE	#
AREA FROM UPSTREAM TO DOWNSTREAM NODE	X.XX AC

0 40 80 160 240

GRAPHICAL SCALE

NOTE: SUPPLEMENTAL TOPO IS SANGIS 2' CONTOUR INTERVAL

SCALE:	1"=80'
JOB #:	4182.30
CREATED:	10/24/18

PREPARED BY:

PROJECT DESIGN CONSULTANTS
Planning | Landscape Architecture | Engineering | Survey
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San Diego, CA 92101
619.235.6471 Tel
619.234.0349 Fax

CITY OF SAN DIEGO

3 ROOTS

DRAINAGE MAP
EXISTING CONDITIONS
EXHIBIT A-1

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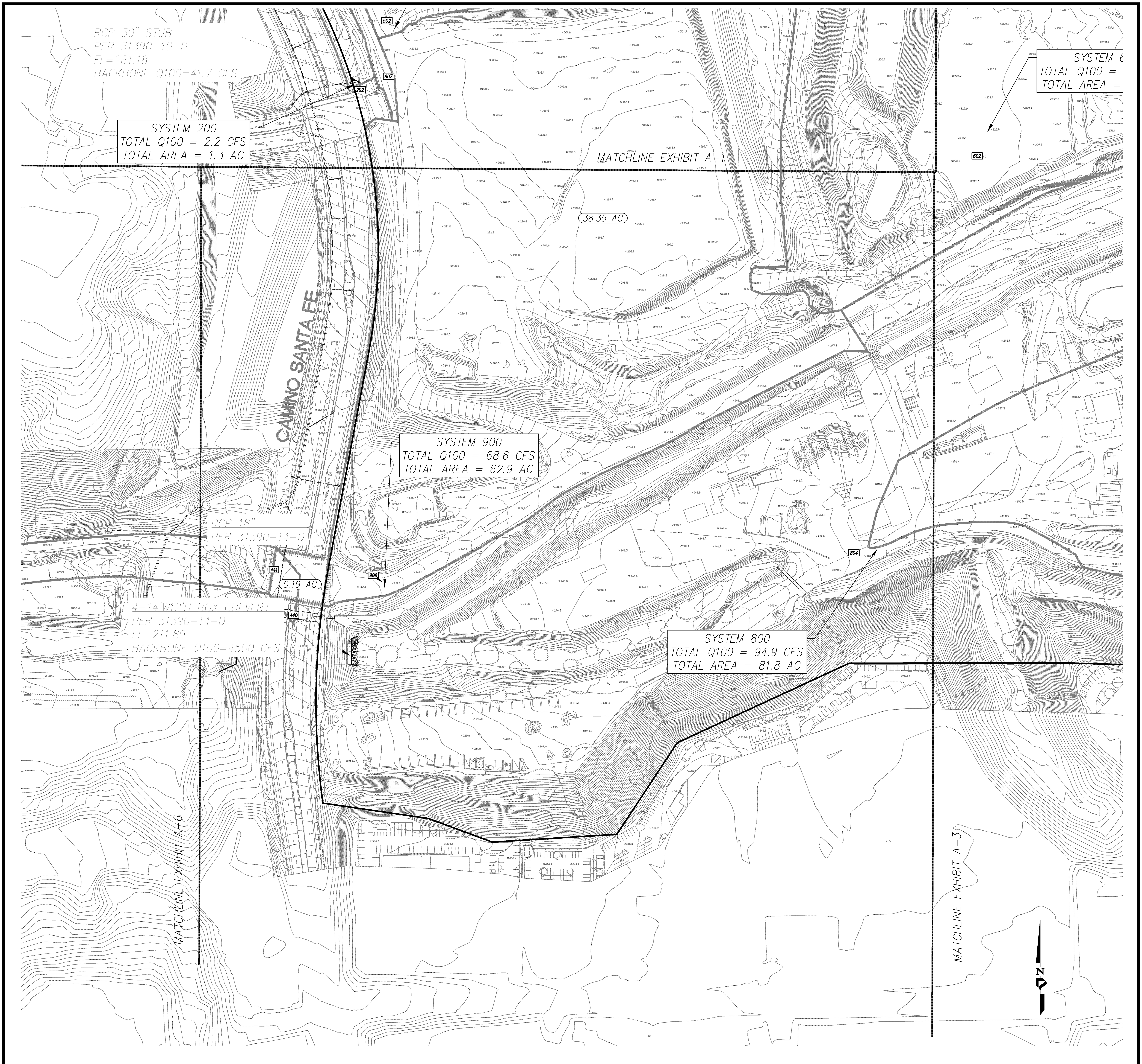

