CA ENGINEERING, INC.

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PRELIMINARY HYDROLOGY REPORT

FOR

LOCUST AVE. INDUSTRIAL BUILDING

2223 & 2271 N Locust Ave

City of Rialto, CA

Date: July 20, 2022

PLANS PREPARED UNDER THE SUPERVISION OF:

Fred Cornwell, P.E. - R.C.E 45591 Date

Table of Contents

1.0 INTRODUCTION

The purpose of this report is to present the hydrology analysis and drainage calculations for a proposed Locust Ave. industrial development located at 2223 and 2271 N. Locust Avenue, in the City of Rialto, California. The site proposes to construct an industrial building with an approximately 387,755 square feet square feet footprint on approximately 8.90 net acres. This report will determine the existing and proposed storm water runoff rates from the Project site, provide analysis of the impacts to adjacent and downstream properties and facilities, and determine how to protect the building from 100-yr flood. This project is considered an "Industrial/Commercial Development".

2.0 EXISTING DRAINAGE CONDITIONS

The 2223 N. Locust property (southern half of the site) is currently developed with five buildings and two shade structures that are used for office space, a self-storage facility, storage and minor servicing of construction vehicles, and a towing company. The 2271 N. Locust property (northern half of the site) is currently developed with a two-story office building that includes an attached shop area that is being used for storage purposes. The north and southeast portions of the 2271 N. Locust property are unpaved and are being used for truck and trailer parking. The site is bordered by Vineyard Avenue to the north, an industrial development to the south, undeveloped vacant land to the east, and North Locust Avenue to the west.

The general drainage pattern of the subject site is to the southeast. A northerly portion of the 2271 N. Locust Ave. property drains offsite to the easterly adjacent property through a chain-link fence. There is an existing temporary 15 foot drainage easement at this location. The remaining portion of the 2271 property drains onto the southerly 2223 N. Locust property through holes in the wall on the property line. There are no apparent drainage mitigation devices located on the 2271 N. Locust property.

As discussed above, the 2223 N. Locust Ave property accepts offsite flows from the adjacent northerly site. A portion of these offsite flows is collected in a concrete ribbon gutter at the northwest corner of the site. This gutter conveys the flows southwesterly to a parkway culvert that drains to N. Locust Avenue. The remainder of the offsite runoff (from the property to the north) is collected in a concrete drainage channel at the northern border that conveys the flows to the eastern border of the site. The runoff then sheet flows southerly along the eastern border of the site where it is collected in a drainage inlet at the southeast corner. The onsite runoff in the westerly quarter of the site sheet flows to one of two onsite catch basins. The remaining onsite runoff either sheet flows to, or is collected in ribbon gutters and conveyed to, one of three drainage inlets at the southern border. It is unclear, at present, to which storm drain the catch basins and drainage inlets outlet.

The Master Plan of Drainage (MPD) shows that the properties to the east of Locust Ave. are tabulated to drain southerly and easterly to a system in Maple Ave. However, there is an existing 102" storm drain in Locust Ave. that our site appears to be currently draining to via existing onsite catch basins and drainage inlets. In addition, to the south of our site, there is a catch basin located on the east side of N. Locust Avenue, just north of Casmalia Street. This catch basin is capturing flows draining through the previously mentioned parkway culvert on the 2223 N. Locust Ave property.

3.0 PROPOSED DRAINAGE CONDITIONS

Drainage for the proposed site will be conveyed via sheet flow and gutters to one of five proposed catch basins that will connect to a subsurface infiltration system located along the southeast and southern portion of the site. The catch basins will have filter inserts installed to remove sediment, debris, and other pollutants of concern from the storm flows prior to the flows being infiltrated. The infiltration system will be sized to retain the Design Capture Volume ("DCV") per San Bernardino County WQMP requirements, and will consist of a 700 foot long, 96 inch perforated CMP pipe placed on a 10 foot wide gravel bed.

Storm flows that exceed the capacity of the infiltration system will be released to the existing 114" storm drain located on North Locust Avenue. The storage pipe facility will be modeled as a flow through basin with the outlet flows being the infiltrated amount.

4.0 HYDROLOGICAL AND SOIL DATA

References used in this report were the following:

- San Bernardino County Flood Control District, Hydrology Manual, dated August 1986.
- NOAA Atlas 14, Volume 6, Version 2, Point Precipitation Frequency Estimates.

Based on the Stormwater Facility Mapping tool for San Bernardino County, the hydrological soils group designation the site consists of soil group "A". The soil group designation is presented in the mapping tool image found in Section 13.0.

- Slope of Intensity Duration Curve = 0.6

The point precipitation frequency estimates for the project site are presented in Section 13.0.

5.0 HYDROLOGY RESULTS

The results of the 2, 25 and 100-year storm events for both the existing and proposed conditions are shown on the hydrology maps in this report. We have also prepared a unit hydrograph for the proposed 2 year storm event which will be utilized in the basin routing model.

6.0 WATER QUALITY

The water quality as shown in the project's WQMP and described Section 3.0, will utilize the inlet filters and infiltration facility as the water quality BMP's. The infiltration system will be sized to retain the Design Capture Volume ("DCV") per San Bernardino County WQMP requirements. More information on the water quality is shown on the WQMP Site Plan (Exhibit D)

7.0 FLOOD PLAIN DESIGNATION

The site falls within a Zone "X" designation under the FEMA Map 06071C7920H, dated August 28, 2008. Zone X (Shaded) represents areas determined to be outside the 0.2% annual chance floodplain.

8.0 METHODOLOGY

The San Bernardino County Rational and Unit Hydrograph Methods described in the San Bernardino County Hydrology Manual were utilized to determine the storm flows. The San Bernardino County Unit Hydrograph Method was used to provide hydrological information for routing of the proposed basin. The Computer Software Programs used was Advanced Engineering Software (AES) Rational Tabling

Version 15.0 for the Rational Method and the small area hydrograph module CH1 – v1.8 for the Hydrograph Routing to size the basins.

This report will analyze the 2, 25 & 100 year storms for the Rational Method and the 0 year storm for the basin routing. Results of the Rational Method output can be found in Appendix "A" (existing) and Appendix "B" (proposed).

9.0 HYDRAULICS

ON-SITE:

The on-site storm drain system was analyzed utilizing the 100 year storm flows as shown in the rational method hydrology map. We will use the exit flow (node 9, 40.10 cfs) and the proposed slope of the pipe (s = 0.020) to determine if the overflow pipe has capacity to convey the flow. The hydraulics of all the pipes will be analyzed during the final engineering once the profiles can be established.

The storage facility consists of a 700 foot long, 96 inch perforated CMP pipe placed on a 10 foot wide gravel bed. During a large storm event flows will crest the internal weir in a diversion structure connected to the storage facility, and will be conveyed to the existing 114" storm drain in Locust Ave. The diversion structure will have a weir with an elevation equal to the to the top of the storage pipe which will allow the flows to completely fill the storage pipe during storm events before overflowing.

The flows that will crest the weir are calculated utilizing the weir formula as shown in King's handbook of hydraulics Table 5-3:
$Q = CLH^{3/2}$
Where C = 2.63; H = 2.0' and L = 6.0'
Q = 44.63 cfs > 40.10 cfs for the 100 year storm event shown on the hydrology map.

The pipe flows and catch basin hydraulics will be analyzed using the rational method flows in the Final Hydrology report.

10.0 RESULTS

RIALTO DISTRIBUTION CENTER - HYDROLOGY STUDY

In the HYDRAULICS (Section 9.0) it is shown that the storm flows will be collected and conveyed to the 36" storm drain exiting the site.

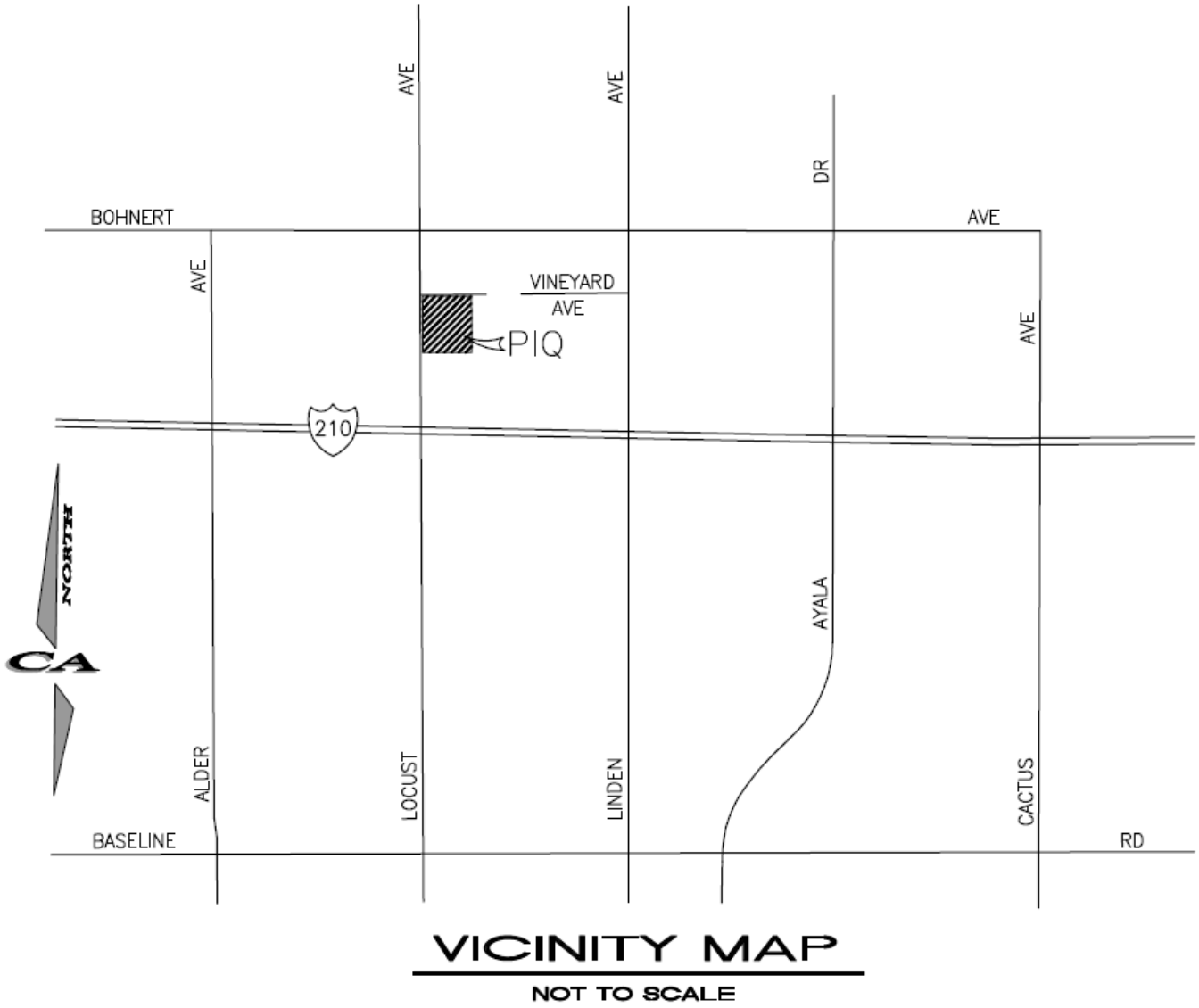
We have calculated the overflow pipe capacity into Ramona's storm drain using FlowMaster. (Appendix D) In the static calculation, the 36" pipe at a slope of 2% has a capacity of 101.46 cfs compared to the calculated flow of shown on the hydrology map (Exhibit B) of 40.10 cfs.

It is shown in Appendix "C" that the storm flows for the 2 year storm event are completely contained in the storage facility and infiltrated on-site. Flows for the 100 year storm will crest the weir and outlet to the 114" Storm Drain in Locust Ave.

11.0 CONCLUSION

The results show that the DCV will be detained and treated, while the 2 year storm will be mitigated to not exceed existing flows. In addition, the proposed storm drain system will be able to convey the 100 year storm to the existing storm drain system on Locust Avenue.

