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Preliminary Drainage Study
APN 0231-021-24, 25, 32, 48, 54, 55, 57, 76, 82, 83 & 84
County of San Bernardino
November 11, 2015

Prepared for:

TEC Equipment, Inc.
Attn: David Thompson
750 North East Columbia Boulevard
Portland, CA 97211

Description

The project site is approximately 14.13 acres in size and consists of 11 parcels: APN 0231-021-24, 25, 32, 48, 54, 55, 57, 76, 82, 83 & 84. The site is located at the northwest corner of Cherry Avenue and Randall Avenue in the Fontana area of unincorporated San Bernardino County. The site is currently vacant with the exception of a few patches of concrete pavement that remain from single family residences that have since been removed. The site currently drains from northeast to southwest at an approximate grade of 1.3%. The frontage along Cherry Avenue is currently improved with curb & gutter that directs flows to the south. The frontage along Randall Avenue is mostly unimproved with the exception of the frontage along APN 0231-021-48 which consists of curb & gutter. Flows from Randall Avenue are directed to the west along a flowline in the shoulder and join the flows of Cherry Avenue. Flows from the intersection continue south to an existing channel that runs along the north side of the Interstate 10 Freeway. From here, flows continue westward to the San Sevaine Channel and eventually to the Santa Ana River.

The neighboring property to the north, APN 0231-021-59, drains to the west and doesn't provide any flows to the subject site. Neighboring property to the east, APN 0231-021-18, is currently developed as a construction equipment rental company with flows directed to the south to Randall Avenue via ribbon gutter and does not contribute any flows to the site.

Proposed development of the site includes the construction of a 172,218 SF facility for truck sales, repair, and parts sales as well as associated parking and landscaping. Flows will be directed to the southeast as they have been historically, via proposed ribbon gutters and curb & gutter around the proposed building. Flows ultimately make their way to a proposed catch basin that will connect to a 60,000 cubic foot underground infiltration basin. This underground basin has been sized for water quality purposes and will help mitigate any increase in both flows and volume from the site due to development. Any excess flows will be allowed to leave the site via an under sidewalk drain at the back of the proposed catch basin to Randall Avenue as they have historically.

Purpose

The purpose of this study is to analyze the flows to and through the site, both pre-development and post-development, and demonstrate that the post-development flows leaving the site will be less than pre-development flows.

Analysis

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

1. Determine the 10, 25 and 100 year pre-development flows.
2. Determine the 10, 25 and 100 year post-development flows.
3. Determine if any onsite mitigation will have to occur in order to have post-development flows that leave the site be less than pre-development flows in both intensity and volume.

Results

1. The 10, 25 & 100 year pre-development flows were determined utilizing the Rational Method per San Bernardino County Hydrology Manual. AES 2014 Software was utilized for the calculations and they can be found in the appendix of this report. The variables used were:

   Rainfall Values (per NOAA Atlas 14, Volume 6, Version 2 Map, Figure 3.1):
   $Y_{10} = 0.851$
   $Y_{100} = 1.42$

   Soil Group (per reference Soil Group Map in appendix, Figure 3.2): A

   Pervious Cover Designations:
   Natural Poor Cover, Grass

   Calculations:

   10-year peak flows: Q_{10} = 16.26 CFS
   10-year time of concentration: Tc_{10}= 16.32 min
   10-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$

   $= (16.26cfs)(16.32\,\text{min})(60\,\text{min})\left(\frac{3}{2}\right)$ **= 23,883 cubic feet**

25-year peak flows: Q_{25} = 21.73 CFS
25-year time of concentration: Tc_{25}= 16.32 min
25-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$

= $(21.73cfs)(16.32\,\text{min})(60\,\text{min})\left(\frac{3}{2}\right)$ = **31,918 cubic feet**

100-year peak flows: Q_{100} = 35.67 CFS
100-year time of concentration: Tc_{100}= 16.32 min
100-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$

= $(35.67cfs)(16.32\,\text{min})(60\,\text{min})\left(\frac{3}{2}\right)$ = **55,330 cubic feet**

2. The 10, 25 and 100 year post-development flows were determined utilizing the Rational Method per San Bernardino County Hydrology Manual. AES 2014 Software was utilized for the calculations and they can be found in the appendix of this report. The variables used were:

   Rainfall Values (per NOAA Atlas 14, Volume 6, Version 2 Map, Figure 3.1):
   Y_{10} = 0.851
   Y_{100} = 1.42

   Soil Group (per reference Soil Group Map in appendix, Figure 3.2): A

   Pervious Cover Designations:
   Commercial

   Calculations:

   10-year peak flows: Q_{10} = 26.65 CFS
   10-year time of concentration: Tc_{10}= 12.59 min
   10-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$

