```
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
NATURAL GOOD COVER
"WOODLAND"                 A        1.58      0.40      1.000    25
NATURAL GOOD COVER
"WOODLAND"                 B        0.24      0.30      1.000    55
NATURAL GOOD COVER
"WOODLAND"                 C        0.63      0.25      1.000    70
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.35
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     32.95
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.44
AVERAGE FLOW DEPTH(FEET) =   0.86   FLOOD WIDTH(FEET) =   13.04
"V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.75   Tc(MIN.) =   20.59
SUBAREA AREA(ACRES) =    2.45       SUBAREA RUNOFF(CFS) =    1.44
EFFECTIVE AREA(ACRES) =   47.58     AREA-AVERAGED Fm(INCH/HR) =   0.28
AREA-AVERAGED Fp(INCH/HR) =   0.28  AREA-AVERAGED Ap =   1.00
TOTAL AREA(ACRES) =       48.5        PEAK FLOW RATE(CFS) =      32.23
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) =  0.86   FLOOD WIDTH(FEET) =   12.95
FLOW VELOCITY(FEET/SEC.) =   4.41   DEPTH*VELOCITY(FT*FT/SEC) =   3.77
LONGEST FLOWPATH FROM NODE     50.00 TO NODE     17.00 =    2604.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     17.00 TO NODE     17.00 IS CODE =  10
----------------------------------------------------------------------------
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE     40.00 TO NODE     41.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =   614.00
ELEVATION DATA: UPSTREAM(FEET) =    681.80  DOWNSTREAM(FEET) =    594.50

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.599
*   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.275
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 FAIR COVER
"CHAPARRAL,NARROWLEAF"     A        0.33      0.40      1.000    55   13.60
NATURAL FAIR COVER
"CHAPARRAL,NARROWLEAF"     B        0.93      0.30      1.000    72   13.60
NATURAL FAIR COVER
"CHAPARRAL,NARROWLEAF"     C        1.30      0.25      1.000    81   13.60
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.29
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA RUNOFF(CFS) =      2.27
TOTAL AREA(ACRES) =      2.56   PEAK FLOW RATE(CFS) =      2.27
```

```
****************************************************************************
 FLOW PROCESS FROM NODE     41.00 TO NODE     42.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   594.50  DOWNSTREAM(FEET) =   567.10
 FLOW LENGTH(FEET) =   131.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  8.000
 DEPTH OF FLOW IN   8.0 INCH PIPE IS   3.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.16
 ESTIMATED PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.27
 PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =   13.75
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE     42.00 =     745.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     42.00 TO NODE     42.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE     40.00 TO NODE     45.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   322.00
 ELEVATION DATA: UPSTREAM(FEET) =    681.80  DOWNSTREAM(FEET) =    618.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.830
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.536
 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 FAIR COVER
 "CHAPARRAL,NARROWLEAF"     B        0.20      0.30      1.000    72    9.83
 NATURAL FAIR COVER
 "CHAPARRAL,NARROWLEAF"     C        2.51      0.25      1.000    81    9.83
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      3.13
 TOTAL AREA(ACRES) =      2.71   PEAK FLOW RATE(CFS) =      3.13

****************************************************************************
 FLOW PROCESS FROM NODE     45.00 TO NODE     46.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   615.00  DOWNSTREAM(FEET) =   609.29
 FLOW LENGTH(FEET) =   306.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.17
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
```

```
 PIPE-FLOW(CFS) =        3.13
 PIPE TRAVEL TIME(MIN.) =   0.83    Tc(MIN.) =   10.66
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE     46.00 =     628.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     46.00 TO NODE     46.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.66
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.466
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 A        0.20      0.40      0.100    32
 COMMERCIAL                 B        0.58      0.30      0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.78      SUBAREA RUNOFF(CFS) =    1.01
 EFFECTIVE AREA(ACRES) =      3.49   AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.26  AREA-AVERAGED Ap =  0.80
 TOTAL AREA(ACRES) =        3.5       PEAK FLOW RATE(CFS) =       3.96

****************************************************************************
 FLOW PROCESS FROM NODE     46.00 TO NODE     47.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   609.29  DOWNSTREAM(FEET) =   571.50
 FLOW LENGTH(FEET) =   168.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.74
 ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.96
 PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =   10.82
 LONGEST FLOWPATH FROM NODE     40.00 TO NODE     47.00 =     796.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     47.00 TO NODE     47.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.82
 RAINFALL INTENSITY(INCH/HR) =   1.45
 AREA-AVERAGED Fm(INCH/HR) =  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.26
 AREA-AVERAGED Ap =  0.80
 EFFECTIVE STREAM AREA(ACRES) =       3.49
 TOTAL STREAM AREA(ACRES) =       3.49
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.96

****************************************************************************
 FLOW PROCESS FROM NODE     48.00 TO NODE     48.50 IS CODE =  21
----------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   529.00
  ELEVATION DATA: UPSTREAM(FEET) =    628.80  DOWNSTREAM(FEET) =    582.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   10.476
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.481
  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
  "CHAPARRAL,NARROWLEAF"     A        1.10      0.40      1.000    71   10.48
  NATURAL POOR COVER
  "GRASS"                    B        0.49      0.30      1.000    78   10.48
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.37
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.59
  TOTAL AREA(ACRES) =      1.59   PEAK FLOW RATE(CFS) =      1.59

********************************************************************************
  FLOW PROCESS FROM NODE     48.50 TO NODE     47.00 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   577.00  DOWNSTREAM(FEET) =   571.50
  FLOW LENGTH(FEET) =   132.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.09
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.59
  PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =   10.79
  LONGEST FLOWPATH FROM NODE     48.00 TO NODE     47.00 =     661.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE     47.00 TO NODE     47.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.79
  RAINFALL INTENSITY(INCH/HR) =   1.46
  AREA-AVERAGED Fm(INCH/HR) =  0.37
  AREA-AVERAGED Fp(INCH/HR) =  0.37
  AREA-AVERAGED Ap =  1.00
  EFFECTIVE STREAM AREA(ACRES) =       1.59
  TOTAL STREAM AREA(ACRES) =       1.59
  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        3.96   10.82    1.453  0.26( 0.20) 0.80        3.5       40.00
```

```
    2        1.59   10.79    1.456  0.37( 0.37) 1.00       1.6      48.00

  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        5.55   10.79    1.456  0.30( 0.26) 0.86       5.1      48.00
      2        5.55   10.82    1.453  0.30( 0.26) 0.86       5.1      40.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.55    Tc(MIN.) =    10.82
  EFFECTIVE AREA(ACRES) =       5.08   AREA-AVERAGED Fm(INCH/HR) =  0.26
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap =  0.86
  TOTAL AREA(ACRES) =        5.1
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     47.00 =     796.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     47.00 TO NODE     49.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   571.50  DOWNSTREAM(FEET) =   568.38
  FLOW LENGTH(FEET) =   162.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.23
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.55
  PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =   11.20
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     49.00 =     958.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     49.00 TO NODE     49.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   11.20
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.425
  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,NARROWLEAF"      A        1.50      0.40      1.000    55
  NATURAL FAIR COVER
  "CHAPARRAL,NARROWLEAF"      B        0.28      0.30      1.000    72
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.38
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.78      SUBAREA RUNOFF(CFS) =    1.67
  EFFECTIVE AREA(ACRES) =      6.86   AREA-AVERAGED Fm(INCH/HR) =  0.29
  AREA-AVERAGED Fp(INCH/HR) =  0.32  AREA-AVERAGED Ap =  0.90
  TOTAL AREA(ACRES) =        6.9       PEAK FLOW RATE(CFS) =       7.01

****************************************************************************
  FLOW PROCESS FROM NODE     49.00 TO NODE     42.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   568.38  DOWNSTREAM(FEET) =   567.10
  FLOW LENGTH(FEET) =    58.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.00
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.01
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   11.32
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     42.00 =    1016.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     42.00 TO NODE     42.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        7.02   11.28    1.419  0.32( 0.29) 0.90       6.8      48.00
      2        7.01   11.32    1.416  0.32( 0.29) 0.90       6.9      40.00
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     42.00 =    1016.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        2.27   13.75    1.266  0.29( 0.29) 1.00       2.6      40.00
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     42.00 =     745.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        9.17   11.28    1.419  0.31( 0.29) 0.92       8.9      48.00
      2        9.17   11.32    1.416  0.31( 0.29) 0.92       9.0      40.00
      3        8.35   13.75    1.266  0.31( 0.29) 0.93       9.4      40.00
    TOTAL AREA(ACRES) =         9.4

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =        9.17  Tc(MIN.) =   11.281
  EFFECTIVE AREA(ACRES) =      8.95  AREA-AVERAGED Fm(INCH/HR) =  0.29
  AREA-AVERAGED Fp(INCH/HR) =  0.31  AREA-AVERAGED Ap =  0.92
  TOTAL AREA(ACRES) =        9.4
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     42.00 =    1016.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     42.00 TO NODE     42.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     42.00 TO NODE     17.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   567.10  DOWNSTREAM(FEET) =   558.83
  FLOW LENGTH(FEET) =    74.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.66
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.17
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =   11.36
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     17.00 =    1090.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     17.00 TO NODE     17.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        9.17   11.36    1.413  0.31( 0.29) 0.92       8.9      48.00
      2        9.17   11.40    1.411  0.31( 0.29) 0.92       9.0      40.00
      3        8.35   13.83    1.262  0.31( 0.29) 0.93       9.4      40.00
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     17.00 =    1090.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       29.14   13.03    1.307  0.28( 0.28) 1.00      30.1      31.00
      2       32.23   20.59    1.004  0.28( 0.28) 1.00      47.6      10.00
      3       30.45   22.55    0.954  0.28( 0.28) 1.00      48.5      50.00
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     17.00 =    2604.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       37.22   11.36    1.413  0.29( 0.28) 0.98      35.2      48.00
      2       37.24   11.40    1.411  0.29( 0.28) 0.98      35.3      40.00
      3       37.76   13.03    1.307  0.29( 0.28) 0.98      39.4      31.00
      4       37.82   13.83    1.262  0.28( 0.28) 0.98      41.4      40.00
      5       38.38   20.59    1.004  0.28( 0.28) 0.99      57.0      10.00
      6       36.15   22.55    0.954  0.28( 0.28) 0.99      57.9      50.00
    TOTAL AREA(ACRES) =        57.9

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       38.38  Tc(MIN.) =   20.594
  EFFECTIVE AREA(ACRES) =     57.00  AREA-AVERAGED Fm(INCH/HR) =  0.28
  AREA-AVERAGED Fp(INCH/HR) =  0.28  AREA-AVERAGED Ap =  0.99
  TOTAL AREA(ACRES) =       57.9
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     17.00 =    2604.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     17.00 TO NODE     17.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
```

```
 FLOW PROCESS FROM NODE     17.00 TO NODE     18.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   558.83  DOWNSTREAM(FEET) =   557.94
 FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  36.0 INCH PIPE IS  25.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.26
 ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      38.38
 PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =   20.96
 LONGEST FLOWPATH FROM NODE     50.00 TO NODE     18.00 =    2764.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     18.00 TO NODE     18.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   20.96
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.994
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "CHAPARRAL,BROADLEAF"      A        1.71      0.40      1.000    31
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    1.71      SUBAREA RUNOFF(CFS) =    0.91
 EFFECTIVE AREA(ACRES) =     58.71   AREA-AVERAGED Fm(INCH/HR) =  0.28
 AREA-AVERAGED Fp(INCH/HR) =  0.28  AREA-AVERAGED Ap =  0.99
 TOTAL AREA(ACRES) =       59.6       PEAK FLOW RATE(CFS) =      38.38
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       59.6  TC(MIN.) =     20.96
 EFFECTIVE AREA(ACRES) =     58.71  AREA-AVERAGED Fm(INCH/HR)=  0.28
 AREA-AVERAGED Fp(INCH/HR) =  0.28  AREA-AVERAGED Ap = 0.988
 PEAK FLOW RATE(CFS)   =      38.38

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1       37.22   11.73    1.388  0.29( 0.29) 0.98      36.9       48.00
     2       37.24   11.77    1.385  0.29( 0.29) 0.98      37.0       40.00
     3       37.76   13.39    1.286  0.29( 0.28) 0.98      41.1       31.00
     4       37.82   14.20    1.243  0.29( 0.28) 0.98      43.1       40.00
     5       38.38   20.96    0.994  0.28( 0.28) 0.99      58.7       10.00
     6       36.15   22.93    0.944  0.28( 0.28) 0.99      59.6       50.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

****
NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS

Ver. 14.0 Release Date: 06/01/2007 License ID 1355

Analysis prepared by:

Fuscoe Engineering, Inc
16795 Von Karman Ave. Suite 100
Irvine, California 92606
PH: 949-474-1960 FAX: 949-474-5315

****

Problem Descriptions:
IRWD SITE
EXISTING OUTLET A
2 YEAR

*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 2.05 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	59.60	95.00	83.	0.280	0.383

TOTAL AREA (Acres) = 59.60

AREA-AVERAGED LOSS RATE, $\overline{Fm}$ (in./hr.) = 0.266

AREA-AVERAGED LOW LOSS FRACTION, $\overline{Y}$ = 0.617

