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Parcel Map 37944
LST20-0018

Preliminary Drainage Study
Compass Danbe Centerpointe
Proposed Industrial Warehouse Facility
APN 297-170-002 & 003
South Side of Alessandro Boulevard
City of Moreno Valley
February 3, 2021

PEN20-0120 & PEN20-0121

Prepared for/Applicant:

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Table of Contents

Introduction:

The project proposes to develop the currently vacant subject site. The development of the site includes relocating the existing property line through a Tentative Parcel Map to accommodate the proposed site layout. Each of the two proposed parcels will be developed with an industrial warehouse building. Parcel 1 will include a 295,031 square foot building, and Parcel 2 will include a 101,244 square foot building. The development also includes the construction of a parking lot, asphalt paving, perimeter landscaping, and other related improvements. Three driveways are proposed along Alessandro Boulevard to provide access to the parking and facilities for the two buildings. The purpose of this study is to analyze the pre-development and post-development flows and proposed drainage mitigation improvements.

Description:

The project site is currently approximately 17.67 net acres in size. The project site, APN 297-170-002 & 003, is located on the south side of Alessandro Boulevard in the middle of the block between Frederick Street, to the west, and Graham Street, to the east, in the City of Moreno Valley. The project proposes to dedicate areas for the use of public sidewalk proposed behind the three proposed driveways, which will drain to the street. The dedication will decrease the parcel size to 17.65 net acres. The existing property line between the two parcels will be relocated, per Tentative Parcel Map No. 37944. The site's westerly boundary is adjacent to APN 297-170-034, which is vacant. The site's northerly boundary is adjacent to the Alessandro Boulevard right of way. The site's easterly boundary is adjacent to APN 297-170-004, which is vacant. The site's southerly boundary is adjacent to APN 297-170-088 & 089, which is fully developed with industrial warehouse facilities.

The area south of the site (APN 297-170-088 & 089) consists of the aforementioned industrial warehouse facilities. The properties drain south; however, there is a portion of landscape that drains to the project site. This small area is included in the study.

The area west of the site (APN 297-170-034) is vacant. The property drains southeasterly and contributes minor tributary flows to the subject site. These flows are included in this study.

The area east of the site (APN 297-170-004) is vacant. The property drains southwesterly and contributes tributary flows to the subject site. These flows are included in this study.

Alessandro Boulevard is currently a partially improved roadway with a paved roadway, curb, gutter, and sidewalk along the north side. The street is divided by an existing raised center median. The south side of the street, adjacent to the project site, is currently unimproved. Flows from the south side of Alessandro Boulevard currently drain south onto the subject site, and these tributary flows are included in this study. The development proposes to improve Alessandro Boulevard across the project frontage with curb, gutter, and sidewalk. The improvements will nearly mirror the improvements on the north side of the street, which contains two separate catch basins. The improvements will include modified under sidewalk drains, which will allow street flows to enter a proposed bioretention swale sized for water quality treatment purposes. The proposed bioretention swales will discharge treated flows to two proposed catch basins connected to the City's storm drain system, which will be extended as part of this development. The two proposed catch basins will also act as an overflow for the bioretention swale.

The proposed development of the site includes the construction of two industrial warehouse buildings with related parking, paved access, and landscaping. Post-development flows from the property will be directed via sheet flow, ribbon gutter, curb and gutter, and an underground storm drain system to one of two proposed underground detention tanks onsite. A proposed sump and pump will pump flows from the detention tank to a proposed Modular Wetland biotreatment unit for water quality treatment. The Modular Wetland biotreatment units will discharge treated flows into a private storm drain system that is being installed as part of this development. Each of the two parcels will have its own Modular Wetlands unit and detention tank, and both are located on the south side of the proposed buildings. A separate proposed sump and pump will discharge flows in excess of water quality volumes from the detention tank to the aforementioned private storm drain system. There will be no increase in flows or intensity from historic storm events.

Offsite Drainage Impacts

As mentioned above, as part of this development, there will be improvements to the City's public storm drain facilities. There are currently two storm drain pipes that discharge flows from the north side of Alessandro Boulevard onto the subject site. The westerly line is known as "Line A," and the easterly line is known as "Line E." As part of the project, those two storm drain pipes will be improved, and two proposed catch basins will be installed on the south side of Alessandro Boulevard. The proposed catch basins will receive the flows conveyed by Line A and Line E and also intercept street flows adjacent to the project site via the bioretention swale mentioned above. From the two proposed catch basins, flows will be routed through the project site (separately) in a proposed storm drain and connect to Riverside County's future storm drain facilities

located in an existing storm drain easement on the two properties to the south (APN 297-170-088 & 089). Based on City Drawing No. 4-888, sheet 8A, the "Future Construction" drawing of Line A, preliminary calculations have been prepared to demonstrate how the line could be installed to accommodate the proposed development. According to the Hydrology Map prepared by Huitt-Zollars, Inc. in their report for Moreno Valley Centerpointe (Project No. 11-0244-01), the 100-year flow discharging from Line A is 78.84 CFS. Flows generated from the proposed street improvements would add an additional 3.09 CFS. Given the start and end inverts shown on sheet 8A, Drawing No. 4-888, a slope of 0.0069 ft/ft can be achieved by Line A (see Figure 5.2 for proposed Line A alignment). Therefore, a 42" pipe will be required to convey the 81.93 CFS through the site in Line A. According to the Hydrology Map prepared by Huitt-Zollars Inc., 100-year flows discharging from Line E are 32.01 CFS. Additional street flows adjacent to the project ad another 1.86 CFS. Based on the invert elevation of Line E shown on Drawing No. 4-992, sheet 3, and survey information of Line E discharging onto the north side of the project site, a pipe slope of 0.0170 ft/ft can be achieved by Line E (see Figure 5.2 for proposed Line E alignment). Therefore, a 30" pipe will be required to convey the 33.87 CFS through the site in Line E. Preliminary pipe sizing calculations for Line A and Line E are included in the appendix of this report (Figure 4.1 and 4.2).

The existing storm drain system, located south of the project site, is currently maintained by the City on an interim basis. As part of this project, the developer will be required to enter into a Cooperative Agreement with the City of Moreno Valley and Riverside County Flood Control & Water Conservation District for the future maintenance by Riverside County Flood Control & Water Conservation District of proposed storm drain Line "A" as well as the existing storm drain located on APN 297-170-088.

Purpose

The purpose of this study is to analyze the flows to and through the site, both pre-development and post-development. Further, the mitigation measures proposed will be discussed to demonstrate that the additional flows from the development will not have a negative impact on the downstream properties.

Analysis

To achieve the desired goal, the following steps will be taken:

1. Determine the 10 and 100 year pre-development flows. Note the pre-development flows currently drain southerly to three locations. A portion of the site flows south then west to APN 297-170-034. This area is denoted as Area A. Area B flows to an existing inlet structure located on the subject site (APN 291-170-002). The inlet structure will be removed as part of the expansion of the interim City's storm drain system. Area C and Area D flow to an existing inlet structure on APN 297-170-089.
2. Determine the 10 and 100 year post-development flows. Note the post-development analysis is broken up by drainage area. Area 0, Area 1, and Area 2 are located in Alessandro Boulevard, and flows from these areas will be directed to bioretention swales located within the right of way as previously discussed. Area 3 and Area 4 are directed to the proposed underground detention tank located in APN 297-170-002. Area 5, Area 6, and Area 7 are directed to the proposed underground detention tank in APN 297-170-003.
3. Identify the proposed mitigation and discuss the potential impacts the development of the site would have on the downstream properties.