   = $(26.65cfs)(12.59\,\text{min})(60\,\text{min})\left(\frac{3}{2}\right)$ = **30,197 cubic feet**

25-year peak flows: Q_{25} = 33.04 CFS
25-year time of concentration: Tc_{25}= 12.59 min
25-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$

= $(33.04cfs)(12.59\,\text{min})(60\,\text{min})\left(\frac{3}{2}\right)$ = **37,438 cubic feet**

100-year peak flows: Q_{100} = 45.14 CFS
100-year time of concentration: Tc_{100}= 12.59 min
100-year volume produced = $(Q)(Tc)(60\,\text{min})\left(\frac{3}{2}\right)$

= $(45.14cfs)(12.59\,\text{min})(60\,\text{min})\left(\frac{3}{2}\right)$ = **51,149 cubic feet**

3. All flows will be mitigated by an onsite underground infiltration basin that has been sized for water quality purposes, holding 60,000 cubic feet. All flow intensities and volumes have been decreased from their pre-development conditions due to the proposed infiltration basin. In the case of back to back 100-year storms flows will be allowed to leave the site via an under sidewalk drain at the back of the proposed catch basin to Randall Avenue as they have historically.

	Pre-development	Post-development Leaving the Site	% of Pre
10-year flows	16.26 cfs	0.00 cfs	100
10-year volume	23,883 cubic feet	0 cubic feet	100
25-year flows	21.73 cfs	0.00 cfs	100
25-year volume	31,918 cubic feet	0 cubic feet	100
100-year flows	35.67 cfs	0.00 cfs	100
100-year volume	55,330 cubic feet	0 cubic feet	100

Conclusion

Any potential increase in post-development volume from pre-development conditions has been mitigated through the use of a 60,000 cubic foot underground infiltration basin. All post-development flows and volumes have been decreased by the proposed 60,000 cubic foot basin. All emergency flows will continue through the site as they have historically and will exit the site to Randall Avenue.

