DRAINAGE STUDY AND HYDRAULIC CALCULATIONS

PREPARED FOR:

MONEY SAMRA
TRUCK SERVICE CENTER

MEMORIAL DRIVE

CITY OF NEWBERRY SPRINGS
COUNTY OF SAN BERNARDINO

PREPARED BY:

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BERNHARD K. MAYER R.C.E. 36866 — 02/26/2018 DATE

SUMMARY

INTRODUCTION

The project is a new commercial development on 5.08 acres of a vacant lot covered with compacted gravel and a portion covered in asphalt. Site located in the City of Newberry Springs, County of San Bernardino. A Truck Service Center with a parking lot and a compacted gravel Impound Yard are proposed. The project will add approximately 94,000 sq. ft. or of impervious surface (including but not limited to: roof areas, walkways, parking lot and entry ways). The purpose of this study is to determine the rate of storm water runoff which will flow through the property during a 100-Year storm event and determine any mitigations which are necessary to protect the proposed development during a 100-Year Storm. This study will also determine the difference in runoff volume between the existing and proposed site conditions.

EXISTING WATERSHED DESCRIPTION

In its existing condition runoff from the north half of the sitesheet flows easterly to the northeast corner of the site and outlets onto Memorial Drive. Runoff from the south half of the site sheet flows easterly to the southeast corner of the site and outlets onto the adjacent property.

PROPOSED WATERSHED DESCRIPTION

In the developed condition runoff from the northwesterly portion of the site will flow southwesterly through a series of Curb & Gutters which will convey the runoff to an infiltration basin located at the westerly most corner of the site. Overflow runoff from the westerly basin will flow over a rock spillway and onto a rock splash pad before leaving the site. Runoff from the southeasterly portion of the developed site will flow easterly through a series of Concrete V-Gutter and Curb & Gutters which will convey the runoff to an infiltration basin located at the Southeast corner of the site. Overflow runoff will flow over a rock spillway and onto a rock splash pad before leaving the site.

METHODOLOGY - RATIONAL METHOD

The following scenario was modeled:

Existing and Developed Condition, 100-year storm & 2-year Storm

Rainfall depth was derived from the San Bernardino County Flood Control & Water Conservation District Hydrology Manual's isohyetal maps and precipitation frequency Atlas, NOAA Atlas 14.

Rational Method computations were performed using Advanced Engineering Software (aes), ver. 15.0, based on the Hydrology Manual. Discharge was calculated by the software, based on user input of rainfall, soil type, acreage, and land use parameters.

Printouts of the rational method calculations, as well as applicable plates from the Manual, are included in this report.

CONCLUSIONS

This drainage study and the calculations presented herein demonstrate the following:

TOTAL RUNOFF LEAVING THE SITE:

EXISTING:	**Q2(NODE 110) = 2.05 C.F.S.**	**Q100(NODE 110) = 9.71 C.F.S.**
	Q2(NODE 210) = 2.01 C.F.S.	**Q100(NODE 210) = 9.15 C.F.S.**
	Q2(NODE 310) = 0.98 C.F.S.	**Q100(NODE 310) = 3.57 C.F.S.**
	Q2(TOTAL) = 4.51 C.F.S.	**Q100(TOTAL) = 22.43 C.F.S.**
PROPOSED:	**Q2(NODE 130) = 1.93 C.F.S.**	**Q100(NODE 130) = 7.02 C.F.S.**
	Q2(NODE 240) = 5.50 C.F.S.	**Q100(NODE 240) = 20.95 C.F.S.**
	Q2(TOTAL) = 7.43 C.F.S.	**Q100(TOTAL) = 27.97 C.F.S.**

DRAINAGE MAPS

HYDROLOGY

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 ************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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            Ver. 15.0  Release Date: 04/01/2008  License ID 1524

                          Analysis prepared by:

                          SITETECH, INC.

  ************************** DESCRIPTION OF STUDY *************************
                    STEENO DESIGN - NEWBERRY SPRINGS
                          MEMORIAL DRIVE
                        EXISTING CONDITION
                    2 YEAR - 1 HOUR DESIGN STORM
  ************************************************************************
FILE NAME: SDMR2E.DAT
   TIME/DATE OF STUDY: 08:36 02/26/2018
 ========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ========================================================================
                        --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =    2.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.4940

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

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

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

 ************************************************************************
   FLOW PROCESS FROM NODE    100.00 TO NODE    110.00 IS CODE =  21
 ------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   781.00
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 ELEVATION DATA: UPSTREAM(FEET) =   1792.00  DOWNSTREAM(FEET) =   1787.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.244
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.233
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        C        2.55      0.57      0.600    69   16.24
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      2.05
 TOTAL AREA(ACRES) =      2.55   PEAK FLOW RATE(CFS) =      2.05

****************************************************************************
 FLOW PROCESS FROM NODE    200.00 TO NODE    210.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   504.00
 ELEVATION DATA: UPSTREAM(FEET) =   1791.00  DOWNSTREAM(FEET) =   1787.90

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.743
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.386
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        C        2.13      0.57      0.600    69   13.74
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      2.01
 TOTAL AREA(ACRES) =      2.13   PEAK FLOW RATE(CFS) =      2.01

****************************************************************************
 FLOW PROCESS FROM NODE    300.00 TO NODE    310.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   302.00
 ELEVATION DATA: UPSTREAM(FEET) =   1791.80  DOWNSTREAM(FEET) =   1788.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.160
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.188
 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                  C        0.51      0.57      0.100    69    7.16
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      0.98
 TOTAL AREA(ACRES) =      0.51   PEAK FLOW RATE(CFS) =      0.98
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==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =         0.5  TC(MIN.) =      7.16
  EFFECTIVE AREA(ACRES) =       0.51  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.57  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)    =        0.98
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
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             Ver. 15.0  Release Date: 04/01/2008  License ID 1524

                              Analysis prepared by:

                                 SITETECH, INC.

  ************************** DESCRIPTION OF STUDY **************************
                        STEENO DESIGN - NEWBERRY SPRINGS
                                MEMORIAL DRIVE
                              EXISTING CONDITION
                          100 YEAR - 1 HOUR DESIGN STORM
  ************************************************************************
FILE NAME: SDMR100E.DAT
   TIME/DATE OF STUDY: 08:36 02/26/2018
 ========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
 ========================================================================
                        --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =  100.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.7600

   *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    100.00 TO NODE    110.00 IS CODE =  21
 ------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 ========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   781.00
```

```
 ELEVATION DATA: UPSTREAM(FEET) =   1792.00  DOWNSTREAM(FEET) =   1787.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.244
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.393
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        C        2.55      0.27      0.600    86   16.24
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      9.71
 TOTAL AREA(ACRES) =      2.55   PEAK FLOW RATE(CFS) =      9.71

****************************************************************************
 FLOW PROCESS FROM NODE    200.00 TO NODE    210.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   504.00
 ELEVATION DATA: UPSTREAM(FEET) =   1791.00  DOWNSTREAM(FEET) =   1787.90

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.743
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.938
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "3-4 DWELLINGS/ACRE"        C        2.13      0.27      0.600    86   13.74
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
 SUBAREA RUNOFF(CFS) =      9.15
 TOTAL AREA(ACRES) =      2.13   PEAK FLOW RATE(CFS) =      9.15

****************************************************************************
 FLOW PROCESS FROM NODE    300.00 TO NODE    310.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   302.00
 ELEVATION DATA: UPSTREAM(FEET) =   1791.80  DOWNSTREAM(FEET) =   1788.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.160
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  7.794
 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                  C        0.51      0.27      0.100    86    7.16
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      3.57
 TOTAL AREA(ACRES) =      0.51   PEAK FLOW RATE(CFS) =      3.57
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==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =         0.5  TC(MIN.) =      7.16
  EFFECTIVE AREA(ACRES) =       0.51  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.27  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)    =        3.57
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
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**************************************************************************
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                        Analysis prepared by:

                          SITETECH, INC.