Results

The 10 and 100 year pre-development flows were determined utilizing the Rational Method per Riverside County Hydrology Manual. AES 2016 Software was utilized for the calculations and they can be found in the appendix of this report. The variables used were:

Rainfall Values (per Duration Curves, Sunnymead - Moreno, Figure 4.1):

10-year storm 10-minute intensity = 1.65
10-year storm 60-minute intensity = 0.73
100-year storm 10-minute intensity = 2.72
100-year storm 60-minute intensity = 1.21

Soil Group: C (Figure 4.2)

1A. PRE-DEVELOPMENT FLOWS

AREA A

10-year peak flows: Q_{10} = 1.68 CFS
10-year time of concentration: Tc_{10}= 21.45 min
10-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (1.68cfs)(21.45min)(60min)(3/2) **= 3,244 cubic feet**
100-year peak flows: Q_{100} = 3.15 CFS
100-year time of concentration: Tc_{100}= 21.45min
100-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (3.15cfs)(21.45min)(60min)(3/2) **= 6,082 cubic feet**

AREA B

10-year peak flows: Q_{10} = 4.75 CFS
10-year time of concentration: Tc_{10}= 22.37 min
10-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (4.75cfs)(22.37min)(60min)(3/2) **= 9,564 cubic feet**

100-year peak flows: Q_{100} = 8.94 CFS
100-year time of concentration: Tc_{100}= 22.37min
100-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (8.94cfs)(22.37min)(60min)(3/2) **= 17,999 cubic feet**

AREA C & AREA D, CONFLUENCE @ NODE 6

10-year peak flows: Q_{10} = 7.71 CFS
10-year time of concentration: Tc_{10}= 28.56 min
10-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (7.71cfs)(28.56min)(60min)(3/2) **= 19,818 cubic feet**

100-year peak flows: Q_{100} = 14.67 CFS
100-year time of concentration: Tc_{100}= 28.56min
100-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (14.67cfs)(28.56min)(60min)(3/2) **= 37,708 cubic feet**

2A. POST-DEVELOPMENT FLOWS

AREA 0

10-year peak flows: Q_{10} = 0.94 CFS
10-year time of concentration: Tc_{10}= 9.81 min
10-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (0.94cfs)(9.81min)(60min)(3/2) **= 830 cubic feet**

100-year peak flows: Q_{100} = 1.55 CFS
100-year time of concentration: Tc_{100}= 9.81 min
100-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (1.55cfs)(9.81min)(60min)(3/2) **= 1,369 cubic feet**

AREA 1

10-year peak flows: Q_{10} = 0.93 CFS
10-year time of concentration: Tc_{10}= 10.02 min
10-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (0.93cfs)(10.02min)(60min)(3/2) **= 839 cubic feet**

100-year peak flows: Q_{100} = 1.54 CFS
100-year time of concentration: Tc_{100}= 10.02 min
100-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (1.54cfs)(10.02min)(60min)(3/2) **= 1,389 cubic feet**

AREA 2

10-year peak flows: Q_{10} = 1.13 CFS
10-year time of concentration: Tc_{10}= 10.74 min
10-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (1.13cfs)(10.74min)(60min)(3/2) **= 1,093 cubic feet**

100-year peak flows: Q_{100} = 1.86 CFS
100-year time of concentration: Tc_{100}= 10.74 min
100-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (1.86cfs)(10.74min)(60min)(3/2) **= 1,798 cubic feet**

AREA 3 & AREA 4, CONFLUENCE @ NODE 7

10-year peak flows: Q_{10} = 18.46 CFS
10-year time of concentration: Tc_{10}= 9.04 min
10-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (18.46cfs)(9.04min)(60min)(3/2) **= 15,020 cubic feet**

100-year peak flows: Q_{100} = 30.38 CFS
100-year time of concentration: Tc_{100}= 9.04 min
100-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (30.34cfs)(9.04min)(60min)(3/2) **= 24,685 cubic feet**

AREA 5, AREA 6, & AREA 7, CONFLUENCE @ NODE 10

10-year peak flows: Q_{10} = 8.24 CFS
10-year time of concentration: Tc_{10}= 10.12 min
10-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (8.24cfs)(10.12min)(60min)(3/2) **= 7,505 cubic feet**

100-year peak flows: Q_{100} = 13.77 CFS
100-year time of concentration: Tc_{100}= 10.12 min
100-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$
= (13.77cfs)(10.12min)(60min)(3/2) **= 12,542 cubic feet**

3. DRAINAGE IMPACTS

- Pre-development: A portion of the site currently drains to APN 297-170-034. The majority of the site drains south to the two existing inlet structures located near the southerly property line.
- Post-development: Flows from Alessandro Boulevard will be directed to a proposed bioretention swale for treatment, then to proposed catch basins that will connect to the city's storm drain. In the event of back to back 100-year storms, the proposed catch basins will capture flows not captured by the proposed bioretention swale. Pre-development flows going to APN 297-170-034 will be mitigated completely due to the development of the site.

  Onsite flows from the site will be directed to one of two proposed underground detention tanks. The required treatment volume will be pumped from the detention tank to a proposed Modular Wetlands unit for water quality treatment purposes. The modular wetlands will discharge treated flows to the private storm drain system. Flows in excess of the water quality treatment volumes will be pumped from the detention tank to the private storm drain system. The total capacity of the detention tank on Parcel 1 is 58,464 cubic feet. The total volume of water expected from a 100-year storm from Parcel 1 is 24,685 cubic feet, which is less than half of the capacity of the tank. The proposed tank will handle back to back 100-year storms, but in the event the basin reaches capacity, it will overflow via the proposed sump and pump to the private storm drain system.

  The total capacity of the detention tank on Parcel 2 is 24,394 cubic feet. The total volume of water expected from a 100-year storm from Parcel 2 is 12,542 cubic feet, which is slightly over half of the capacity of the system. The proposed tank will handle back to back 100-year storms, but in the event the basin reaches capacity, it will overflow via the proposed sump and pump to the city's storm drain. The table below summarizes pre development flows, which set the requirements for flows leaving the site post development.

	Pre-development
10-year flows	14.14 cfs
10-year volume	32,626 cubic feet
100-year flows	26.76 cfs
100-year volume	61,789 cubic feet

Conclusion

The increased post-development flow volumes from the development area will be contained within the proposed underground detention tanks. Treated flows and flows in excess of water quality treatment volumes will be discharged from the detention tanks to the private storm drain system at a rate equal to or less than the pre-development condition. Emergency overflow is provided for large back to back storms, which will leave the underground basin via sump and pump to the city's storm drain system, which is being expanded as part of this project. The post-development flow volumes allowed to enter APN 297-170-034 will be completely mitigated as a result of this development. Flows generated onsite from back to back 100-year storms will be contained within the proposed underground detention tanks. Therefore, there will be no increase in flows as a result of the proposed development.

The proposed storm drain Line "A" will connect to the future RCFC&WCD maintained Line "A", at the southwest corner of the project site, which is currently maintained on an interim basis by City and how the proposed private storm drain Line "E" will connect to the existing City maintained Line "E" located at the southeast corner of the project site.

Prepared By:

_____ _____

Rob Lane, E.I.T. 157676

Patrick C. Flanagan, Jr., P.E.
RCE 86046 Exp 9/30/22

APPENDIX

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1533

                          Analysis prepared by:

                   THATCHER ENGINEERING & ASSOCIATES, INC.
                        1461 FORD STREET, SUITE 105
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 ************************* DESCRIPTION OF STUDY *************************
* APN 297-170-002 & 003                                                 *
* PRE-DEVELOPMENT DRAINAGE STUDY                                        *
* 10-YEAR STORM EVENT                                                   *
 ************************************************************************

  FILE NAME: 162012PR.DAT
  TIME/DATE OF STUDY: 14:09 04/01/2020
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.650
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.734
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.720
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.210
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4520815
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4520759
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.741
  SLOPE OF INTENSITY DURATION CURVE = 0.4521
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *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.*

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   545.00
  UPSTREAM ELEVATION(FEET) =     82.50
  DOWNSTREAM ELEVATION(FEET) =     76.10
  ELEVATION DIFFERENCE(FEET) =      6.40
  TC = 0.709*[(  545.00**3)/(     6.40)]**.2 =   21.453
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.180
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5970
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.68
  TOTAL AREA(ACRES) =      2.38   TOTAL RUNOFF(CFS) =      1.68

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   689.00
  UPSTREAM ELEVATION(FEET) =     82.50
  DOWNSTREAM ELEVATION(FEET) =     72.00
  ELEVATION DIFFERENCE(FEET) =     10.50
  TC = 0.709*[(  689.00**3)/(    10.50)]**.2 =   22.366
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.158
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5932
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      4.75
  TOTAL AREA(ACRES) =      6.92   TOTAL RUNOFF(CFS) =      4.75

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   666.00
  UPSTREAM ELEVATION(FEET) =     81.50
  DOWNSTREAM ELEVATION(FEET) =     74.50
  ELEVATION DIFFERENCE(FEET) =      7.00
  TC = 0.709*[(  666.00**3)/(     7.00)]**.2 =   23.766
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.127
```

```
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5876
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =      1.74
 TOTAL AREA(ACRES) =      2.63   TOTAL RUNOFF(CFS) =      1.74

****************************************************************************
 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.) =   23.77
 RAINFALL INTENSITY(INCH/HR) =   1.13
 TOTAL STREAM AREA(ACRES) =     2.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.74

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =  1058.00
 UPSTREAM ELEVATION(FEET) =     83.00
 DOWNSTREAM ELEVATION(FEET) =     71.80
 ELEVATION DIFFERENCE(FEET) =     11.20
 TC = 0.709*[( 1058.00**3)/(    11.20)]**.2 =   28.559
   10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.037
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5705
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =      6.11
 TOTAL AREA(ACRES) =     10.33   TOTAL RUNOFF(CFS) =      6.11