Shane Smith, EIT 143791

M.W. "Bud" Thatcher III, P.E.
RCE 39964 Exp 12/31/17

APPENDIX

```
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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

 ************************* DESCRIPTION OF STUDY *************************
* 56003 - TEC EQUIPMENT                                                 *
* PRE-DEVELOPMENT DRAINAGE STUDY                                        *
* 10-YEAR STORM EVENT                                                   *
 *************************************************************************

  FILE NAME: 56003PR.DAT
  TIME/DATE OF STUDY: 09:49 10/28/2015
=========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.851
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.420
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) = 0.8595
  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 0.0312 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) =   702.00
 ELEVATION DATA: UPSTREAM(FEET) =     33.90  DOWNSTREAM(FEET) =    22.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.325
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  1.877
 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.)
 NATURAL POOR COVER
 "GRASS"                    A       14.13      0.60      1.000    67   16.32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =     16.26
 TOTAL AREA(ACRES) =     14.13   PEAK FLOW RATE(CFS) =     16.26
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       14.1  TC(MIN.) =     16.32
 EFFECTIVE AREA(ACRES) =     14.13  AREA-AVERAGED Fm(INCH/HR)=  0.60
 AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)    =      16.26
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

Figure 1.1
Page 2 of 2

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

 ************************* DESCRIPTION OF STUDY *************************
* 56003 - TEC EQUIPMENT                                                 *
* PRE-DEVELOPMENT DRAINAGE STUDY                                        *
* 25-YEAR STORM EVENT                                                   *
 *************************************************************************

  FILE NAME: 56003PR.DAT
  TIME/DATE OF STUDY: 09:49 10/28/2015
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.851
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.420
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   25.00   1-HOUR INTENSITY(INCH/HOUR) = 1.0564
  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  0.0312  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) =   702.00
 ELEVATION DATA: UPSTREAM(FEET) =     33.90  DOWNSTREAM(FEET) =     22.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.325
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.307
 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.)