 ************************* DESCRIPTION OF STUDY *************************
                  STEENO DESIGN - NEWBERRY SPRINGS
                          MEMORIAL DRIVE
                        PROPOSED CONDITION
                    2 YEAR - 1 HOUR DESIGN STORM
 **************************************************************************
FILE NAME: SDMR2P.DAT
   TIME/DATE OF STUDY: 08:32 02/26/2018
==========================================================================
   USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                      --*TIME-OF-CONCENTRATION MODEL*--

   USER SPECIFIED STORM EVENT(YEAR) =    2.00
   SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
   SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
   *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

   SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
   USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.4940

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

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

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

**************************************************************************
   FLOW PROCESS FROM NODE    100.00 TO NODE    120.00 IS CODE =  21
--------------------------------------------------------------------------
   >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
   >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
   INITIAL SUBAREA FLOW-LENGTH(FEET) =   110.00
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 ELEVATION DATA: UPSTREAM(FEET) =   1791.80  DOWNSTREAM(FEET) =   1788.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.813
 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                C        0.14      0.57     0.100    69    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      0.35
 TOTAL AREA(ACRES) =      0.14   PEAK FLOW RATE(CFS) =      0.35

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 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.) =    5.00
 RAINFALL INTENSITY(INCH/HR) =   2.81
 AREA-AVERAGED Fm(INCH/HR) =  0.06
 AREA-AVERAGED Fp(INCH/HR) =  0.57
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       0.14
 TOTAL STREAM AREA(ACRES) =       0.14
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.35

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   128.00
 ELEVATION DATA: UPSTREAM(FEET) =   1792.00  DOWNSTREAM(FEET) =   1788.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.813
 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                C        0.64      0.57     0.100    69    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      1.59
 TOTAL AREA(ACRES) =      0.64   PEAK FLOW RATE(CFS) =      1.59

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
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 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    5.00
 RAINFALL INTENSITY(INCH/HR) =   2.81
 AREA-AVERAGED Fm(INCH/HR) =  0.06
 AREA-AVERAGED Fp(INCH/HR) =  0.57
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       0.64
 TOTAL STREAM AREA(ACRES) =       0.64
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.59

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        0.35    5.00    2.813  0.57( 0.06) 0.10       0.1     100.00
     2        1.59    5.00    2.813  0.57( 0.06) 0.10       0.6     110.00

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

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        1.93    5.00    2.813  0.57( 0.06) 0.10       0.8     100.00
     2        1.93    5.00    2.813  0.57( 0.06) 0.10       0.8     110.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       1.93    Tc(MIN.) =     5.00
 EFFECTIVE AREA(ACRES) =       0.78   AREA-AVERAGED Fm(INCH/HR) =  0.06
 AREA-AVERAGED Fp(INCH/HR) =  0.57  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        0.8
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    120.00 =     128.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    130.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1788.00  DOWNSTREAM(FEET) =   1787.90
 CHANNEL LENGTH THRU SUBAREA(FEET) =    68.00   CHANNEL SLOPE =  0.0015
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   3.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.326
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "BARREN"                   C        0.06      0.18     1.000    91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.18
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.99
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.73
 AVERAGE FLOW DEPTH(FEET) =   0.25   TRAVEL TIME(MIN.) =   1.56
 Tc(MIN.) =    6.56
 SUBAREA AREA(ACRES) =     0.06       SUBAREA RUNOFF(CFS) =    0.12
 EFFECTIVE AREA(ACRES) =      0.84     AREA-AVERAGED Fm(INCH/HR) =   0.07
```

```
 AREA-AVERAGED Fp(INCH/HR) =   0.40  AREA-AVERAGED Ap =   0.16
 TOTAL AREA(ACRES) =        0.8          PEAK FLOW RATE(CFS) =       1.93
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.25   FLOW VELOCITY(FEET/SEC.) =   0.72
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    130.00 =     196.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    200.00 TO NODE    220.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   377.00
 ELEVATION DATA: UPSTREAM(FEET) =   1791.30  DOWNSTREAM(FEET) =   1787.60

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.223
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.986
 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                 C        1.22      0.57      0.100    69    8.22
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      2.12
 TOTAL AREA(ACRES) =      1.22   PEAK FLOW RATE(CFS) =      2.12

****************************************************************************
 FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.22
 RAINFALL INTENSITY(INCH/HR) =   1.99
 AREA-AVERAGED Fm(INCH/HR) =  0.06
 AREA-AVERAGED Fp(INCH/HR) =  0.57
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       1.22
 TOTAL STREAM AREA(ACRES) =       1.22
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.12

****************************************************************************
 FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   467.00
 ELEVATION DATA: UPSTREAM(FEET) =   1791.00  DOWNSTREAM(FEET) =   1787.60

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.510
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.794
```

```
 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                  C        0.75      0.57      0.100    69    9.51
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      1.17
 TOTAL AREA(ACRES) =      0.75   PEAK FLOW RATE(CFS) =      1.17

****************************************************************************
 FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 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.) =    9.51
 RAINFALL INTENSITY(INCH/HR) =   1.79
 AREA-AVERAGED Fm(INCH/HR) =  0.06
 AREA-AVERAGED Fp(INCH/HR) =  0.57
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       0.75
 TOTAL STREAM AREA(ACRES) =       0.75
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.17

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1        2.12    8.22    1.986  0.57( 0.06) 0.10       1.2      200.00
     2        1.17    9.51    1.794  0.57( 0.06) 0.10       0.8      210.00