12.0 VICINITY MAP



VICINITY MAP

NOT TO SCALE

13.0 SOIL AND RAINFALL DATA TABLES

WQMP Project Report

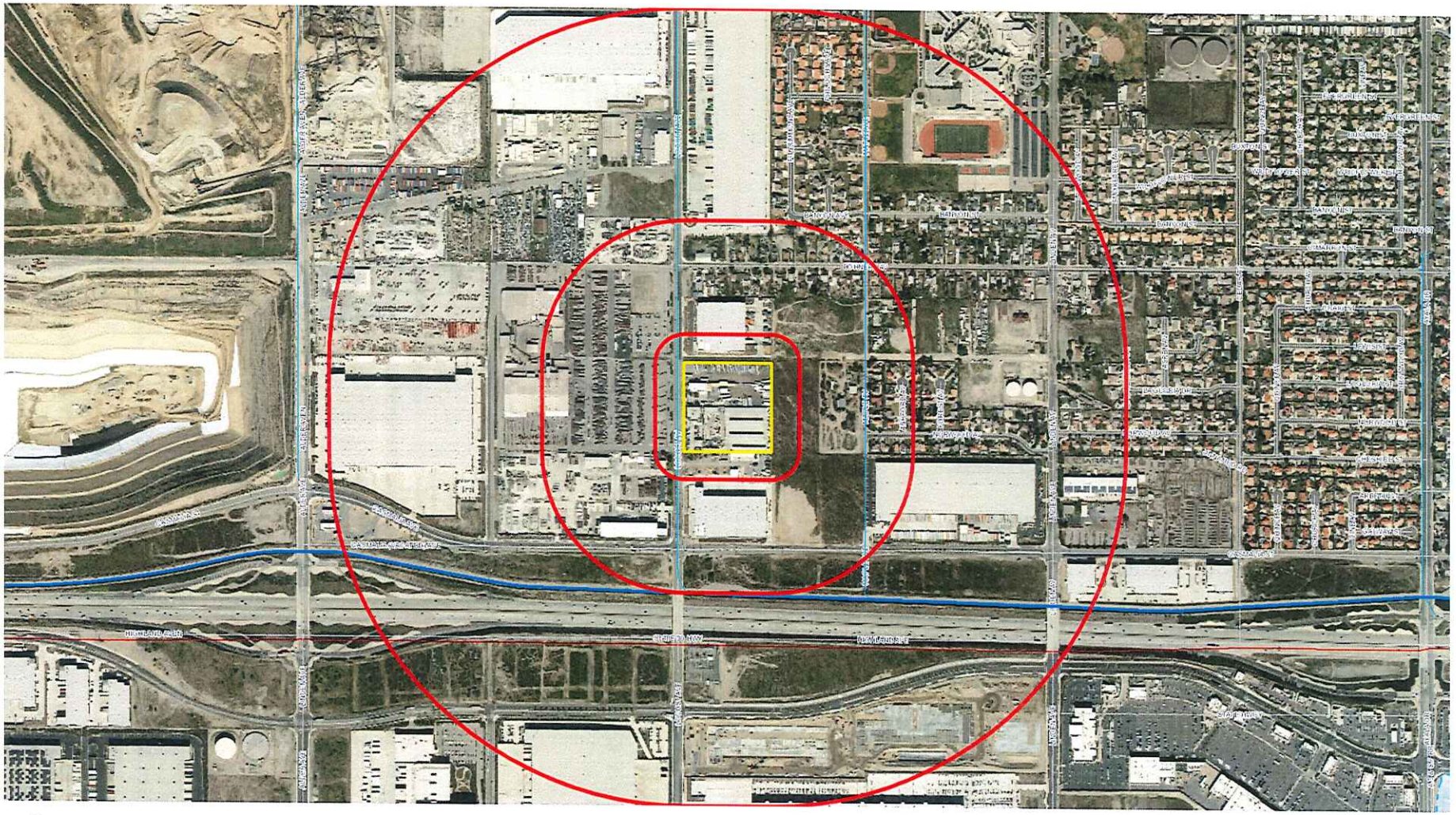
County of San Bernardino Stormwater Program

Santa Ana River Watershed Geodatabase

Thursday, March 17, 2022

Note: The information provided in this report and on the Stormwater Geodatabase for the County of San Bernardino Stormwater Program is intended to provide basic guidance in the preparation of the applicant's Water Quality Management Plan (WQMP) and should not be relied upon without independent verification.

Project Site Parcel Number(s):	113322104, 113322101, 113322105
Project Site Acreage:	8.927
HCOC Exempt Area:	Yes. Verify that the project is completely with the HCOC exemption area.
Closest Receiving Waters: (Applicant to verify based on local drainage facilities and topography.)	**System Number** - 104 **Facility Name** - Cactus Channel **Owner** - SBCFCD
Closest channel segment's susceptibility to Hydromodification:	EHM
Highest downstream hydromodification susceptibility:	High
Is this drainage segment subject to TMDLs?	No
Are there downstream drainage segments subject to TMDLs?	No
Is this drainage segment a 303d listed stream?	No
Are there 303d listed streams downstream?	Yes
Are there unlined downstream waterbodies?	No
Project Site Onsite Soil Group(s):	A
Environmentally Sensitive Areas within 200':	None
Groundwater Depth (FT):	-419
Parcels with potential septic tanks within 1000':	No
Known Groundwater Contamination Plumes within 1000':	Yes
Studies and Reports Related to Project Site:	Cactus Basin CSDP 3-3 Rialto Channel Drainage Area Volume I CSDP 3-3 Rialto Channel Drainage Area Volume II CSDP 3-3 Rialto Channel Drainage Area Volume III Revised CSDP 3-3 Rialto Channel Drainage Area CSDP 3-3 Rialto Channel Drainage Area Volume I CSDP 3-3 Rialto Channel Drainage Area Volume IV CSDP 3-3 Rialto Channel Drainage Area Volume V CSDP 3 CALC SHEET FOR HYDRO CSDP 3-3 Rialto Channel Drain Area Draft Preliminary Report on Proposed North SBFCP Rialto Channel SD Plan Rialto MPD Vol1 Rialto MPD Vol II RS-Rialto Map Book-FINAL Layout2 San Sevaine - Boyle Map 0001 San Sevaine - Boyle Map 0002 San Sevaine - Boyle Map 0003 SBCounty CSDP Project No.2 Volume 1 SBCounty CSDP Project No.2 Volume 2 Volume 2 Map SBCounty CSDP Project No.3 Volume I SBCounty CSDP Project No.3 Volume II SBVMWD High Groundwater / Pressure Zone Area



0.2 Miles

RBF CONSULTING GIS

Site Address: permitrack.sbcounty.gov/wap

County of San Bernardino
Stormwater Facility Mapping

Stormwater Map

NOAA Atlas 14, Volume 6, Version 2
Location name: Rialto, California, USA*
Latitude: 34.14°, Longitude: -117.4086°
Elevation: 1530.64 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.135** (0.113-0.164)	**0.180** (0.149-0.218)	**0.237** (0.197-0.289)	**0.284** (0.233-0.349)	**0.348** (0.276-0.442)	**0.397** (0.309-0.516)	**0.447** (0.339-0.596)	**0.500** (0.368-0.685)	**0.571** (0.403-0.818)	**0.628** (0.427-0.931)
10-min	**0.194** (0.161-0.236)	**0.257** (0.214-0.313)	**0.340** (0.282-0.414)	**0.407** (0.335-0.500)	**0.499** (0.396-0.634)	**0.569** (0.442-0.740)	**0.641** (0.486-0.855)	**0.716** (0.527-0.982)	**0.819** (0.578-1.17)	**0.900** (0.613-1.33)
15-min	**0.235** (0.195-0.285)	**0.311** (0.259-0.378)	**0.411** (0.341-0.501)	**0.492** (0.405-0.605)	**0.603** (0.479-0.767)	**0.688** (0.535-0.895)	**0.776** (0.588-1.03)	**0.866** (0.638-1.19)	**0.990** (0.699-1.42)	**1.09** (0.741-1.61)
30-min	**0.353** (0.294-0.429)	**0.469** (0.390-0.570)	**0.619** (0.513-0.755)	**0.741** (0.609-0.911)	**0.908** (0.721-1.16)	**1.04** (0.805-1.35)	**1.17** (0.885-1.56)	**1.30** (0.960-1.79)	**1.49** (1.05-2.13)	**1.64** (1.12-2.43)
60-min	**0.537** (0.447-0.651)	**0.712** (0.591-0.865)	**0.940** (0.779-1.15)	**1.13** (0.925-1.38)	**1.38** (1.10-1.75)	**1.57** (1.22-2.05)	**1.77** (1.34-2.36)	**1.98** (1.46-2.72)	**2.26** (1.60-3.24)	**2.49** (1.69-3.69)
2-hr	**0.812** (0.676-0.986)	**1.06** (0.882-1.29)	**1.38** (1.15-1.69)	**1.65** (1.35-2.02)	**2.00** (1.59-2.54)	**2.27** (1.76-2.95)	**2.54** (1.93-3.39)	**2.82** (2.08-3.87)	**3.20** (2.26-4.59)	**3.50** (2.38-5.20)
3-hr	**1.04** (0.863-1.26)	**1.35** (1.12-1.64)	**1.75** (1.45-2.13)	**2.07** (1.70-2.55)	**2.51** (1.99-3.19)	**2.84** (2.20-3.69)	**3.17** (2.40-4.22)	**3.51** (2.59-4.82)	**3.97** (2.80-5.69)	**4.33** (2.95-6.42)
6-hr	**1.53** (1.28-1.86)	**1.99** (1.65-2.41)	**2.56** (2.12-3.12)	**3.03** (2.49-3.72)	**3.64** (2.89-4.63)	**4.11** (3.19-5.34)	**4.57** (3.46-6.09)	**5.04** (3.71-6.92)	**5.68** (4.01-8.13)	**6.16** (4.20-9.14)
12-hr	**2.10** (1.74-2.54)	**2.72** (2.26-3.31)	**3.51** (2.91-4.28)	**4.14** (3.40-5.09)	**4.96** (3.94-6.32)	**5.58** (4.34-7.25)	**6.19** (4.69-8.25)	**6.80** (5.01-9.33)	**7.61** (5.37-10.9)	**8.22** (5.60-12.2)
24-hr	**2.86** (2.53-3.29)	**3.75** (3.32-4.33)	**4.87** (4.30-5.64)	**5.76** (5.04-6.71)	**6.91** (5.85-8.32)	**7.76** (6.44-9.55)	**8.61** (6.97-10.8)	**9.45** (7.44-12.2)	**10.5** (7.98-14.2)	**11.4** (8.31-15.9)
2-day	**3.51** (3.10-4.04)	**4.70** (4.15-5.42)	**6.23** (5.49-7.20)	**7.45** (6.52-8.69)	**9.08** (7.69-10.9)	**10.3** (8.56-12.7)	**11.6** (9.36-14.6)	**12.8** (10.1-16.6)	**14.5** (11.0-19.5)	**15.8** (11.5-22.0)
3-day	**3.75** (3.32-4.32)	**5.12** (4.53-5.90)	**6.91** (6.10-8.00)	**8.38** (7.34-9.78)	**10.4** (8.80-12.5)	**12.0** (9.92-14.7)	**13.5** (11.0-17.1)	**15.2** (12.0-19.7)	**17.5** (13.2-23.6)	**19.2** (14.1-26.8)
4-day	**4.00** (3.55-4.61)	**5.53** (4.89-6.37)	**7.55** (6.66-8.73)	**9.22** (8.07-10.8)	**11.5** (9.78-13.9)	**13.4** (11.1-16.4)	**15.2** (12.3-19.2)	**17.2** (13.6-22.3)	**20.0** (15.1-26.9)	**22.1** (16.2-30.9)
7-day	**4.57** (4.05-5.27)	**6.38** (5.65-7.37)	**8.81** (7.77-10.2)	**10.8** (9.47-12.6)	**13.6** (11.5-16.4)	**15.9** (13.2-19.5)	**18.2** (14.7-22.9)	**20.6** (16.2-26.7)	**24.0** (18.2-32.4)	**26.7** (19.5-37.3)
10-day	**4.94** (4.37-5.69)	**6.94** (6.14-8.00)	**9.63** (8.49-11.1)	**11.9** (10.4-13.9)	**15.0** (12.7-18.1)	**17.5** (14.5-21.6)	**20.1** (16.3-25.4)	**22.9** (18.0-29.7)	**26.8** (20.3-36.1)	**29.9** (21.8-41.7)
20-day	**5.91** (5.23-6.80)	**8.38** (7.41-9.67)	**11.8** (10.4-13.6)	**14.6** (12.8-17.0)	**18.7** (15.8-22.5)	**21.9** (18.2-26.9)	**25.3** (20.5-31.9)	**29.0** (22.8-37.5)	**34.2** (25.8-46.1)	**38.4** (28.1-53.6)
30-day	**6.90** (6.11-7.95)	**9.80** (8.67-11.3)	**13.8** (12.2-16.0)	**17.2** (15.1-20.1)	**22.1** (18.7-26.6)	**26.0** (21.6-32.0)	**30.2** (24.5-38.0)	**34.7** (27.3-44.9)	**41.1** (31.1-55.5)	**46.4** (33.9-64.7)
45-day	**8.24** (7.30-9.49)	**11.6** (10.3-13.4)	**16.4** (14.4-18.9)	**20.4** (17.9-23.8)	**26.3** (22.3-31.7)	**31.0** (25.8-38.2)	**36.2** (29.3-45.5)	**41.7** (32.9-54.0)	**49.7** (37.6-67.0)	**56.3** (41.2-78.5)
60-day	**9.58** (8.48-11.0)	**13.4** (11.9-15.5)	**18.8** (16.6-21.7)	**23.4** (20.5-27.3)	**30.1** (25.5-36.3)	**35.6** (29.6-43.8)	**41.5** (33.6-52.3)	**48.0** (37.8-62.2)	**57.4** (43.4-77.4)	**65.2** (47.6-90.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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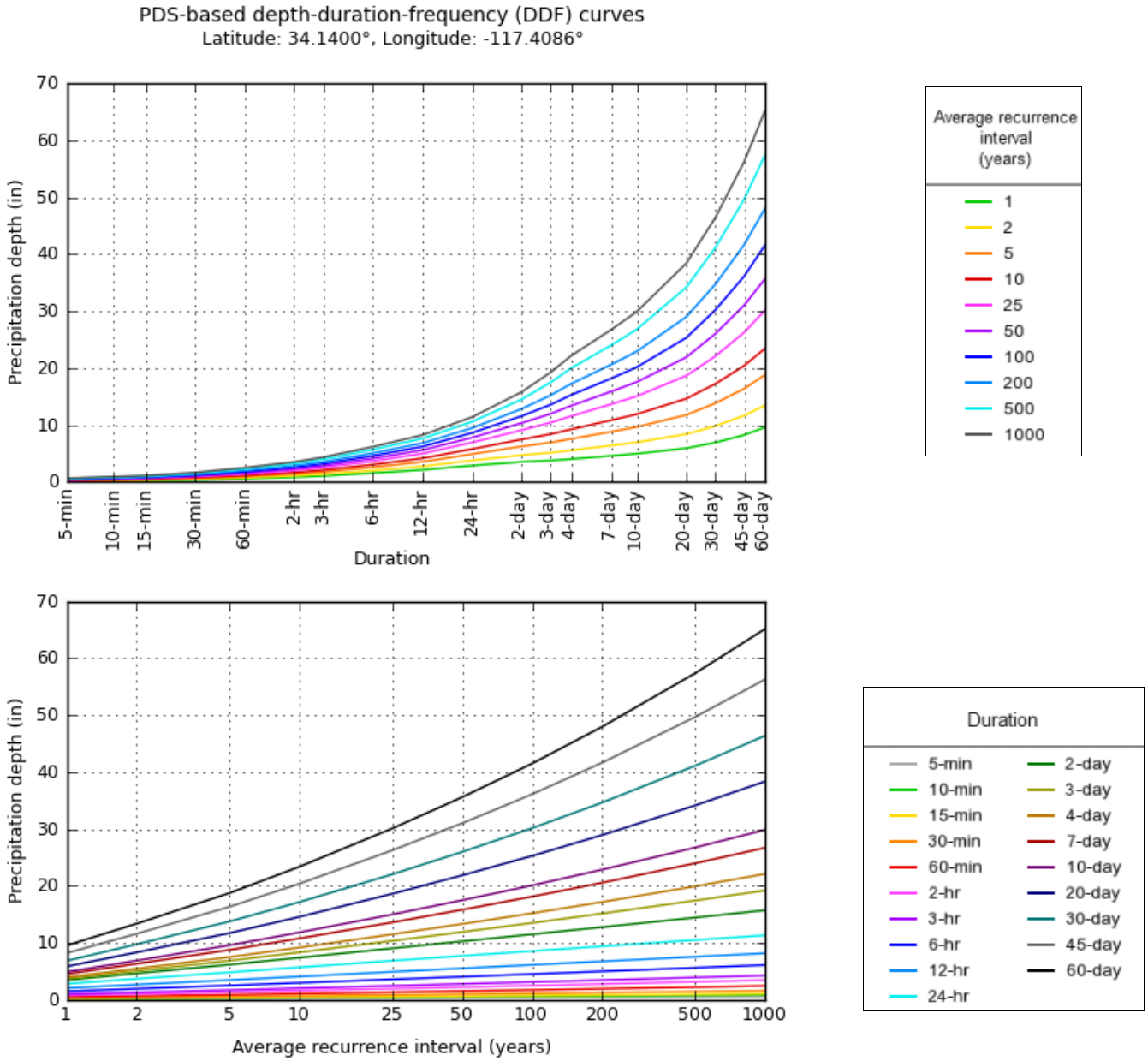
PF graphical