 NATURAL POOR COVER
 "GRASS"                    A       14.13      0.60      1.000    67   16.32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =     21.73
 TOTAL AREA(ACRES) =     14.13   PEAK FLOW RATE(CFS) =     21.73
==========================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       14.1  TC(MIN.) =     16.32
 EFFECTIVE AREA(ACRES) =     14.13  AREA-AVERAGED Fm(INCH/HR)=  0.60
 AREA-AVERAGED Fp(INCH/HR) =  0.60  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)   =      21.73
==========================================================================
==========================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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

 ************************* DESCRIPTION OF STUDY *************************
* 56003 - TEC EQUIPMENT                                                 *
* PRE-DEVELOPMENT DRAINAGE STUDY                                        *
* 100-YEAR STORM EVENT                                                  *
 ************************************************************************

  FILE NAME: 56003PR.DAT
  TIME/DATE OF STUDY: 09:48 10/28/2015
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.851
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.420
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) = 1.4200
  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) =   702.00
 ELEVATION DATA: UPSTREAM(FEET) =     33.90  DOWNSTREAM(FEET) =     22.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.325
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.101
 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.)
 NATURAL POOR COVER
 "GRASS"                    A       14.13      0.30      1.000    85   16.32
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =     35.67
 TOTAL AREA(ACRES) =     14.13   PEAK FLOW RATE(CFS) =     35.67
==========================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       14.1  TC(MIN.) =     16.32
 EFFECTIVE AREA(ACRES) =     14.13  AREA-AVERAGED Fm(INCH/HR)=  0.30
 AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)    =      35.67
==========================================================================
==========================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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

 ************************* DESCRIPTION OF STUDY *************************
* 56003 - TEC EQUIPMENT                                                 *
* POST-DEVELOPMENT DRAINAGE STUDY                                       *
* 10-YEAR STORM EVENT                                                   *
 *************************************************************************

  FILE NAME: 56003PO.DAT
  TIME/DATE OF STUDY: 13:21 11/11/2015
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.851