****************************************************************************
 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.) =   28.56
 RAINFALL INTENSITY(INCH/HR) =   1.04
 TOTAL STREAM AREA(ACRES) =    10.33
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.11

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
    1         1.74    23.77        1.127         2.63
    2         6.11    28.56        1.037        10.33
```

```
**********WARNING**********
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
***************************************************************

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc       INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        6.83    23.77       1.127
     2        7.71    28.56       1.037

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       7.71   Tc(MIN.) =   28.56
 TOTAL AREA(ACRES) =       13.0
 LONGEST FLOWPATH FROM NODE      7.00 TO NODE      6.00 =    1058.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       13.0  TC(MIN.) =     28.56
 PEAK FLOW RATE(CFS)   =       7.71
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
       RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
        (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                  Release Date: 07/01/2016  License ID 1533

                          Analysis prepared by:

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                            REDLANDS, CA 92373
                 PHONE: (909) 748-7777   FAX: (909) 748-7776

 ************************* DESCRIPTION OF STUDY *************************
* APN 297-170-002 & 003                                                 *
* PRE-DEVELOPMENT DRAINAGE STUDY                                        *
* 100-YEAR STORM EVENT                                                  *
 ************************************************************************

  FILE NAME: 162012PR.DAT
  TIME/DATE OF STUDY: 14:10 04/01/2020
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.650
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.734
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.720
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.210
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4520815
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4520759
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.210
  SLOPE OF INTENSITY DURATION CURVE = 0.4521
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *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.*

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   545.00
  UPSTREAM ELEVATION(FEET) =     82.50
  DOWNSTREAM ELEVATION(FEET) =     76.10
  ELEVATION DIFFERENCE(FEET) =      6.40
  TC = 0.709*[(  545.00**3)/(     6.40)]**.2 =   21.453
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.926
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6865
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      3.15
  TOTAL AREA(ACRES) =      2.38   TOTAL RUNOFF(CFS) =      3.15

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   689.00
  UPSTREAM ELEVATION(FEET) =     82.50
  DOWNSTREAM ELEVATION(FEET) =     72.00
  ELEVATION DIFFERENCE(FEET) =     10.50
  TC = 0.709*[(  689.00**3)/(    10.50)]**.2 =   22.366
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.890
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6834
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      8.94
  TOTAL AREA(ACRES) =      6.92   TOTAL RUNOFF(CFS) =      8.94

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   666.00
  UPSTREAM ELEVATION(FEET) =     81.50
  DOWNSTREAM ELEVATION(FEET) =     74.50
  ELEVATION DIFFERENCE(FEET) =      7.00
  TC = 0.709*[(  666.00**3)/(     7.00)]**.2 =   23.766
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.839
```

```
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6789
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =      3.28
 TOTAL AREA(ACRES) =      2.63   TOTAL RUNOFF(CFS) =      3.28

****************************************************************************
 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.) =   23.77
 RAINFALL INTENSITY(INCH/HR) =   1.84
 TOTAL STREAM AREA(ACRES) =     2.63
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.28

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      6.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =  1058.00
 UPSTREAM ELEVATION(FEET) =     83.00
 DOWNSTREAM ELEVATION(FEET) =     71.80
 ELEVATION DIFFERENCE(FEET) =     11.20
 TC = 0.709*[( 1058.00**3)/(    11.20)]**.2 =   28.559
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.693
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6647
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =     11.62
 TOTAL AREA(ACRES) =     10.33   TOTAL RUNOFF(CFS) =     11.62

****************************************************************************
 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.) =   28.56
 RAINFALL INTENSITY(INCH/HR) =   1.69
 TOTAL STREAM AREA(ACRES) =    10.33
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.62

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
    1         3.28    23.77        1.839         2.63
    2        11.62    28.56        1.693        10.33
```

```
**********WARNING**********
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
**********

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1        12.96    23.77       1.839
    2        14.64    28.56       1.693

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      14.64   Tc(MIN.) =   28.56
 TOTAL AREA(ACRES) =       13.0
 LONGEST FLOWPATH FROM NODE      7.00 TO NODE      6.00 =    1058.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       13.0  TC(MIN.) =     28.56
 PEAK FLOW RATE(CFS)   =      14.64
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
       RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1533

                          Analysis prepared by:

                  THATCHER ENGINEERING & ASSOCIATES, INC.
                       1461 FORD STREET, SUITE 105
                           REDLANDS, CA 92373
                PHONE: (909) 748-7777   FAX: (909) 748-7776

 ************************* DESCRIPTION OF STUDY *************************
* APN 297-170-002 & 003                                                 *
* POST-DEVELOPMENT DRAINAGE STUDY                                       *
* 10-YEAR STORM EVENT                                                   *
 *************************************************************************

  FILE NAME: 162012PO.DAT
  TIME/DATE OF STUDY: 11:31 07/13/2020
-------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
-------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.650
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.734
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.720
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.210
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4520815
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4520759
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.741
  SLOPE OF INTENSITY DURATION CURVE = 0.4521
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *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.*

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   427.00
  UPSTREAM ELEVATION(FEET) =     83.00
  DOWNSTREAM ELEVATION(FEET) =     80.80
  ELEVATION DIFFERENCE(FEET) =      2.20
  TC = 0.303*[(  427.00**3)/(     2.20)]**.2 =    9.803
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.682
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8764
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.94
  TOTAL AREA(ACRES) =      0.64   TOTAL RUNOFF(CFS) =      0.94

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.00 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.) =    9.80
  RAINFALL INTENSITY(INCH/HR) =   1.68
  TOTAL STREAM AREA(ACRES) =     0.64
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.94

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   443.00
  UPSTREAM ELEVATION(FEET) =     83.00
  DOWNSTREAM ELEVATION(FEET) =     80.80
  ELEVATION DIFFERENCE(FEET) =      2.20
  TC = 0.303*[(  443.00**3)/(     2.20)]**.2 =   10.022
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.665
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8762
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      0.93
  TOTAL AREA(ACRES) =      0.64   TOTAL RUNOFF(CFS) =      0.93

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.00 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.) =   10.02
  RAINFALL INTENSITY(INCH/HR) =   1.66
  TOTAL STREAM AREA(ACRES) =     0.64
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.93

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        0.94      9.80       1.682         0.64
      2        0.93     10.02       1.665         0.64

 **********************************WARNING***********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
      1        1.86      9.80       1.682
      2        1.87     10.02       1.665

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.86   Tc(MIN.) =    9.80
  TOTAL AREA(ACRES) =        1.3
  LONGEST FLOWPATH FROM NODE      3.00 TO NODE      2.00 =     443.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   551.00
  UPSTREAM ELEVATION(FEET) =     83.00
  DOWNSTREAM ELEVATION(FEET) =     80.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.303*[(  551.00**3)/(     3.00)]**.2 =   10.736
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.614
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8756
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.13
```

```
 TOTAL AREA(ACRES) =      0.80   TOTAL RUNOFF(CFS) =      1.13

****************************************************************************
 FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   622.00
 UPSTREAM ELEVATION(FEET) =     82.20
 DOWNSTREAM ELEVATION(FEET) =     72.00
 ELEVATION DIFFERENCE(FEET) =     10.20
 TC = 0.303*[(  622.00**3)/(    10.20)]**.2 =    9.039
   10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.744
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8770
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =     10.22
 TOTAL AREA(ACRES) =      6.68   TOTAL RUNOFF(CFS) =     10.22

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 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.) =    9.04
 RAINFALL INTENSITY(INCH/HR) =   1.74
 TOTAL STREAM AREA(ACRES) =     6.68
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.22

****************************************************************************
 FLOW PROCESS FROM NODE      8.00 TO NODE      7.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   637.00
 UPSTREAM ELEVATION(FEET) =     80.50
 DOWNSTREAM ELEVATION(FEET) =     73.50
 ELEVATION DIFFERENCE(FEET) =      7.00
 TC = 0.303*[(  637.00**3)/(     7.00)]**.2 =    9.887
   10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.675
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8763
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =      9.01
 TOTAL AREA(ACRES) =      6.14   TOTAL RUNOFF(CFS) =      9.01

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 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.) =    9.89
  RAINFALL INTENSITY(INCH/HR) =   1.68
  TOTAL STREAM AREA(ACRES) =     6.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.01

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       10.22     9.04        1.744          6.68
      2        9.01     9.89        1.675          6.14

 **********************************WARNING**********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ***************************************************************************

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
      1       18.46     9.04        1.744
      2       18.83     9.89        1.675