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

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1        3.24    8.22    1.986  0.57( 0.06) 0.10       1.9      200.00
     2        3.08    9.51    1.794  0.57( 0.06) 0.10       2.0      210.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       3.24    Tc(MIN.) =     8.22
 EFFECTIVE AREA(ACRES) =       1.87   AREA-AVERAGED Fm(INCH/HR) =  0.06
 AREA-AVERAGED Fp(INCH/HR) =  0.57  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        2.0
 LONGEST FLOWPATH FROM NODE    210.00 TO NODE    220.00 =     467.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    220.00 TO NODE    240.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1787.60  DOWNSTREAM(FEET) =   1787.20
 CHANNEL LENGTH THRU SUBAREA(FEET) =    83.00   CHANNEL SLOPE =  0.0048
 CHANNEL BASE(FEET) =    0.10   "Z" FACTOR =   4.000
```

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 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.908
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "CHAPARRAL,BROADLEAF"       C        0.20      0.47     1.000    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.47
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.37
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.85
 AVERAGE FLOW DEPTH(FEET) =   0.53   TRAVEL TIME(MIN.) =   0.48
 Tc(MIN.) =    8.71
 SUBAREA AREA(ACRES) =     0.20       SUBAREA RUNOFF(CFS) =    0.26
 EFFECTIVE AREA(ACRES) =      2.07     AREA-AVERAGED Fm(INCH/HR) =   0.10
 AREA-AVERAGED Fp(INCH/HR) =   0.52  AREA-AVERAGED Ap =   0.19
 TOTAL AREA(ACRES) =        2.2          PEAK FLOW RATE(CFS) =       3.37

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.53   FLOW VELOCITY(FEET/SEC.) =   2.85
 LONGEST FLOWPATH FROM NODE    210.00 TO NODE    240.00 =     550.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.71
 RAINFALL INTENSITY(INCH/HR) =   1.91
 AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.52
 AREA-AVERAGED Ap =  0.19
 EFFECTIVE STREAM AREA(ACRES) =       2.07
 TOTAL STREAM AREA(ACRES) =       2.17
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.37

****************************************************************************
 FLOW PROCESS FROM NODE    230.00 TO NODE    240.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   310.00
 ELEVATION DATA: UPSTREAM(FEET) =   1791.20  DOWNSTREAM(FEET) =   1787.20

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.433
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.487
 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
 "BARREN"                    C        1.95      0.18     1.000    91   12.43
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.18
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
```

```
 SUBAREA RUNOFF(CFS) =      2.29
 TOTAL AREA(ACRES) =      1.95   PEAK FLOW RATE(CFS) =      2.29

****************************************************************************
 FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 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.) =   12.43
 RAINFALL INTENSITY(INCH/HR) =   1.49
 AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.18
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =       1.95
 TOTAL STREAM AREA(ACRES) =       1.95
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.29

 ** CONFLUENCE DATA **
  STREAM       Q      Tc    Intensity   Fp(Fm)     Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1        3.37    8.71    1.908  0.52( 0.10) 0.19       2.1      200.00
     1        3.20   10.00    1.731  0.52( 0.09) 0.18       2.2      210.00
     2        2.29   12.43    1.487  0.18( 0.18) 1.00       2.0      230.00

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

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc    Intensity   Fp(Fm)     Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1        5.50    8.71    1.908  0.25( 0.13) 0.51       3.4      200.00
     2        5.39   10.00    1.731  0.25( 0.13) 0.53       3.7      210.00
     3        5.01   12.43    1.487  0.24( 0.14) 0.57       4.1      230.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       5.50    Tc(MIN.) =     8.71
 EFFECTIVE AREA(ACRES) =       3.43   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.51
 TOTAL AREA(ACRES) =        4.1
 LONGEST FLOWPATH FROM NODE    210.00 TO NODE    240.00 =     550.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    240.00 TO NODE    250.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1787.20  DOWNSTREAM(FEET) =   1787.10
 CHANNEL LENGTH THRU SUBAREA(FEET) =   145.00   CHANNEL SLOPE =  0.0007
 CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =   3.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.50
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.499
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
```

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     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
NATURAL POOR COVER
"BARREN"                     C        0.23       0.18      1.000    91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.18
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.63
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.68
AVERAGE FLOW DEPTH(FEET) =   0.39   TRAVEL TIME(MIN.) =   3.58
Tc(MIN.) =   12.29
SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    0.27
EFFECTIVE AREA(ACRES) =      3.66     AREA-AVERAGED Fm(INCH/HR) =   0.13
AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.54
TOTAL AREA(ACRES) =        4.3         PEAK FLOW RATE(CFS) =       5.50
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.39   FLOW VELOCITY(FEET/SEC.) =   0.66
LONGEST FLOWPATH FROM NODE    210.00 TO NODE    250.00 =     695.00 FEET.
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =        4.3  TC(MIN.) =     12.29
EFFECTIVE AREA(ACRES) =      3.66  AREA-AVERAGED Fm(INCH/HR)=  0.13
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 0.541
PEAK FLOW RATE(CFS)    =       5.50