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.420
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) = 0.8595
  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 0.0312 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) =  1198.00
 ELEVATION DATA: UPSTREAM(FEET) =      33.90  DOWNSTREAM(FEET) =      19.80

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.592
 *  10 YEAR RAINFALL INTENSITY(INCH/HR) =  2.193
 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       14.13      0.98      0.100    32   12.59
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =     26.65
 TOTAL AREA(ACRES) =     14.13   PEAK FLOW RATE(CFS) =     26.65
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       14.1  TC(MIN.) =     12.59
 EFFECTIVE AREA(ACRES) =     14.13  AREA-AVERAGED Fm(INCH/HR)=  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS)    =      26.65
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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

 ************************* DESCRIPTION OF STUDY *************************
* 56003 - TEC EQUIPMENT                                                 *
* POST-DEVELOPMENT DRAINAGE STUDY                                       *
* 25-YEAR STORM EVENT                                                   *
 *************************************************************************

  FILE NAME: 56003PO.DAT
  TIME/DATE OF STUDY: 13:20 11/11/2015
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.851
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.420
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   25.00   1-HOUR INTENSITY(INCH/HOUR) = 1.0564
  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 0.0312 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) =  1198.00
 ELEVATION DATA: UPSTREAM(FEET) =     33.90  DOWNSTREAM(FEET) =     19.80

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.592
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.696
 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       14.13      0.98      0.100    32   12.59
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.98
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =     33.04
 TOTAL AREA(ACRES) =     14.13   PEAK FLOW RATE(CFS) =     33.04
==========================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       14.1  TC(MIN.) =     12.59
 EFFECTIVE AREA(ACRES) =     14.13  AREA-AVERAGED Fm(INCH/HR)=  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.98  AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS)    =      33.04
==========================================================================
==========================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
       (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