LEGEND

DRAINAGE SUBAREA

HYDROLOGY NODE #

AREA FROM UPSTREAM TO DOWNSTREAM NODE X.XX AC

0 40 80 160 240

GRAPHICAL SCALE

NOTE: SUPPLEMENTAL TOPO IS SANGIS 2' CONTOUR INTERVAL

SCALE: 1"=80'

JOB #: 4182.30

CREATED: 10/24/18

PREPARED BY:

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3 ROOTS

DRAINAGE MAP
EXISTING CONDITIONS
EXHIBIT A-2

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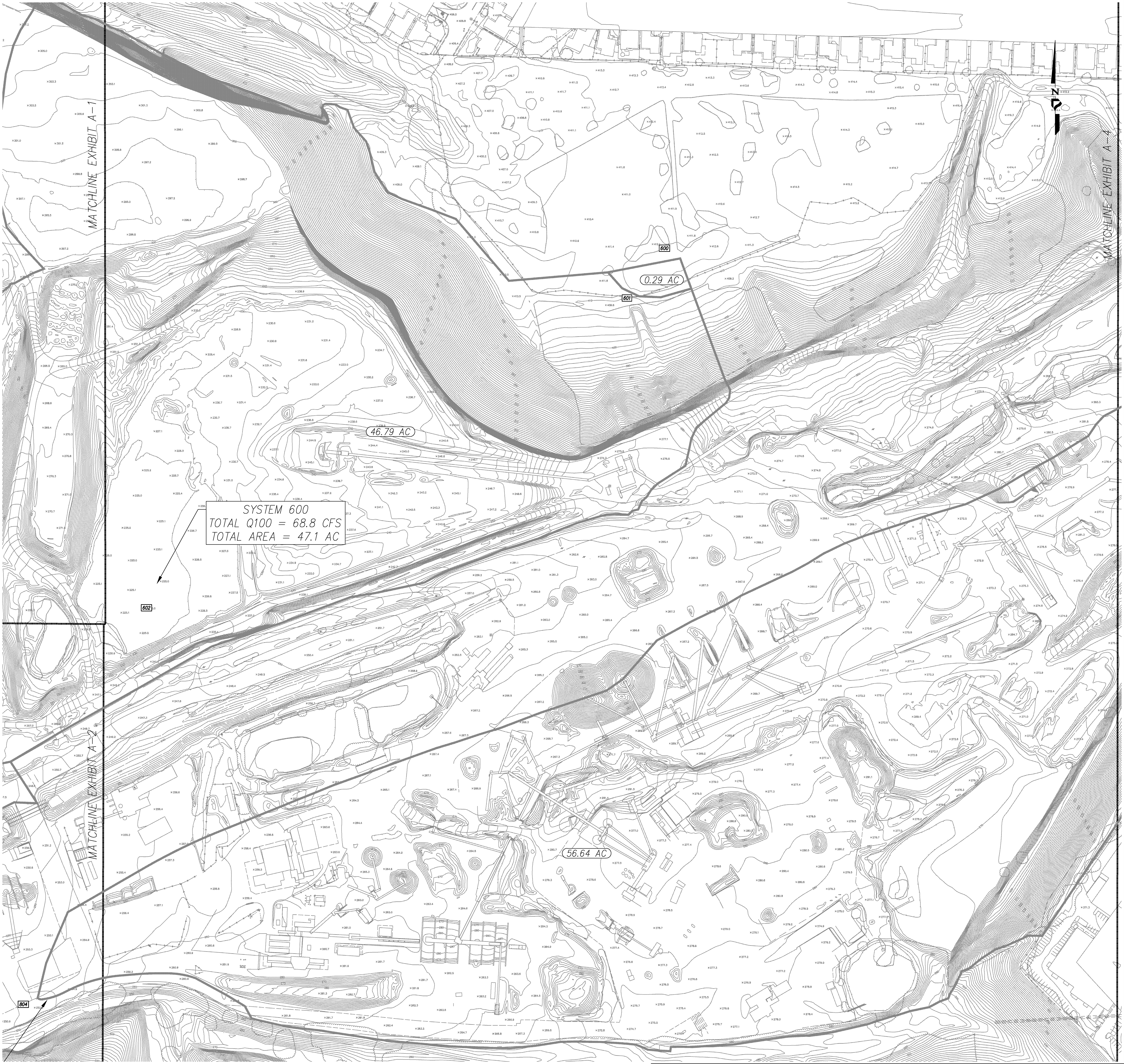