** PEAK FLOW RATE TABLE **
 STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
 NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
    1        5.50   12.29    1.499  0.25( 0.13) 0.54       3.7     200.00
    2        5.39   13.64    1.393  0.24( 0.13) 0.55       4.0     210.00
    3        5.01   16.13    1.239  0.23( 0.14) 0.59       4.3     230.00
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS
```

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**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
       (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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         Ver. 15.0  Release Date: 04/01/2008  License ID 1524

                        Analysis prepared by:

                        SITETECH, INC.

 ************************** DESCRIPTION OF STUDY **************************
                  STEENO DESIGN - NEWBERRY SPRINGS
                         MEMORIAL DRIVE
                       PROPOSED CONDITION
                  100 YEAR - 1 HOUR DESIGN STORM
 **************************************************************************
  FILE NAME: SDMR100P.DAT
  TIME/DATE OF STUDY: 08:35 02/26/2018
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.7000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.7600

  *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    100.00 TO NODE    120.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   110.00
```

```
 ELEVATION DATA: UPSTREAM(FEET) =   1791.80  DOWNSTREAM(FEET) =   1788.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 10.022
 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                 C        0.14      0.27      0.100    86    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      1.26
 TOTAL AREA(ACRES) =      0.14   PEAK FLOW RATE(CFS) =      1.26

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 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.) =    5.00
 RAINFALL INTENSITY(INCH/HR) =  10.02
 AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.27
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       0.14
 TOTAL STREAM AREA(ACRES) =       0.14
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.26

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   128.00
 ELEVATION DATA: UPSTREAM(FEET) =   1792.00  DOWNSTREAM(FEET) =   1788.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 10.022
 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                 C        0.64      0.27      0.100    86    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      5.76
 TOTAL AREA(ACRES) =      0.64   PEAK FLOW RATE(CFS) =      5.76

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 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.) =    5.00
 RAINFALL INTENSITY(INCH/HR) =  10.02
 AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.27
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       0.64
 TOTAL STREAM AREA(ACRES) =       0.64
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.76

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        1.26    5.00   10.022  0.27( 0.03) 0.10       0.1     100.00
     2        5.76    5.00   10.022  0.27( 0.03) 0.10       0.6     110.00

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

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        7.02    5.00   10.022  0.27( 0.03) 0.10       0.8     100.00
     2        7.02    5.00   10.022  0.27( 0.03) 0.10       0.8     110.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       7.02    Tc(MIN.) =     5.00
 EFFECTIVE AREA(ACRES) =       0.78   AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.27  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        0.8
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    120.00 =     128.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    130.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1788.00  DOWNSTREAM(FEET) =   1787.90
 CHANNEL LENGTH THRU SUBAREA(FEET) =    68.00   CHANNEL SLOPE =  0.0015
 CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   3.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  8.831
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "BARREN"                    C        0.06      0.06     1.000    98
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.06