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      18.46   Tc(MIN.) =    9.04
  TOTAL AREA(ACRES) =       12.8
  LONGEST FLOWPATH FROM NODE      8.00 TO NODE      7.00 =     637.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   704.00
  UPSTREAM ELEVATION(FEET) =     80.20
  DOWNSTREAM ELEVATION(FEET) =     71.80
  ELEVATION DIFFERENCE(FEET) =      8.40
  TC = 0.303*[(  704.00**3)/(     8.40)]**.2 =   10.122
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.657
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8761
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      4.27
```

```
 TOTAL AREA(ACRES) =      2.94   TOTAL RUNOFF(CFS) =      4.27

****************************************************************************
 FLOW PROCESS FROM NODE     10.00 TO NODE     10.00 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.) =   10.12
 RAINFALL INTENSITY(INCH/HR) =   1.66
 TOTAL STREAM AREA(ACRES) =     2.94
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.27

****************************************************************************
 FLOW PROCESS FROM NODE     11.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   705.00
 UPSTREAM ELEVATION(FEET) =     81.20
 DOWNSTREAM ELEVATION(FEET) =     10.10
 ELEVATION DIFFERENCE(FEET) =     71.10
 TC = 0.303*[(  705.00**3)/(    71.10)]**.2 =    6.609
   10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.010
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8793
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =      3.76
 TOTAL AREA(ACRES) =      2.13   TOTAL RUNOFF(CFS) =      3.76

****************************************************************************
 FLOW PROCESS FROM NODE     10.00 TO NODE     10.00 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.) =    6.61
 RAINFALL INTENSITY(INCH/HR) =   2.01
 TOTAL STREAM AREA(ACRES) =     2.13
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.76

****************************************************************************
 FLOW PROCESS FROM NODE     12.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   695.00
```

```
 UPSTREAM ELEVATION(FEET) =      81.50
 DOWNSTREAM ELEVATION(FEET) =     71.20
 ELEVATION DIFFERENCE(FEET) =     10.30
 TC = 0.709*[(  695.00**3)/(    10.30)]**.2 =   22.569
   10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.153
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5924
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =      1.94
 TOTAL AREA(ACRES) =      2.84   TOTAL RUNOFF(CFS) =      1.94

****************************************************************************
 FLOW PROCESS FROM NODE     10.00 TO NODE     10.00 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.) =   22.57
 RAINFALL INTENSITY(INCH/HR) =   1.15
 TOTAL STREAM AREA(ACRES) =     2.84
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.94

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        4.27     10.12        1.657         2.94
     2        3.76      6.61        2.010         2.13
     3        1.94     22.57        1.153         2.84

 **********************************WARNING***********************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        7.12      6.61       2.010
     2        8.24     10.12       1.657
     3        7.07     22.57       1.153

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       8.24   Tc(MIN.) =   10.12
 TOTAL AREA(ACRES) =        7.9
 LONGEST FLOWPATH FROM NODE     11.00 TO NODE     10.00 =     705.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        7.9  TC(MIN.) =     10.12
 PEAK FLOW RATE(CFS)   =       8.24
```

Figure 2.1

END OF RATIONAL METHOD ANALYSIS

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
       RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
        (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                 Release Date: 07/01/2016  License ID 1533

                          Analysis prepared by:

                  THATCHER ENGINEERING & ASSOCIATES, INC.
                        1461 FORD STREET, SUITE 105
                            REDLANDS, CA 92373
                PHONE: (909) 748-7777   FAX: (909) 748-7776

 ************************* DESCRIPTION OF STUDY *************************
* APN 297-170-002 & 003                                                 *
* POST-DEVELOPMENT DRAINAGE STUDY                                       *
* 100-YEAR STORM EVENT                                                  *
 *************************************************************************

  FILE NAME: 162012PO.DAT
  TIME/DATE OF STUDY: 11:32 07/13/2020
-------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
-------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   3.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  1.650
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.734
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.720
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.210
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4520815
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4520759
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.210
  SLOPE OF INTENSITY DURATION CURVE = 0.4521
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *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.*

****************************************************************************
  FLOW PROCESS FROM NODE       1.00 TO NODE       2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   427.00
  UPSTREAM ELEVATION(FEET) =     83.00
  DOWNSTREAM ELEVATION(FEET) =     80.80
  ELEVATION DIFFERENCE(FEET) =      2.20
  TC = 0.303*[(  427.00**3)/(     2.20)]**.2 =    9.803
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.745
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8839
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.55
  TOTAL AREA(ACRES) =      0.64   TOTAL RUNOFF(CFS) =      1.55

****************************************************************************
  FLOW PROCESS FROM NODE       2.00 TO NODE       2.00 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.) =    9.80
  RAINFALL INTENSITY(INCH/HR) =   2.74
  TOTAL STREAM AREA(ACRES) =     0.64
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.55

****************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   443.00
  UPSTREAM ELEVATION(FEET) =     83.00
  DOWNSTREAM ELEVATION(FEET) =     80.80
  ELEVATION DIFFERENCE(FEET) =      2.20
  TC = 0.303*[(  443.00**3)/(     2.20)]**.2 =   10.022
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.717
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8837
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.54
  TOTAL AREA(ACRES) =      0.64   TOTAL RUNOFF(CFS) =      1.54

****************************************************************************
  FLOW PROCESS FROM NODE       2.00 TO NODE       2.00 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.) =   10.02
  RAINFALL INTENSITY(INCH/HR) =   2.72
  TOTAL STREAM AREA(ACRES) =     0.64
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.54

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.55     9.80        2.745          0.64
      2        1.54    10.02        2.717          0.64

 **********************************WARNING***********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
      1        3.06     9.80        2.745
      2        3.07    10.02        2.717

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.06   Tc(MIN.) =    9.80
  TOTAL AREA(ACRES) =        1.3
  LONGEST FLOWPATH FROM NODE      3.00 TO NODE      2.00 =     443.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   551.00
  UPSTREAM ELEVATION(FEET) =     83.00
  DOWNSTREAM ELEVATION(FEET) =     80.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  TC = 0.303*[(  551.00**3)/(     3.00)]**.2 =   10.736
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.634
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8833
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      1.86
```

```
 TOTAL AREA(ACRES) =      0.80   TOTAL RUNOFF(CFS) =      1.86

****************************************************************************
 FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   622.00
 UPSTREAM ELEVATION(FEET) =     82.20
 DOWNSTREAM ELEVATION(FEET) =     72.00
 ELEVATION DIFFERENCE(FEET) =     10.20
 TC = 0.303*[(  622.00**3)/(    10.20)]**.2 =    9.039
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.847
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8844
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =     16.82
 TOTAL AREA(ACRES) =      6.68   TOTAL RUNOFF(CFS) =     16.82

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 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.) =    9.04
 RAINFALL INTENSITY(INCH/HR) =   2.85
 TOTAL STREAM AREA(ACRES) =     6.68
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     16.82

****************************************************************************
 FLOW PROCESS FROM NODE      8.00 TO NODE      7.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   637.00
 UPSTREAM ELEVATION(FEET) =     80.50
 DOWNSTREAM ELEVATION(FEET) =     73.50
 ELEVATION DIFFERENCE(FEET) =      7.00
 TC = 0.303*[(  637.00**3)/(     7.00)]**.2 =    9.887
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.734
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8838
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =     14.84
 TOTAL AREA(ACRES) =      6.14   TOTAL RUNOFF(CFS) =     14.84

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 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.) =    9.89
  RAINFALL INTENSITY(INCH/HR) =   2.73
  TOTAL STREAM AREA(ACRES) =     6.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     14.84

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       16.82     9.04        2.847          6.68
      2       14.84     9.89        2.734          6.14

 **********************************WARNING***********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
      1       30.38     9.04        2.847
      2       30.99     9.89        2.734

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      30.38   Tc(MIN.) =    9.04
  TOTAL AREA(ACRES) =       12.8
  LONGEST FLOWPATH FROM NODE      8.00 TO NODE      7.00 =     637.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   704.00
  UPSTREAM ELEVATION(FEET) =     80.20
  DOWNSTREAM ELEVATION(FEET) =     71.80
  ELEVATION DIFFERENCE(FEET) =      8.40
  TC = 0.303*[(  704.00**3)/(     8.40)]**.2 =   10.122
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.705
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8837
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      7.03
```

```
 TOTAL AREA(ACRES) =      2.94   TOTAL RUNOFF(CFS) =      7.03

****************************************************************************
 FLOW PROCESS FROM NODE     10.00 TO NODE     10.00 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.) =   10.12
 RAINFALL INTENSITY(INCH/HR) =   2.71
 TOTAL STREAM AREA(ACRES) =     2.94
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.03

****************************************************************************
 FLOW PROCESS FROM NODE     11.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS COMMERCIAL
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   705.00
 UPSTREAM ELEVATION(FEET) =     81.20
 DOWNSTREAM ELEVATION(FEET) =     10.10
 ELEVATION DIFFERENCE(FEET) =     71.10
 TC = 0.303*[(  705.00**3)/(    71.10)]**.2 =    6.609
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.280
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8861
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =      6.19
 TOTAL AREA(ACRES) =      2.13   TOTAL RUNOFF(CFS) =      6.19

****************************************************************************
 FLOW PROCESS FROM NODE     10.00 TO NODE     10.00 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.) =    6.61
 RAINFALL INTENSITY(INCH/HR) =   3.28
 TOTAL STREAM AREA(ACRES) =     2.13
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.19

****************************************************************************
 FLOW PROCESS FROM NODE     12.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS: UNDEVELOPED WITH FAIR COVER
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   695.00
```

```
 UPSTREAM ELEVATION(FEET) =     81.50
 DOWNSTREAM ELEVATION(FEET) =     71.20
 ELEVATION DIFFERENCE(FEET) =     10.30
 TC = 0.709*[(  695.00**3)/(    10.30)]**.2 =   22.569
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.883
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6828
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =      3.65
 TOTAL AREA(ACRES) =      2.84   TOTAL RUNOFF(CFS) =      3.65

****************************************************************************
 FLOW PROCESS FROM NODE     10.00 TO NODE     10.00 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.) =   22.57
 RAINFALL INTENSITY(INCH/HR) =   1.88
 TOTAL STREAM AREA(ACRES) =     2.84
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.65

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        7.03    10.12        2.705          2.94
     2        6.19     6.61        3.280          2.13
     3        3.65    22.57        1.883          2.84

 **********************************WARNING***********************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       11.85     6.61       3.280
     2       13.77    10.12       2.705
     3       12.09    22.57       1.883

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      13.77   Tc(MIN.) =   10.12
 TOTAL AREA(ACRES) =        7.9
 LONGEST FLOWPATH FROM NODE     11.00 TO NODE     10.00 =     705.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        7.9  TC(MIN.) =     10.12
 PEAK FLOW RATE(CFS)   =      13.77
```