NOAA Atlas 14, Volume 6, Version 2

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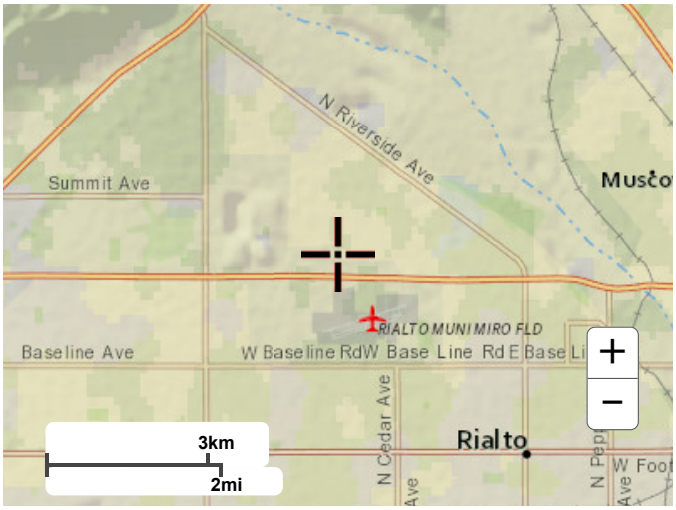
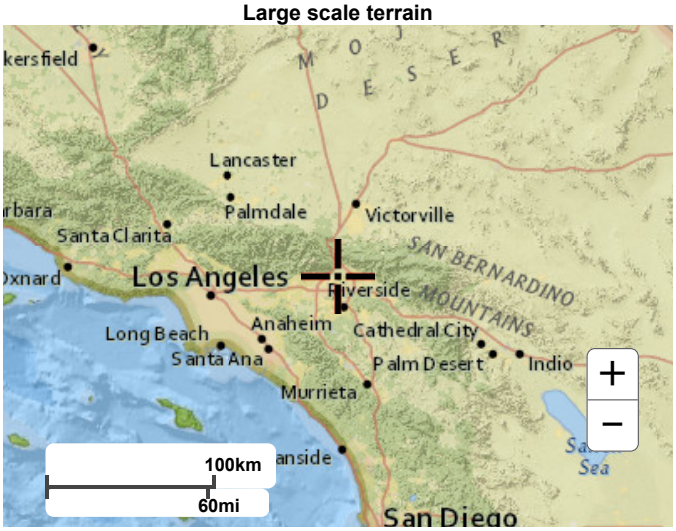
Maps & aerials

Small scale terrain



Large scale terrain



Large scale map

Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDICES

APPENDIX A: EXISTING RATIONAL METHOD, 2, 25 & 100 YEAR STORM FREQUENCY OUTPUT FILES.

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 ************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
         (c) Copyright 1983-2008 Advanced Engineering Software (aes)
            Ver. 15.0  Release Date: 04/01/2008  License ID 1420

                          Analysis prepared by:

                              CA Engineering
                         13821 Newport Ave., Ste 110
                              Tustin, Ca. 92780


  ************************* DESCRIPTION OF STUDY *************************
 * EXISTING CONDITION                                                    *
 * 2 YR STORM                                                            *
 *                                                                       *
  ************************************************************************

   FILE NAME: 251-77EX.DAT
   TIME/DATE OF STUDY: 16:17 07/18/2022
 ========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =    2.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.130
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.770
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =    2.00   1-HOUR INTENSITY(INCH/HOUR) = 0.6827
   SLOPE OF INTENSITY DURATION CURVE = 0.6000

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.    (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ************************************************************************
   FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
 ------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   697.00
  ELEVATION DATA: UPSTREAM(FEET) =   1541.70  DOWNSTREAM(FEET) =   1531.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.853
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.645
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "2 DWELLINGS/ACRE"         A        4.25      1.33     0.700    17   13.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
  SUBAREA RUNOFF(CFS) =      2.74
  TOTAL AREA(ACRES) =      4.25   PEAK FLOW RATE(CFS) =      2.74

********************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  54
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1531.00  DOWNSTREAM(FEET) =   1528.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   928.00   CHANNEL SLOPE =  0.0032
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.301
  SUBAREA LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        4.68      1.33     0.100    17
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
  * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.17
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.33
  AVERAGE FLOW DEPTH(FEET) =   0.33   TRAVEL TIME(MIN.) =   6.64
  Tc(MIN.) =   20.49
  SUBAREA AREA(ACRES) =     4.68       SUBAREA RUNOFF(CFS) =    4.93
  EFFECTIVE AREA(ACRES) =      8.93     AREA-AVERAGED Fm(INCH/HR) =   0.51
  AREA-AVERAGED Fp(INCH/HR) =   1.33  AREA-AVERAGED Ap =   0.39
  * RAINFALL INTENSITY IS LESS THAN AREA-AVERAGED Fp;
  * IMPERVIOUS AREA USED FOR RUNOFF ESTIMATES.
  TOTAL AREA(ACRES) =        8.9         PEAK FLOW RATE(CFS) =       6.42

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.38   FLOW VELOCITY(FEET/SEC.) =   2.48
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =    1625.00 FEET.
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.9  TC(MIN.) =     20.49
  EFFECTIVE AREA(ACRES) =      8.93  AREA-AVERAGED Fm(INCH/HR)=  0.51
  AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap = 0.386
  PEAK FLOW RATE(CFS)   =       6.42
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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                          Analysis prepared by:

                              CA Engineering
                          13821 Newport Ave., Ste 110
                               Tustin, Ca. 92780


 ************************* DESCRIPTION OF STUDY *************************
* EXISTING CONDITION                                                    *
* 25 YR STORM                                                           *
*                                                                       *
 ************************************************************************

  FILE NAME: 251-77EX.DAT
  TIME/DATE OF STUDY: 16:16 07/18/2022
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.130
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.770
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   25.00   1-HOUR INTENSITY(INCH/HOUR) = 1.3576
  SLOPE OF INTENSITY DURATION CURVE = 0.6000

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   697.00
  ELEVATION DATA: UPSTREAM(FEET) =   1541.70  DOWNSTREAM(FEET) =   1531.00
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.853
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.271
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
        LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "2 DWELLINGS/ACRE"         A        4.25      0.98     0.700    32   13.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
  SUBAREA RUNOFF(CFS) =      9.90
  TOTAL AREA(ACRES) =      4.25   PEAK FLOW RATE(CFS) =      9.90

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  54
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1531.00  DOWNSTREAM(FEET) =   1528.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   928.00   CHANNEL SLOPE =  0.0032
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.737
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
        LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        4.68      0.98     0.100    32
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.97
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      15.46
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.22
  AVERAGE FLOW DEPTH(FEET) =   0.60   TRAVEL TIME(MIN.) =   4.80
  Tc(MIN.) =   18.65
  SUBAREA AREA(ACRES) =     4.68       SUBAREA RUNOFF(CFS) =   11.12
  EFFECTIVE AREA(ACRES) =      8.93     AREA-AVERAGED Fm(INCH/HR) =   0.38
  AREA-AVERAGED Fp(INCH/HR) =   0.98  AREA-AVERAGED Ap =   0.39
  TOTAL AREA(ACRES) =        8.9         PEAK FLOW RATE(CFS) =      18.97

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.67   FLOW VELOCITY(FEET/SEC.) =   3.42
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =    1625.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.9  TC(MIN.) =     18.65
  EFFECTIVE AREA(ACRES) =      8.93  AREA-AVERAGED Fm(INCH/HR)=  0.38
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap = 0.386
  PEAK FLOW RATE(CFS)   =      18.97
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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                          Analysis prepared by:

                              CA Engineering
                          13821 Newport Ave., Ste 110
                               Tustin, Ca. 92780


 ************************* DESCRIPTION OF STUDY *************************
* EXISTING CONDITION                                                    *
* 100 YR STORM                                                          *
*                                                                       *
 ************************************************************************

  FILE NAME: 251-77EX.DAT
  TIME/DATE OF STUDY: 16:15 07/18/2022
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.130
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.770
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) = 1.7700
  SLOPE OF INTENSITY DURATION CURVE = 0.6000

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   697.00
  ELEVATION DATA: UPSTREAM(FEET) =   1541.70  DOWNSTREAM(FEET) =   1531.00
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.853
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.265
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  RESIDENTIAL
  "2 DWELLINGS/ACRE"         A        4.25      0.74     0.700    52   13.85
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.700
  SUBAREA RUNOFF(CFS) =     14.33
  TOTAL AREA(ACRES) =      4.25   PEAK FLOW RATE(CFS) =     14.33

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  54
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1531.00  DOWNSTREAM(FEET) =   1528.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   928.00   CHANNEL SLOPE =  0.0032
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.621
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 A        4.68      0.74     0.100    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      21.80
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.56
  AVERAGE FLOW DEPTH(FEET) =   0.71   TRAVEL TIME(MIN.) =   4.34
  Tc(MIN.) =   18.20
  SUBAREA AREA(ACRES) =     4.68       SUBAREA RUNOFF(CFS) =   14.94
  EFFECTIVE AREA(ACRES) =      8.93     AREA-AVERAGED Fm(INCH/HR) =   0.29
  AREA-AVERAGED Fp(INCH/HR) =   0.74  AREA-AVERAGED Ap =   0.39
  TOTAL AREA(ACRES) =        8.9         PEAK FLOW RATE(CFS) =      26.81