     (c) Copyright 1983-2014 Advanced Engineering Software (aes)
         Ver. 21.0  Release Date: 06/01/2014  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 *************************
* 56003 - TEC EQUIPMENT                                                 *
* POST-DEVELOPMENT DRAINAGE STUDY                                       *
* 100-YEAR STORM EVENT                                                  *
 *************************************************************************

  FILE NAME: 56003PO.DAT
  TIME/DATE OF STUDY: 13:20 11/11/2015
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.851
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.420
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) = 1.4200
  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) =  1198.00
 ELEVATION DATA: UPSTREAM(FEET) =      33.90  DOWNSTREAM(FEET) =      19.80

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.592
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.623
 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       14.13      0.74      0.100     52   12.59
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =     45.14
 TOTAL AREA(ACRES) =     14.13   PEAK FLOW RATE(CFS) =     45.14
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       14.1  TC(MIN.) =     12.59
 EFFECTIVE AREA(ACRES) =     14.13  AREA-AVERAGED Fm(INCH/HR)=  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS)    =      45.14
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

NOAA Atlas 14, Volume 6, Version 2
Location name: Fontana, California, US*
Latitude: 34.0856°, Longitude: -117.4867°
Elevation: 1124 ft*
* source: Google Maps

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	0.106 (0.089-0.129)	0.140 (0.116-0.170)	0.186 (0.154-0.226)	0.225 (0.185-0.276)	0.281 (0.224-0.357)	0.327 (0.254-0.424)	0.375 (0.285-0.500)	0.428 (0.315-0.586)	0.503 (0.355-0.719)	0.564 (0.384-0.837)
10-min	0.152 (0.127-0.185)	0.200 (0.167-0.243)	0.266 (0.221-0.324)	0.322 (0.265-0.396)	0.403 (0.320-0.512)	0.468 (0.364-0.608)	0.538 (0.408-0.716)	0.613 (0.452-0.840)	0.720 (0.508-1.03)	0.809 (0.551-1.20)
15-min	0.184 (0.154-0.223)	0.242 (0.202-0.294)	0.322 (0.267-0.392)	0.390 (0.321-0.479)	0.487 (0.387-0.619)	0.566 (0.441-0.736)	0.650 (0.493-0.866)	0.741 (0.546-1.02)	0.871 (0.615-1.25)	0.978 (0.666-1.45)
30-min	0.275 (0.229-0.333)	0.361 (0.300-0.438)	0.480 (0.398-0.584)	0.581 (0.478-0.713)	0.726 (0.577-0.923)	0.844 (0.657-1.10)	0.969 (0.735-1.29)	1.10 (0.814-1.51)	1.30 (0.916-1.86)	1.46 (0.993-2.16)
60-min	0.402 (0.335-0.487)	0.528 (0.440-0.641)	0.702 (0.583-0.855)	0.851 (0.700-1.04)	1.06 (0.845-1.35)	1.24 (0.961-1.60)	1.42 (1.08-1.89)	1.62 (1.19-2.22)	1.90 (1.34-2.72)	2.13 (1.45-3.16)
2-hr	0.609 (0.508-0.738)	0.788 (0.656-0.956)	1.03 (0.853-1.25)	1.23 (1.01-1.51)	1.51 (1.20-1.92)	1.73 (1.35-2.25)	1.97 (1.49-2.62)	2.21 (1.63-3.03)	2.56 (1.80-3.66)	2.83 (1.93-4.20)