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.25
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.14
 AVERAGE FLOW DEPTH(FEET) =   0.54   TRAVEL TIME(MIN.) =   0.99
 Tc(MIN.) =    5.99
 SUBAREA AREA(ACRES) =     0.06       SUBAREA RUNOFF(CFS) =    0.47
 EFFECTIVE AREA(ACRES) =      0.84     AREA-AVERAGED Fm(INCH/HR) =   0.03
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 AREA-AVERAGED Fp(INCH/HR) =   0.18  AREA-AVERAGED Ap =   0.16
 TOTAL AREA(ACRES) =        0.8          PEAK FLOW RATE(CFS) =       7.02
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.53   FLOW VELOCITY(FEET/SEC.) =   1.14
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    130.00 =     196.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    200.00 TO NODE    220.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   377.00
 ELEVATION DATA: UPSTREAM(FEET) =   1791.30  DOWNSTREAM(FEET) =   1787.60

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.223
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  7.074
 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                C        1.22      0.27      0.100    86    8.22
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      7.74
 TOTAL AREA(ACRES) =      1.22   PEAK FLOW RATE(CFS) =      7.74

****************************************************************************
 FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.22
 RAINFALL INTENSITY(INCH/HR) =   7.07
 AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.27
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       1.22
 TOTAL STREAM AREA(ACRES) =       1.22
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.74

****************************************************************************
 FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   467.00
 ELEVATION DATA: UPSTREAM(FEET) =   1791.00  DOWNSTREAM(FEET) =   1787.60

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.510
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.390
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 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                  C        0.75      0.27      0.100    86    9.51
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      4.29
 TOTAL AREA(ACRES) =      0.75   PEAK FLOW RATE(CFS) =      4.29

****************************************************************************
 FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 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.) =    9.51
 RAINFALL INTENSITY(INCH/HR) =   6.39
 AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.27
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       0.75
 TOTAL STREAM AREA(ACRES) =       0.75
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.29

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1        7.74    8.22    7.074  0.27( 0.03) 0.10       1.2      200.00
     2        4.29    9.51    6.390  0.27( 0.03) 0.10       0.8      210.00

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

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1       11.85    8.22    7.074  0.27( 0.03) 0.10       1.9      200.00
     2       11.28    9.51    6.390  0.27( 0.03) 0.10       2.0      210.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      11.85    Tc(MIN.) =     8.22
 EFFECTIVE AREA(ACRES) =       1.87   AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.27  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        2.0
 LONGEST FLOWPATH FROM NODE    210.00 TO NODE    220.00 =     467.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    220.00 TO NODE    240.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1787.60  DOWNSTREAM(FEET) =   1787.20
 CHANNEL LENGTH THRU SUBAREA(FEET) =    83.00   CHANNEL SLOPE =  0.0048
 CHANNEL BASE(FEET) =    0.10   "Z" FACTOR =   4.000
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 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.869
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "CHAPARRAL,BROADLEAF"       C        0.20      0.21      1.000    91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.45
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.91
 AVERAGE FLOW DEPTH(FEET) =   0.88   TRAVEL TIME(MIN.) =   0.35
 Tc(MIN.) =    8.58
 SUBAREA AREA(ACRES) =     0.20       SUBAREA RUNOFF(CFS) =    1.20
 EFFECTIVE AREA(ACRES) =      2.07     AREA-AVERAGED Fm(INCH/HR) =   0.04