LEGEND

DRAINAGE SUBAREA	
HYDROLOGY NODE	#
AREA FROM UPSTREAM TO DOWNSTREAM NODE	X.XX AC

0 40 80 160 240

GRAPHICAL SCALE

NOTE: SUPPLEMENTAL TOPO IS SANGIS 2' CONTOUR INTERVAL

SCALE: 1"=80'

JOB #: 4182.30

CREATED: 10/24/18

PREPARED BY:

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3 ROOTS

DRAINAGE MAP
EXISTING CONDITIONS
EXHIBIT A-3

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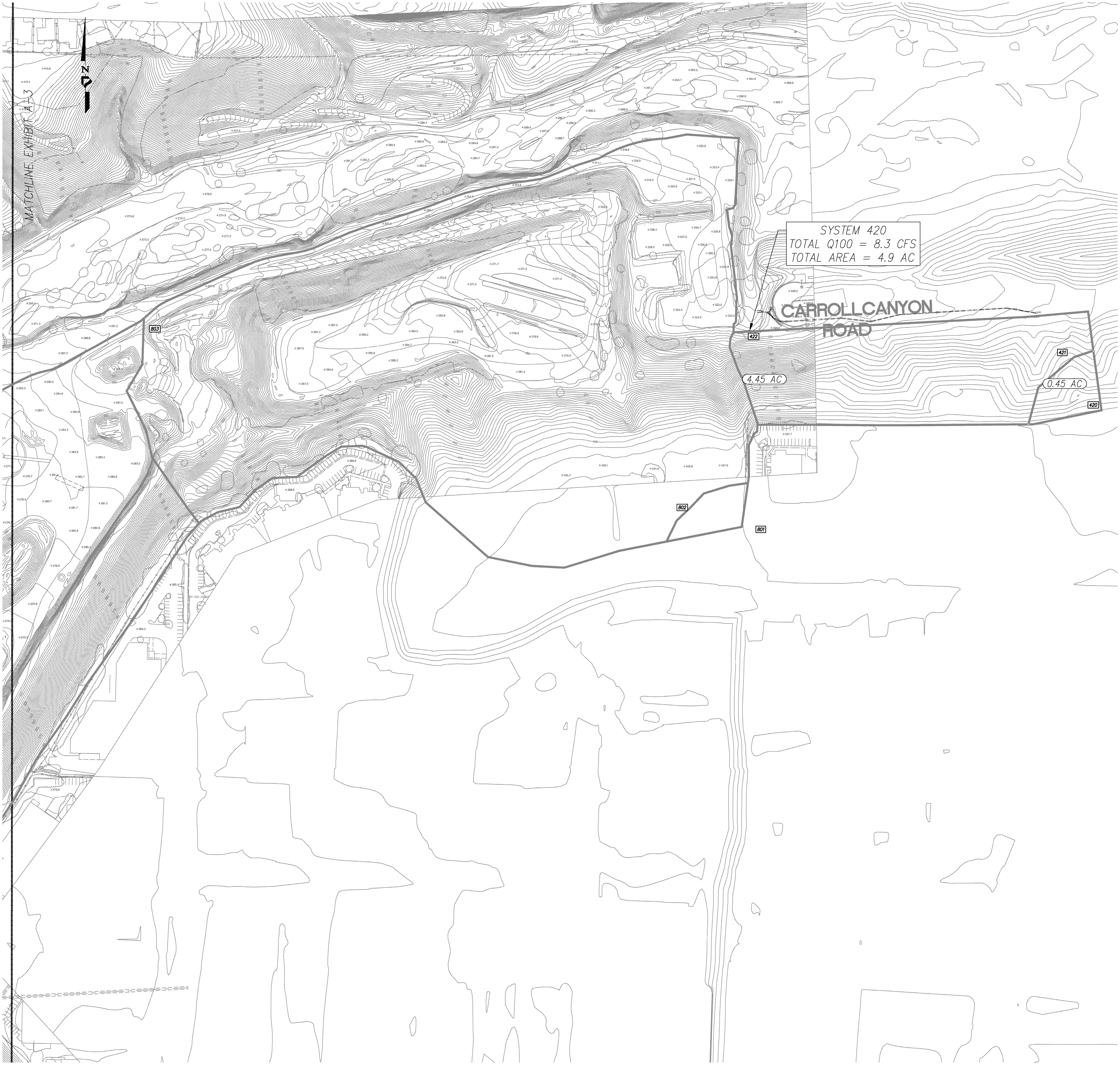