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.80   FLOW VELOCITY(FEET/SEC.) =   3.75
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =    1625.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.9  TC(MIN.) =     18.20
  EFFECTIVE AREA(ACRES) =      8.93  AREA-AVERAGED Fm(INCH/HR)=  0.29
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap = 0.386
  PEAK FLOW RATE(CFS)   =      26.81
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX B: PROPOSED RATIONAL METHOD, 2, 25 & 100 YEAR STORM FREQUENCY OUTPUT FILES.

```
 ************************************************************************
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                          Analysis prepared by:

                              CA Engineering
                         13821 Newport Ave., Ste 110
                              Tustin, Ca. 92780


  ************************* DESCRIPTION OF STUDY *************************
 * PROPOSED CONDITION                                                   *
 * 2 YR STORM                                                           *
 *                                                                      *
  ************************************************************************

   FILE NAME: 251-77PR.DAT
   TIME/DATE OF STUDY: 15:25 07/18/2022
 ========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =    2.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
   10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.130
   100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.770
   COMPUTED RAINFALL INTENSITY DATA:
   STORM EVENT =    2.00   1-HOUR INTENSITY(INCH/HOUR) = 0.6827
   SLOPE OF INTENSITY DURATION CURVE = 0.6000

   *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

   *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
      HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
      WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.    (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

   GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
     1. Relative Flow-Depth =  0.00 FEET
        as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
     2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
   *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
    OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
   *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

 ************************************************************************
   FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   299.00
  ELEVATION DATA: UPSTREAM(FEET) =   1536.00  DOWNSTREAM(FEET) =   1534.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.265
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.243
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        0.59      1.33     0.100    17    8.26
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.12
  TOTAL AREA(ACRES) =      0.59   PEAK FLOW RATE(CFS) =      1.12

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1528.60  DOWNSTREAM(FEET) =  1528.00
  FLOW LENGTH(FEET) =   108.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.04
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.12
  PIPE TRAVEL TIME(MIN.) =   0.59    Tc(MIN.) =    8.86
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     407.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.86
  RAINFALL INTENSITY(INCH/HR) =   2.15
  AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  1.33
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.59
  TOTAL STREAM AREA(ACRES) =       0.59
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.12

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   346.00
  ELEVATION DATA: UPSTREAM(FEET) =   1536.00  DOWNSTREAM(FEET) =   1534.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.628
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.046
```

```
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  A        0.70      1.33      0.100    17    9.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.21
  TOTAL AREA(ACRES) =      0.70   PEAK FLOW RATE(CFS) =      1.21

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1528.30  DOWNSTREAM(FEET) =  1528.00
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.13
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.21
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    9.73
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      3.00 =     371.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.73
  RAINFALL INTENSITY(INCH/HR) =   2.03
  AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  1.33
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.70
  TOTAL STREAM AREA(ACRES) =       0.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.21

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        1.12    8.86    2.152  1.33( 0.13) 0.10       0.6       1.00
      2        1.21    9.73    2.034  1.33( 0.13) 0.10       0.7       4.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.29    8.86    2.152  1.33( 0.13) 0.10       1.2       1.00
      2        2.26    9.73    2.034  1.33( 0.13) 0.10       1.3       4.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       2.29    Tc(MIN.) =     8.86
  EFFECTIVE AREA(ACRES) =       1.23   AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.3
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     407.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      6.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1528.00  DOWNSTREAM(FEET) =  1522.00
  FLOW LENGTH(FEET) =   522.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.77
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.29
  PIPE TRAVEL TIME(MIN.) =   1.82    Tc(MIN.) =   10.68
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =     929.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.68
  RAINFALL INTENSITY(INCH/HR) =   1.92
  AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  1.33
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.23
  TOTAL STREAM AREA(ACRES) =       1.29
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.29

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   595.00
  ELEVATION DATA: UPSTREAM(FEET) =   1535.90  DOWNSTREAM(FEET) =   1528.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.315
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.087
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        2.24      1.33     0.100    17    9.31
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      3.94
  TOTAL AREA(ACRES) =      2.24   PEAK FLOW RATE(CFS) =      3.94

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      6.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1523.00  DOWNSTREAM(FEET) =  1522.00
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.51
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.94
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    9.35
  LONGEST FLOWPATH FROM NODE      7.00 TO NODE      6.00 =     615.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.35
  RAINFALL INTENSITY(INCH/HR) =   2.08
  AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  1.33
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.24
  TOTAL STREAM AREA(ACRES) =       2.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.94

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.29   10.68    1.923  1.33( 0.13) 0.10       1.2       1.00
      1        2.26   11.56    1.834  1.33( 0.13) 0.10       1.3       4.00
      2        3.94    9.35    2.083  1.33( 0.13) 0.10       2.2       7.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.12    9.35    2.083  1.33( 0.13) 0.10       3.3       7.00
      2        5.90   10.68    1.923  1.33( 0.13) 0.10       3.5       1.00
      3        5.70   11.56    1.834  1.33( 0.13) 0.10       3.5       4.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.12    Tc(MIN.) =     9.35
  EFFECTIVE AREA(ACRES) =       3.31   AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        3.5
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =     929.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1522.00  DOWNSTREAM(FEET) =  1520.00
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.25
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.12
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    9.45
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      9.00 =     982.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
```

```
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.45
  RAINFALL INTENSITY(INCH/HR) =   2.07
  AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  1.33
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.31
  TOTAL STREAM AREA(ACRES) =       3.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.12

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   680.00
  ELEVATION DATA: UPSTREAM(FEET) =   1535.50  DOWNSTREAM(FEET) =   1526.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.701
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.037
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        4.54      1.33     0.100    17    9.70
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      7.78
  TOTAL AREA(ACRES) =      4.54   PEAK FLOW RATE(CFS) =      7.78

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1521.00  DOWNSTREAM(FEET) =  1520.00
  FLOW LENGTH(FEET) =   592.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.09
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.78
  PIPE TRAVEL TIME(MIN.) =   3.19    Tc(MIN.) =   12.89
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE      9.00 =    1272.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.89
  RAINFALL INTENSITY(INCH/HR) =   1.72
  AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  1.33
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       4.54
```

```
  TOTAL STREAM AREA(ACRES) =       4.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.78

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   427.00
  ELEVATION DATA: UPSTREAM(FEET) =   1529.60  DOWNSTREAM(FEET) =   1527.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.662
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.042
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        0.83      1.33     0.100    17    9.66
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  1.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.43
  TOTAL AREA(ACRES) =      0.83   PEAK FLOW RATE(CFS) =      1.43

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1522.00  DOWNSTREAM(FEET) =  1520.00
  FLOW LENGTH(FEET) =    34.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.67
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.43
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    9.74
  LONGEST FLOWPATH FROM NODE     13.00 TO NODE      9.00 =     461.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.74
  RAINFALL INTENSITY(INCH/HR) =   2.03
  AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  1.33
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.83
  TOTAL STREAM AREA(ACRES) =       0.83
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.43

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.12    9.45    2.070  1.33( 0.13) 0.10       3.3       7.00
      1        5.90   10.77    1.913  1.33( 0.13) 0.10       3.5       1.00
      1        5.70   11.66    1.825  1.33( 0.13) 0.10       3.5       4.00
```

```
    2        7.78   12.89    1.717  1.33( 0.13) 0.10       4.5      11.00
    3        1.43    9.74    2.033  1.33( 0.13) 0.10       0.8      13.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       14.50    9.45    2.070  1.33( 0.13) 0.10       7.4       7.00
      2       14.54    9.74    2.033  1.33( 0.13) 0.10       7.6      13.00
      3       14.54   10.77    1.913  1.33( 0.13) 0.10       8.1       1.00
      4       14.48   11.66    1.825  1.33( 0.13) 0.10       8.5       4.00
      5       14.31   12.89    1.717  1.33( 0.13) 0.10       8.9      11.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      14.54    Tc(MIN.) =    10.77
  EFFECTIVE AREA(ACRES) =       8.09   AREA-AVERAGED Fm(INCH/HR) =  0.13
  AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        8.9
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE      9.00 =    1272.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.9  TC(MIN.) =     10.77
  EFFECTIVE AREA(ACRES) =      8.09  AREA-AVERAGED Fm(INCH/HR)=  0.13
  AREA-AVERAGED Fp(INCH/HR) =  1.33  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =      14.54

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       14.50    9.45    2.070  1.33( 0.13) 0.10       7.4       7.00
      2       14.54    9.74    2.033  1.33( 0.13) 0.10       7.6      13.00
      3       14.54   10.77    1.913  1.33( 0.13) 0.10       8.1       1.00
      4       14.48   11.66    1.825  1.33( 0.13) 0.10       8.5       4.00
      5       14.31   12.89    1.717  1.33( 0.13) 0.10       8.9      11.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
         (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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                          Analysis prepared by:

                              CA Engineering
                          13821 Newport Ave., Ste 110
                               Tustin, Ca. 92780


 ************************* DESCRIPTION OF STUDY *************************
* PROPOSED CONDITION                                                    *
* 25 YR STORM                                                           *
*                                                                       *
 ************************************************************************

  FILE NAME: 251-77PR.DAT
  TIME/DATE OF STUDY: 15:26 07/18/2022
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.130
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.770
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   25.00   1-HOUR INTENSITY(INCH/HOUR) = 1.3576
  SLOPE OF INTENSITY DURATION CURVE = 0.6000

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   299.00
  ELEVATION DATA: UPSTREAM(FEET) =   1536.00  DOWNSTREAM(FEET) =   1534.20
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.265
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.460
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
        LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        0.59      0.98     0.100    32    8.26
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.32
  TOTAL AREA(ACRES) =      0.59   PEAK FLOW RATE(CFS) =      2.32

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1528.60  DOWNSTREAM(FEET) =  1528.00
  FLOW LENGTH(FEET) =   108.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.55
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.32
  PIPE TRAVEL TIME(MIN.) =   0.51    Tc(MIN.) =    8.77
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     407.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.77
  RAINFALL INTENSITY(INCH/HR) =   4.30
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.59
  TOTAL STREAM AREA(ACRES) =       0.59
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.32

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   346.00
  ELEVATION DATA: UPSTREAM(FEET) =   1536.00  DOWNSTREAM(FEET) =   1534.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.628
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.070
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
        LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        0.70      0.98     0.100    32    9.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.50
  TOTAL AREA(ACRES) =      0.70   PEAK FLOW RATE(CFS) =      2.50
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1528.30  DOWNSTREAM(FEET) =  1528.00
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.95
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.50
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    9.71
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      3.00 =     371.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.71
  RAINFALL INTENSITY(INCH/HR) =   4.05
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.70
  TOTAL STREAM AREA(ACRES) =       0.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.50

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        2.32    8.77    4.303  0.98( 0.10) 0.10       0.6       1.00
      2        2.50    9.71    4.048  0.98( 0.10) 0.10       0.7       4.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.72    8.77    4.303  0.98( 0.10) 0.10       1.2       1.00
      2        4.68    9.71    4.048  0.98( 0.10) 0.10       1.3       4.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.72    Tc(MIN.) =     8.77
  EFFECTIVE AREA(ACRES) =       1.22   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.3
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     407.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      6.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1528.00  DOWNSTREAM(FEET) =  1522.00
  FLOW LENGTH(FEET) =   522.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.69
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.72
  PIPE TRAVEL TIME(MIN.) =   1.53    Tc(MIN.) =   10.30
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =     929.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.30
  RAINFALL INTENSITY(INCH/HR) =   3.91
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.22
  TOTAL STREAM AREA(ACRES) =       1.29
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.72

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   595.00
  ELEVATION DATA: UPSTREAM(FEET) =   1535.90  DOWNSTREAM(FEET) =   1528.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.315
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.151
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        2.24      0.98     0.100    32    9.31
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      8.17
  TOTAL AREA(ACRES) =      2.24   PEAK FLOW RATE(CFS) =      8.17