Figure 2.2
Page 7 of 8

==========

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END OF RATIONAL METHOD ANALYSIS

NOAA Atlas 14, Volume 6, Version 2
Location name: Moreno Valley, California, USA*
Latitude: 33.9159°, Longitude: -117.2492°
Elevation: 1566.65 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/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.06 (0.876-1.27)	1.42 (1.18-1.72)	1.90 (1.57-2.30)	2.30 (1.90-2.82)	2.87 (2.28-3.64)	3.32 (2.59-4.31)	3.79 (2.88-5.04)	4.30 (3.17-5.88)	4.99 (3.53-7.14)	5.56 (3.78-8.23)
10-min	0.756 (0.630-0.918)	1.01 (0.846-1.23)	1.36 (1.13-1.65)	1.65 (1.36-2.02)	2.06 (1.64-2.61)	2.38 (1.85-3.08)	2.72 (2.06-3.61)	3.07 (2.27-4.21)	3.58 (2.53-5.11)	3.98 (2.71-5.90)
15-min	0.608 (0.508-0.740)	0.816 (0.680-0.988)	1.10 (0.912-1.33)	1.33 (1.10-1.63)	1.66 (1.32-2.10)	1.92 (1.50-2.49)	2.19 (1.66-2.91)	2.48 (1.83-3.40)	2.88 (2.04-4.12)	3.21 (2.19-4.76)
30-min	0.480 (0.400-0.580)	0.642 (0.536-0.778)	0.862 (0.716-1.05)	1.05 (0.862-1.28)	1.30 (1.04-1.65)	1.51 (1.18-1.96)	1.72 (1.31-2.29)	1.95 (1.44-2.67)	2.27 (1.60-3.24)	2.52 (1.72-3.74)
60-min	0.337 (0.281-0.408)	0.451 (0.376-0.546)	0.605 (0.503-0.735)	0.734 (0.605-0.900)	0.915 (0.729-1.16)	1.06 (0.825-1.37)	1.21 (0.918-1.61)	1.37 (1.01-1.87)	1.59 (1.13-2.28)	1.77 (1.21-2.63)
2-hr	0.246 (0.206-0.298)	0.321 (0.268-0.389)	0.420 (0.350-0.511)	0.503 (0.414-0.616)	0.616 (0.491-0.782)	0.706 (0.550-0.914)	0.796 (0.605-1.06)	0.892 (0.658-1.22)	1.02 (0.722-1.46)	1.13 (0.768-1.67)
3-hr	0.201 (0.168-0.243)	0.260 (0.217-0.315)	0.338 (0.281-0.411)	0.402 (0.331-0.493)	0.490 (0.390-0.621)	0.558 (0.435-0.723)	0.627 (0.477-0.834)	0.700 (0.516-0.958)	0.799 (0.564-1.14)	0.876 (0.597-1.30)
6-hr	0.139 (0.116-0.169)	0.179 (0.149-0.217)	0.231 (0.193-0.281)	0.274 (0.226-0.336)	0.332 (0.265-0.422)	0.377 (0.294-0.489)	0.422 (0.321-0.562)	0.469 (0.346-0.642)	0.532 (0.376-0.761)	0.581 (0.396-0.862)
12-hr	0.090 (0.075-0.108)	0.116 (0.097-0.141)	0.151 (0.126-0.184)	0.180 (0.148-0.220)	0.218 (0.174-0.277)	0.248 (0.193-0.321)	0.277 (0.211-0.369)	0.308 (0.227-0.422)	0.349 (0.247-0.499)	0.381 (0.260-0.565)
24-hr	0.058 (0.051-0.067)	0.077 (0.068-0.088)	0.101 (0.089-0.117)	0.121 (0.106-0.141)	0.148 (0.125-0.178)	0.168 (0.139-0.207)	0.189 (0.153-0.238)	0.210 (0.166-0.272)	0.239 (0.181-0.322)	0.261 (0.191-0.364)
2-day	0.034 (0.030-0.039)	0.046 (0.040-0.053)	0.061 (0.054-0.071)	0.074 (0.064-0.086)	0.091 (0.077-0.109)	0.104 (0.086-0.128)	0.117 (0.095-0.147)	0.131 (0.103-0.169)	0.149 (0.113-0.201)	0.163 (0.120-0.228)
3-day	0.024 (0.021-0.028)	0.033 (0.029-0.038)	0.044 (0.039-0.051)	0.054 (0.047-0.063)	0.067 (0.056-0.080)	0.076 (0.063-0.094)	0.087 (0.070-0.109)	0.097 (0.076-0.125)	0.111 (0.084-0.150)	0.122 (0.089-0.170)
4-day	0.020 (0.017-0.023)	0.027 (0.024-0.031)	0.037 (0.032-0.042)	0.044 (0.039-0.052)	0.055 (0.047-0.067)	0.064 (0.053-0.078)	0.072 (0.059-0.091)	0.081 (0.064-0.105)	0.093 (0.071-0.126)	0.103 (0.075-0.143)
7-day	0.012 (0.011-0.014)	0.017 (0.015-0.020)	0.024 (0.021-0.028)	0.029 (0.026-0.034)	0.037 (0.031-0.044)	0.042 (0.035-0.052)	0.048 (0.039-0.061)	0.054 (0.043-0.070)	0.063 (0.048-0.085)	0.069 (0.051-0.097)
10-day	0.009 (0.008-0.010)	0.013 (0.011-0.015)	0.018 (0.016-0.021)	0.022 (0.019-0.026)	0.028 (0.023-0.033)	0.032 (0.027-0.039)	0.037 (0.030-0.046)	0.041 (0.033-0.054)	0.048 (0.036-0.065)	0.053 (0.039-0.074)
20-day	0.005 (0.005-0.006)	0.008 (0.007-0.009)	0.011 (0.009-0.012)	0.013 (0.012-0.015)	0.017 (0.014-0.020)	0.020 (0.016-0.024)	0.023 (0.018-0.029)	0.026 (0.020-0.034)	0.030 (0.023-0.041)	0.034 (0.025-0.047)
30-day	0.004 (0.004-0.005)	0.006 (0.005-0.007)	0.008 (0.007-0.010)	0.010 (0.009-0.012)	0.013 (0.011-0.016)	0.016 (0.013-0.019)	0.018 (0.015-0.023)	0.021 (0.016-0.027)	0.024 (0.018-0.033)	0.027 (0.020-0.038)
45-day	0.003 (0.003-0.004)	0.005 (0.004-0.005)	0.006 (0.006-0.007)	0.008 (0.007-0.009)	0.010 (0.009-0.012)	0.012 (0.010-0.015)	0.014 (0.011-0.018)	0.016 (0.013-0.021)	0.019 (0.015-0.026)	0.022 (0.016-0.030)
60-day	0.003 (0.002-0.003)	0.004 (0.003-0.004)	0.005 (0.005-0.006)	0.007 (0.006-0.008)	0.009 (0.007-0.010)	0.010 (0.009-0.013)	0.012 (0.010-0.015)	0.014 (0.011-0.018)	0.016 (0.012-0.022)	0.019 (0.014-0.026)

[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.