```
**************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL

==========================================================================
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              Ver. 14.0  Release Date: 06/01/2007  License ID 1355

                           Analysis prepared by:

                              Fuscoe Engineering, Inc
                           16795 Von Karman Ave. Suite 100
                              Irvine, California 92606
                        PH: 949-474-1960       FAX: 949-474-5315

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

  Problem Descriptions:
   IRWD SITE
   EXISTING OUTLET A
   2 YEAR
 ------------------------------------------------------------------------


     RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
     TOTAL CATCHMENT AREA(ACRES) =   59.60
     SOIL-LOSS RATE, Fm,(INCH/HR) =  0.266
     LOW LOSS FRACTION = 0.617
     TIME OF CONCENTRATION(MIN.) = 20.96
     SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
     ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
     RETURN FREQUENCY(YEARS) =   2
        5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
       30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
        1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
        3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
        6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
       24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

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

     TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     4.02
     TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     6.17


**************************************************************************
   TIME      VOLUME        Q    0.       10.0      20.0      30.0      40.0
  (HOURS)     (AF)       (CFS)
 ------------------------------------------------------------------------
   0.28      0.0076      0.66  Q          .         .         .         .
   0.63      0.0267      0.66  Q          .         .         .         .
   0.98      0.0461      0.68  Q          .         .         .         .
   1.33      0.0657      0.68  Q          .         .         .         .
   1.68      0.0856      0.70  Q          .         .         .         .
```

2.03	0.1059	0.70	Q	.	.	.	.
2.38	0.1264	0.72	Q	.	.	.	.
2.73	0.1473	0.73	Q	.	.	.	.
3.07	0.1685	0.74	Q	.	.	.	.
3.42	0.1900	0.75	Q	.	.	.	.
3.77	0.2120	0.77	Q	.	.	.	.
4.12	0.2343	0.78	Q	.	.	.	.
4.47	0.2570	0.80	Q	.	.	.	.
4.82	0.2801	0.81	Q	.	.	.	.
5.17	0.3037	0.83	Q	.	.	.	.
5.52	0.3278	0.84	Q	.	.	.	.
5.87	0.3523	0.86	Q	.	.	.	.
6.22	0.3774	0.87	Q	.	.	.	.
6.57	0.4030	0.90	Q	.	.	.	.
6.92	0.4292	0.91	Q	.	.	.	.
7.27	0.4560	0.94	Q	.	.	.	.
7.62	0.4835	0.96	Q	.	.	.	.
7.97	0.5117	0.99	Q	.	.	.	.
8.31	0.5406	1.01	.Q	.	.	.	.
8.66	0.5704	1.05	.Q	.	.	.	.
9.01	0.6010	1.07	.Q	.	.	.	.
9.36	0.6325	1.11	.Q	.	.	.	.
9.71	0.6650	1.14	.Q	.	.	.	.
10.06	0.6987	1.19	.Q	.	.	.	.
10.41	0.7335	1.22	.Q	.	.	.	.
10.76	0.7697	1.29	.Q	.	.	.	.
11.11	0.8074	1.32	.Q	.	.	.	.
11.46	0.8466	1.40	.Q	.	.	.	.
11.81	0.8877	1.44	.Q	.	.	.	.
12.16	0.9317	1.61	.Q	.	.	.	.
12.51	0.9829	1.94	.Q	.	.	.	.
12.86	1.0411	2.08	. Q	.	.	.	.
13.21	1.1025	2.17	. Q	.	.	.	.
13.55	1.1679	2.37	. Q	.	.	.	.
13.90	1.2379	2.49	. Q	.	.	.	.
14.25	1.3150	2.85	. Q	.	.	.	.
14.60	1.4007	3.09	. Q	.	.	.	.
14.95	1.4979	3.64	. Q	.	.	.	.
15.30	1.6090	4.05	. Q	.	.	.	.
15.65	1.7385	4.92	. Q	.	.	.	.
16.00	1.9060	6.68	. Q	.	.	.	.
16.35	2.5603	38.65	.	.	.	.	Q .
16.70	3.1851	4.63	. Q	.	.	.	.
17.05	3.3001	3.33	. Q	.	.	.	.
17.40	3.3861	2.63	. Q	.	.	.	.
17.75	3.4567	2.26	. Q	.	.	.	.
18.10	3.5183	2.01	. Q	.	.	.	.
18.45	3.5689	1.49	.Q	.	.	.	.
18.79	3.6100	1.36	.Q	.	.	.	.
19.14	3.6477	1.25	.Q	.	.	.	.
19.49	3.6826	1.17	.Q	.	.	.	.
19.84	3.7152	1.09	.Q	.	.	.	.
20.19	3.7458	1.03	.Q	.	.	.	.
20.54	3.7748	0.98	Q	.	.	.	.
20.89	3.8023	0.93	Q	.	.	.	.
21.24	3.8285	0.89	Q	.	.	.	.
21.59	3.8536	0.85	Q	.	.	.	.

21.94	3.8777	0.82	Q	.	.	.	.
22.29	3.9008	0.79	Q	.	.	.	.
22.64	3.9231	0.76	Q	.	.	.	.
22.99	3.9447	0.73	Q	.	.	.	.
23.34	3.9655	0.71	Q	.	.	.	.
23.69	3.9858	0.69	Q	.	.	.	.
24.03	4.0054	0.67	Q	.	.	.	.
24.38	4.0151	0.00	Q	.	.	.	.

AREA B EXISTING 2 YEAR HYDROLOGY AND HYDROGRAPH

```
**************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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              Ver. 13.5  Release Date: 02/06/2007  License ID 1355

                              Analysis prepared by:

                                  Fuscoe Engineering, Inc
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                                    Irvine, California 92606
                             PH: 949-474-1960       FAX: 949-474-5315

 ************************* DESCRIPTION OF STUDY *************************
* IRWD SITE - AREA B                                                    *
* 2 YEAR EXISTING HYDROLOGY                                             *
*                                                                       *
 *************************************************************************

  FILE NAME: IRWD02B.DAT
  TIME/DATE OF STUDY: 10:46 03/09/2010
=========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *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     60.00 TO NODE     61.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   240.00
  ELEVATION DATA: UPSTREAM(FEET) =    679.70  DOWNSTREAM(FEET) =    673.60
```

```
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.675
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.105
 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        2.04      0.25      0.100    69    5.67
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      3.82
 TOTAL AREA(ACRES) =      2.04   PEAK FLOW RATE(CFS) =      3.82

****************************************************************************
 FLOW PROCESS FROM NODE     61.00 TO NODE     62.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   673.60  DOWNSTREAM(FEET) =   637.00
 FLOW LENGTH(FEET) =   540.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.71
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.82
 PIPE TRAVEL TIME(MIN.) =   0.84    Tc(MIN.) =    6.52
 LONGEST FLOWPATH FROM NODE     60.00 TO NODE     62.00 =     780.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     62.00 TO NODE     62.50 IS CODE =  91
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =    637.00
 DOWNSTREAM NODE ELEVATION(FEET) =    624.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    62.00
 "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
 PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.12500
 MAXIMUM DEPTH(FEET) =   3.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.926
 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
 "GRASS"                    B        0.11      0.30      1.000    78
 NATURAL POOR COVER
 "GRASS"                    C        1.36      0.25      1.000    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      4.93
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   9.35
 AVERAGE FLOW DEPTH(FEET) =   0.12   FLOOD WIDTH(FEET) =    6.02
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.11   Tc(MIN.) =    6.63
 SUBAREA AREA(ACRES) =    1.47       SUBAREA RUNOFF(CFS) =    2.21
 EFFECTIVE AREA(ACRES) =    3.51     AREA-AVERAGED Fm(INCH/HR) =   0.12
 AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.48
```