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      6.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1523.00  DOWNSTREAM(FEET) =  1522.00
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.40
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.17
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    9.34
  LONGEST FLOWPATH FROM NODE      7.00 TO NODE      6.00 =     615.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
```

```
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.34
  RAINFALL INTENSITY(INCH/HR) =   4.14
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.24
  TOTAL STREAM AREA(ACRES) =       2.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.17

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        4.72   10.30    3.908  0.98( 0.10) 0.10       1.2       1.00
      1        4.68   11.24    3.708  0.98( 0.10) 0.10       1.3       4.00
      2        8.17    9.34    4.143  0.98( 0.10) 0.10       2.2       7.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       12.72    9.34    4.143  0.98( 0.10) 0.10       3.3       7.00
      2       12.42   10.30    3.908  0.98( 0.10) 0.10       3.5       1.00
      3       11.97   11.24    3.708  0.98( 0.10) 0.10       3.5       4.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      12.72    Tc(MIN.) =     9.34
  EFFECTIVE AREA(ACRES) =       3.35   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.97  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        3.5
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =     929.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1522.00  DOWNSTREAM(FEET) =  1520.00
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.43
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.72
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    9.42
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      9.00 =     982.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.42
  RAINFALL INTENSITY(INCH/HR) =   4.12
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.97
```

```
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.35
  TOTAL STREAM AREA(ACRES) =       3.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      12.72

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   680.00
  ELEVATION DATA: UPSTREAM(FEET) =   1535.50  DOWNSTREAM(FEET) =   1526.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.701
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.051
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        4.54      0.98     0.100    32    9.70
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     16.15
  TOTAL AREA(ACRES) =      4.54   PEAK FLOW RATE(CFS) =     16.15

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1521.00  DOWNSTREAM(FEET) =  1520.00
  FLOW LENGTH(FEET) =   592.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.75
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.15
  PIPE TRAVEL TIME(MIN.) =   2.63    Tc(MIN.) =   12.33
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE      9.00 =    1272.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.33
  RAINFALL INTENSITY(INCH/HR) =   3.51
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       4.54
  TOTAL STREAM AREA(ACRES) =       4.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      16.15

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   427.00
 ELEVATION DATA: UPSTREAM(FEET) =   1529.60  DOWNSTREAM(FEET) =   1527.20

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.662
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.061
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 A        0.83      0.98     0.100    32    9.66
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      2.96
 TOTAL AREA(ACRES) =      0.83   PEAK FLOW RATE(CFS) =      2.96

****************************************************************************
 FLOW PROCESS FROM NODE     14.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1522.00  DOWNSTREAM(FEET) =  1520.00
 FLOW LENGTH(FEET) =    34.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.38
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.96
 PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    9.72
 LONGEST FLOWPATH FROM NODE     13.00 TO NODE      9.00 =     461.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.72
 RAINFALL INTENSITY(INCH/HR) =   4.05
 AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.98
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       0.83
 TOTAL STREAM AREA(ACRES) =       0.83
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.96

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       12.72    9.42    4.123  0.98( 0.10) 0.10       3.3       7.00
     1       12.42   10.38    3.890  0.98( 0.10) 0.10       3.5       1.00
     1       11.97   11.32    3.692  0.98( 0.10) 0.10       3.5       4.00
     2       16.15   12.33    3.508  0.98( 0.10) 0.10       4.5      11.00
     3        2.96    9.72    4.046  0.98( 0.10) 0.10       0.8      13.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  3 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
```

```
     1       30.21    9.42    4.123  0.98( 0.10) 0.10       7.6       7.00
     2       30.33    9.72    4.046  0.98( 0.10) 0.10       7.8      13.00
     3       30.38   10.38    3.890  0.98( 0.10) 0.10       8.1       1.00
     4       30.30   11.32    3.692  0.98( 0.10) 0.10       8.5       4.00
     5       30.07   12.33    3.508  0.98( 0.10) 0.10       8.9      11.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      30.38    Tc(MIN.) =    10.38
  EFFECTIVE AREA(ACRES) =       8.11   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        8.9
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE      9.00 =    1272.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.9  TC(MIN.) =     10.38
  EFFECTIVE AREA(ACRES) =      8.11  AREA-AVERAGED Fm(INCH/HR)=  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =      30.38

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       30.21    9.42    4.123  0.98( 0.10) 0.10       7.6       7.00
     2       30.33    9.72    4.046  0.98( 0.10) 0.10       7.8      13.00
     3       30.38   10.38    3.890  0.98( 0.10) 0.10       8.1       1.00
     4       30.30   11.32    3.692  0.98( 0.10) 0.10       8.5       4.00
     5       30.07   12.33    3.508  0.98( 0.10) 0.10       8.9      11.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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                          Analysis prepared by:

                              CA Engineering
                          13821 Newport Ave., Ste 110
                               Tustin, Ca. 92780


 ************************* DESCRIPTION OF STUDY *************************
* PROPOSED CONDITION                                                    *
* 100 YR STORM                                                          *
*                                                                       *
 ************************************************************************

  FILE NAME: 251-77PR.DAT
  TIME/DATE OF STUDY: 15:27 07/18/2022
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.130
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.770
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) = 1.7700
  SLOPE OF INTENSITY DURATION CURVE = 0.6000

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   299.00
  ELEVATION DATA: UPSTREAM(FEET) =   1536.00  DOWNSTREAM(FEET) =   1534.20
```

```
  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.265
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.815
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        0.59      0.74     0.100    52    8.26
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      3.05
  TOTAL AREA(ACRES) =      0.59   PEAK FLOW RATE(CFS) =      3.05

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1528.60  DOWNSTREAM(FEET) =  1528.00
  FLOW LENGTH(FEET) =   108.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.89
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.05
  PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =    8.73
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     407.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.73
  RAINFALL INTENSITY(INCH/HR) =   5.63
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.59
  TOTAL STREAM AREA(ACRES) =       0.59
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.05

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   346.00
  ELEVATION DATA: UPSTREAM(FEET) =   1536.00  DOWNSTREAM(FEET) =   1534.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.628
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.306
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        0.70      0.74     0.100    52    9.63
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      3.30
  TOTAL AREA(ACRES) =      0.70   PEAK FLOW RATE(CFS) =      3.30
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      3.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1528.30  DOWNSTREAM(FEET) =  1528.00
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.20
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.30
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    9.71
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE      3.00 =     371.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.71
  RAINFALL INTENSITY(INCH/HR) =   5.28
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.70
  TOTAL STREAM AREA(ACRES) =       0.70
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.30

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        3.05    8.73    5.628  0.74( 0.07) 0.10       0.6       1.00
      2        3.30    9.71    5.279  0.74( 0.07) 0.10       0.7       4.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.21    8.73    5.628  0.74( 0.07) 0.10       1.2       1.00
      2        6.15    9.71    5.279  0.74( 0.07) 0.10       1.3       4.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.21    Tc(MIN.) =     8.73
  EFFECTIVE AREA(ACRES) =       1.22   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        1.3
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     407.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      6.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1528.00  DOWNSTREAM(FEET) =  1522.00
  FLOW LENGTH(FEET) =   522.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.93
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.21
  PIPE TRAVEL TIME(MIN.) =   1.47    Tc(MIN.) =   10.19
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =     929.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.19
  RAINFALL INTENSITY(INCH/HR) =   5.13
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.22
  TOTAL STREAM AREA(ACRES) =       1.29
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.21

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   595.00
  ELEVATION DATA: UPSTREAM(FEET) =   1535.90  DOWNSTREAM(FEET) =   1528.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.315
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.412
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        2.24      0.74     0.100    52    9.31
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     10.76
  TOTAL AREA(ACRES) =      2.24   PEAK FLOW RATE(CFS) =     10.76

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      6.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1523.00  DOWNSTREAM(FEET) =  1522.00
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.08
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.76
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    9.34
  LONGEST FLOWPATH FROM NODE      7.00 TO NODE      6.00 =     615.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      6.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
```

```
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.34
  RAINFALL INTENSITY(INCH/HR) =   5.40
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.24
  TOTAL STREAM AREA(ACRES) =       2.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.76

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1        6.21   10.19    5.127  0.74( 0.07) 0.10       1.2       1.00
      1        6.15   11.18    4.852  0.74( 0.07) 0.10       1.3       4.00
      2       10.76    9.34    5.402  0.74( 0.07) 0.10       2.2       7.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
      1       16.76    9.34    5.402  0.74( 0.07) 0.10       3.4       7.00
      2       16.41   10.19    5.127  0.74( 0.07) 0.10       3.5       1.00
      3       15.80   11.18    4.852  0.74( 0.07) 0.10       3.5       4.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.76    Tc(MIN.) =     9.34
  EFFECTIVE AREA(ACRES) =       3.36   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        3.5
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =     929.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1522.00  DOWNSTREAM(FEET) =  1520.00
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.03
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.76
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    9.42
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      9.00 =     982.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.42
  RAINFALL INTENSITY(INCH/HR) =   5.38
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
```

```
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       3.36
  TOTAL STREAM AREA(ACRES) =       3.53
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      16.76

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   680.00
  ELEVATION DATA: UPSTREAM(FEET) =   1535.50  DOWNSTREAM(FEET) =   1526.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.701
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.282
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 A        4.54      0.74     0.100    52    9.70
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     21.28
  TOTAL AREA(ACRES) =      4.54   PEAK FLOW RATE(CFS) =     21.28

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1521.00  DOWNSTREAM(FEET) =  1520.00
  FLOW LENGTH(FEET) =   592.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  25.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.01
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.28
  PIPE TRAVEL TIME(MIN.) =   2.46    Tc(MIN.) =   12.16
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE      9.00 =    1272.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.16
  RAINFALL INTENSITY(INCH/HR) =   4.61
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       4.54
  TOTAL STREAM AREA(ACRES) =       4.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      21.28

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     14.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   427.00
 ELEVATION DATA: UPSTREAM(FEET) =   1529.60  DOWNSTREAM(FEET) =   1527.20

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.662
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.294
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 A        0.83      0.74     0.100    52    9.66
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      3.90
 TOTAL AREA(ACRES) =      0.83   PEAK FLOW RATE(CFS) =      3.90

****************************************************************************
 FLOW PROCESS FROM NODE     14.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1522.00  DOWNSTREAM(FEET) =  1520.00
 FLOW LENGTH(FEET) =    34.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.08
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.90
 PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    9.72
 LONGEST FLOWPATH FROM NODE     13.00 TO NODE      9.00 =     461.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.72
 RAINFALL INTENSITY(INCH/HR) =   5.28
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.74
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       0.83
 TOTAL STREAM AREA(ACRES) =       0.83
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.90

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       16.76    9.42    5.377  0.74( 0.07) 0.10       3.4       7.00
     1       16.41   10.27    5.105  0.74( 0.07) 0.10       3.5       1.00
     1       15.80   11.25    4.832  0.74( 0.07) 0.10       3.5       4.00
     2       21.28   12.16    4.611  0.74( 0.07) 0.10       4.5      11.00
     3        3.90    9.72    5.276  0.74( 0.07) 0.10       0.8      13.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  3 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       39.86    9.42    5.377  0.74( 0.07) 0.10       7.7       7.00
```

```
     2       40.02    9.72    5.276  0.74( 0.07) 0.10       7.9      13.00
     3       40.10   10.27    5.105  0.74( 0.07) 0.10       8.1       1.00
     4       40.01   11.25    4.832  0.74( 0.07) 0.10       8.6       4.00
     5       39.75   12.16    4.611  0.74( 0.07) 0.10       8.9      11.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      40.10    Tc(MIN.) =    10.27
  EFFECTIVE AREA(ACRES) =       8.12   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        8.9
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE      9.00 =    1272.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        8.9  TC(MIN.) =     10.27
  EFFECTIVE AREA(ACRES) =      8.12  AREA-AVERAGED Fm(INCH/HR)=  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =      40.10

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       39.86    9.42    5.377  0.74( 0.07) 0.10       7.7       7.00
     2       40.02    9.72    5.276  0.74( 0.07) 0.10       7.9      13.00
     3       40.10   10.27    5.105  0.74( 0.07) 0.10       8.1       1.00
     4       40.01   11.25    4.832  0.74( 0.07) 0.10       8.6       4.00
     5       39.75   12.16    4.611  0.74( 0.07) 0.10       8.9      11.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX C: PROPOSED HYDROGRAPH METHOD & BASIN ROUTING, 100 YEAR STORM FREQUENCY OUTPUT FILE.