 AREA-AVERAGED Fp(INCH/HR) =   0.24  AREA-AVERAGED Ap =   0.19
 TOTAL AREA(ACRES) =        2.2         PEAK FLOW RATE(CFS) =      12.70

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.88   FLOW VELOCITY(FEET/SEC.) =   3.97
 LONGEST FLOWPATH FROM NODE    210.00 TO NODE    240.00 =     550.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.58
 RAINFALL INTENSITY(INCH/HR) =   6.87
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.24
 AREA-AVERAGED Ap =  0.19
 EFFECTIVE STREAM AREA(ACRES) =       2.07
 TOTAL STREAM AREA(ACRES) =       2.17
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      12.70

****************************************************************************
 FLOW PROCESS FROM NODE    230.00 TO NODE    240.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   310.00
 ELEVATION DATA: UPSTREAM(FEET) =   1791.20  DOWNSTREAM(FEET) =   1787.20

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   12.433
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.297
 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
 "BARREN"                    C        1.95      0.06      1.000    98   12.43
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.06
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
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 SUBAREA RUNOFF(CFS) =      9.19
 TOTAL AREA(ACRES) =      1.95   PEAK FLOW RATE(CFS) =      9.19

****************************************************************************
 FLOW PROCESS FROM NODE    240.00 TO NODE    240.00 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.) =   12.43
 RAINFALL INTENSITY(INCH/HR) =   5.30
 AREA-AVERAGED Fm(INCH/HR) =  0.06
 AREA-AVERAGED Fp(INCH/HR) =  0.06
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =       1.95
 TOTAL STREAM AREA(ACRES) =       1.95
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.19

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       12.70    8.58    6.869  0.24( 0.04) 0.19       2.1      200.00
     1       12.08    9.87    6.228  0.24( 0.04) 0.18       2.2      210.00
     2        9.19   12.43    5.297  0.06( 0.06) 1.00       2.0      230.00

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

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       20.95    8.58    6.869  0.10( 0.05) 0.51       3.4      200.00
     2       20.66    9.87    6.228  0.10( 0.05) 0.52       3.7      210.00
     3       19.45   12.43    5.297  0.09( 0.05) 0.57       4.1      230.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      20.95    Tc(MIN.) =     8.58
 EFFECTIVE AREA(ACRES) =       3.41   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.10  AREA-AVERAGED Ap =  0.51
 TOTAL AREA(ACRES) =        4.1
 LONGEST FLOWPATH FROM NODE    210.00 TO NODE    240.00 =     550.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    240.00 TO NODE    250.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1787.20  DOWNSTREAM(FEET) =   1787.10
 CHANNEL LENGTH THRU SUBAREA(FEET) =   145.00   CHANNEL SLOPE =  0.0007
 CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =   3.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.50
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.849
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
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     LAND USE              GROUP   (ACRES)   (INCH/HR)   (DECIMAL)  CN
  NATURAL POOR COVER
  "BARREN"                   C        0.23       0.06       1.000    98
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.06
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      21.54
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.09
  AVERAGE FLOW DEPTH(FEET) =   0.87   TRAVEL TIME(MIN.) =   2.21
  Tc(MIN.) =   10.79
  SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    1.20
  EFFECTIVE AREA(ACRES) =      3.64     AREA-AVERAGED Fm(INCH/HR) =   0.05
  AREA-AVERAGED Fp(INCH/HR) =   0.10  AREA-AVERAGED Ap =   0.54
  TOTAL AREA(ACRES) =        4.3         PEAK FLOW RATE(CFS) =      20.95
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.86   FLOW VELOCITY(FEET/SEC.) =   1.08
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    250.00 =     695.00 FEET.
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        4.3  TC(MIN.) =     10.79