3-hr	0.781 (0.651-0.947)	1.00 (0.836-1.22)	1.30 (1.08-1.58)	1.55 (1.27-1.90)	1.89 (1.50-2.40)	2.15 (1.67-2.79)	2.43 (1.84-3.23)	2.71 (2.00-3.72)	3.11 (2.19-4.45)	3.42 (2.33-5.08)
6-hr	1.12 (0.934-1.36)	1.44 (1.20-1.75)	1.85 (1.54-2.26)	2.19 (1.80-2.69)	2.65 (2.10-3.36)	2.99 (2.33-3.89)	3.35 (2.54-4.46)	3.71 (2.73-5.08)	4.20 (2.96-6.01)	4.58 (3.12-6.79)
12-hr	1.49 (1.24-1.80)	1.93 (1.60-2.34)	2.49 (2.06-3.03)	2.93 (2.41-3.60)	3.52 (2.80-4.47)	3.96 (3.08-5.14)	4.40 (3.33-5.86)	4.83 (3.56-6.63)	5.42 (3.82-7.75)	5.85 (3.99-8.68)
24-hr	2.00 (1.77-2.31)	2.65 (2.34-3.05)	3.45 (3.04-3.99)	4.08 (3.57-4.76)	4.90 (4.15-5.91)	5.51 (4.57-6.78)	6.10 (4.94-7.69)	6.69 (5.27-8.66)	7.46 (5.64-10.1)	8.03 (5.87-11.2)
2-day	2.42 (2.15-2.79)	3.28 (2.90-3.78)	4.36 (3.85-5.05)	5.22 (4.57-6.09)	6.35 (5.38-7.65)	7.19 (5.96-8.84)	8.02 (6.50-10.1)	8.86 (6.98-11.5)	9.95 (7.53-13.4)	10.8 (7.88-15.0)
3-day	2.64 (2.34-3.04)	3.63 (3.21-4.19)	4.90 (4.32-5.67)	5.92 (5.18-6.90)	7.28 (6.16-8.77)	8.30 (6.89-10.2)	9.33 (7.56-11.8)	10.4 (8.18-13.4)	11.8 (8.90-15.9)	12.8 (9.38-17.9)
4-day	2.85 (2.52-3.28)	3.96 (3.50-4.57)	5.40 (4.76-6.25)	6.56 (5.74-7.65)	8.13 (6.88-9.79)	9.32 (7.73-11.5)	10.5 (8.52-13.2)	11.7 (9.25-15.2)	13.4 (10.1-18.1)	14.7 (10.7-20.5)
7-day	3.25 (2.87-3.74)	4.60 (4.07-5.31)	6.37 (5.62-7.37)	7.82 (6.84-9.12)	9.78 (8.28-11.8)	11.3 (9.37-13.9)	12.8 (10.4-16.2)	14.4 (11.4-18.7)	16.6 (12.5-22.4)	18.3 (13.4-25.5)
10-day	3.51 (3.11-4.05)	5.03 (4.45-5.80)	7.03 (6.20-8.14)	8.68 (7.59-10.1)	10.9 (9.26-13.2)	12.7 (10.5-15.6)	14.5 (11.7-18.2)	16.4 (12.9-21.2)	18.9 (14.3-25.5)	20.9 (15.3-29.2)
20-day	4.16 (3.68-4.79)	6.04 (5.34-6.97)	8.57 (7.56-9.92)	10.7 (9.36-12.5)	13.7 (11.6-16.5)	16.0 (13.3-19.7)	18.5 (15.0-23.3)	21.0 (16.6-27.3)	24.7 (18.7-33.3)	27.6 (20.2-38.4)
30-day	4.91 (4.34-5.65)	7.12 (6.29-8.21)	10.1 (8.94-11.7)	12.7 (11.1-14.8)	16.3 (13.8-19.7)	19.2 (16.0-23.7)	22.3 (18.1-28.1)	25.6 (20.2-33.1)	30.2 (22.9-40.8)	34.0 (24.9-47.5)
45-day	5.80 (5.13-6.68)	8.30 (7.34-9.58)	11.8 (10.4-13.6)	14.8 (12.9-17.2)	19.1 (16.1-23.0)	22.6 (18.7-27.8)	26.3 (21.3-33.2)	30.4 (23.9-39.3)	36.2 (27.4-48.9)	41.0 (30.0-57.2)
60-day	6.86 (6.08-7.91)	9.65 (8.53-11.1)	13.6 (12.0-15.7)	17.0 (14.8-19.8)	21.9 (18.6-26.4)	26.0 (21.6-32.0)	30.5 (24.7-38.4)	35.3 (27.8-45.7)	42.3 (32.0-57.1)	48.2 (35.3-67.3)

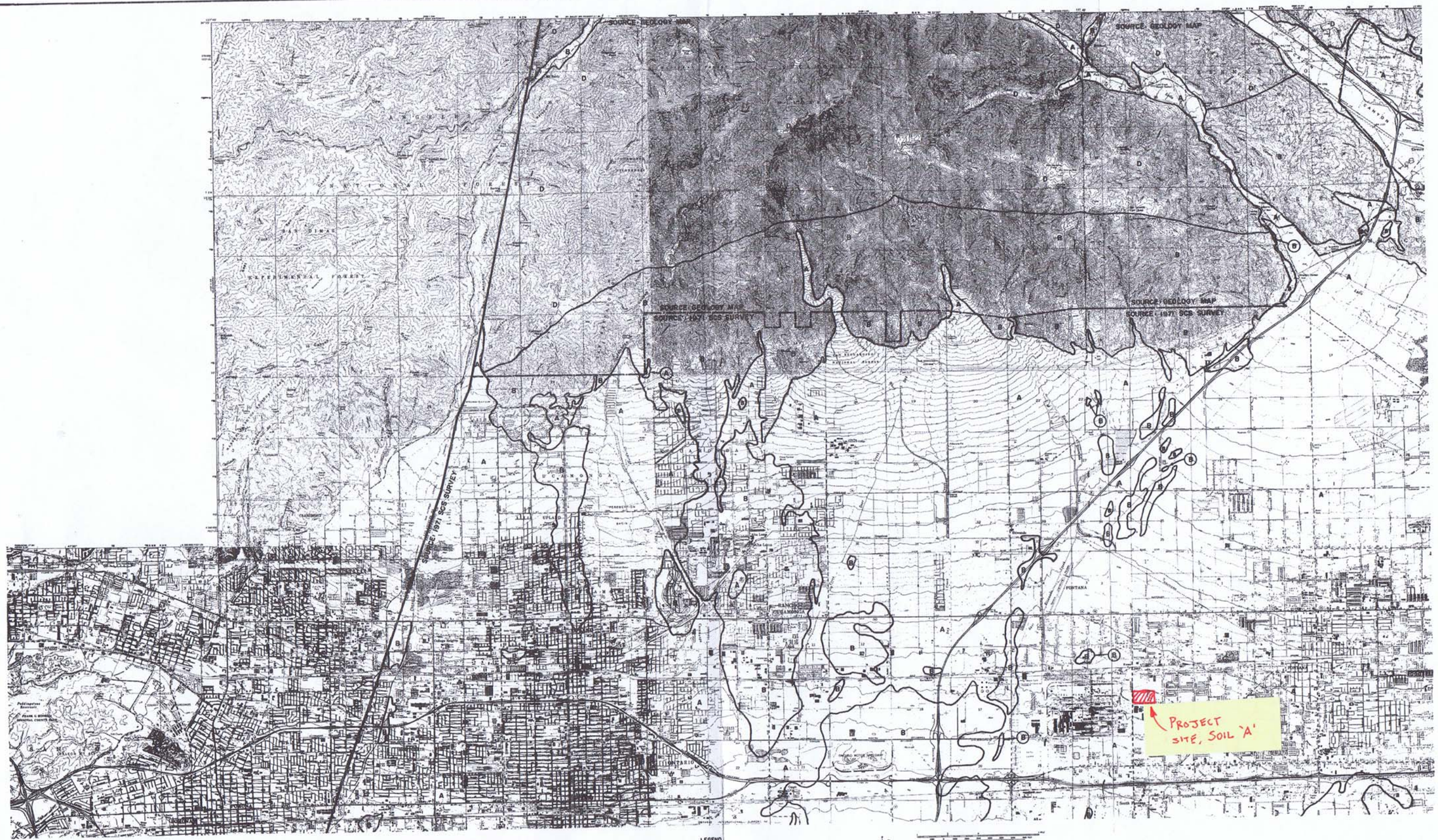
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

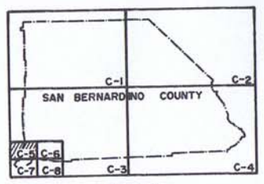
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper 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

FIGURE 3.1





INDEX MAP

LEGEND

SOIL GROUP BOUNDARY

A — SOIL GROUP DESIGNATION

BOUNDARY OF INDICATED SOURCE

SCALE 1:48,000

SCALE REDUCED BY 1/2

FIGURE 3.2

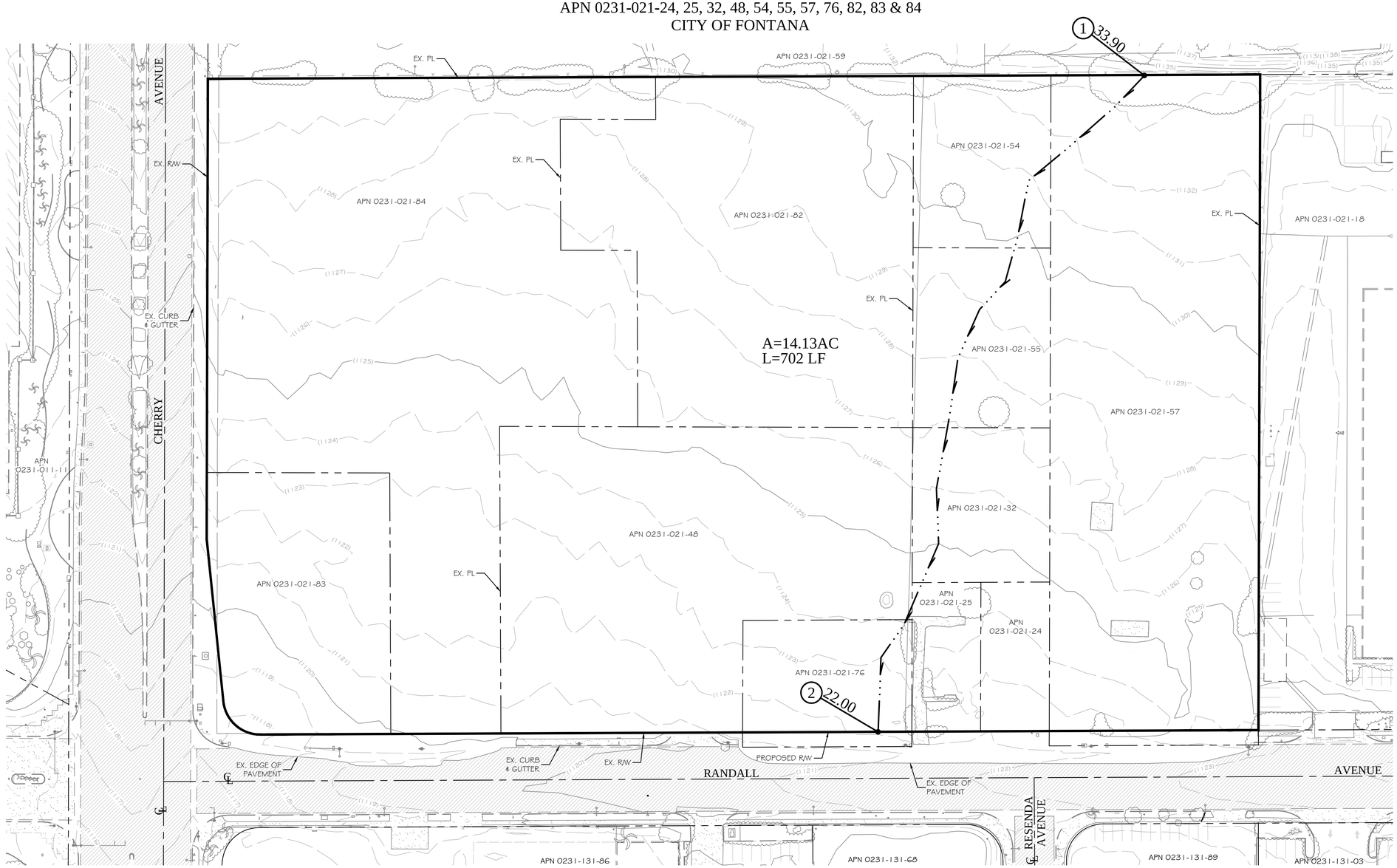
HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHWEST-A AREA

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

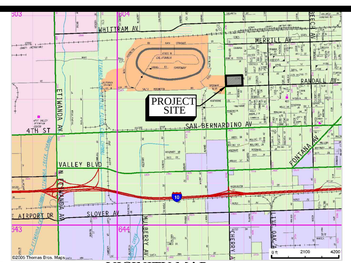
FIGURE C-13

TRIBUTARY AREA MAP

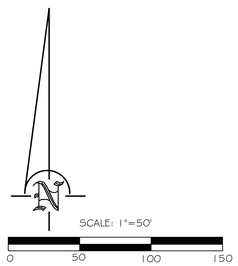
PRE-DEVELOPMENT
APN 0231-021-24, 25, 32, 48, 54, 55, 57, 76, 82, 83 & 84
CITY OF FONTANA



TOTAL ON-SITE
POST-DEVELOPMENT
FLOWS LEAVING THE SITE
Q(10) = 16.26 CFS
Q(25) = 21.73 CFS
Q(100) = 35.67 CFS



VICINITY MAP
Map © Rand McNally & company R.L.08-S-17



LEGEND

(1)——●	NODE #
L=165'	FLOWLINE LENGTH
A=1.44 AC	SUB AREA
—·—·—·—	FLOWLINE

LEGEND

AC	ASPHALT CONCRETE
EX.	EXISTING
PCC	PORTLAND CEMENT CONCRETE
PL	PROPERTY LINE
R/W	RIGHT-OF-WAY

PAVING LEGEND

- EXISTING AC PAVING
- EXISTING PCC PAVING

PREPARED FOR:

TEC EQUIPMENT, INC.
ATTN: DAVID THOMPSON
750 NORTH EAST COLUMBIA BLVD.
PORTLAND, CA 97211
PHONE: (503) 247-4655
FAX: (503) 972-4311

TRIBUTARY AREA MAP
APN 0231-021-24, 25, 32, 48, 54, 55, 57, 76, 82, 83 & 84
CITY OF FONTANA

• land planning
• civil engineering
• landscape architecture
phone 909.748.7777
fax 909.748.7776
thatcher engineering & associates, inc.
1461 ford street, suite 105, redlands, ca 92373
est. 1989

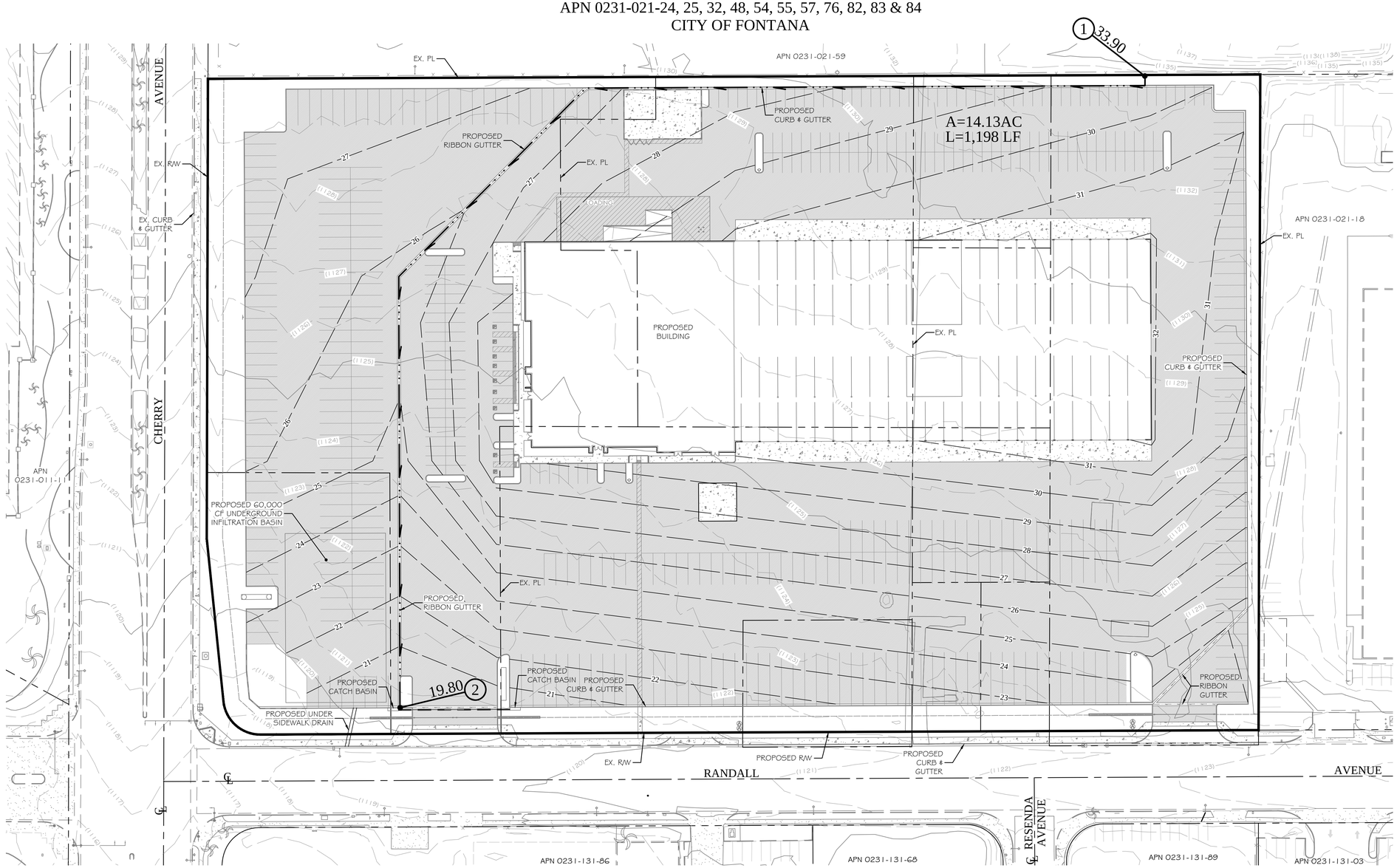
REGISTERED PROFESSIONAL ENGINEER
MELVIN W. THATCHER, III
No. 39964
Exp. 12/31/17
CIVIL
STATE OF CALIFORNIA

Melvin W. Thatcher, III R.C.E. 39964 Exp. Dec 31, 2017

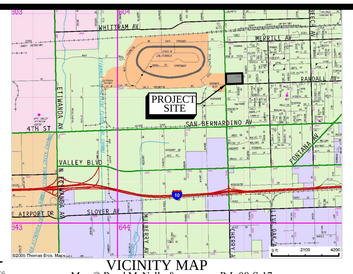
Job No.	Date Prepared	Designed By	Drawn By	Reference No.	Sheet No.
56003	11/12/15	MWT	PF	56003TAM	1 of 1

TRIBUTARY AREA MAP

POST-DEVELOPMENT
APN 0231-021-24, 25, 32, 48, 54, 55, 57, 76, 82, 83 & 84
CITY OF FONTANA



TOTAL ON-SITE
POST-DEVELOPMENT
FLOWS LEAVING THE SITE
Q(10) = 0.00 CFS
Q(25) = 0.00 CFS
Q(100) = 0.00 CFS



VICINITY MAP
Map © Rand McNally & company R.L.08-S-17

NTS

SCALE: 1"=50'
0 50 100 150

LEGEND

(1)——●	NODE #
L=165'	FLOWLINE LENGTH
A=1.44 AC	SUB AREA
—·—·—	FLOWLINE

LEGEND	
AC	ASPHALT CONCRETE
EX.	EXISTING
PCC	PORTLAND CEMENT CONCRETE
PL	PROPERTY LINE
R/W	RIGHT-OF-WAY

PAVING LEGEND
- PROPOSED AC PAVING
- PROPOSED PCC PAVING
- EXISTING PCC PAVING

PREPARED FOR:

TEC EQUIPMENT, INC.
ATTN: DAVID THOMPSON
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PORTLAND, CA 97211
PHONE: (503) 247-4655
FAX: (503) 972-4311

TRIBUTARY AREA MAP
APN 0231-021-24, 25, 32, 48, 54, 55, 57, 76, 82, 83 & 84
CITY OF FONTANA

thatcher engineering & associates, inc.
• land planning
• civil engineering
• landscape architecture
1461 ford street, suite 105, redlands, ca 92373
phone 909.748.7777
fax 909.748.7776
est. 1989

REGISTERED PROFESSIONAL ENGINEER
MELVIN W. THATCHER, III
No. 39964
Exp. 12/31/17
CIVIL
STATE OF CALIFORNIA

Melvin W. Thatcher, III R.C.E. 39964 Exp. Dec 31, 2017

Job No.	Date Prepared	Designed By	Drawn By	Reference No.	Sheet No.
56003	11/12/15	MWT	PF	56003TAM	1 of 1