```
 **************************************************************************
                      SMALL AREA UNIT HYDROGRAPH MODEL
 ==========================================================================
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                            Analysis prepared by:

                                 CA Engineering
                              13821 Newport Ave., Ste 110
                                   Tustin, Ca. 92780


 **************************************************************************
 --------------------------------------------------------------------------

  Problem Descriptions:

   2 Year Basin Routing

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


     RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
     TOTAL CATCHMENT AREA(ACRES) =    8.90
     SOIL-LOSS RATE, Fm,(INCH/HR) =  0.130
     LOW LOSS FRACTION = 0.490
     TIME OF CONCENTRATION(MIN.) = 10.77
     SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
     USER SPECIFIED RAINFALL VALUES ARE USED
     RETURN FREQUENCY(YEARS) =   2
        5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.18
       30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.47
        1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.71
        3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.35
        6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.99
       24-HOUR   POINT RAINFALL VALUE(INCHES) =  3.75

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

     TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.45
     TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     1.33

 **************************************************************************
   TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
  (HOURS)    (AF)      (CFS)
 --------------------------------------------------------------------------
   0.02      0.0000      0.00  Q         .         .         .         .
   0.20      0.0022      0.29  Q         .         .         .         .
   0.38      0.0065      0.29  Q         .         .         .         .
   0.56      0.0109      0.30  Q         .         .         .         .
   0.74      0.0153      0.30  Q         .         .         .         .
   0.92      0.0197      0.30  Q         .         .         .         .
   1.10      0.0242      0.30  Q         .         .         .         .
   1.28      0.0287      0.30  Q         .         .         .         .
   1.46      0.0332      0.31  Q         .         .         .         .
   1.64      0.0377      0.31  Q         .         .         .         .
```

1.82	0.0423	0.31	Q	.	.	.	.
2.00	0.0469	0.31	Q	.	.	.	.
2.18	0.0516	0.31	Q	.	.	.	.
2.36	0.0563	0.32	Q	.	.	.	.
2.54	0.0610	0.32	Q	.	.	.	.
2.72	0.0657	0.32	Q	.	.	.	.
2.90	0.0705	0.32	Q	.	.	.	.
3.08	0.0753	0.33	Q	.	.	.	.
3.26	0.0801	0.33	Q	.	.	.	.
3.43	0.0850	0.33	Q	.	.	.	.
3.61	0.0899	0.33	Q	.	.	.	.
3.79	0.0949	0.34	Q	.	.	.	.
3.97	0.0999	0.34	Q	.	.	.	.
4.15	0.1049	0.34	Q	.	.	.	.
4.33	0.1100	0.34	Q	.	.	.	.
4.51	0.1152	0.35	Q	.	.	.	.
4.69	0.1203	0.35	Q	.	.	.	.
4.87	0.1255	0.35	Q	.	.	.	.
5.05	0.1308	0.36	Q	.	.	.	.
5.23	0.1361	0.36	Q	.	.	.	.
5.41	0.1414	0.36	Q	.	.	.	.
5.59	0.1468	0.37	Q	.	.	.	.
5.77	0.1523	0.37	Q	.	.	.	.
5.95	0.1578	0.37	Q	.	.	.	.
6.13	0.1633	0.38	Q	.	.	.	.
6.31	0.1689	0.38	Q	.	.	.	.
6.49	0.1746	0.38	Q	.	.	.	.
6.67	0.1803	0.39	Q	.	.	.	.
6.85	0.1861	0.39	Q	.	.	.	.
7.02	0.1919	0.40	Q	.	.	.	.
7.20	0.1978	0.40	Q	.	.	.	.
7.38	0.2038	0.40	Q	.	.	.	.
7.56	0.2098	0.41	Q	.	.	.	.
7.74	0.2160	0.41	Q	.	.	.	.
7.92	0.2221	0.42	Q	.	.	.	.
8.10	0.2284	0.42	Q	.	.	.	.
8.28	0.2347	0.43	Q	.	.	.	.
8.46	0.2411	0.43	Q	.	.	.	.
8.64	0.2476	0.44	Q	.	.	.	.
8.82	0.2542	0.44	Q	.	.	.	.
9.00	0.2608	0.45	Q	.	.	.	.
9.18	0.2676	0.46	Q	.	.	.	.
9.36	0.2744	0.47	Q	.	.	.	.
9.54	0.2813	0.47	Q	.	.	.	.
9.72	0.2884	0.48	Q	.	.	.	.
9.90	0.2955	0.48	Q	.	.	.	.
10.08	0.3028	0.49	Q	.	.	.	.
10.26	0.3102	0.50	.Q	.	.	.	.
10.44	0.3177	0.51	.Q	.	.	.	.
10.61	0.3253	0.52	.Q	.	.	.	.
10.79	0.3331	0.53	.Q	.	.	.	.
10.97	0.3410	0.54	.Q	.	.	.	.
11.15	0.3491	0.55	.Q	.	.	.	.
11.33	0.3573	0.56	.Q	.	.	.	.
11.51	0.3657	0.57	.Q	.	.	.	.
11.69	0.3743	0.58	.Q	.	.	.	.
11.87	0.3830	0.60	.Q	.	.	.	.
12.05	0.3920	0.61	.Q	.	.	.	.
12.23	0.4022	0.77	.Q	.	.	.	.
12.41	0.4137	0.78	.Q	.	.	.	.
12.59	0.4254	0.80	.Q	.	.	.	.
12.77	0.4374	0.81	.Q	.	.	.	.
12.95	0.4496	0.84	.Q	.	.	.	.

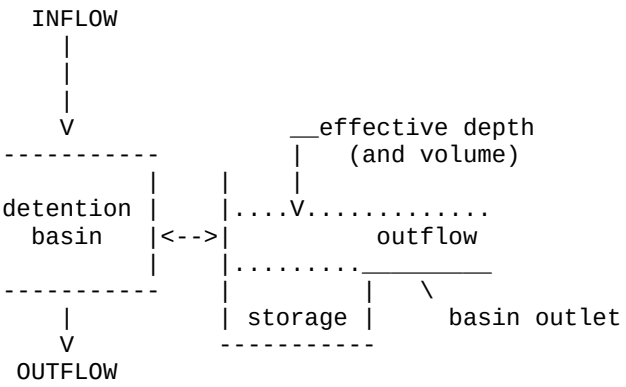
```
13.13      0.4622      0.85  .Q        .         .         .         .
13.31      0.4751      0.89  .Q        .         .         .         .
13.49      0.4884      0.90  .Q        .         .         .         .
13.67      0.5021      0.94  .Q        .         .         .         .
13.85      0.5162      0.96  .Q        .         .         .         .
14.03      0.5308      1.01  . Q       .         .         .         .
14.20      0.5462      1.06  . Q       .         .         .         .
14.38      0.5629      1.19  . Q       .         .         .         .
14.56      0.5810      1.25  . Q       .         .         .         .
14.74      0.6007      1.41  . Q       .         .         .         .
14.92      0.6224      1.51  .  Q      .         .         .         .
15.10      0.6465      1.74  .  Q      .         .         .         .
15.28      0.6735      1.89  .  Q      .         .         .         .
15.46      0.7051      2.36  .   Q     .         .         .         .
15.64      0.7427      2.70  .    Q    .         .         .         .
15.82      0.7873      3.31  .     Q   .         .         .         .
16.00      0.8444      4.39  .       Q .         .         .         .
16.18      0.9590     11.06  .         .         . Q       .         .
16.36      1.0640      3.10  .     Q   .         .         .         .
16.54      1.1024      2.07  .   Q     .         .         .         .
16.72      1.1298      1.62  .  Q      .         .         .         .
16.90      1.1516      1.33  . Q       .         .         .         .
17.08      1.1698      1.13  . Q       .         .         .         .
17.26      1.1855      0.98  .Q        .         .         .         .
17.44      1.1996      0.92  .Q        .         .         .         .
17.62      1.2129      0.87  .Q        .         .         .         .
17.80      1.2255      0.83  .Q        .         .         .         .
17.97      1.2375      0.79  .Q        .         .         .         .
18.15      1.2483      0.68  .Q        .         .         .         .
18.33      1.2577      0.59  .Q        .         .         .         .
18.51      1.2663      0.57  .Q        .         .         .         .
18.69      1.2745      0.54  .Q        .         .         .         .
18.87      1.2825      0.52  .Q        .         .         .         .
19.05      1.2901      0.51  .Q        .         .         .         .