```
 TOTAL AREA(ACRES) =        3.5          PEAK FLOW RATE(CFS) =       5.70

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  0.13   FLOOD WIDTH(FEET) =    6.16
 FLOW VELOCITY(FEET/SEC.) =   9.84   DEPTH*VELOCITY(FT*FT/SEC) =   1.30
 LONGEST FLOWPATH FROM NODE     60.00 TO NODE     62.50 =     842.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     62.50 TO NODE     63.00 IS CODE =  91
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =    624.00
 DOWNSTREAM NODE ELEVATION(FEET) =    613.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   192.00
 "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
 PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0500
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.12500
 MAXIMUM DEPTH(FEET) =   3.00
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.778
 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
 "GRASS"                    B        1.41      0.30     1.000    78
 NATURAL POOR COVER
 "GRASS"                    C        3.92      0.25     1.000    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.26
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      9.31
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.23
 AVERAGE FLOW DEPTH(FEET) =   0.41   FLOOD WIDTH(FEET) =   10.57
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.99   Tc(MIN.) =    7.62
 SUBAREA AREA(ACRES) =    5.33       SUBAREA RUNOFF(CFS) =    7.26
 EFFECTIVE AREA(ACRES) =    8.84     AREA-AVERAGED Fm(INCH/HR) =   0.21
 AREA-AVERAGED Fp(INCH/HR) =   0.26  AREA-AVERAGED Ap =   0.79
 TOTAL AREA(ACRES) =        8.8         PEAK FLOW RATE(CFS) =      12.50

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  0.47   FLOOD WIDTH(FEET) =   11.56
 FLOW VELOCITY(FEET/SEC.) =   3.50   DEPTH*VELOCITY(FT*FT/SEC) =   1.65
 LONGEST FLOWPATH FROM NODE     60.00 TO NODE     63.00 =    1034.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     63.00 TO NODE     64.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   613.00  DOWNSTREAM(FEET) =   607.80
 FLOW LENGTH(FEET) =   108.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.05
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      12.50
 PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =    7.76
```

```
 LONGEST FLOWPATH FROM NODE     60.00 TO NODE     64.00 =    1142.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     64.00 TO NODE     64.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.76
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.759
 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
 "GRASS"                    B        0.01      0.30      1.000    78
 NATURAL POOR COVER
 "GRASS"                    C        0.77      0.25      1.000    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    0.78      SUBAREA RUNOFF(CFS) =    1.06
 EFFECTIVE AREA(ACRES) =      9.62   AREA-AVERAGED Fm(INCH/HR) =  0.21
 AREA-AVERAGED Fp(INCH/HR) =  0.26  AREA-AVERAGED Ap =  0.81
 TOTAL AREA(ACRES) =        9.6       PEAK FLOW RATE(CFS) =      13.41

****************************************************************************
 FLOW PROCESS FROM NODE     64.00 TO NODE     65.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   607.80  DOWNSTREAM(FEET) =   582.15
 FLOW LENGTH(FEET) =   416.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  14.58
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      13.41
 PIPE TRAVEL TIME(MIN.) =   0.48    Tc(MIN.) =    8.23
 LONGEST FLOWPATH FROM NODE     60.00 TO NODE     65.00 =    1558.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     65.00 TO NODE     65.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.23
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.700
 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
 "GRASS"                    B        0.99      0.30      1.000    78
 NATURAL POOR COVER
 "GRASS"                    C        0.30      0.25      1.000    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.29
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    1.29      SUBAREA RUNOFF(CFS) =    1.64
 EFFECTIVE AREA(ACRES) =     10.91   AREA-AVERAGED Fm(INCH/HR) =  0.22
```

```
 AREA-AVERAGED Fp(INCH/HR) =  0.26  AREA-AVERAGED Ap =  0.83
 TOTAL AREA(ACRES) =       10.9       PEAK FLOW RATE(CFS) =      14.54

****************************************************************************
 FLOW PROCESS FROM NODE     65.00 TO NODE     65.00 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.) =    8.23
 RAINFALL INTENSITY(INCH/HR) =   1.70
 AREA-AVERAGED Fm(INCH/HR) =  0.22
 AREA-AVERAGED Fp(INCH/HR) =  0.26
 AREA-AVERAGED Ap =  0.83
 EFFECTIVE STREAM AREA(ACRES) =      10.91
 TOTAL STREAM AREA(ACRES) =      10.91
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      14.54

****************************************************************************
 FLOW PROCESS FROM NODE     70.00 TO NODE     71.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   572.00
 ELEVATION DATA: UPSTREAM(FEET) =    644.70  DOWNSTREAM(FEET) =    593.80

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   14.518
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.228
 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 FAIR COVER
 "GRASS"                    B        1.93      0.30      1.000    69   14.52
 NATURAL FAIR COVER
 "GRASS"                    C        0.97      0.25      1.000    79   14.52
 NATURAL FAIR COVER
 "GRASS"                    D        0.04      0.20      1.000    84   14.52
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      2.50
 TOTAL AREA(ACRES) =      2.94   PEAK FLOW RATE(CFS) =      2.50

****************************************************************************
 FLOW PROCESS FROM NODE     71.00 TO NODE     72.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   589.80  DOWNSTREAM(FEET) =   583.00
 FLOW LENGTH(FEET) =   266.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.69
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
```

```
 PIPE-FLOW(CFS) =       2.50
 PIPE TRAVEL TIME(MIN.) =   0.66    Tc(MIN.) =   15.18
 LONGEST FLOWPATH FROM NODE     70.00 TO NODE     72.00 =     838.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     72.00 TO NODE     72.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   15.18
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.197
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "GRASS"                    A        0.10      0.40      1.000    38
 NATURAL GOOD COVER
 "GRASS"                    B        1.19      0.30      1.000    61
 NATURAL GOOD COVER
 "GRASS"                    C        0.26      0.25      1.000    74
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    1.55      SUBAREA RUNOFF(CFS) =    1.25
 EFFECTIVE AREA(ACRES) =      4.49   AREA-AVERAGED Fm(INCH/HR) =  0.29
 AREA-AVERAGED Fp(INCH/HR) =  0.29  AREA-AVERAGED Ap =  1.00
 TOTAL AREA(ACRES) =        4.5       PEAK FLOW RATE(CFS) =       3.67

****************************************************************************
 FLOW PROCESS FROM NODE     72.00 TO NODE     65.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   583.00  DOWNSTREAM(FEET) =   582.15
 FLOW LENGTH(FEET) =   128.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.57
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.67
 PIPE TRAVEL TIME(MIN.) =   0.47    Tc(MIN.) =   15.65
 LONGEST FLOWPATH FROM NODE     70.00 TO NODE     65.00 =     966.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     65.00 TO NODE     65.00 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.) =   15.65
 RAINFALL INTENSITY(INCH/HR) =   1.18
 AREA-AVERAGED Fm(INCH/HR) =  0.29
 AREA-AVERAGED Fp(INCH/HR) =  0.29
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =       4.49
```

```
 TOTAL STREAM AREA(ACRES) =       4.49
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.67

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       14.54    8.23    1.700  0.26( 0.22) 0.83      10.9       60.00
     2        3.67   15.65    1.176  0.29( 0.29) 1.00       4.5       70.00

 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       17.61    8.23    1.700  0.27( 0.23) 0.86      13.3       60.00
     2       13.07   15.65    1.176  0.27( 0.24) 0.88      15.4       70.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      17.61    Tc(MIN.) =     8.23
 EFFECTIVE AREA(ACRES) =      13.27   AREA-AVERAGED Fm(INCH/HR) =  0.23
 AREA-AVERAGED Fp(INCH/HR) =  0.27  AREA-AVERAGED Ap =  0.86
 TOTAL AREA(ACRES) =       15.4
 LONGEST FLOWPATH FROM NODE     60.00 TO NODE     65.00 =    1558.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     65.00 TO NODE     66.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   582.15  DOWNSTREAM(FEET) =   563.50
 FLOW LENGTH(FEET) =   278.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.06
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      17.61
 PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =    8.52
 LONGEST FLOWPATH FROM NODE     60.00 TO NODE     66.00 =    1836.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     66.00 TO NODE     67.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   563.50  DOWNSTREAM(FEET) =   562.00
 FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.14
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      17.61
 PIPE TRAVEL TIME(MIN.) =   0.43    Tc(MIN.) =    8.95
 LONGEST FLOWPATH FROM NODE     60.00 TO NODE     67.00 =    2021.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       15.4  TC(MIN.) =      8.95
```

EFFECTIVE AREA(ACRES) = 13.27 AREA-AVERAGED Fm(INCH/HR)= 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.27 AREA-AVERAGED Ap = 0.862
PEAK FLOW RATE(CFS) = 17.61

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	17.61	8.95	1.620	0.27(0.23)	0.86	13.3	60.00
2	13.07	16.43	1.144	0.27(0.24)	0.88	15.4	70.00

END OF RATIONAL METHOD ANALYSIS

```
*****************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
=============================================================================
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                          Analysis prepared by:

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                                Irvine, California 92606
                         PH: 949-474-1960       FAX: 949-474-5315

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

 Problem Descriptions:
  IRWD SITE
  EXISTING OUTLET B
  2 YEAR
=============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.05 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)     YIELD
         1         15.40       95.00           83.       0.270        0.383

    TOTAL AREA (Acres) =     15.40

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.257

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.617
=============================================================================
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**************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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            Ver. 14.0  Release Date: 06/01/2007  License ID 1355

                          Analysis prepared by:

                             Fuscoe Engineering, Inc
                           16795 Von Karman Ave. Suite 100
                               Irvine, California 92606
                        PH: 949-474-1960       FAX: 949-474-5315

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

 Problem Descriptions:
  IRWD SITE
  EXISTING OUTLET B
  2 YEAR
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.85
    TOTAL CATCHMENT AREA(ACRES) =   15.40
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.257
    LOW LOSS FRACTION = 0.617
    TIME OF CONCENTRATION(MIN.) =  8.95
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.98
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     1.65