LEGEND

DRAINAGE SUBAREA	
HYDROLOGY NODE	#
AREA FROM UPSTREAM TO DOWNSTREAM NODE	X.XX AC

0 40 80 160 240

GRAPHICAL SCALE

NOTE: SUPPLEMENTAL TOPO IS SANGIS 2' CONTOUR INTERVAL

SCALE: 1"=80'	PREPARED BY:		**CITY OF SAN DIEGO**
JOB #: 4182.30	**PROJECT DESIGN CONSULTANTS** Planning I Landscape Architecture I Engineering I Survey	701 B Street, Suite 800 San Diego, CA 92101 619.235.6471 Tel 619.234.0349 Fax	**3 ROOTS**
CREATED: 10/24/18			*DRAINAGE MAP* *EXISTING CONDITIONS* *EXHIBIT A-4*

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LEGEND

DRAINAGE SUBAREA

HYDROLOGY NODE #

AREA FROM UPSTREAM TO DOWNSTREAM NODE X.XX AC

0 40 80 160 240

GRAPHICAL SCALE

NOTE: SUPPLEMENTAL TOPO IS SANGIS 2' CONTOUR INTERVAL

SCALE: 1"=80'

JOB #: 4182.30

CREATED: 10/24/18

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3 ROOTS

DRAINAGE MAP
EXISTING CONDITIONS
EXHIBIT A-5

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LEGEND

DRAINAGE SUBAREA	
OVERALL DRAINAGE SYSTEM BOUNDARY	
HYDROLOGY NODE	
AREA FROM UPSTREAM TO DOWNSTREAM NODE	X.XX AC

0 40 80 160 240
GRAPHICAL SCALE

SCALE: 1"=80'
JOB #: 4182.30
CREATED: 10/24/18

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CITY OF SAN DIEGO
3 ROOTS
DRAINAGE MAP
PROPOSED CONDITIONS
EXHIBIT B-1

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LEGEND

DRAINAGE SUBAREA	
OVERALL DRAINAGE SYSTEM BOUNDARY	
HYDROLOGY NODE	
AREA FROM UPSTREAM TO DOWNSTREAM NODE	X.XX AC

0 40 80 160 240

GRAPHICAL SCALE

SCALE: 1"=80'