19.23      1.2975      0.49  Q         .         .         .         .
19.41      1.3046      0.47  Q         .         .         .         .
19.59      1.3116      0.46  Q         .         .         .         .
19.77      1.3183      0.45  Q         .         .         .         .
19.95      1.3249      0.44  Q         .         .         .         .
20.13      1.3313      0.43  Q         .         .         .         .
20.31      1.3376      0.42  Q         .         .         .         .
20.49      1.3437      0.41  Q         .         .         .         .
20.67      1.3496      0.40  Q         .         .         .         .
20.85      1.3555      0.39  Q         .         .         .         .
21.03      1.3612      0.38  Q         .         .         .         .
21.21      1.3668      0.37  Q         .         .         .         .
21.39      1.3723      0.37  Q         .         .         .         .
21.56      1.3777      0.36  Q         .         .         .         .
21.74      1.3830      0.35  Q         .         .         .         .
21.92      1.3882      0.35  Q         .         .         .         .
22.10      1.3933      0.34  Q         .         .         .         .
22.28      1.3984      0.34  Q         .         .         .         .
22.46      1.4033      0.33  Q         .         .         .         .
22.64      1.4082      0.33  Q         .         .         .         .
22.82      1.4130      0.32  Q         .         .         .         .
23.00      1.4178      0.32  Q         .         .         .         .
23.18      1.4225      0.31  Q         .         .         .         .
23.36      1.4271      0.31  Q         .         .         .         .
23.54      1.4316      0.30  Q         .         .         .         .
23.72      1.4361      0.30  Q         .         .         .         .
23.90      1.4405      0.30  Q         .         .         .         .
24.08      1.4449      0.29  Q         .         .         .         .
24.26      1.4471      0.00  Q         .         .         .         .
```

Problem Descriptions:

==========

FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 10.770
DEAD STORAGE(AF) = 0.00
SPECIFIED DEAD STORAGE(AF) FILLED = 0.00
ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN = 0.00



DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 10

*BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	**	**BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	*
0.000	0.000	0.000**		1.000	0.058	0.491	*
2.000	0.158	0.491**		3.000	0.277	0.491	*
4.000	0.404	0.491**		5.000	0.543	0.491	*
6.000	0.676	0.491**		7.000	0.797	0.491	*
8.000	0.892	0.491**		9.000	0.948	0.491	*

BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:

INTERVAL NUMBER	DEPTH (FEET)	{S-O*DT/2} (ACRE-FEET)	{S+O*DT/2} (ACRE-FEET)
1	0.00	0.00000	0.00000
2	1.00	0.05469	0.06197
3	2.00	0.15433	0.16161
4	3.00	0.27308	0.28036
5	4.00	0.40035	0.40763
6	5.00	0.53933	0.54661
7	6.00	0.67276	0.68004
8	7.00	0.79377	0.80105
9	8.00	0.88793	0.89521
10	9.00	0.94417	0.95145

WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT INTERVAL(MIN.)

DETENTION BASIN ROUTING RESULTS:
NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES
OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE

AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	EFFECTIVE DEPTH(FT)	OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
0.024	0.000	0.00	0.00	0.00	0.000
0.204	0.000	0.29	0.07	0.02	0.004
0.383	0.000	0.29	0.13	0.05	0.008
0.563	0.000	0.30	0.19	0.08	0.011
0.742	0.000	0.30	0.24	0.10	0.014
0.922	0.000	0.30	0.28	0.13	0.016
1.101	0.000	0.30	0.32	0.15	0.019
1.281	0.000	0.30	0.35	0.17	0.021
1.460	0.000	0.31	0.39	0.18	0.023
1.640	0.000	0.31	0.41	0.20	0.024
1.819	0.000	0.31	0.44	0.21	0.026
1.999	0.000	0.31	0.46	0.22	0.027
2.178	0.000	0.31	0.48	0.23	0.028
2.358	0.000	0.32	0.50	0.24	0.029
2.537	0.000	0.32	0.52	0.25	0.030
2.717	0.000	0.32	0.54	0.26	0.031
2.896	0.000	0.32	0.55	0.27	0.032
3.076	0.000	0.33	0.56	0.27	0.033
3.255	0.000	0.33	0.58	0.28	0.034
3.435	0.000	0.33	0.59	0.29	0.034
3.614	0.000	0.33	0.60	0.29	0.035
3.794	0.000	0.34	0.61	0.30	0.035
3.973	0.000	0.34	0.62	0.30	0.036
4.153	0.000	0.34	0.63	0.31	0.037
4.332	0.000	0.34	0.64	0.31	0.037
4.512	0.000	0.35	0.64	0.31	0.038
4.691	0.000	0.35	0.65	0.32	0.038
4.871	0.000	0.35	0.66	0.32	0.038
5.050	0.000	0.36	0.67	0.33	0.039
5.230	0.000	0.36	0.67	0.33	0.039
5.409	0.000	0.36	0.68	0.33	0.040
5.589	0.000	0.37	0.69	0.34	0.040
5.768	0.000	0.37	0.70	0.34	0.041
5.948	0.000	0.37	0.70	0.34	0.041
6.127	0.000	0.38	0.71	0.35	0.041
6.307	0.000	0.38	0.72	0.35	0.042
6.486	0.000	0.38	0.73	0.35	0.042
6.666	0.000	0.39	0.73	0.36	0.043
6.845	0.000	0.39	0.74	0.36	0.043
7.025	0.000	0.40	0.75	0.37	0.044
7.204	0.000	0.40	0.76	0.37	0.044
7.384	0.000	0.40	0.76	0.37	0.045
7.563	0.000	0.41	0.77	0.38	0.045
7.743	0.000	0.41	0.78	0.38	0.046
7.922	0.000	0.42	0.79	0.39	0.046
8.102	0.000	0.42	0.80	0.39	0.047
8.281	0.000	0.43	0.81	0.39	0.047
8.461	0.000	0.43	0.82	0.40	0.048
8.641	0.000	0.44	0.83	0.40	0.048
8.820	0.000	0.44	0.83	0.41	0.049
8.999	0.000	0.45	0.85	0.41	0.049
9.179	0.000	0.46	0.86	0.42	0.050
9.359	0.000	0.47	0.87	0.42	0.051
9.538	0.000	0.47	0.88	0.43	0.051
9.717	0.000	0.48	0.89	0.43	0.052
9.897	0.000	0.48	0.90	0.44	0.053
10.076	0.000	0.49	0.91	0.45	0.053
10.256	0.000	0.50	0.93	0.45	0.054

10.436	0.000	0.51	0.94	0.46	0.055
10.615	0.000	0.52	0.95	0.46	0.056
10.794	0.000	0.53	0.97	0.47	0.056
10.974	0.000	0.54	0.98	0.48	0.057
11.153	0.000	0.55	1.00	0.49	0.058
11.333	0.000	0.56	1.01	0.49	0.059
11.512	0.000	0.57	1.02	0.49	0.060
11.692	0.000	0.58	1.04	0.49	0.062
11.872	0.000	0.60	1.05	0.49	0.063
12.051	0.000	0.61	1.07	0.49	0.065
12.231	0.000	0.77	1.11	0.49	0.069
12.410	0.000	0.78	1.15	0.49	0.074
12.589	0.000	0.80	1.20	0.49	0.078
12.769	0.000	0.81	1.25	0.49	0.083
12.948	0.000	0.84	1.30	0.49	0.088
13.128	0.000	0.85	1.35	0.49	0.094
13.307	0.000	0.89	1.41	0.49	0.099
13.487	0.000	0.90	1.47	0.49	0.105
13.667	0.000	0.94	1.54	0.49	0.112
13.846	0.000	0.96	1.61	0.49	0.119
14.025	0.000	1.01	1.69	0.49	0.127
14.205	0.000	1.06	1.77	0.49	0.135
14.385	0.000	1.19	1.88	0.49	0.146
14.564	0.000	1.25	1.99	0.49	0.157
14.743	0.000	1.41	2.11	0.49	0.171
14.923	0.000	1.51	2.23	0.49	0.186
15.102	0.000	1.74	2.39	0.49	0.204
15.282	0.000	1.89	2.57	0.49	0.225
15.462	0.000	2.36	2.80	0.49	0.253
15.641	0.000	2.70	3.07	0.49	0.286
15.820	0.000	3.31	3.40	0.49	0.328
16.000	0.000	4.39	3.85	0.49	0.385
16.180	0.000	11.06	4.99	0.49	0.542
16.359	0.000	3.10	5.28	0.49	0.581
16.538	0.000	2.07	5.46	0.49	0.604
16.718	0.000	1.62	5.59	0.49	0.621
16.897	0.000	1.33	5.68	0.49	0.633
17.077	0.000	1.13	5.75	0.49	0.643
17.257	0.000	0.98	5.80	0.49	0.650
17.436	0.000	0.92	5.85	0.49	0.657
17.616	0.000	0.87	5.89	0.49	0.662
17.795	0.000	0.83	5.93	0.49	0.667
17.974	0.000	0.79	5.96	0.49	0.672
18.154	0.000	0.68	5.98	0.49	0.674
18.333	0.000	0.59	6.00	0.49	0.676