  EFFECTIVE AREA(ACRES) =      3.64  AREA-AVERAGED Fm(INCH/HR)=  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.10  AREA-AVERAGED Ap = 0.538
  PEAK FLOW RATE(CFS)    =     20.95

  ** PEAK FLOW RATE TABLE **
   STREAM       Q       Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
      1       20.95   10.79    5.849  0.10( 0.05) 0.54       3.6     200.00
      2       20.66   12.09    5.401  0.09( 0.05) 0.55       3.9     210.00
      3       19.45   14.71    4.709  0.09( 0.05) 0.59       4.3     230.00
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
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HYDRAULIC CALCULATION

4' WIDE BY 18" DEEP CONCRETE V-GUTTER @ 0.50% (NODE 220-240)

Given Input Data:

Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	12.7000 cfs
Slope	0.0050 ft/ft
Manning's n	0.0130
Height	18.0000 in
Bottom width	0.0000 in
Left slope	0.7500 ft/ft (V/H)
Right slope	0.7500 ft/ft (V/H)

Computed Results:

Depth	16.0474 in
Velocity	5.3262 fps
Full Flowrate	17.2497 cfs
Flow area	2.3844 ft2
Flow perimeter	53.4914 in
Hydraulic radius	6.4190 in
Top width	42.7931 in
Area	3.0000 ft2
Perimeter	60.0000 in
Percent full	89.1524 %

CAPACITY IN CURB & GUTTER (6" CURB @ 0.50% GRADE)

MEASURED VALUES		
DEPTH OF FLOW IN CURB	0.500	ft*
FRICTION FACTOR (N)	0.015	
CURB HEIGHT	0.500	in
CL TO RIGHT-OF-WAY	33.000	ft
CL TO CURB WIDTH	33.000	ft
GUTTER WIDTH	1.500	ft
GUTTER DEPTH	0.125	ft
PAVEMENT LIP	0.020	ft
SLOPE OF STREET (S)	0.0050	ft/ft
CURB FACE SLOPE	3.0000	ft/ft
X-SLOPE OF PAVEMENT	0.0150	ft/ft
CALCULATED VALUES		
WIDTH OF FLOW IN STREET	25.181	ft
WETTED PERIMETER (P)	25.722	ft
FLOW AREA (A)	4.899	sf
HYDRAULIC RADIUS (R)	0.190	ft
VELOCITY (V)	2.319	ft/s
FLOW RATE (Q) HALF WIDTH	**11.359**	**cfs**

REFERENCE MAPS

NOAA Atlas 14, Volume 6, Version 2
Location name: Newberry Springs, California, USA*
Latitude: 34.8173°, Longitude: -116.6075°
Elevation: 1792.39 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.088 (0.072-0.108)	0.127 (0.104-0.157)	0.182 (0.149-0.225)	0.230 (0.186-0.286)	0.298 (0.234-0.384)	0.355 (0.273-0.466)	0.416 (0.312-0.559)	0.482 (0.353-0.665)	0.578 (0.406-0.829)	0.657 (0.447-0.975)
10-min	0.126 (0.103-0.155)	0.182 (0.149-0.225)	0.261 (0.213-0.323)	0.329 (0.266-0.410)	0.428 (0.336-0.551)	0.509 (0.391-0.668)	0.596 (0.448-0.801)	0.691 (0.506-0.953)	0.828 (0.583-1.19)	0.942 (0.641-1.40)
15-min	0.152 (0.125-0.188)	0.221 (0.180-0.272)	0.316 (0.258-0.391)	0.398 (0.322-0.496)	0.517 (0.406-0.666)	0.615 (0.473-0.808)	0.721 (0.542-0.968)	0.835 (0.611-1.15)	1.00 (0.705-1.44)	1.14 (0.776-1.69)
30-min	0.206 (0.169-0.254)	0.298 (0.244-0.368)	0.427 (0.348-0.529)	0.538 (0.436-0.671)	0.700 (0.549-0.901)	0.832 (0.640-1.09)	0.975 (0.733-1.31)	1.13 (0.827-1.56)	1.35 (0.953-1.94)	1.54 (1.05-2.29)
60-min	0.276 (0.226-0.341)	0.400 (0.327-0.494)	0.572 (0.467-0.709)	0.721 (0.584-0.900)	0.938 (0.736-1.21)	1.12 (0.858-1.47)	1.31 (0.982-1.76)	1.51 (1.11-2.09)	1.82 (1.28-2.61)	2.07 (1.41-3.06)
2-hr	0.352 (0.289-0.435)	0.486 (0.397-0.600)	0.671 (0.547-0.830)	0.829 (0.672-1.03)	1.06 (0.830-1.36)	1.24 (0.957-1.63)	1.44 (1.08-1.94)	1.65 (1.21-2.28)	1.96 (1.38-2.81)	2.20 (1.50-3.27)
3-hr	0.407 (0.333-0.502)	0.553 (0.452-0.682)	0.754 (0.615-0.933)	0.925 (0.749-1.15)	1.17 (0.919-1.51)	1.37 (1.05-1.80)	1.58 (1.19-2.12)	1.81 (1.32-2.49)	2.12 (1.50-3.05)	2.38 (1.62-3.53)
6-hr	0.490 (0.401-0.604)	0.656 (0.537-0.810)	0.884 (0.721-1.09)	1.08 (0.872-1.34)	1.35 (1.06-1.74)	1.57 (1.21-2.06)	1.80 (1.35-2.42)	2.05 (1.50-2.82)	2.39 (1.68-3.43)	2.66 (1.81-3.95)
12-hr	0.540 (0.442-0.666)	0.728 (0.596-0.899)	0.985 (0.804-1.22)	1.20 (0.971-1.50)	1.50 (1.18-1.93)	1.74 (1.34-2.29)	1.99 (1.50-2.67)	2.25 (1.65-3.11)	2.61 (1.84-3.75)	2.90 (1.97-4.30)
24-hr	0.668 (0.593-0.769)	0.917 (0.812-1.06)	1.25 (1.11-1.45)	1.53 (1.34-1.78)	1.91 (1.62-2.30)	2.22 (1.84-2.72)	2.53 (2.05-3.18)	2.85 (2.25-3.69)	3.30 (2.50-4.45)	3.65 (2.67-5.09)
2-day	0.788 (0.699-0.907)	1.09 (0.968-1.26)	1.50 (1.33-1.73)	1.84 (1.61-2.14)	2.30 (1.95-2.76)	2.66 (2.21-3.26)	3.03 (2.45-3.81)	3.41 (2.69-4.41)	3.94 (2.98-5.31)	4.35 (3.18-6.06)
3-day	0.834 (0.739-0.959)	1.16 (1.03-1.34)	1.61 (1.42-1.86)	1.97 (1.73-2.29)	2.46 (2.09-2.97)	2.85 (2.37-3.50)	3.24 (2.63-4.08)	3.65 (2.88-4.72)	4.21 (3.18-5.67)	4.64 (3.39-6.48)
4-day	0.865 (0.767-0.995)	1.21 (1.08-1.40)	1.68 (1.49-1.94)	2.06 (1.81-2.40)	2.58 (2.19-3.11)	2.98 (2.48-3.66)	3.39 (2.75-4.26)	3.81 (3.01-4.93)	4.39 (3.32-5.91)	4.83 (3.53-6.74)