**************************************************************************
  TIME      VOLUME       Q    0.        5.0       10.0       15.0       20.0
 (HOURS)     (AF)      (CFS)
--------------------------------------------------------------------------
  0.04      0.0000      0.00  Q         .         .          .          .
  0.19      0.0010      0.16  Q         .         .          .          .
  0.34      0.0030      0.16  Q         .         .          .          .
  0.49      0.0050      0.16  Q         .         .          .          .
  0.64      0.0070      0.16  Q         .         .          .          .
  0.79      0.0090      0.16  Q         .         .          .          .
  0.93      0.0110      0.17  Q         .         .          .          .
  1.08      0.0131      0.17  Q         .         .          .          .
  1.23      0.0152      0.17  Q         .         .          .          .
```

1.38	0.0172	0.17	Q	.	.	.	.
1.53	0.0193	0.17	Q	.	.	.	.
1.68	0.0214	0.17	Q	.	.	.	.
1.83	0.0235	0.17	Q	.	.	.	.
1.98	0.0257	0.17	Q	.	.	.	.
2.13	0.0278	0.17	Q	.	.	.	.
2.28	0.0300	0.18	Q	.	.	.	.
2.43	0.0321	0.18	Q	.	.	.	.
2.58	0.0343	0.18	Q	.	.	.	.
2.72	0.0365	0.18	Q	.	.	.	.
2.87	0.0387	0.18	Q	.	.	.	.
3.02	0.0410	0.18	Q	.	.	.	.
3.17	0.0432	0.18	Q	.	.	.	.
3.32	0.0455	0.18	Q	.	.	.	.
3.47	0.0478	0.19	Q	.	.	.	.
3.62	0.0500	0.19	Q	.	.	.	.
3.77	0.0524	0.19	Q	.	.	.	.
3.92	0.0547	0.19	Q	.	.	.	.
4.07	0.0570	0.19	Q	.	.	.	.
4.22	0.0594	0.19	Q	.	.	.	.
4.37	0.0618	0.19	Q	.	.	.	.
4.51	0.0642	0.20	Q	.	.	.	.
4.66	0.0666	0.20	Q	.	.	.	.
4.81	0.0691	0.20	Q	.	.	.	.
4.96	0.0715	0.20	Q	.	.	.	.
5.11	0.0740	0.20	Q	.	.	.	.
5.26	0.0765	0.20	Q	.	.	.	.
5.41	0.0791	0.21	Q	.	.	.	.
5.56	0.0816	0.21	Q	.	.	.	.
5.71	0.0842	0.21	Q	.	.	.	.
5.86	0.0868	0.21	Q	.	.	.	.
6.01	0.0894	0.21	Q	.	.	.	.
6.16	0.0921	0.22	Q	.	.	.	.
6.30	0.0947	0.22	Q	.	.	.	.
6.45	0.0974	0.22	Q	.	.	.	.
6.60	0.1001	0.22	Q	.	.	.	.
6.75	0.1029	0.22	Q	.	.	.	.
6.90	0.1057	0.23	Q	.	.	.	.
7.05	0.1085	0.23	Q	.	.	.	.
7.20	0.1113	0.23	Q	.	.	.	.
7.35	0.1142	0.23	Q	.	.	.	.
7.50	0.1171	0.24	Q	.	.	.	.
7.65	0.1200	0.24	Q	.	.	.	.
7.80	0.1229	0.24	Q	.	.	.	.
7.95	0.1259	0.24	Q	.	.	.	.
8.09	0.1290	0.25	Q	.	.	.	.
8.24	0.1320	0.25	Q	.	.	.	.
8.39	0.1351	0.25	Q	.	.	.	.
8.54	0.1382	0.26	Q	.	.	.	.
8.69	0.1414	0.26	Q	.	.	.	.
8.84	0.1446	0.26	Q	.	.	.	.
8.99	0.1479	0.27	Q	.	.	.	.
9.14	0.1512	0.27	Q	.	.	.	.
9.29	0.1545	0.27	Q	.	.	.	.
9.44	0.1579	0.28	Q	.	.	.	.
9.59	0.1613	0.28	Q	.	.	.	.
9.74	0.1648	0.28	Q	.	.	.	.

9.88	0.1684	0.29	Q	.	.	.	.
10.03	0.1720	0.29	Q	.	.	.	.
10.18	0.1756	0.30	Q	.	.	.	.
10.33	0.1793	0.30	Q	.	.	.	.
10.48	0.1831	0.31	Q	.	.	.	.
10.63	0.1869	0.31	Q	.	.	.	.
10.78	0.1908	0.32	Q	.	.	.	.
10.93	0.1947	0.32	Q	.	.	.	.
11.08	0.1988	0.33	Q	.	.	.	.
11.23	0.2029	0.34	Q	.	.	.	.
11.38	0.2071	0.34	Q	.	.	.	.
11.52	0.2113	0.35	Q	.	.	.	.
11.67	0.2157	0.36	Q	.	.	.	.
11.82	0.2201	0.36	Q	.	.	.	.
11.97	0.2247	0.37	Q	.	.	.	.
12.12	0.2294	0.40	Q	.	.	.	.
12.27	0.2348	0.48	Q	.	.	.	.
12.42	0.2407	0.48	Q	.	.	.	.
12.57	0.2468	0.50	Q	.	.	.	.
12.72	0.2529	0.50	.Q	.	.	.	.
12.87	0.2593	0.52	.Q	.	.	.	.
13.02	0.2657	0.53	.Q	.	.	.	.
13.17	0.2724	0.55	.Q	.	.	.	.
13.32	0.2792	0.56	.Q	.	.	.	.
13.46	0.2863	0.58	.Q	.	.	.	.
13.61	0.2935	0.59	.Q	.	.	.	.
13.76	0.3010	0.62	.Q	.	.	.	.
13.91	0.3088	0.64	.Q	.	.	.	.
14.06	0.3168	0.67	.Q	.	.	.	.
14.21	0.3254	0.71	.Q	.	.	.	.
14.36	0.3344	0.76	.Q	.	.	.	.
14.51	0.3439	0.78	.Q	.	.	.	.
14.66	0.3538	0.83	.Q	.	.	.	.
14.81	0.3643	0.87	.Q	.	.	.	.
14.96	0.3755	0.94	.Q	.	.	.	.
15.10	0.3874	0.99	.Q	.	.	.	.
15.25	0.4003	1.11	. Q	.	.	.	.
15.40	0.4144	1.18	. Q	.	.	.	.
15.55	0.4292	1.21	. Q	.	.	.	.
15.70	0.4451	1.37	. Q	.	.	.	.
15.85	0.4658	1.99	. Q	.	.	.	.
16.00	0.5010	3.72	.	Q	.	.	.
16.15	0.6342	17.87	.	.	.	Q	.
16.30	0.7542	1.61	. Q	.	.	.	.
16.45	0.7712	1.15	. Q	.	.	.	.
16.60	0.7847	1.04	. Q	.	.	.	.
16.75	0.7967	0.90	.Q	.	.	.	.
16.90	0.8073	0.81	.Q	.	.	.	.
17.04	0.8167	0.73	.Q	.	.	.	.
17.19	0.8253	0.65	.Q	.	.	.	.
17.34	0.8331	0.61	.Q	.	.	.	.
17.49	0.8403	0.57	.Q	.	.	.	.
17.64	0.8472	0.54	.Q	.	.	.	.
17.79	0.8536	0.51	.Q	.	.	.	.
17.94	0.8598	0.49	Q	.	.	.	.
18.09	0.8657	0.47	Q	.	.	.	.
18.24	0.8709	0.37	Q	.	.	.	.

18.39	0.8753	0.35	Q	.	.	.	.
18.54	0.8796	0.34	Q	.	.	.	.
18.68	0.8837	0.33	Q	.	.	.	.
18.83	0.8877	0.32	Q	.	.	.	.
18.98	0.8915	0.31	Q	.	.	.	.
19.13	0.8952	0.30	Q	.	.	.	.
19.28	0.8988	0.29	Q	.	.	.	.
19.43	0.9023	0.28	Q	.	.	.	.
19.58	0.9057	0.27	Q	.	.	.	.
19.73	0.9090	0.26	Q	.	.	.	.
19.88	0.9122	0.26	Q	.	.	.	.
20.03	0.9153	0.25	Q	.	.	.	.
20.18	0.9184	0.25	Q	.	.	.	.
20.33	0.9214	0.24	Q	.	.	.	.
20.48	0.9243	0.23	Q	.	.	.	.
20.62	0.9271	0.23	Q	.	.	.	.
20.77	0.9300	0.23	Q	.	.	.	.
20.92	0.9327	0.22	Q	.	.	.	.
21.07	0.9354	0.22	Q	.	.	.	.
21.22	0.9380	0.21	Q	.	.	.	.
21.37	0.9406	0.21	Q	.	.	.	.
21.52	0.9432	0.21	Q	.	.	.	.
21.67	0.9457	0.20	Q	.	.	.	.
21.82	0.9482	0.20	Q	.	.	.	.
21.97	0.9506	0.20	Q	.	.	.	.
22.12	0.9530	0.19	Q	.	.	.	.
22.27	0.9553	0.19	Q	.	.	.	.
22.41	0.9576	0.19	Q	.	.	.	.
22.56	0.9599	0.18	Q	.	.	.	.
22.71	0.9622	0.18	Q	.	.	.	.
22.86	0.9644	0.18	Q	.	.	.	.
23.01	0.9666	0.18	Q	.	.	.	.
23.16	0.9687	0.17	Q	.	.	.	.
23.31	0.9709	0.17	Q	.	.	.	.
23.46	0.9730	0.17	Q	.	.	.	.
23.61	0.9750	0.17	Q	.	.	.	.
23.76	0.9771	0.17	Q	.	.	.	.
23.91	0.9791	0.16	Q	.	.	.	.
24.06	0.9811	0.16	Q	.	.	.	.
24.20	0.9821	0.00	Q	.	.	.	.

AREA OFFSITE 8
2 YEAR HYDROLOGY

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

                              Fuscoe Engineering, Inc
                          16795 Von Karman Ave. Suite 100
                              Irvine, California 92606
                      PH: 949-474-1960       FAX: 949-474-5315

 ************************* DESCRIPTION OF STUDY *************************
* IRWD SITE -AREA OFF-SITE 8 TO TRACT 15594                             *
* 2 YEAR EXISTING HYDROLOGY                                             *
*                                                                       *
 *************************************************************************

  FILE NAME: IRW02OS8.DAT
  TIME/DATE OF STUDY: 11:08 03/09/2010
=========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  *DATA BANK RAINFALL USED*
  *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
  2   14.0      9.0    0.020/0.020/0.050   0.33    1.50  0.0313  0.125  0.0180

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.33 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     90.00 TO NODE     91.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   332.00
  ELEVATION DATA: UPSTREAM(FEET) =    693.40  DOWNSTREAM(FEET) =    625.00
```

```
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.076
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.304
 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 GOOD COVER
 "OPEN BRUSH"               C        2.68      0.25      1.000    75   13.08
 NATURAL GOOD COVER
 "OPEN BRUSH"               D        1.62      0.20      1.000    81   13.08
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.23
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      4.15
 TOTAL AREA(ACRES) =     4.30   PEAK FLOW RATE(CFS) =      4.15
================================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =        4.3  TC(MIN.) =     13.08
 EFFECTIVE AREA(ACRES) =      4.30  AREA-AVERAGED Fm(INCH/HR)=  0.23
 AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)    =       4.15
================================================================================
================================================================================
 END OF RATIONAL METHOD ANALYSIS
```