Back to Top

PF graphical

FIGURE 3.1

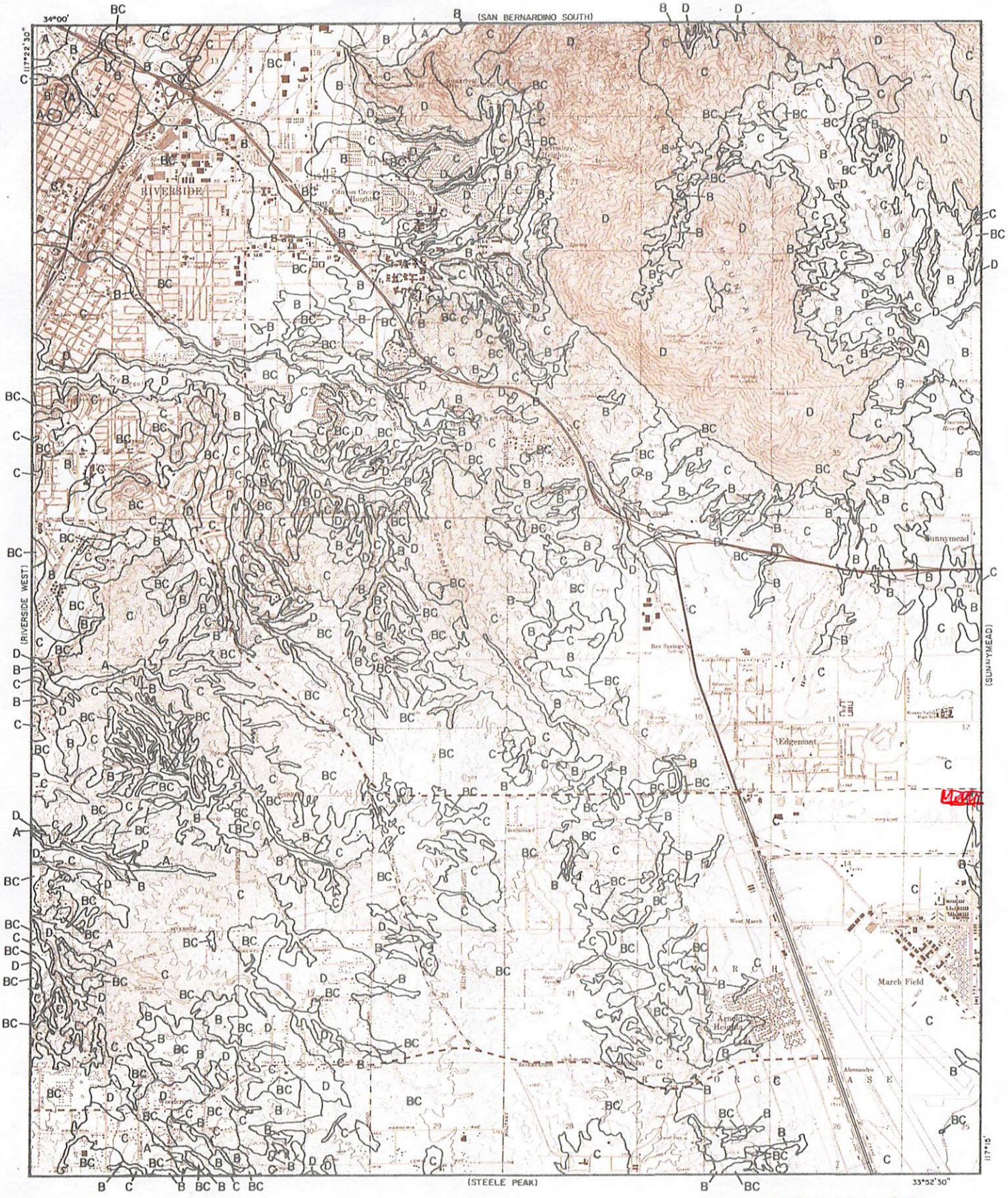

FIGURE 3.2

LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

N

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR RIVERSIDE–EAST

****

HYDRAULIC ELEMENTS - I PROGRAM PACKAGE

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Analysis prepared by:

THATCHER ENGINEERING & ASSOCIATES, INC.

1461 FORD STREET, SUITE 105

REDLANDS, CA 92373

PHONE: (909) 748-7777 FAX: (909) 748-7776

TIME/DATE OF STUDY: 09:54 09/28/2020

==========

Problem Descriptions:

APN 297-170-002 & 003

POST-DEVELOPMENT DRAINAGE STUDY

STORM DRAIN PIPE SIZING (LINE A)

****

>>>>PIPEFLOW HYDRAULIC INPUT INFORMATION<<<<

PIPE SLOPE(FEET/FEET) = 0.0069

PIPEFLOW(CFS) = 81.93

MANNINGS FRICTION FACTOR = 0.013000

>>>>>SOFFIT-FLOW PIPE DIAMETER(FEET) = 3.472, USE 3.5'

==========

Figure 4.1

****

HYDRAULIC ELEMENTS - I PROGRAM PACKAGE

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Analysis prepared by:

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1461 FORD STREET, SUITE 105

REDLANDS, CA 92373

PHONE: (909) 748-7777 FAX: (909) 748-7776

TIME/DATE OF STUDY: 10:13 09/28/2020

==========

Problem Descriptions:

APN 297-170-002 & 003

POST-DEVELOPMENT DRAINAGE STUDY

STORM DRAIN PIPE SIZING (LINE E)

****

>>>>PIPEFLOW HYDRAULIC INPUT INFORMATION<<<<

PIPE SLOPE(FEET/FEET) = 0.0170

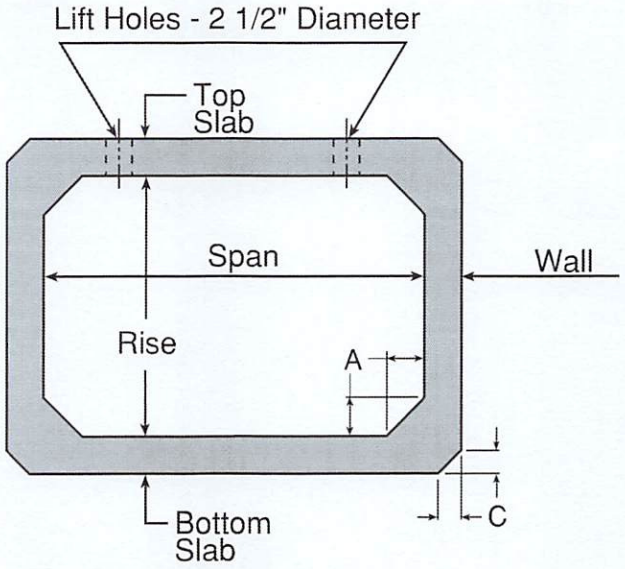
PIPEFLOW(CFS) = 33.87

MANNINGS FRICTION FACTOR = 0.013000

>>>>>SOFFIT-FLOW PIPE DIAMETER(FEET) = 2.106, USE 2.5'

==========

FastCast™ Drycast
PreGasketed
Stormwater Storage



Typical Section

Standard Box Dimensions

Span (Ft.)	Rise (Ft.)	Top Slab (In.)	Bottom Slab (In.)	Wall (In.)	Weight (Lbs./ft.)
3	2	7	6	4	848
3	3	7	6	4	952
4	2	7 1/2	6	5	1146
4	3	7 1/2	6	5	1276
4	4	7 1/2	6	5	1405
5	2	8	7	6	1541
5	3	8	7	6	1696
5	4	8	7	6	1851
5	5	8	7	6	2006
6	2	8	7	7	1821
6	3	8	7	7	2002
6	4	8	7	7	2183
6	5	8	7	7	2364
6	6	8	7	7	2545
7	2	8	8	8	2238
7	3	8	8	8	2446
7	4	8	8	8	2652
7	5	8	8	8	2859
7	6	8	8	8	3066
7	7	8	8	8	3272