18.513	0.000	0.57	6.00	0.49	0.677
18.693	0.000	0.54	6.01	0.49	0.678
18.872	0.000	0.52	6.02	0.49	0.678
19.052	0.000	0.51	**6.02**	0.49	0.678
19.231	0.000	0.49	6.02	0.49	0.678
19.410	0.000	0.47	6.01	0.49	0.678
19.590	0.000	0.46	6.01	0.49	0.678
19.770	0.000	0.45	6.01	0.49	0.677
19.949	0.000	0.44	6.00	0.49	0.676
20.128	0.000	0.43	5.99	0.49	0.675
20.308	0.000	0.42	5.98	0.49	0.674
20.487	0.000	0.41	5.97	0.49	0.673
20.667	0.000	0.40	5.96	0.49	0.672
20.847	0.000	0.39	5.95	0.49	0.670
21.026	0.000	0.38	5.94	0.49	0.669
21.205	0.000	0.37	5.93	0.49	0.667
21.385	0.000	0.37	5.91	0.49	0.665
21.565	0.000	0.36	5.90	0.49	0.663

21.744	0.000	0.35	5.88	0.49	0.661
21.924	0.000	0.35	5.87	0.49	0.659
22.103	0.000	0.34	5.85	0.49	0.657
22.283	0.000	0.34	5.83	0.49	0.654
22.462	0.000	0.33	5.82	0.49	0.652
22.642	0.000	0.33	5.80	0.49	0.650
22.821	0.000	0.32	5.78	0.49	0.647
23.000	0.000	0.32	5.76	0.49	0.644
23.180	0.000	0.31	5.74	0.49	0.642
23.360	0.000	0.31	5.72	0.49	0.639
23.539	0.000	0.30	5.70	0.49	0.636
23.719	0.000	0.30	5.68	0.49	0.634
23.898	0.000	0.30	5.66	0.49	0.631
24.078	0.000	0.29	5.64	0.49	0.628
24.257	0.000	0.00	5.58	0.49	0.620

APPENDIX D: STORAGE VOLUME & OUTFLOW CALCULATIONS AND Ybar CALCULATIONS

96" CMP STORAGE PIPE CALCULATIONS

VOLUME = 700 LF - 96" DIA. PIPE INF. FACILITY

INFILTRATION

INFILTRATION RATE - 3.03 "/HR (WQMP Worksheet H)

FACILITY AREA - 7000 SF

TOTAL INF. = 3.03"/HR*(1/3600 SEC/HR*1/12FT/IN)7000SF=0.491CFS

OUTLET		STORAGE			
HEAD (h)	OUTLET FLOW (cfs)	CF/LF	CF	AF	TOTAL
1	0.491	3.63	2541	0.05833	0.05833
2	1.491	6.20	4340	0.09963	0.15797
3	2.491	7.39	5173	0.11876	0.27672
4	3.491	7.92	5544	0.12727	0.40399
5	4.491	8.65	6054	0.13897	0.54297
6	5.491	8.30	5812	0.13344	0.67640
7	6.491	7.53	5271	0.12101	0.79741
8	7.491	5.86	4102	0.09416	0.89157
9	8.491	3.50	2450	0.05624	0.94781

ON -SITE YBAR CALCULATIONS

DEFINITIONS:

CN - CURVE NUMBER OF HYDRAULIC SOIL COVER
S - ESTIMATE OF TOTAL SOIL CAPACITY
Ia - INITIAL ABSTRACTION
Yj - 24-HR STORM RUNOFF YIELD FRACTION
Ybar - CATCHMENT LOW LOSS FRACTION

2 YEAR STORM						
P24 = 3.75 in.						
SUBAREA	**ACRES**	**CN**	**S**	**Ia**	**Yj**	**Yj*Aj**
A1	0.59	81	2.35	0.47	0.51	0.30
A2	0.7	81	2.35	0.47	0.51	0.36
A3	2.24	81	2.35	0.47	0.51	1.14
A4	4.54	81	2.35	0.47	0.51	2.32
A5	0.83	81	2.35	0.47	0.51	0.42
TOTAL	**8.9**					

Y=(∑Yj*Aj)/A Y= 0.51

Ybar=1-Y **Ybar= 0.49**

AMC II -CN=91.4 is Weighted Average for 10% Landscape and 90% Impervious Area - AMC I/ CN = 81

251-77 36" OVerflow Pipe
Worksheet for Circular Channel

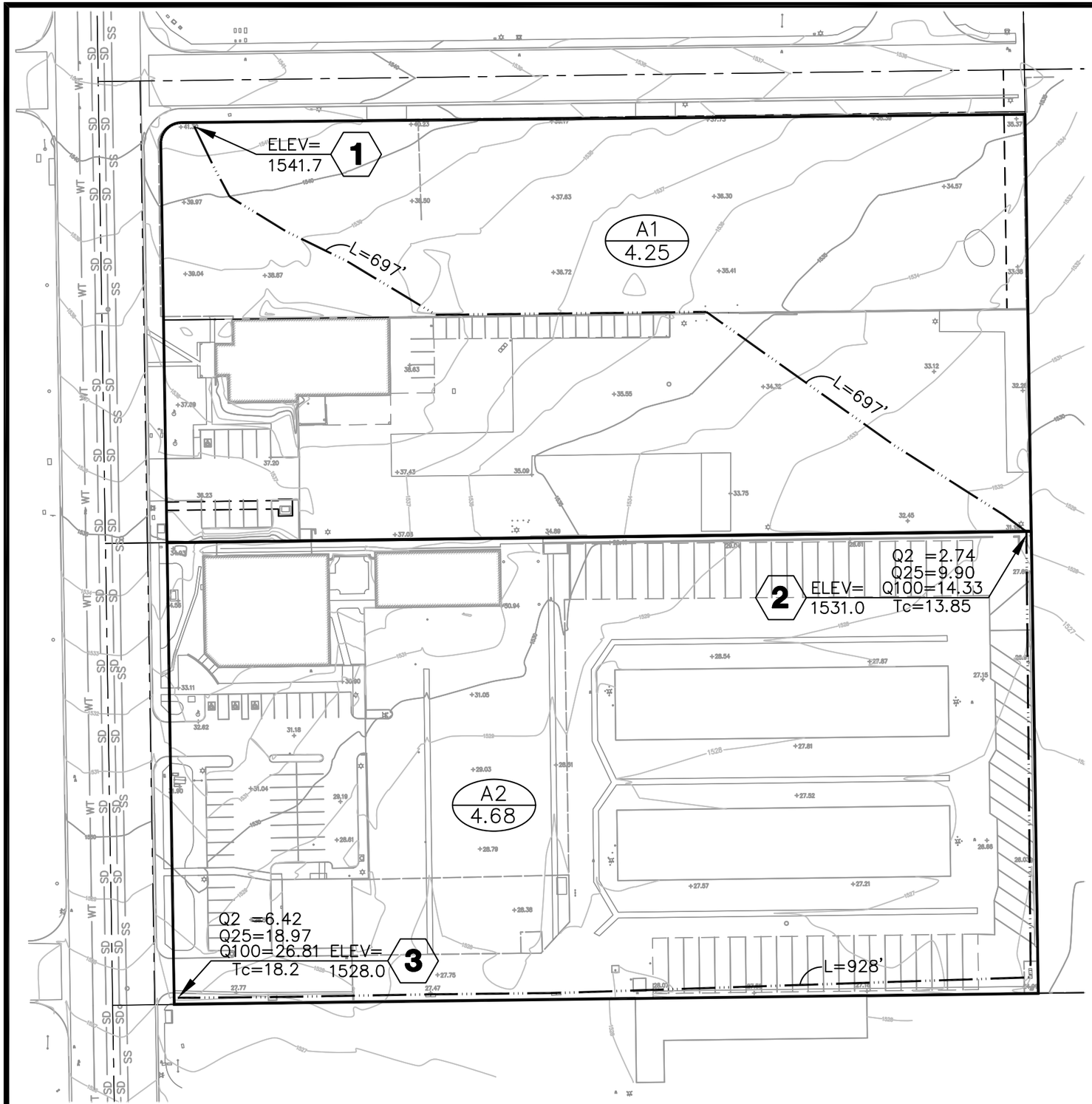
Project Description	
Project File	untitled.fm2
Worksheet	251-77
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.020000	ft/ft
Diameter	36.00	in
Discharge	40.10	cfs

Results		
Depth	1.37	ft
Flow Area	3.13	ft²
Wetted Perimeter	4.44	ft
Top Width	2.99	ft
Critical Depth	2.06	ft
Percent Full	45.53	
Critical Slope	0.005412	ft/ft
Velocity	12.80	ft/s
Velocity Head	2.55	ft
Specific Energy	3.91	ft
Froude Number	2.20	
Maximum Discharge	101.46	cfs
Full Flow Capacity	94.32	cfs
Full Flow Slope	0.003615	ft/ft
Flow is supercritical.		

EXHIBITS

EXHIBIT A: EXISTING CONDITION HYDROLOGY MAP



LEGEND:

SUBAREA BOUNDARY

L=205'

FLOWPATH

A2
1.83

SUBAREA DESIGNATION

TRIBUTARY AREA (AC.)

DISCHARGE AT NODE
(Q_2 cfs)/
(Q_{10} cfs)/
(Q_{100} cfs)

Q=13.41 EL=
Tc=11.37 527.8

4

NODE NUMBER

TIME OF CONCENTRATION (Tc)
FOR 100 YR STORM

F.S. ELEVATION
AT NODE(ft)

SOIL TYPE — A

ENTIRE SITE

NORTH

CA

0 80

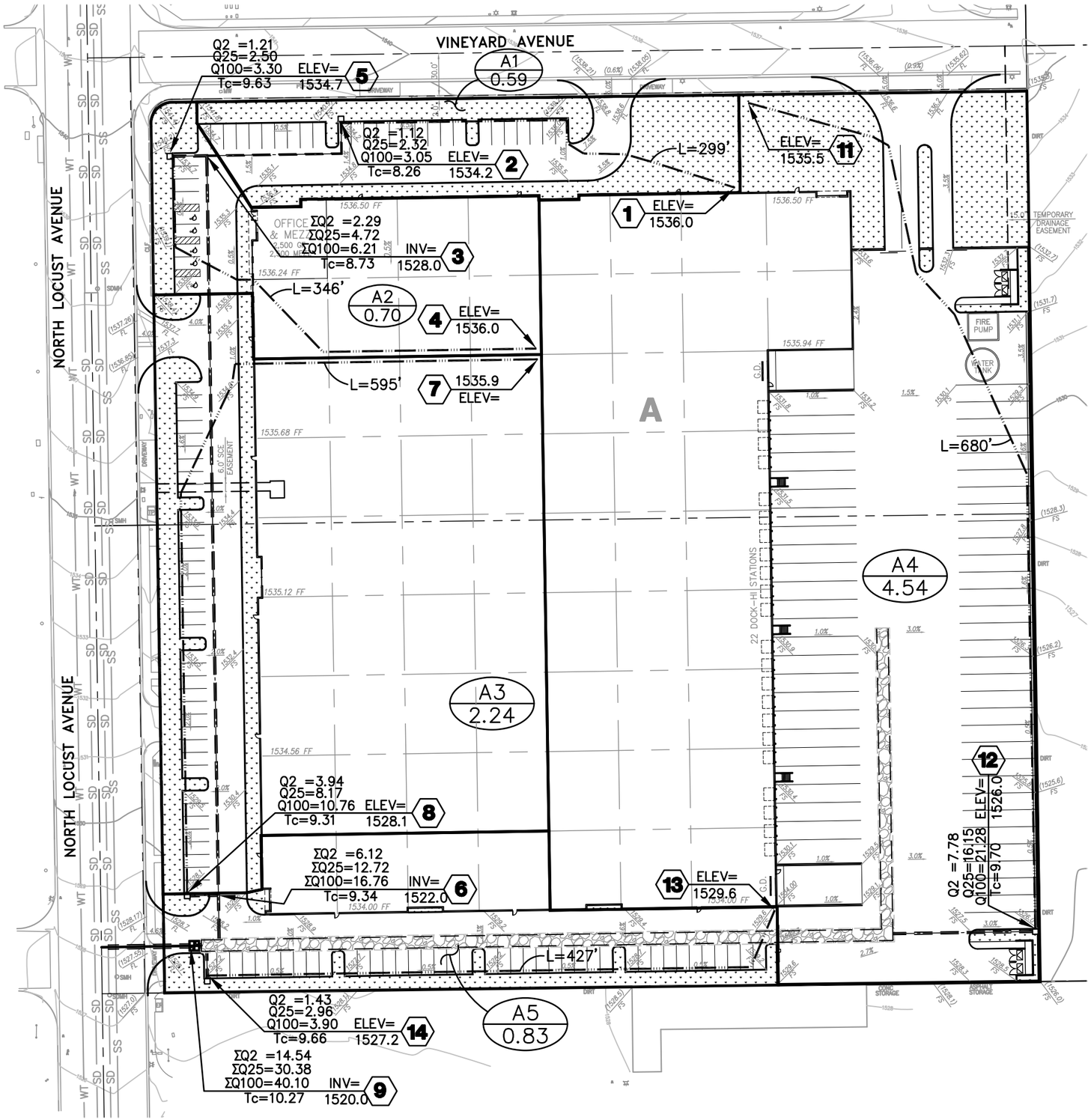
SCALE: 1"=80'

CITY OF RIALTO

HYDROLOGY MAP
(EXISTING CONDITION)

2223, 2271 N. LOCUST AVENUE
RIALTO, CA

EXHIBIT B: PROPOSED CONDITION HYDROLOGY MAP



LEGEND:

SUBAREA BOUNDARY

L=205' FLOWPATH

SUBAREA DESIGNATION

TRIBUTARY AREA (AC.)

DISCHARGE AT NODE
(Q_2 cfs)/
(Q_{10} cfs)/
(Q_{100} cfs)

Q=13.41 EL=
Tc=11.37 527.8

NODE NUMBER 4

TIME OF CONCENTRATION (Tc) FOR 100 YR STORM

F.S. ELEVATION AT NODE(ft)

SOIL TYPE → A

ENTIRE SITE

NORTH

CA

0 80

SCALE: 1"=80'

CITY OF RIALTO

HYDROLOGY MAP (PROPOSED CONDITION)

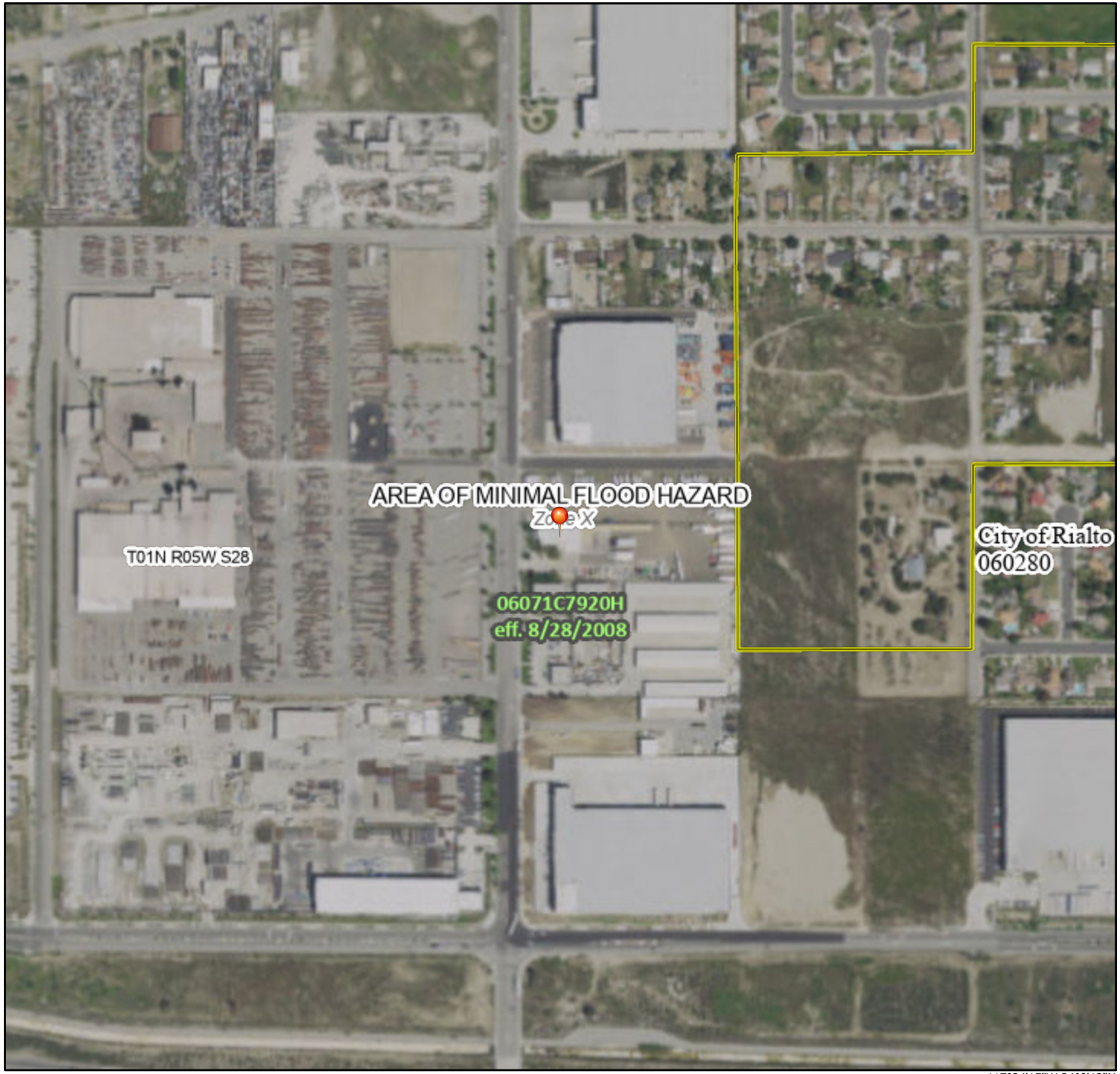
2223, 2271 N. LOCUST AVENUE RIALTO, CA

EXHIBIT C: FIRM MAP

National Flood Hazard Layer FIRMette

FEMA

117°24'52"W 34°8'42"N



117°24'15"W 34°8'12"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

2223 & 2271 N. Locust Ave., Rialto

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

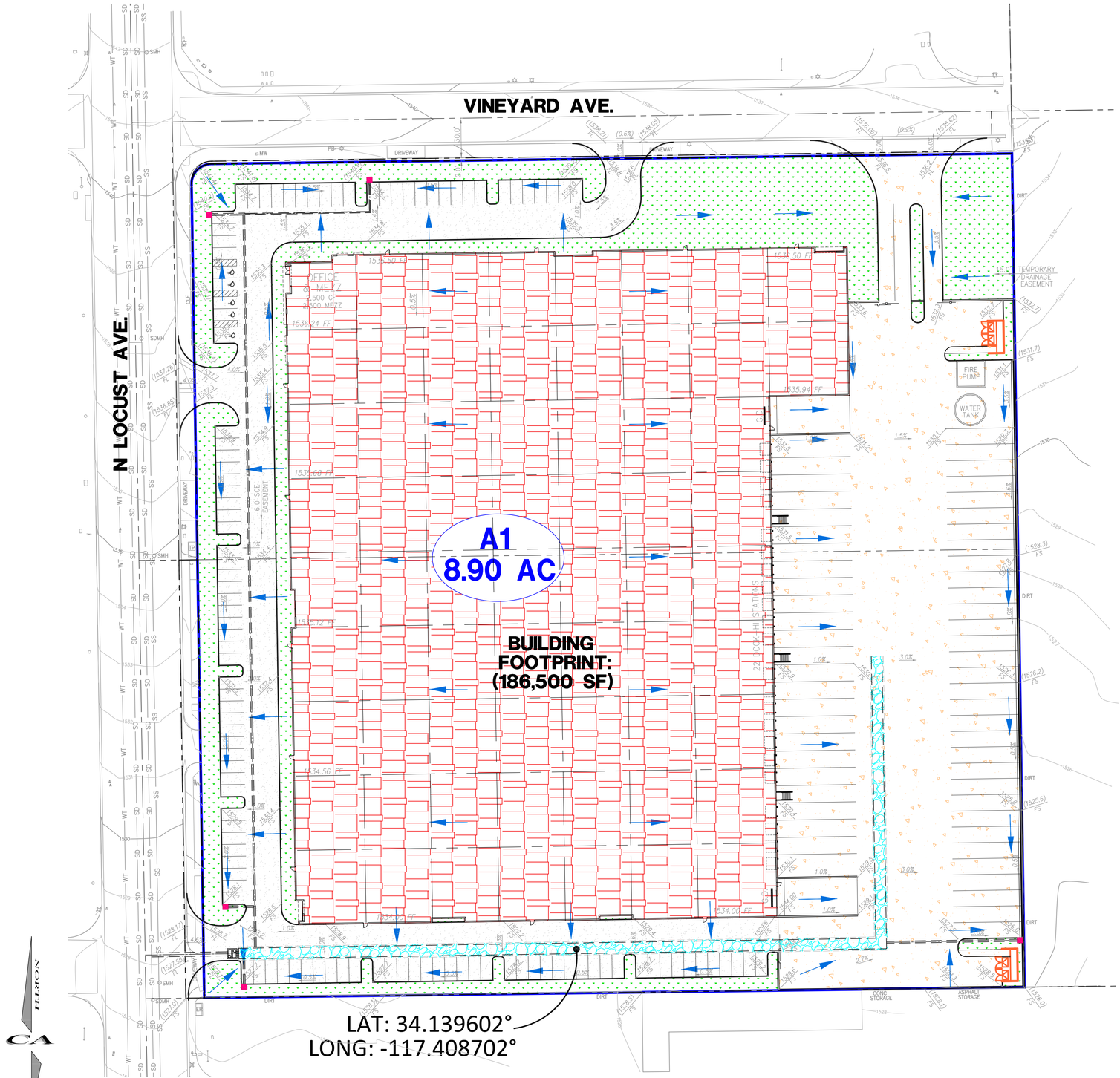
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/17/2022 at 6:35 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

EXHIBIT D: WQMP SITE PLAN

PRELIMINARY WQMP SITE PLAN

2223, 2271 N. LOCUST AVE.
RIALTO, CA



BMP LEGEND

- DRAINAGE AREAS — AREA 1
- FLOW DIRECTION
- UNDERGROUND INFILTRATION PIPE PER DETAIL HEREON
- LANDSCAPE AREA EFFICIENT IRRIGATION / LANDSCAPE AREA RUNOFF-MINIMIZING DESIGN
- PROPOSED BUILDING
- ASPHALT CONCRETE DRIVE AISLES
- CONCRETE HARDSCAPE
- CATCH BASIN WITH INSERT FILTER & STORM DRAIN STENCIL SIGNAGE
- TRASH ENCLOSURE

PROJECT DATA:

TOTAL SITE AREA OF PROPOSED DEVELOPMENT: 8.90 AC (387,755 SF)

BUILDING AREA: 186,500 SF
WALKWAYS / CONC. GUTTER / DOCK AREAS: 98,500 SF
DRIVEWAYS / DRIVE AISLES / PARKING AREAS: 53,259 SF

49,496 SF LANDSCAPING PROVIDED
(13% PERVIOUS AREA)

CURRENT USE: OFFICE/WAREHOUSE/STORAGE/VACANT
PROPOSED USE: INDUSTRIAL

WATERSHED:
SANTA ANA RIVER

WQMP DCV CALCULATION

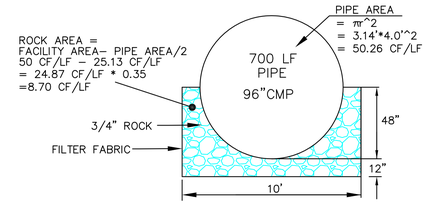
AREA 1

AREA – 8.90 AC (387,755 SF)
RUNOFF COEFFICIENT (87% IMPERVIOUS)
C = 0.858 * (.87)^3 –0.78 * (.87)^2 + 0.774 * (.87) + .04 = 0.688
2YR 1 HR STORM – 0.712 IN
P6 = 1.4807 * 0.712 = 1.054 IN
DCV = 387,756 SF * 0.688 * 1.054 IN / 12IN/FT * 1.963 = 45,997 CF

BMP VOLUME CALCULATION

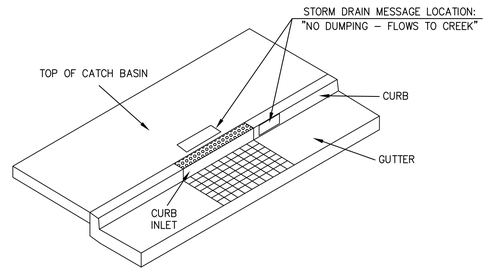
BMP VOLUME
PIPE CROSS SECTIONAL AREA = 50.26 CF/LF
ROCK CROSS SECTIONAL AREA = 24.87 CF/LF ROCK AREA * 0.35 = 8.70 CF/LF
TOTAL CROSS SECTIONAL AREA = 58.96 CF/LF * 700 LF = 41,272 CF
EFFECTIVE DEPTH = 41,272 CF / 7,000 SF BOTTOM = 5.90'

Vret = (Pdesign/12 * SAinf * Tfill) + (SAres * Dres * Nagg)
Pdesign = 6.05" MEASURED / 2.00 S.F. = 3.03"/HR
SAinf = 7,000 SF
SAres = 7,000 SF
Tfill = 3 HRS
Dres = EFFECTIVE DEPTH = 5.90'
Nagg = 1.0 (EFFECTIVE DEPTH ACCOUNTED FOR ROCK)
Vret = (3.03/12 * 7,000 * 3) + (7,000 * 5.90 * 1)
Vret = 46,603 CF
BMP VOLUME (46,603 CF) > DCV VOLUME (45,997 CF)



INFILTRATION BMP CROSS SECTION

SCALE: 1"=4'



STORM DRAIN STENCIL SIGNAGE – CURB INLET

NTS

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

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(714) 650-7111
CONTACT: MR. DANIEL RICKS

REGISTERED PROFESSIONAL ENGINEER FRED CORNWELL No. 45591 CIVIL STATE OF CALIFORNIA

FRED CORNWELL R.C.E. 45591 DATE

PREPARED BY:
CA ENGINEERING, INC.
Planning • Engineering • Surveying
13821 NEWPORT AVE., STE 110
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DATE	BY	REVISION

DATE
Jul 20 2022

JOB NO.
251-77

Sht. C-1