AREA OFFSITE 9
2 YEAR HYDROLOGY

```
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                          Analysis prepared by:

                              Fuscoe Engineering, Inc
                            16795 Von Karman Ave. Suite 100
                                Irvine, California 92606
                          PH: 949-474-1960       FAX: 949-474-5315

 ************************* DESCRIPTION OF STUDY *************************
* IRWD SITE - AREA OFF-SITE 9 TO OFF-SITE AREA                          *
* 2 YEAR EXISTING HYDROLOGY                                             *
*                                                                       *
 *************************************************************************

  FILE NAME: IRW02OS9.DAT
  TIME/DATE OF STUDY: 11:16 03/09/2010
=========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  *DATA BANK RAINFALL USED*
  *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     95.00 TO NODE     96.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   587.00
  ELEVATION DATA: UPSTREAM(FEET) =    700.00  DOWNSTREAM(FEET) =    660.00
```

```
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   20.492
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.007
 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 GOOD COVER
 "OPEN BRUSH"               C        2.02      0.25     1.000    75   20.49
 NATURAL GOOD COVER
 "OPEN BRUSH"               D        0.08      0.20     1.000    81   20.49
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      1.43
 TOTAL AREA(ACRES) =      2.10   PEAK FLOW RATE(CFS) =      1.43
================================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =        2.1  TC(MIN.) =     20.49
 EFFECTIVE AREA(ACRES) =      2.10  AREA-AVERAGED Fm(INCH/HR)=  0.25
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)    =       1.43
================================================================================
================================================================================
 END OF RATIONAL METHOD ANALYSIS
```