Standard Box Dimensions

Span (Ft.)	Rise (Ft.)	Top Slab (In.)	Bottom Slab (In.)	Wall (In.)	Weight (Lbs./ft.)
8	3	8	8	8	2652
8	4	8	8	8	2859
8	5	8	8	8	3066
8	6	8	8	8	3272
8	7	8	8	8	3479
8	8	8	8	8	3686
9	4	9	9	9	3511
9	5	9	9	9	3744
9	6	9	9	9	3976
9	7	9	9	9	4209
9	8	9	9	9	4441
9	9	9	9	9	4674
10	4	10	10	10	4228
10	5	10	10	10	4486
10	6	10	10	10	4745
10	7	10	10	10	5003
10	8	10	10	10	5261
10	9	10	10	10	5520
10	10	10	10	10	5778

Standard Box Dimensions

Span (Ft.)	Rise (Ft.)	Top Slab (In.)	Bottom Slab (In.)	Wall (In.)	Weight (Lbs./ft.)
11	4	11	11	11	5010
11	5	11	11	11	5294
11	6	11	11	11	5578
11	7	11	11	11	5862
11	8	11	11	11	6146
11	9	11	11	11	6430
11	10	11	11	11	6715
11	11	11	11	11	6999
12	4	12	12	12	5856
12	5	12	12	12	6166
12	6	12	12	12	6476
12	7	12	12	12	6786
12	8	12	12	12	7096
12	9	12	12	12	7406
12	10	12	12	12	7716
12	11	12	12	12	8026
12	12	12	12	12	8336

Note:
- A = Wall thickness
- C = 2" for 4", 5" and 6" wall
- C = 4" for 7" and greater wall
- Contact manufacturer for standard joint lengths.

Figure 4.3

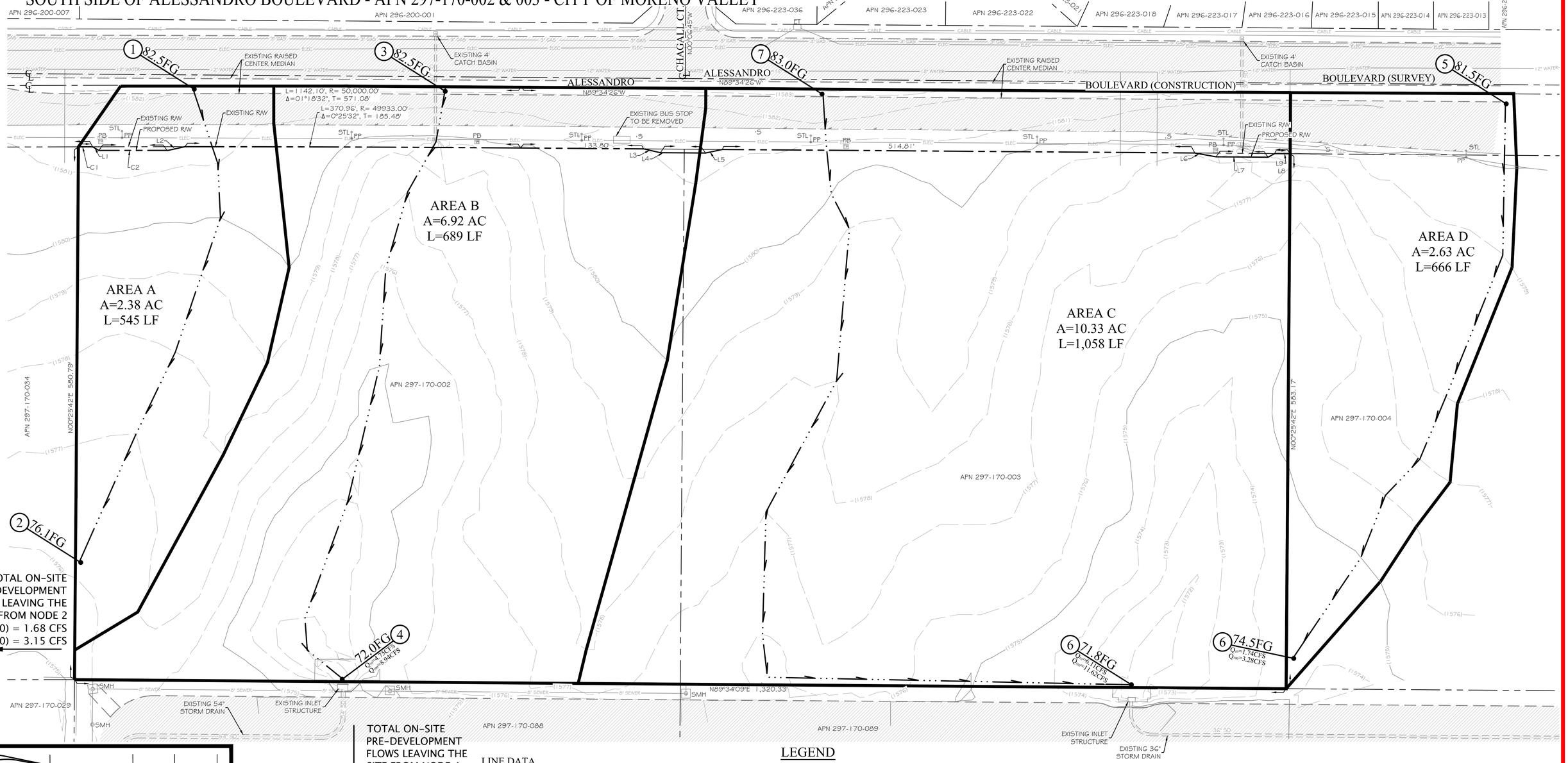
-No Scale-
All dimensions subject to allowable specification tolerances.

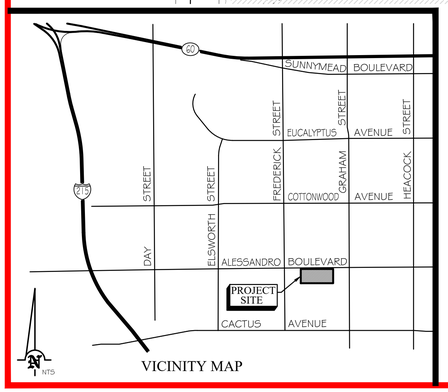
TITLE	PLANT	STATE	SECTION.PAGE	DATE	
Reinforced Concrete Precast Box Section	Grand Prairie Houston	TX	4.1	11-12-15	Bio Clean A Forterra Company

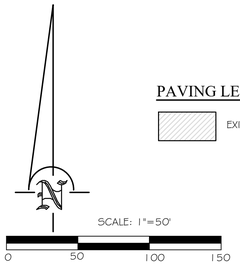
TRIBUTARY AREA MAP

PRE-DEVELOPMENT - COMPASS DANBE CENTERPOINTE - PROPOSED INDUSTRIAL WAREHOUSE FACILITY, PEN20-0120/TPM 37944

SOUTH SIDE OF ALESSANDRO BOULEVARD - APN 297-170-002 & 003 - CITY OF MORENO VALLEY







LINE DATA

	BEARING	DISTANCE
L1	N59°38'55"W	7.89'
L2	N77°40'24"E	18.74'
L3	N77°12'47"W	18.69'
L4	N89°34'26"W	49.33'
L5	N78°03'57"E	18.69'
L6	N79°46'02"E	23.49'
L7	N89°34'26"W	56.75'
L8	N60°53'25"E	8.11'
L9	N89°34'26"W	16.97'

CURVE DATA

	Δ	R	T	L
C1	00°01'04"	49933.00'	7.71'	15.41'
C2	00°05'12"	49929.00'	37.73'	75.46'

PAVING LEGEND

EXISTING AC PAVING

LEGEND

1 ELEV. — NODE # & ELEV.

L=165' — FLOWLINE LENGTH

A=1.44 AC — SUB AREA

FLOWLINE

TRIBUTARY BOUNDARY

LEGEND

ET	ELECTRIC TRANSFORMER
INV	INVERT ELEVATION
PB	PULL BOX
PL	PROPERTY LINE
PP	EX. POWER POLE
R/W	RIGHT-OF-WAY
SMH	SEWER MANHOLE
STL	EX. STREET LIGHT

SOURCE OF SURVEY

TOPOGRAPHIC SURVEY
DATED DECEMBER 2019
AS CONDUCTED BY
PARTNER ENGINEERING AND SCIENCE, INC.
1761 EAST GARRY AVENUE
SANTA ANA, CA 92705
PHONE: (714) 477-8657

SOIL ENGINEER

REPORT DATED JANUARY 31, 2020
PROJECT NO. 21631-20
AS CONDUCTED BY
NORCAL ENGINEERING
10641 HUMBOLT STREET
LOS ALAMITOS, CA 90720
PHONE: (562) 799-9469
FAX: (562) 799-9459

PROPERTY OWNER:

MORENO VALLEY CENTERPOINTE
C/O CDRE HOLDINGS 17 LLC
ATTN: MARK BACHLI
523 MAIN STREET
EL SEGUNDO, CA 90245
(310) 428-3302

PREPARED FOR/APPLICANT:

CDRE HOLDINGS 17 LLC
ATTN: MARK BACHLI
523 MAIN STREET
EL SEGUNDO, CA 90245
(310) 428-3302

TRIBUTARY AREA MAP
PEN20-0120/TPM37944
PRE-DEVELOPMENT - APN 297-170-002 & 003
COMPASS DANBE CENTERPOINTE
PROPOSED INDUSTRIAL WAREHOUSE FACILITY
SOUTH SIDE OF ALESSANDRO BOULEVARD
CITY OF MORENO VALLEY

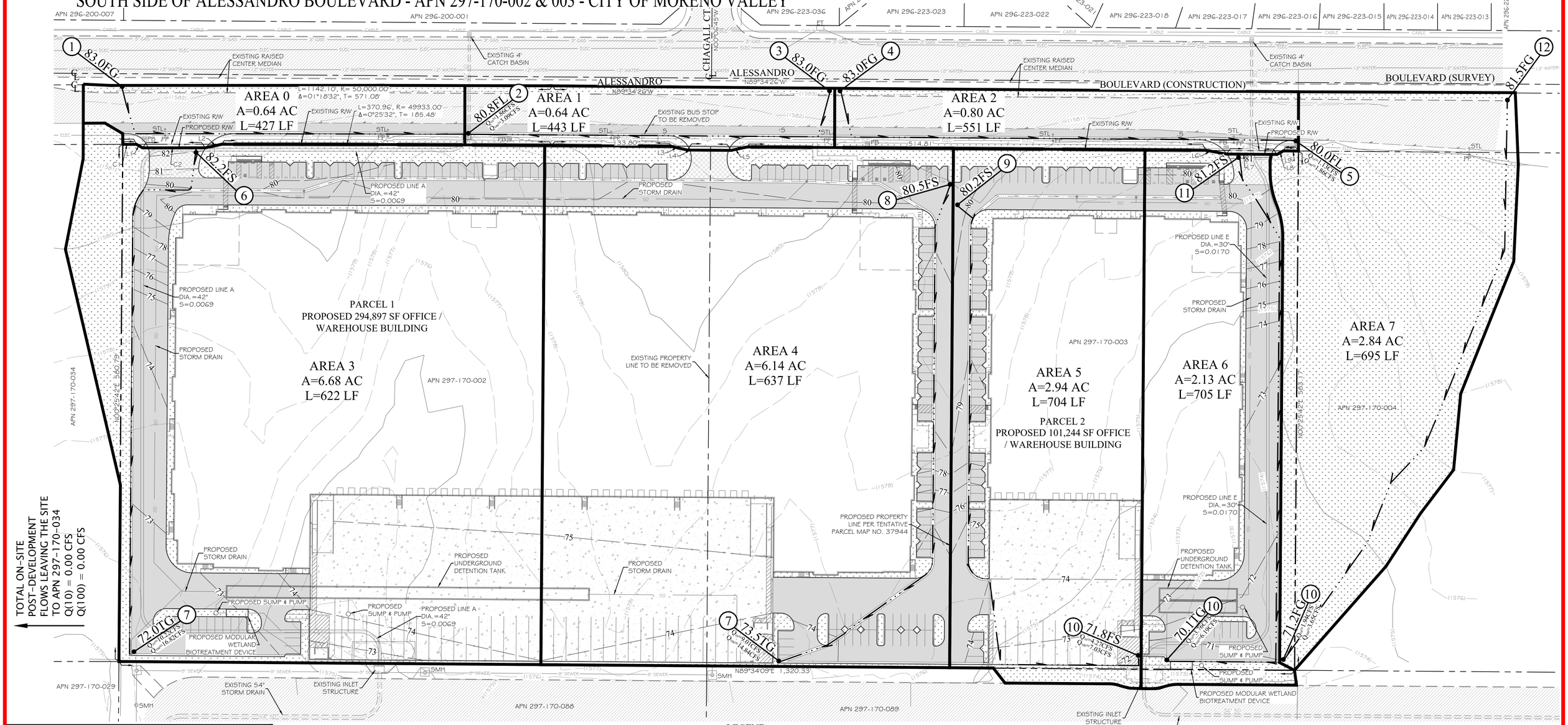
thatcher engineering & associates, inc.
1461 ford street, suite 105, redlands, ca 92373
• land planning
• civil engineering
• landscape architecture
phone 909.748.7777
fax 909.748.7776
est. 1989
REGISTERED PROFESSIONAL ENGINEER
PATRICK C. FLANAGAN, JR.
No. 86046
Exp. 9/30/22
CIVIL
STATE OF CALIFORNIA
Patrick C. Flanagan, Jr. R.C.E. 86046 Exp. Sep 30, 2020

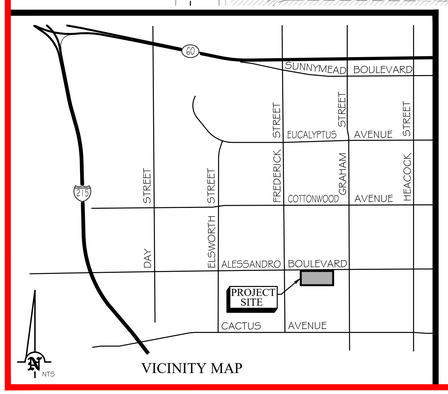
Job Number:	Date Prepared:	Drawn By:	Reference Number:
162012	2/18/21	RL	162012TAM

TRIBUTARY AREA MAP

POST-DEVELOPMENT - COMPASS DANBE CENTERPOINTE - PROPOSED INDUSTRIAL WAREHOUSE FACILITY, PEN20-0120/TPM 37944

SOUTH SIDE OF ALESSANDRO BOULEVARD - APN 297-170-002 & 003 - CITY OF MORENO VALLEY





TOTAL ON-SITE
POST-DEVELOPMENT
FLOWS LEAVING THE SITE
FROM CONFLUENCE NODE 6
Q(10) = 0.00 CFS
Q(100) = 0.00 CFS

SCALE: 1"=50'

0 50 100 150

LINE DATA

	BEARING	DISTANCE
L1	N59°38'55"W	7.89'
L2	N77°40'24"E	18.74'
L3	N77°12'47"W	18.69'
L4	N89°34'26"W	49.33'
L5	N78°03'57"E	18.69'
L6	N79°46'02"E	23.49'
L7	N89°34'26"W	56.75'
L8	N60°53'25"E	8.11'
L9	N89°34'26"W	16.97'

CURVE DATA

	Δ	R	T	L
C1	00°01'04"	49933.00'	7.7'	15.41'
C2	00°05'12"	49929.00'	37.73'	75.46'

PAVING LEGEND

- PROPOSED/EXISTING LANDSCAPE
- PROPOSED AC PAVING
- PROPOSED PCC PAVING
- PROPOSED DECORATIVE PAVING
- EXISTING AC PAVING

LEGEND

AC	ASPHALT CONCRETE
CF	CURB FACE
DIA	DIAMETER
ET	ELECTRIC TRANSFORMER
FF	FINISHED FLOOR
FG	FINISHED GROUND
FL	FLOWLINE
FS	FINISHED SURFACE
PB	PULL BOX
PCC	PORTLAND CEMENT CONCRETE
PL	PROPERTY LINE
PP	EX. POWER POLE
R/W	RIGHT-OF-WAY
SMH	SEWER MANHOLE
STL	EX. STREET LIGHT
TC	TOP OF CURB
TG	TOP OF GRATE

SOURCE OF SURVEY

TOPOGRAPHIC SURVEY
DATED DECEMBER 2019
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LOS ALAMITOS, CA 90720
PHONE: (562) 799-9469
FAX: (562) 799-9459

LEGEND

1 ELEV.
L=165'
A=1.44 AC

NODE # & ELEV.
FLOWLINE LENGTH
SUB AREA
FLOWLINE
TRIBUTARY BOUNDARY

TOTAL ON-SITE
POST-DEVELOPMENT
FLOWS LEAVING THE SITE
FROM CONFLUENCE NODE 10
Q(10) = 0.00 CFS
Q(100) = 0.00 CFS

PROPERTY OWNER:
MORENO VALLEY CENTERPOINTE
C/O CDRE HOLDINGS 17 LLC
ATTN: MARK BACHLI
523 MAIN STREET
EL SEGUNDO, CA 90245
(310) 428-3302

PREPARED FOR/APPLICANT:
CDRE HOLDINGS 17 LLC
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POST-DEVELOPMENT - APN 297-170-002 & 003
COMPASS DANBE CENTERPOINTE
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