JOB #: 4182.30

CREATED: 10/24/18

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3 ROOTS

DRAINAGE MAP
PROPOSED CONDITIONS
EXHIBIT B-2

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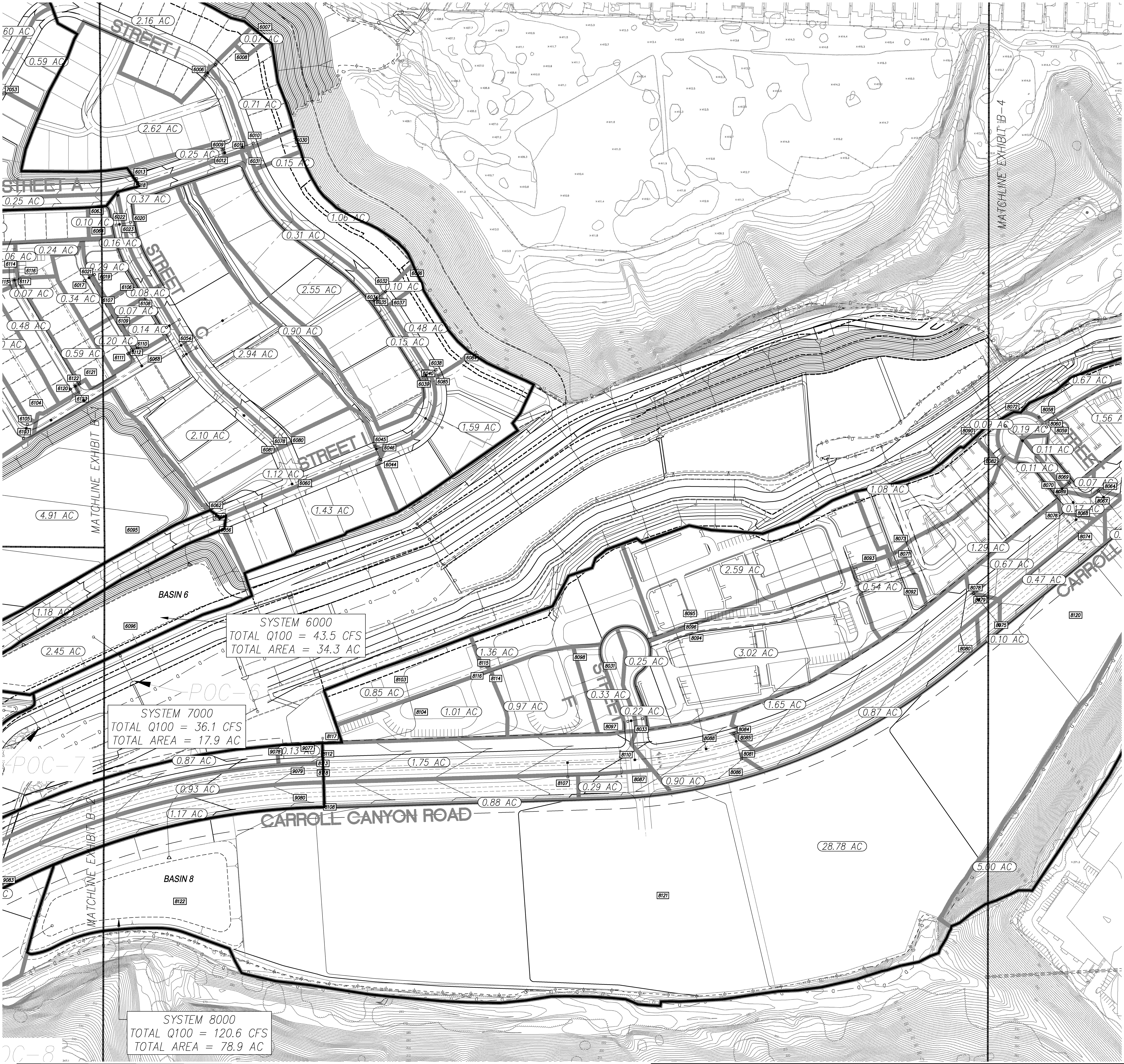

LEGEND

DRAINAGE SUBAREA	
OVERALL DRAINAGE SYSTEM BOUNDARY	
HYDROLOGY NODE	
AREA FROM UPSTREAM TO DOWNSTREAM NODE	X.XX AC

0 40 80 160 240

GRAPHICAL SCALE

SCALE: 1"=80'

JOB #: 4182.30

CREATED: 10/24/18

PREPARED BY:

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3 ROOTS

DRAINAGE MAP
PROPOSED CONDITIONS
EXHIBIT B-3

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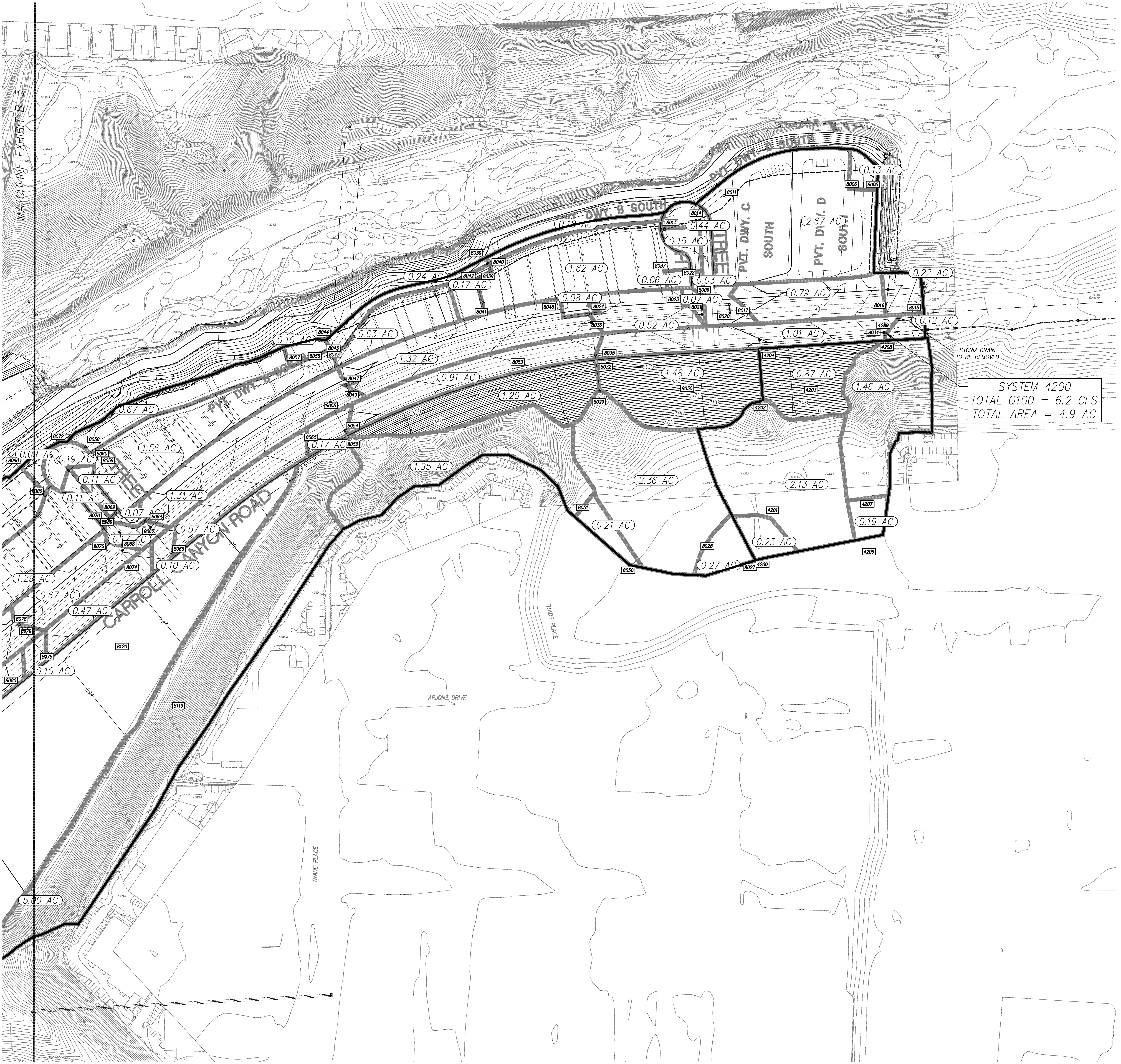

LEGEND

DRAINAGE SUBAREA		HYDROLOGY NODE	
OVERALL DRAINAGE SYSTEM BOUNDARY		AREA FROM UPSTREAM TO DOWNSTREAM NODE	X.XX AC

0 40 80 160 240

GRAPHICAL SCALE

SCALE:	1"=80'
JOB #:	4182.30
CREATED:	10/24/18

PREPARED BY:

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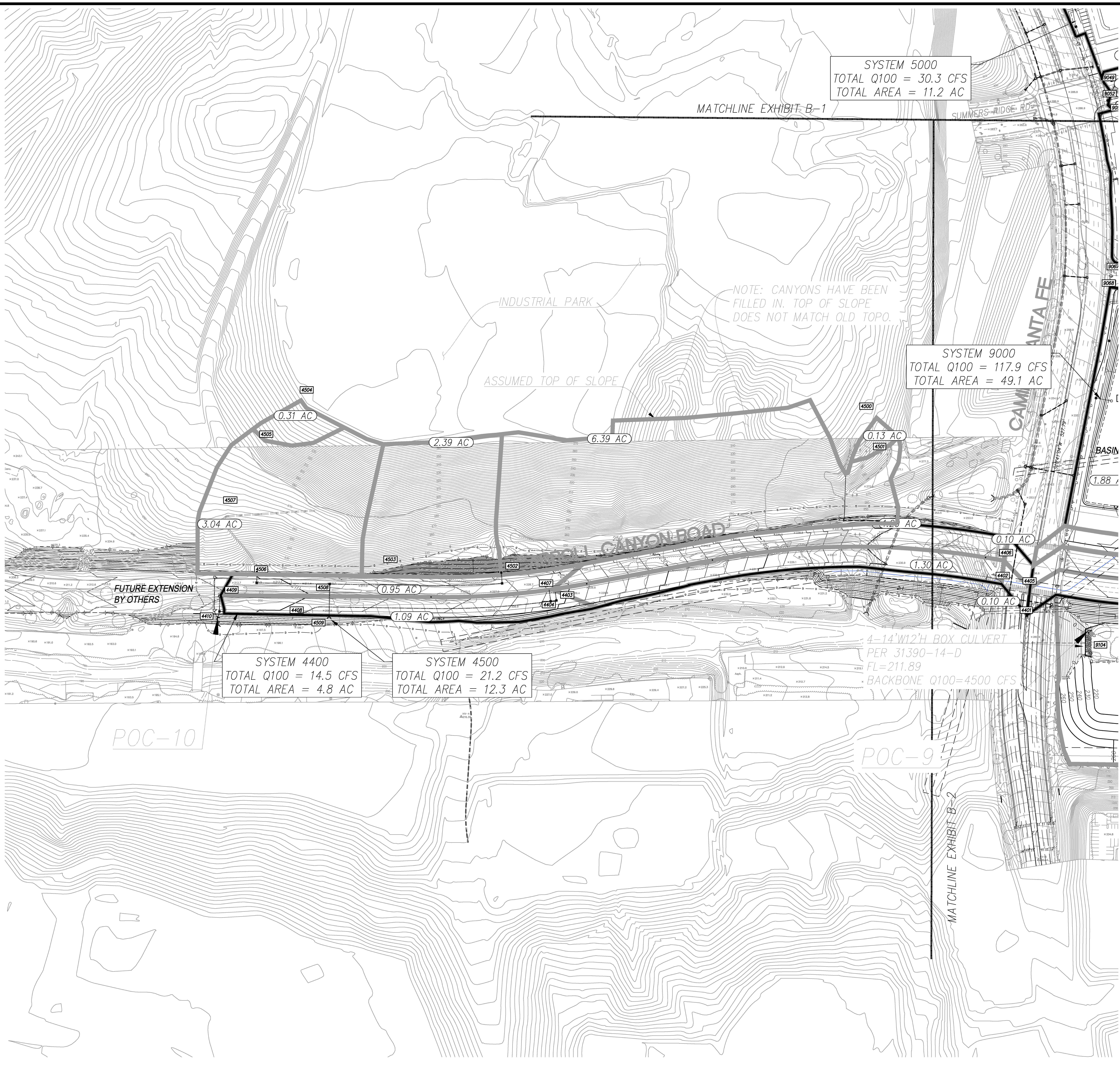
3 ROOTS

DRAINAGE MAP
PROPOSED CONDITIONS
EXHIBIT B-4



LEGEND

DRAINAGE SUBAREA	
OVERALL DRAINAGE SYSTEM BOUNDARY	
HYDROLOGY NODE	
AREA FROM UPSTREAM TO DOWNSTREAM NODE	X.XX AC

0 40 80 160 240

GRAPHICAL SCALE

SCALE: 1"=80'

JOB #: 4182.30

CREATED: 10/24/18

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3 ROOTS

DRAINAGE MAP
PROPOSED CONDITIONS
EXHIBIT B-5

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