AREA A PROPOSED 2 YEAR HYDROLOGY AND HYDROGRAPH

```
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                          Analysis prepared by:

                              Fuscoe Engineering, Inc
                            16795 Von Karman Ave. Suite 100
                                Irvine, California 92606
                          PH: 949-474-1960       FAX: 949-474-5315

 ************************* DESCRIPTION OF STUDY *************************
* IRWD LAKE FOREST SITE                                                 *
* PROPOSED 2 YEAR HYDROLOGY                                             *
* RESIDENTIAL AREA - A                                                  *
 **************************************************************************

  FILE NAME: IRW02A.DAT
  TIME/DATE OF STUDY: 13:07 03/09/2010
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  *DATA BANK RAINFALL USED*
  *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   18.0     13.0    0.020/0.020/0.020   0.42    1.50 0.0313 0.125 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      6.00 TO NODE      7.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   295.00
  ELEVATION DATA: UPSTREAM(FEET) =    692.10  DOWNSTREAM(FEET) =    689.30
```

```
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.998
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.729
 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
 "11+ DWELLINGS/ACRE"       C        1.97      0.25      0.200    69    8.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      2.98
 TOTAL AREA(ACRES) =      1.97   PEAK FLOW RATE(CFS) =      2.98

****************************************************************************
 FLOW PROCESS FROM NODE      7.00 TO NODE      8.00 IS CODE =  56
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    689.30  DOWNSTREAM(FEET) =    683.80
 CHANNEL LENGTH THRU SUBAREA(FEET) =   320.00   CHANNEL SLOPE =  0.0172
 GIVEN CHANNEL BASE(FEET) =  120.00   CHANNEL FREEBOARD(FEET) =  0.1
 "Z" FACTOR =   0.100   MANNING'S FACTOR = 0.030
 *ESTIMATED CHANNEL HEIGHT(FEET) =   0.17
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.289
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"       C        7.10      0.25      0.200    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.99
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.00
 AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   5.33
 Tc(MIN.) =   13.33
 SUBAREA AREA(ACRES) =     7.10       SUBAREA RUNOFF(CFS) =    7.92
 EFFECTIVE AREA(ACRES) =      9.07     AREA-AVERAGED Fm(INCH/HR) =   0.05
 AREA-AVERAGED Fp(INCH/HR) =   0.25  AREA-AVERAGED Ap =   0.20
 TOTAL AREA(ACRES) =        9.1         PEAK FLOW RATE(CFS) =      10.12
 GIVEN CHANNEL BASE(FEET) =  120.00   CHANNEL FREEBOARD(FEET) =  0.1
 "Z" FACTOR =   0.100   MANNING'S FACTOR = 0.030
 *ESTIMATED CHANNEL HEIGHT(FEET) =   0.17

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   1.15
 LONGEST FLOWPATH FROM NODE      6.00 TO NODE      8.00 =     615.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   676.70  DOWNSTREAM(FEET) =   654.30
 FLOW LENGTH(FEET) =   510.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
```

```
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.48
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      10.12
 PIPE TRAVEL TIME(MIN.) =   0.74    Tc(MIN.) =   14.07
 LONGEST FLOWPATH FROM NODE      6.00 TO NODE      9.00 =    1125.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 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.) =   14.07
 RAINFALL INTENSITY(INCH/HR) =   1.25
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       9.07
 TOTAL STREAM AREA(ACRES) =       9.07
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.12

****************************************************************************
 FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   186.00
 ELEVATION DATA: UPSTREAM(FEET) =    691.00  DOWNSTREAM(FEET) =    689.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.487
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.949
 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
 "11+ DWELLINGS/ACRE"       C        0.75      0.25      0.200    69    6.49
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      1.28
 TOTAL AREA(ACRES) =      0.75   PEAK FLOW RATE(CFS) =      1.28

****************************************************************************
 FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.49
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.949
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"       C        0.98      0.25      0.200    69
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA AREA(ACRES) =    0.98      SUBAREA RUNOFF(CFS) =    1.68
 EFFECTIVE AREA(ACRES) =      1.73   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =        1.7       PEAK FLOW RATE(CFS) =       2.96

****************************************************************************
 FLOW PROCESS FROM NODE     12.00 TO NODE      9.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   654.70  DOWNSTREAM(FEET) =   654.30
 FLOW LENGTH(FEET) =    80.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.73
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.96
 PIPE TRAVEL TIME(MIN.) =   0.36    Tc(MIN.) =    6.84
 LONGEST FLOWPATH FROM NODE     10.00 TO NODE      9.00 =     266.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      9.00 TO NODE      9.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.84
 RAINFALL INTENSITY(INCH/HR) =   1.89
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       1.73
 TOTAL STREAM AREA(ACRES) =       1.73
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.96

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       10.12   14.07    1.250  0.25( 0.05) 0.20       9.1        6.00
     2        2.96    6.84    1.890  0.25( 0.05) 0.20       1.7       10.00

 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       10.51    6.84    1.890  0.25( 0.05) 0.20       6.1       10.00
     2       12.05   14.07    1.250  0.25( 0.05) 0.20      10.8        6.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      12.05    Tc(MIN.) =    14.07
```

```
 EFFECTIVE AREA(ACRES) =      10.80   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =      10.8
 LONGEST FLOWPATH FROM NODE      6.00 TO NODE      9.00 =    1125.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      9.00 TO NODE     13.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   654.30  DOWNSTREAM(FEET) =   652.00
 FLOW LENGTH(FEET) =   450.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.28
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      12.05
 PIPE TRAVEL TIME(MIN.) =   1.42    Tc(MIN.) =   15.49
 LONGEST FLOWPATH FROM NODE      6.00 TO NODE     13.00 =    1575.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 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.) =   15.49
 RAINFALL INTENSITY(INCH/HR) =   1.18
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =      10.80
 TOTAL STREAM AREA(ACRES) =      10.80
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      12.05

****************************************************************************
 FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   279.00
 ELEVATION DATA: UPSTREAM(FEET) =    688.90  DOWNSTREAM(FEET) =    686.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.681
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.769
 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
 "11+ DWELLINGS/ACRE"       C        0.98      0.25      0.200    69    7.68
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      1.52
 TOTAL AREA(ACRES) =      0.98   PEAK FLOW RATE(CFS) =      1.52
```

```
****************************************************************************
 FLOW PROCESS FROM NODE     15.00 TO NODE     16.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.68
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.769
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"       C        4.48      0.25      0.200    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA AREA(ACRES) =    4.48      SUBAREA RUNOFF(CFS) =    6.93
 EFFECTIVE AREA(ACRES) =      5.46   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =        5.5       PEAK FLOW RATE(CFS) =       8.45

****************************************************************************
 FLOW PROCESS FROM NODE     16.00 TO NODE     13.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   676.50  DOWNSTREAM(FEET) =   652.00
 FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  18.11
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       8.45
 PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =    7.81
 LONGEST FLOWPATH FROM NODE     14.00 TO NODE     13.00 =     419.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 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.) =    7.81
 RAINFALL INTENSITY(INCH/HR) =   1.75
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       5.46
 TOTAL STREAM AREA(ACRES) =       5.46
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.45

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       10.51    8.30    1.692  0.25( 0.05) 0.20       6.1       10.00
```

```
     1       12.05    15.49     1.183  0.25( 0.05) 0.20       10.8        6.00
     2        8.45     7.81     1.752  0.25( 0.05) 0.20        5.5       14.00

  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       18.70     7.81     1.752  0.25( 0.05) 0.20       11.2       14.00
     2       18.65     8.30     1.692  0.25( 0.05) 0.20       11.6       10.00
     3       17.67    15.49     1.183  0.25( 0.05) 0.20       16.3        6.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      18.70    Tc(MIN.) =     7.81
  EFFECTIVE AREA(ACRES) =      11.24   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =       16.3
  LONGEST FLOWPATH FROM NODE      6.00 TO NODE     13.00 =    1575.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     17.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   652.00  DOWNSTREAM(FEET) =   648.00
  FLOW LENGTH(FEET) =   280.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.71
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.70
  PIPE TRAVEL TIME(MIN.) =   0.54    Tc(MIN.) =    8.35
  LONGEST FLOWPATH FROM NODE      6.00 TO NODE     17.00 =    1855.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     17.00 TO NODE     17.00 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.) =    8.35
  RAINFALL INTENSITY(INCH/HR) =   1.69
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =      11.24
  TOTAL STREAM AREA(ACRES) =      16.26
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      18.70

****************************************************************************
  FLOW PROCESS FROM NODE     18.00 TO NODE     19.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   216.00
 ELEVATION DATA: UPSTREAM(FEET) =    667.00  DOWNSTREAM(FEET) =    663.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.796
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.080
 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                 D        0.37      0.20      0.100    75    5.80
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      0.69
 TOTAL AREA(ACRES) =      0.37   PEAK FLOW RATE(CFS) =      0.69

****************************************************************************
 FLOW PROCESS FROM NODE     19.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.80
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.080
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 D        1.35      0.20      0.100    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.35      SUBAREA RUNOFF(CFS) =    2.50
 EFFECTIVE AREA(ACRES) =      1.72   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        1.7       PEAK FLOW RATE(CFS) =       3.19

****************************************************************************
 FLOW PROCESS FROM NODE     20.00 TO NODE     17.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   654.50  DOWNSTREAM(FEET) =   648.00
 FLOW LENGTH(FEET) =   510.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.37
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.19
 PIPE TRAVEL TIME(MIN.) =   1.58    Tc(MIN.) =    7.38
 LONGEST FLOWPATH FROM NODE     18.00 TO NODE     17.00 =     726.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     17.00 TO NODE     17.00 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.) =     7.38
 RAINFALL INTENSITY(INCH/HR) =   1.81
 AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       1.72
 TOTAL STREAM AREA(ACRES) =       1.72
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.19

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1       18.70    8.35    1.687  0.25( 0.05) 0.20       11.2       14.00
     1       18.65    8.84    1.632  0.25( 0.05) 0.20       11.6       10.00
     1       17.67   16.03    1.160  0.25( 0.05) 0.20       16.3        6.00
     2        3.19    7.38    1.811  0.20( 0.02) 0.10        1.7       18.00

 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       20.96    7.38    1.811  0.25( 0.05) 0.19       11.7       18.00
     2       21.66    8.35    1.687  0.25( 0.05) 0.19       13.0       14.00
     3       21.53    8.84    1.632  0.25( 0.05) 0.19       13.3       10.00
     4       19.70   16.03    1.160  0.25( 0.05) 0.19       18.0        6.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      21.66    Tc(MIN.) =     8.35
 EFFECTIVE AREA(ACRES) =      12.96   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.19
 TOTAL AREA(ACRES) =       18.0
 LONGEST FLOWPATH FROM NODE      6.00 TO NODE     17.00 =    1855.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     17.00 TO NODE     21.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   648.00  DOWNSTREAM(FEET) =   637.70
 FLOW LENGTH(FEET) =   526.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.17
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      21.66
 PIPE TRAVEL TIME(MIN.) =   0.86    Tc(MIN.) =    9.21
 LONGEST FLOWPATH FROM NODE      6.00 TO NODE     21.00 =    2381.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     21.00 TO NODE     21.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
```

```
 FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   223.00
 ELEVATION DATA: UPSTREAM(FEET) =    691.00  DOWNSTREAM(FEET) =    687.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.297
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.983
 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
 "11+ DWELLINGS/ACRE"       C        0.66      0.25      0.200    69    6.30
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      1.15
 TOTAL AREA(ACRES) =      0.66   PEAK FLOW RATE(CFS) =      1.15

****************************************************************************
 FLOW PROCESS FROM NODE     23.00 TO NODE     24.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.30
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.983
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"       C        7.32      0.25      0.200    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA AREA(ACRES) =    7.32      SUBAREA RUNOFF(CFS) =   12.73
 EFFECTIVE AREA(ACRES) =      7.98   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =        8.0       PEAK FLOW RATE(CFS) =      13.88

****************************************************************************
 FLOW PROCESS FROM NODE     24.00 TO NODE     25.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   674.00  DOWNSTREAM(FEET) =   639.50
 FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  22.42
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      13.88
 PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    6.42
 LONGEST FLOWPATH FROM NODE     22.00 TO NODE     25.00 =     383.00 FEET.

****************************************************************************
```

```
 FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 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.) =    6.42
 RAINFALL INTENSITY(INCH/HR) =   1.96
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       7.98
 TOTAL STREAM AREA(ACRES) =       7.98
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      13.88

****************************************************************************
 FLOW PROCESS FROM NODE     26.00 TO NODE     41.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   264.00
 ELEVATION DATA: UPSTREAM(FEET) =    685.70  DOWNSTREAM(FEET) =    675.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.723
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.095
 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
 "11+ DWELLINGS/ACRE"       C        0.44      0.25     0.200    69    5.72
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      0.81
 TOTAL AREA(ACRES) =      0.44   PEAK FLOW RATE(CFS) =      0.81

****************************************************************************
 FLOW PROCESS FROM NODE     41.00 TO NODE     25.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  675.00  DOWNSTREAM ELEVATION(FEET) =  650.00
 STREET LENGTH(FEET) =   760.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 18.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.91
```

```
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    6.70
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.37
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.88
  STREET FLOW TRAVEL TIME(MIN.) =   3.76   Tc(MIN.) =    9.48
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.568
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       C        1.60      0.25      0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    1.60      SUBAREA RUNOFF(CFS) =    2.19
  EFFECTIVE AREA(ACRES) =      2.04    AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        2.0        PEAK FLOW RATE(CFS) =       2.79

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.02
  FLOW VELOCITY(FEET/SEC.) =  3.66   DEPTH*VELOCITY(FT*FT/SEC.) =   1.05
  LONGEST FLOWPATH FROM NODE     26.00 TO NODE     25.00 =    1024.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.48
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.568
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       C        2.23      0.25      0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    2.23      SUBAREA RUNOFF(CFS) =    3.05
  EFFECTIVE AREA(ACRES) =      4.27   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.3        PEAK FLOW RATE(CFS) =       5.83

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     25.00 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.) =    9.48
  RAINFALL INTENSITY(INCH/HR) =   1.57
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       4.27
```

```
 TOTAL STREAM AREA(ACRES) =       4.27
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.83

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       13.88    6.42    1.962  0.25( 0.05) 0.20       8.0      22.00
     2        5.83    9.48    1.568  0.25( 0.05) 0.20       4.3      26.00

 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       18.86    6.42    1.962  0.25( 0.05) 0.20      10.9      22.00
     2       16.86    9.48    1.568  0.25( 0.05) 0.20      12.2      26.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      18.86    Tc(MIN.) =     6.42
 EFFECTIVE AREA(ACRES) =      10.87   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =       12.2
 LONGEST FLOWPATH FROM NODE     26.00 TO NODE     25.00 =    1024.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     25.00 TO NODE     21.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   639.50  DOWNSTREAM(FEET) =   637.70
 FLOW LENGTH(FEET) =   240.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.85
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      18.86
 PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =    7.00
 LONGEST FLOWPATH FROM NODE     26.00 TO NODE     21.00 =    1264.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     21.00 TO NODE     21.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       18.86    7.00    1.866  0.25( 0.05) 0.20      10.9      22.00
     2       16.86   10.09    1.513  0.25( 0.05) 0.20      12.2      26.00
 LONGEST FLOWPATH FROM NODE     26.00 TO NODE     21.00 =    1264.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       20.96    8.25    1.699  0.25( 0.05) 0.19      11.7      18.00
```

```
    2       21.66     9.21    1.594  0.25( 0.05) 0.19       13.0       14.00
    3       21.53     9.70    1.547  0.25( 0.05) 0.19       13.3       10.00
    4       19.70    16.94    1.124  0.25( 0.05) 0.19       18.0        6.00
  LONGEST FLOWPATH FROM NODE      6.00 TO NODE     21.00 =    2381.00 FEET.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q       Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
      1       38.45     7.00    1.866  0.25( 0.05) 0.19       20.8       22.00
      2       39.01     8.25    1.699  0.25( 0.05) 0.19       23.1       18.00
      3       39.09     9.21    1.594  0.25( 0.05) 0.19       24.8       14.00
      4       38.63     9.70    1.547  0.25( 0.05) 0.19       25.4       10.00
      5       38.28    10.09    1.513  0.25( 0.05) 0.19       25.8       26.00
      6       32.07    16.94    1.124  0.25( 0.05) 0.19       30.2        6.00
    TOTAL AREA(ACRES) =         30.2

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       39.09  Tc(MIN.) =    9.208
  EFFECTIVE AREA(ACRES) =     24.81  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.19
  TOTAL AREA(ACRES) =       30.2
  LONGEST FLOWPATH FROM NODE      6.00 TO NODE     21.00 =    2381.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     21.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     26.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   637.70  DOWNSTREAM(FEET) =   636.50
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.07
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      39.09
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    9.54
  LONGEST FLOWPATH FROM NODE      6.00 TO NODE     26.00 =    2541.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     26.00 TO NODE     26.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.54
  RAINFALL INTENSITY(INCH/HR) =   1.56
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.19
  EFFECTIVE STREAM AREA(ACRES) =      24.81
```

```
 TOTAL STREAM AREA(ACRES) =      30.23
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      39.09

****************************************************************************
 FLOW PROCESS FROM NODE     27.00 TO NODE     28.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   225.00
 ELEVATION DATA: UPSTREAM(FEET) =    658.30  DOWNSTREAM(FEET) =    657.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.926
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.738
 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
 "11+ DWELLINGS/ACRE"       C        0.49      0.25      0.200    69    7.93
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      0.74
 TOTAL AREA(ACRES) =      0.49   PEAK FLOW RATE(CFS) =      0.74

****************************************************************************
 FLOW PROCESS FROM NODE     28.00 TO NODE     26.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  657.00  DOWNSTREAM ELEVATION(FEET) =  642.00
 STREET LENGTH(FEET) =  1020.00   CURB HEIGHT(INCHES) =  5.0
 STREET HALFWIDTH(FEET) = 18.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      3.79
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.35
   HALFSTREET FLOOD WIDTH(FEET) =   10.97
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.87
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.99
 STREET FLOW TRAVEL TIME(MIN.) =   5.93   Tc(MIN.) =   13.85
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.261
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"       C        5.50      0.25      0.200    69
```