7-day	0.916 (0.812-1.05)	1.30 (1.15-1.50)	1.81 (1.60-2.09)	2.23 (1.95-2.59)	2.79 (2.36-3.36)	3.22 (2.67-3.95)	3.65 (2.96-4.59)	4.09 (3.22-5.29)	4.68 (3.54-6.31)	5.13 (3.75-7.16)
10-day	0.959 (0.851-1.10)	1.37 (1.22-1.58)	1.92 (1.70-2.22)	2.37 (2.07-2.76)	2.97 (2.52-3.58)	3.43 (2.85-4.21)	3.89 (3.15-4.89)	4.35 (3.43-5.63)	4.98 (3.77-6.71)	5.45 (3.98-7.60)
20-day	1.08 (0.959-1.25)	1.57 (1.39-1.81)	2.23 (1.97-2.58)	2.77 (2.42-3.22)	3.50 (2.97-4.22)	4.07 (3.38-5.00)	4.63 (3.76-5.83)	5.21 (4.11-6.74)	5.96 (4.51-8.04)	6.52 (4.77-9.10)
30-day	1.19 (1.05-1.36)	1.73 (1.54-2.00)	2.48 (2.19-2.87)	3.10 (2.71-3.61)	3.95 (3.35-4.76)	4.61 (3.83-5.67)	5.27 (4.27-6.64)	5.94 (4.68-7.69)	6.82 (5.16-9.20)	7.47 (5.46-10.4)
45-day	1.33 (1.18-1.53)	1.95 (1.73-2.25)	2.80 (2.48-3.24)	3.52 (3.09-4.10)	4.54 (3.85-5.46)	5.33 (4.43-6.55)	6.13 (4.97-7.71)	6.94 (5.47-8.97)	8.00 (6.06-10.8)	8.79 (6.43-12.3)
60-day	1.44 (1.28-1.66)	2.11 (1.87-2.44)	3.06 (2.70-3.53)	3.86 (3.38-4.49)	4.99 (4.23-6.01)	5.89 (4.89-7.24)	6.81 (5.52-8.57)	7.73 (6.10-10.0)	8.97 (6.79-12.1)	9.88 (7.23-13.8)

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

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

Please refer to NOAA Atlas 14 document for more information.

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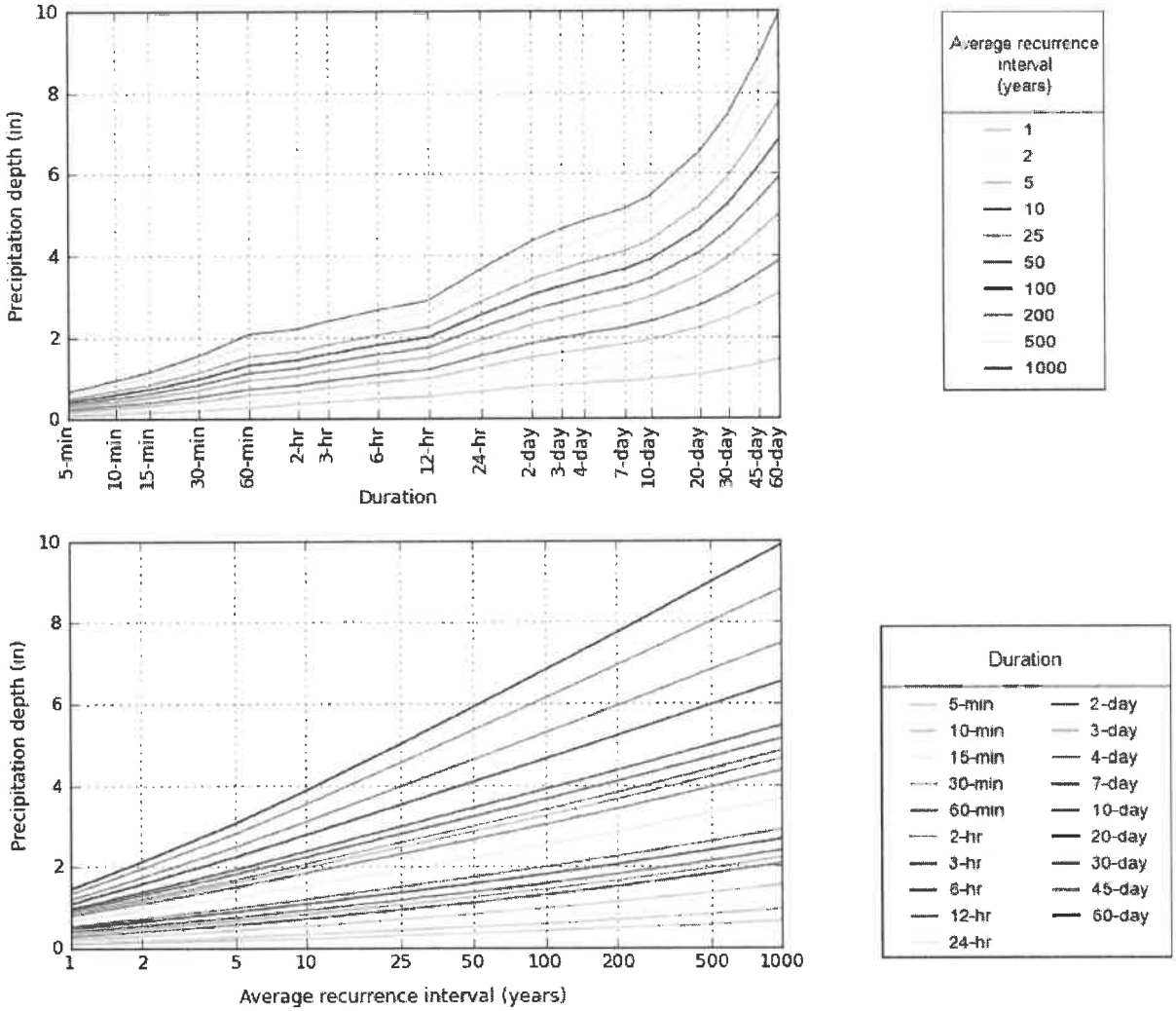
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 34.8173°, Longitude: -116.6075°



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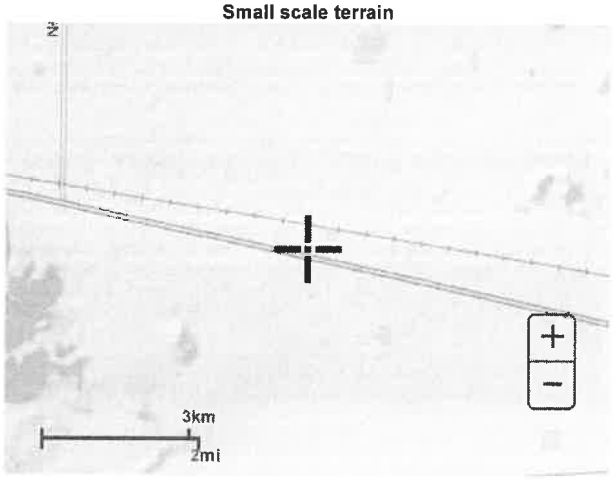
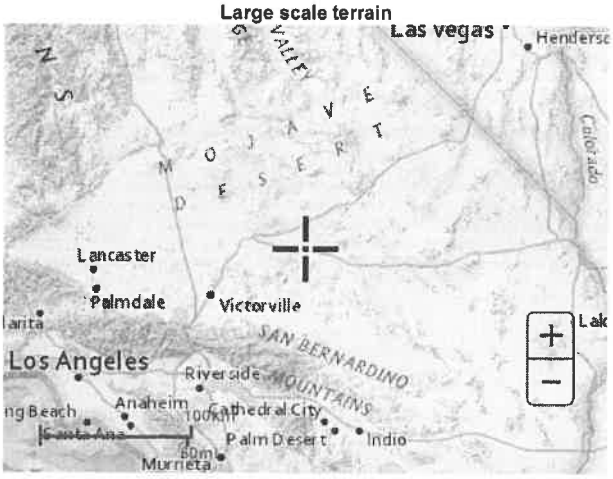
Maps & aerials

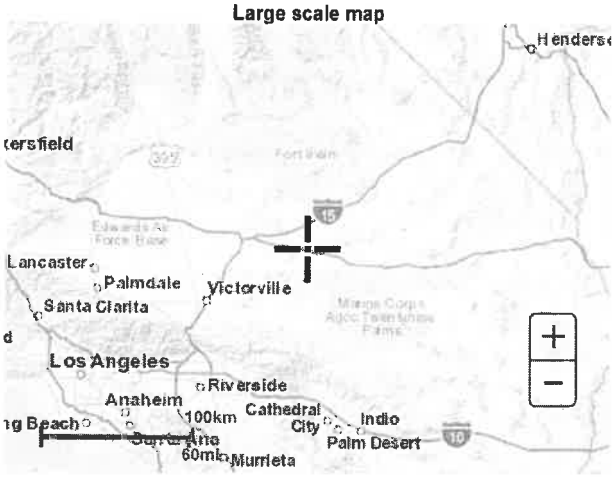
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

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

Disclaimer

IN THE COUNTY OF SAN BERNARDINIO

DRAINAGE MAP
EXISTING CONDITION
MONEY SAMRA
TRUCK SERVIVE CENTER

PORTION OF THE EAST HALF OF THE WEST HALF OF GOVERNMENT LOT 1 OF THE NORTHWEST QUARTER OF SECTION 6, TOWNSHIP 8 NORTH, RANGE 4 EAST, SAN BERNARDINO BASE & MERIDIAN. IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA,
SITETECH, INC.

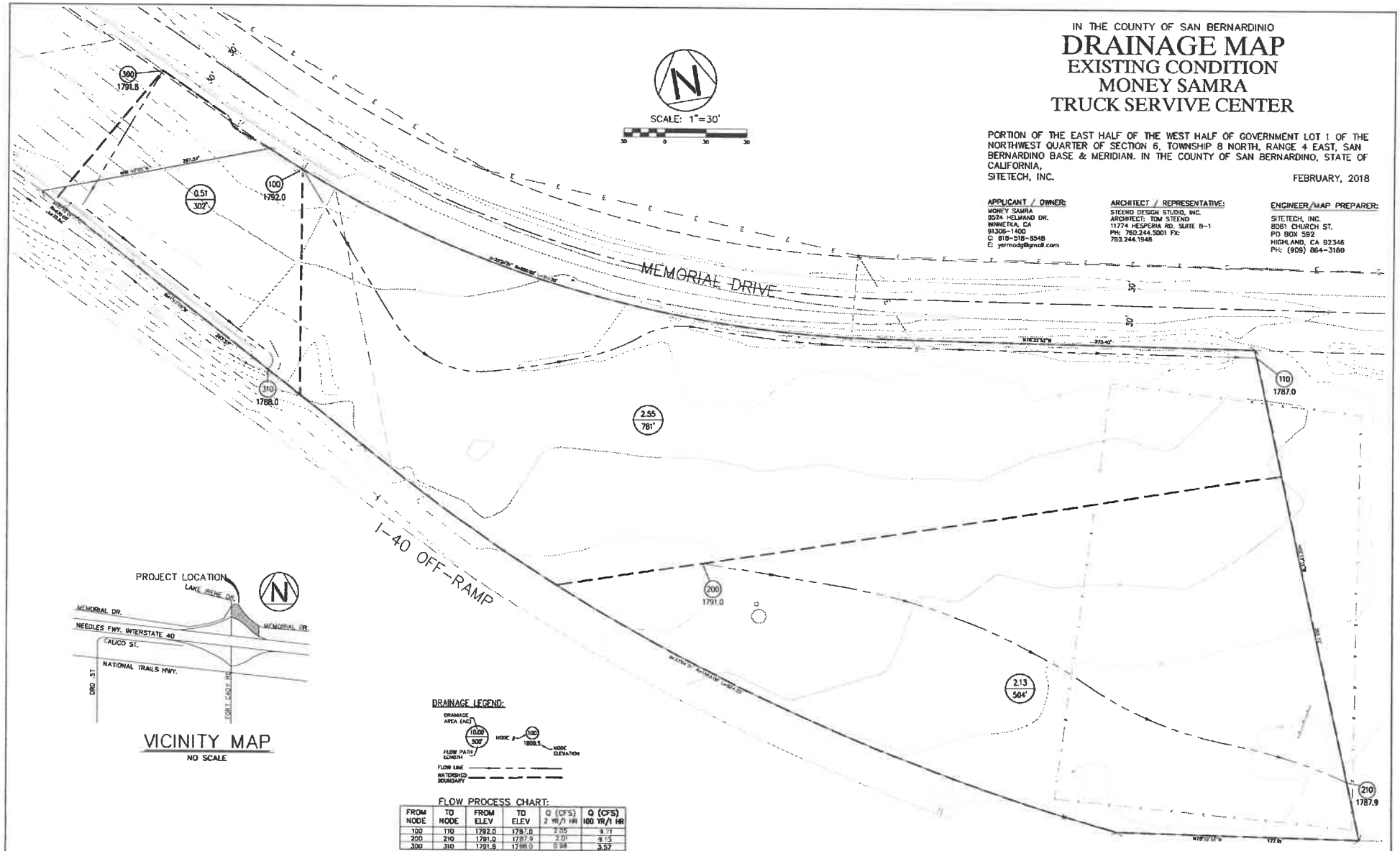
FEBRUARY, 2018

APPLICANT / OWNER:
MONEY SAMRA
8524 HELMAND DR.
WHITTIER, CA
91306-1400
C: 818-518-8548
E: yermadg@gmail.com

ARCHITECT / REPRESENTATIVE:
STEENO DESIGN STUDIO, INC.
ARCHITECT: TOM STEENO
11774 HESPERIA RD. SUITE B-1
PH: 760.244.5001 FX:
760.244.1948

ENGINEER/MAP PREPARER:
SITETECH, INC.
8061 CHURCH ST.
PO BOX 592
HIGHLAND, CA 92346
PH: (909) 864-3180

SCALE: 1"=30'



VICINITY MAP
NO SCALE

DRAINAGE LEGEND:

FLOW PROCESS CHART:

FROM NODE	TO NODE	FROM ELEV	TO ELEV	Q (CFS) 2 YR/1 HR	Q (CFS) 100 YR/1 HR
100	110	1792.0	1787.0	2.05	8.71
200	210	1791.0	1787.9	2.01	8.13
300	310	1791.8	1788.0	0.98	3.57

SITETECH INC.
8061 CHURCH ST. HIGHLAND CA 92346 PO BOX 592
PH: (909)864-3180, FAX: (909)864-0850

BERNHARD C. MAYER R.C.E. 36868 L.S. 7319 DATE 02/28/2018

IN THE COUNTY OF SAN BERNARDINIO

DRAINAGE MAP
PROPOSED CONDITION
MONEY SAMRA
TRUCK SERVIVE CENTER

PORTION OF THE EAST HALF OF THE WEST HALF OF GOVERNMENT LOT 1 OF THE NORTHWEST QUARTER OF SECTION 6, TOWNSHIP 8 NORTH, RANGE 4 EAST, SAN BERNARDINO BASE & MERIDIAN. IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA,
SITETECH, INC.

FEBRUARY, 2018

APPLICANT / OWNER:
MONEY SAMRA
8524 HELMAND DR.
WINNETKA, CA
91306-1400
C: 818-518-8548
E: yermodg@gmail.com

ARCHITECT / REPRESENTATIVE:
STEEND DESIGN STUDIO, INC.
ARCHITECT: TOM STEENO
11774 HESPERIA RD. SUITE B-1
PH: 760.244.5001 FX:
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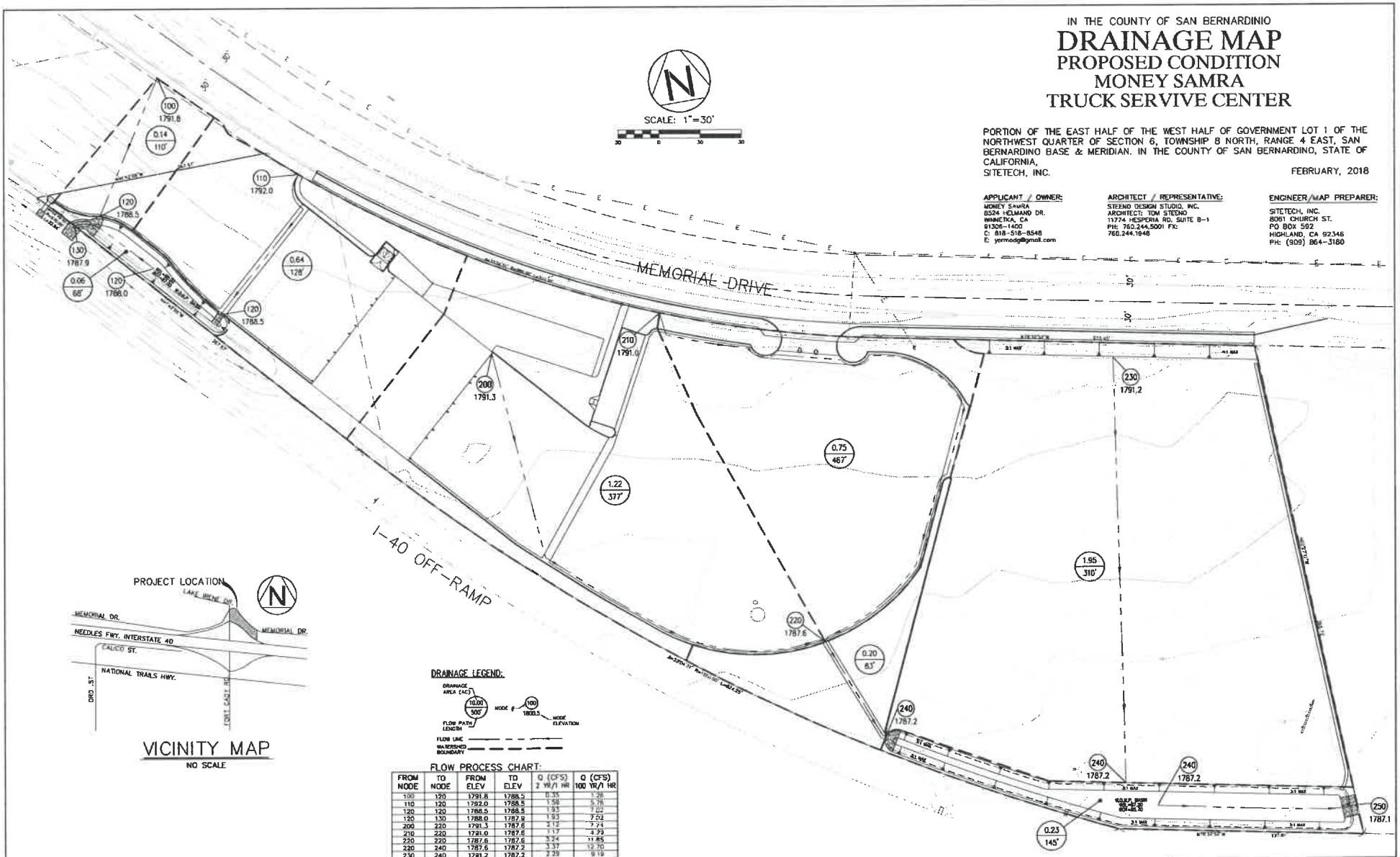
SCALE: 1"=30'



VICINITY MAP
NO SCALE

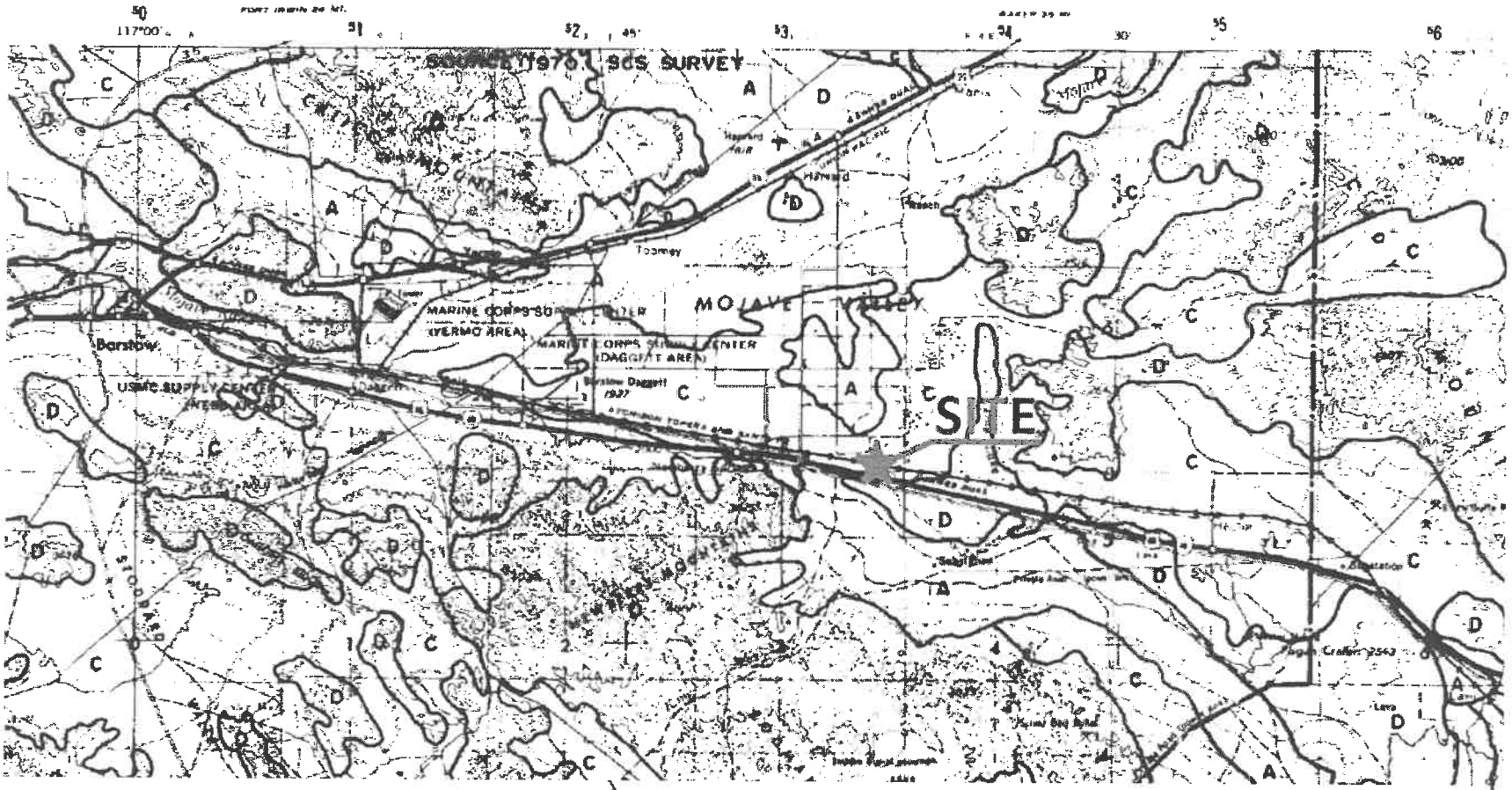
DRAINAGE LEGEND:

FLOW PROCESS CHART:

FROM NODE	TO NODE	FROM ELEV	TO ELEV	Q (CFS) 2 YR/1 HR	Q (CFS) 100 YR/1 HR
100	120	1791.8	1788.5	0.35	1.26
110	120	1792.0	1788.5	1.58	5.76
120	120	1788.5	1788.5	1.93	7.02
120	130	1788.0	1787.9	1.93	7.02
200	220	1791.3	1787.6	2.12	7.74
210	220	1791.0	1787.6	1.17	4.23
220	220	1787.6	1787.6	3.24	11.85
220	240	1787.6	1787.2	3.37	12.70
230	240	1791.2	1787.2	2.39	9.19
240	240	1787.2	1787.2	5.50	20.95
240	250	1787.2	1787.1	5.50	20.95

SITETECH INC.
8051 CHURCH ST. HIGHLAND CA 92346 PO BOX 592
PH: (909)864-3180, FAX: (909)864-0830

BERNHARD E. MAYER R.C.E. 36865 L.S. 7319 DATE



HYDROLOGIC SOILS GROUP MAP FOR SOUTHCENTRAL AREA

FIGURE C-11