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 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA AREA(ACRES) =    5.50      SUBAREA RUNOFF(CFS) =    6.00
 EFFECTIVE AREA(ACRES) =      5.99    AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =        6.0        PEAK FLOW RATE(CFS) =       6.53

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.40   HALFSTREET FLOOD WIDTH(FEET) =  13.71
 FLOW VELOCITY(FEET/SEC.) =  3.27   DEPTH*VELOCITY(FT*FT/SEC.) =   1.31
 LONGEST FLOWPATH FROM NODE     27.00 TO NODE     26.00 =    1245.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     26.00 TO NODE     26.00 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.) =   13.85
 RAINFALL INTENSITY(INCH/HR) =   1.26
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =       5.99
 TOTAL STREAM AREA(ACRES) =       5.99
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.53

 ** CONFLUENCE DATA **
  STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
     1       38.45    7.33    1.817  0.25( 0.05) 0.19      20.8      22.00
     1       39.01    8.58    1.661  0.25( 0.05) 0.19      23.1      18.00
     1       39.09    9.54    1.562  0.25( 0.05) 0.19      24.8      14.00
     1       38.63   10.03    1.518  0.25( 0.05) 0.19      25.4      10.00
     1       38.28   10.42    1.485  0.25( 0.05) 0.19      25.8      26.00
     1       32.07   17.29    1.111  0.25( 0.05) 0.19      30.2       6.00
     2        6.53   13.85    1.261  0.25( 0.05) 0.20       6.0      27.00

 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       43.50    7.33    1.817  0.25( 0.05) 0.19      23.9      22.00
     2       44.39    8.58    1.661  0.25( 0.05) 0.19      26.8      18.00
     3       44.70    9.54    1.562  0.25( 0.05) 0.19      28.9      14.00
     4       44.36   10.03    1.518  0.25( 0.05) 0.19      29.7      10.00
     5       44.10   10.42    1.485  0.25( 0.05) 0.19      30.3      26.00
     6       41.71   13.85    1.261  0.25( 0.05) 0.19      34.0      27.00
     7       37.79   17.29    1.111  0.25( 0.05) 0.20      36.2       6.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      44.70    Tc(MIN.) =     9.54
 EFFECTIVE AREA(ACRES) =      28.94   AREA-AVERAGED Fm(INCH/HR) =  0.05
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 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.19
 TOTAL AREA(ACRES) =       36.2
 LONGEST FLOWPATH FROM NODE      6.00 TO NODE     26.00 =    2541.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     26.00 TO NODE     29.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   636.50  DOWNSTREAM(FEET) =   636.00
 FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.24
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      44.70
 PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    9.60
 LONGEST FLOWPATH FROM NODE      6.00 TO NODE     29.00 =    2581.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     29.00 TO NODE     29.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.60
 RAINFALL INTENSITY(INCH/HR) =   1.56
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.19
 EFFECTIVE STREAM AREA(ACRES) =      28.94
 TOTAL STREAM AREA(ACRES) =      36.22
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      44.70

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     31.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   190.00
 ELEVATION DATA: UPSTREAM(FEET) =    672.00  DOWNSTREAM(FEET) =    670.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.570
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.935
 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
 "11+ DWELLINGS/ACRE"       C        0.40      0.25      0.200     69    6.57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA RUNOFF(CFS) =      0.68
 TOTAL AREA(ACRES) =      0.40   PEAK FLOW RATE(CFS) =      0.68
```

```
****************************************************************************
 FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  670.00  DOWNSTREAM ELEVATION(FEET) =  652.00
 STREET LENGTH(FEET) =  1770.00   CURB HEIGHT(INCHES) =  5.0
 STREET HALFWIDTH(FEET) = 18.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  13.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.41
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.40
   HALFSTREET FLOOD WIDTH(FEET) =   13.71
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.71
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.08
 STREET FLOW TRAVEL TIME(MIN.) =  10.89   Tc(MIN.) =   17.46
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.104
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "11+ DWELLINGS/ACRE"       C        9.60      0.25      0.200    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
 SUBAREA AREA(ACRES) =    9.60      SUBAREA RUNOFF(CFS) =    9.11
 EFFECTIVE AREA(ACRES) =     10.00    AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
 TOTAL AREA(ACRES) =       10.0        PEAK FLOW RATE(CFS) =       9.49

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.47   HALFSTREET FLOOD WIDTH(FEET) =  19.70
 FLOW VELOCITY(FEET/SEC.) =  3.05   DEPTH*VELOCITY(FT*FT/SEC.) =   1.43
 *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
        AND L = 1770.0 FT WITH ELEVATION-DROP =  18.0 FT, IS    9.5 CFS,
        WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     32.00
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     32.00 =    1960.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     32.00 TO NODE     29.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   644.00  DOWNSTREAM(FEET) =   636.00
 FLOW LENGTH(FEET) =   450.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.98
```

```
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       9.49
 PIPE TRAVEL TIME(MIN.) =   0.94    Tc(MIN.) =   18.40
 LONGEST FLOWPATH FROM NODE     30.00 TO NODE     29.00 =    2410.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     29.00 TO NODE     29.00 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.) =   18.40
 RAINFALL INTENSITY(INCH/HR) =   1.07
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.20
 EFFECTIVE STREAM AREA(ACRES) =      10.00
 TOTAL STREAM AREA(ACRES) =      10.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.49

 ** CONFLUENCE DATA **
  STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR)  (INCH/HR)           (ACRES)    NODE
     1       43.50    7.40    1.808  0.25( 0.05) 0.19       23.9       22.00
     1       44.39    8.64    1.654  0.25( 0.05) 0.19       26.8       18.00
     1       44.70    9.60    1.556  0.25( 0.05) 0.19       28.9       14.00
     1       44.36   10.10    1.512  0.25( 0.05) 0.19       29.7       10.00
     1       44.10   10.49    1.480  0.25( 0.05) 0.19       30.3       26.00
     1       41.71   13.92    1.258  0.25( 0.05) 0.19       34.0       27.00
     1       37.79   17.35    1.108  0.25( 0.05) 0.20       36.2        6.00
     2        9.49   18.40    1.071  0.25( 0.05) 0.20       10.0       30.00

 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       50.06    7.40    1.808  0.25( 0.05) 0.19       28.0       22.00
     2       51.38    8.64    1.654  0.25( 0.05) 0.19       31.5       18.00
     3       52.01    9.60    1.556  0.25( 0.05) 0.19       34.2       14.00
     4       51.82   10.10    1.512  0.25( 0.05) 0.20       35.2       10.00
     5       51.67   10.49    1.480  0.25( 0.05) 0.20       36.0       26.00
     6       50.19   13.92    1.258  0.25( 0.05) 0.20       41.6       27.00
     7       47.06   17.35    1.108  0.25( 0.05) 0.20       45.7        6.00
     8       45.97   18.40    1.071  0.25( 0.05) 0.20       46.2       30.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      52.01    Tc(MIN.) =     9.60
 EFFECTIVE AREA(ACRES) =      34.15   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.19
 TOTAL AREA(ACRES) =       46.2
 LONGEST FLOWPATH FROM NODE      6.00 TO NODE     29.00 =    2581.00 FEET.

****************************************************************************
```

```
 FLOW PROCESS FROM NODE     29.00 TO NODE     42.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   636.00  DOWNSTREAM(FEET) =   610.00
 FLOW LENGTH(FEET) =   400.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  19.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  19.29
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      52.01
 PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =    9.95
 LONGEST FLOWPATH FROM NODE      6.00 TO NODE     42.00 =    2981.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     42.00 TO NODE     42.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    9.95
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.525
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "CHAPARRAL,BROADLEAF"      C        1.18      0.25     1.000    71
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    1.18      SUBAREA RUNOFF(CFS) =    1.35
 EFFECTIVE AREA(ACRES) =     35.33   AREA-AVERAGED Fm(INCH/HR) =  0.06
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.22
 TOTAL AREA(ACRES) =       47.4       PEAK FLOW RATE(CFS) =      52.01
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
 FLOW PROCESS FROM NODE     42.00 TO NODE     33.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   610.00  DOWNSTREAM(FEET) =   608.50
 FLOW LENGTH(FEET) =   270.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  39.0 INCH PIPE IS  29.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.76
 ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      52.01
 PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =   10.53
 LONGEST FLOWPATH FROM NODE      6.00 TO NODE     33.00 =    3251.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     33.00 TO NODE     33.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE     34.00 TO NODE     35.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   254.00
  ELEVATION DATA: UPSTREAM(FEET) =    658.70  DOWNSTREAM(FEET) =    656.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.365
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.812
  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
  "11+ DWELLINGS/ACRE"       C        1.34      0.25      0.200    69    7.36
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.13
  TOTAL AREA(ACRES) =      1.34   PEAK FLOW RATE(CFS) =      2.13

****************************************************************************
  FLOW PROCESS FROM NODE     35.00 TO NODE     36.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.36
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.812
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       C        2.58      0.25      0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =    2.58      SUBAREA RUNOFF(CFS) =    4.09
  EFFECTIVE AREA(ACRES) =      3.92   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        3.9       PEAK FLOW RATE(CFS) =       6.22

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     37.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   645.30  DOWNSTREAM(FEET) =   638.90
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.25
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.22
  PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =    7.59
  LONGEST FLOWPATH FROM NODE     34.00 TO NODE     37.00 =     394.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     37.00 TO NODE     37.00 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.) =    7.59
  RAINFALL INTENSITY(INCH/HR) =   1.78
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       3.92
  TOTAL STREAM AREA(ACRES) =       3.92
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.22

****************************************************************************
  FLOW PROCESS FROM NODE     38.00 TO NODE     39.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   132.00
  ELEVATION DATA: UPSTREAM(FEET) =    651.30  DOWNSTREAM(FEET) =    650.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.756
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.088
  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
  "11+ DWELLINGS/ACRE"       C        1.08      0.25      0.200    69    5.76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.98
  TOTAL AREA(ACRES) =      1.08   PEAK FLOW RATE(CFS) =      1.98

****************************************************************************
  FLOW PROCESS FROM NODE     39.00 TO NODE     37.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.76
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.088
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  RESIDENTIAL
  "11+ DWELLINGS/ACRE"       C        3.24      0.25      0.200    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA AREA(ACRES) =     3.24      SUBAREA RUNOFF(CFS) =     5.94
  EFFECTIVE AREA(ACRES) =      4.32   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        4.3       PEAK FLOW RATE(CFS) =       7.92

****************************************************************************
  FLOW PROCESS FROM NODE     37.00 TO NODE     37.00 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.) =    5.76
  RAINFALL INTENSITY(INCH/HR) =   2.09
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25
  AREA-AVERAGED Ap =  0.20
  EFFECTIVE STREAM AREA(ACRES) =       4.32
  TOTAL STREAM AREA(ACRES) =       4.32
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.92

  ** CONFLUENCE DATA **
   STREAM       Q      Tc    Intensity   Fp(Fm)     Ap      Ae      HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
      1        6.22    7.59    1.781  0.25( 0.05) 0.20       3.9       34.00
      2        7.92    5.76    2.088  0.25( 0.05) 0.20       4.3       38.00

  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       13.47    5.76    2.088  0.25( 0.05) 0.20       7.3       38.00
      2       12.95    7.59    1.781  0.25( 0.05) 0.20       8.2       34.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      13.47    Tc(MIN.) =     5.76
  EFFECTIVE AREA(ACRES) =       7.29   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.20
  TOTAL AREA(ACRES) =        8.2
  LONGEST FLOWPATH FROM NODE     34.00 TO NODE     37.00 =     394.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     37.00 TO NODE     33.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   638.90  DOWNSTREAM(FEET) =   608.50
  FLOW LENGTH(FEET) =   146.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  21.96
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.47
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    5.87
  LONGEST FLOWPATH FROM NODE     34.00 TO NODE     33.00 =     540.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     33.00 TO NODE     33.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
```

```
==============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       13.47    5.87    2.065  0.25( 0.05) 0.20        7.3       38.00
     2       12.95    7.70    1.766  0.25( 0.05) 0.20        8.2       34.00
 LONGEST FLOWPATH FROM NODE     34.00 TO NODE     33.00 =     540.00 FEET.

 ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       50.06    8.33    1.689  0.25( 0.06) 0.23       29.1       22.00
     2       51.38    9.57    1.560  0.25( 0.06) 0.22       32.7       18.00
     3       52.01   10.53    1.476  0.25( 0.06) 0.22       35.3       14.00
     4       51.82   11.02    1.438  0.25( 0.06) 0.22       36.4       10.00
     5       51.67   11.42    1.409  0.25( 0.05) 0.22       37.2       26.00
     6       50.19   14.85    1.212  0.25( 0.05) 0.22       42.8       27.00
     7       47.06   18.29    1.075  0.25( 0.05) 0.22       46.8        6.00
     8       45.97   19.34    1.041  0.25( 0.05) 0.22       47.4       30.00
 LONGEST FLOWPATH FROM NODE      6.00 TO NODE     33.00 =    3251.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       56.87    5.87    2.065  0.25( 0.05) 0.22       27.8       38.00
     2       61.46    7.70    1.766  0.25( 0.06) 0.22       35.2       34.00
     3       62.43    8.33    1.689  0.25( 0.06) 0.22       37.4       22.00
     4       62.77    9.57    1.560  0.25( 0.05) 0.22       40.9       18.00
     5       62.77   10.53    1.476  0.25( 0.05) 0.22       43.6       14.00
     6       62.29   11.02    1.438  0.25( 0.05) 0.22       44.6       10.00
     7       61.93   11.42    1.409  0.25( 0.05) 0.22       45.5       26.00
     8       58.96   14.85    1.212  0.25( 0.05) 0.22       51.0       27.00
     9       54.80   18.29    1.075  0.25( 0.05) 0.21       55.1        6.00
    10       53.45   19.34    1.041  0.25( 0.05) 0.21       55.6       30.00
   TOTAL AREA(ACRES) =        55.6

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       62.77  Tc(MIN.) =    9.568
 EFFECTIVE AREA(ACRES) =     40.90  AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.22
 TOTAL AREA(ACRES) =       55.6
 LONGEST FLOWPATH FROM NODE      6.00 TO NODE     33.00 =    3251.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     33.00 TO NODE     33.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE     33.00 TO NODE     40.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   608.50  DOWNSTREAM(FEET) =   590.00
```

```
 FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  34.95
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      62.77
 PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    9.60
 LONGEST FLOWPATH FROM NODE      6.00 TO NODE     40.00 =    3321.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.60
 RAINFALL INTENSITY(INCH/HR) =   1.56
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.22
 EFFECTIVE STREAM AREA(ACRES) =      40.90
 TOTAL STREAM AREA(ACRES) =      55.64
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      62.77

****************************************************************************
 FLOW PROCESS FROM NODE     43.00 TO NODE     44.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   365.00
 ELEVATION DATA: UPSTREAM(FEET) =    645.00  DOWNSTREAM(FEET) =    608.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.089
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.241
 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        3.24      0.25      0.100    69    5.09
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      6.46
 TOTAL AREA(ACRES) =      3.24   PEAK FLOW RATE(CFS) =      6.46

****************************************************************************
 FLOW PROCESS FROM NODE     44.00 TO NODE     40.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.09
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  2.241
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
 "GRASS"                    C        4.48      0.25      1.000    74
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    4.48      SUBAREA RUNOFF(CFS) =    8.03
 EFFECTIVE AREA(ACRES) =      7.72   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.62
 TOTAL AREA(ACRES) =        7.7       PEAK FLOW RATE(CFS) =      14.49

****************************************************************************
 FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 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.) =    5.09
 RAINFALL INTENSITY(INCH/HR) =   2.24
 AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.62
 EFFECTIVE STREAM AREA(ACRES) =       7.72
 TOTAL STREAM AREA(ACRES) =       7.72
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      14.49

 ** CONFLUENCE DATA **
  STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       56.87    5.90    2.058  0.25( 0.05) 0.22      27.8       38.00
     1       61.46    7.74    1.762  0.25( 0.06) 0.22      35.2       34.00
     1       62.43    8.36    1.685  0.25( 0.06) 0.22      37.4       22.00
     1       62.77    9.60    1.557  0.25( 0.05) 0.22      40.9       18.00
     1       62.77   10.56    1.474  0.25( 0.05) 0.22      43.6       14.00
     1       62.29   11.06    1.435  0.25( 0.05) 0.22      44.6       10.00
     1       61.93   11.45    1.407  0.25( 0.05) 0.22      45.5       26.00
     1       58.96   14.89    1.210  0.25( 0.05) 0.22      51.0       27.00
     1       54.80   18.33    1.074  0.25( 0.05) 0.21      55.1        6.00
     1       53.45   19.38    1.040  0.25( 0.05) 0.21      55.6       30.00
     2       14.49    5.09    2.241  0.25( 0.16) 0.62       7.7       43.00

 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       68.00    5.09    2.241  0.25( 0.08) 0.32      31.7       43.00
     2       70.09    5.90    2.058  0.25( 0.08) 0.31      35.5       38.00
     3       72.61    7.74    1.762  0.25( 0.07) 0.29      42.9       34.00
     4       73.06    8.36    1.685  0.25( 0.07) 0.29      45.1       22.00
     5       72.51    9.60    1.557  0.25( 0.07) 0.28      48.6       18.00
     6       71.93   10.56    1.474  0.25( 0.07) 0.28      51.3       14.00
     7       71.18   11.06    1.435  0.25( 0.07) 0.28      52.4       10.00
     8       70.62   11.45    1.407  0.25( 0.07) 0.28      53.2       26.00
     9       66.29   14.89    1.210  0.25( 0.07) 0.27      58.7       27.00
    10       61.18   18.33    1.074  0.25( 0.07) 0.26      62.8        6.00
    11       59.60   19.38    1.040  0.25( 0.07) 0.26      63.4       30.00
```

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 73.06 Tc(MIN.) = 8.36
EFFECTIVE AREA(ACRES) = 45.09 AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.29
TOTAL AREA(ACRES) = 63.4
LONGEST FLOWPATH FROM NODE 6.00 TO NODE 40.00 = 3321.00 FEET.

END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 63.4 TC(MIN.) = 8.36
EFFECTIVE AREA(ACRES) = 45.09 AREA-AVERAGED Fm(INCH/HR)= 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.290
PEAK FLOW RATE(CFS) = 73.06

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	68.00	5.09	2.241	0.25(0.08)	0.32	31.7	43.00
2	70.09	5.90	2.058	0.25(0.08)	0.31	35.5	38.00
3	72.61	7.74	1.762	0.25(0.07)	0.29	42.9	34.00
4	73.06	8.36	1.685	0.25(0.07)	0.29	45.1	22.00
5	72.51	9.60	1.557	0.25(0.07)	0.28	48.6	18.00
6	71.93	10.56	1.474	0.25(0.07)	0.28	51.3	14.00
7	71.18	11.06	1.435	0.25(0.07)	0.28	52.4	10.00
8	70.62	11.45	1.407	0.25(0.07)	0.28	53.2	26.00
9	66.29	14.89	1.210	0.25(0.07)	0.27	58.7	27.00
10	61.18	18.33	1.074	0.25(0.07)	0.26	62.8	6.00
11	59.60	19.38	1.040	0.25(0.07)	0.26	63.4	30.00

END OF RATIONAL METHOD ANALYSIS

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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              Ver. 14.0  Release Date: 06/01/2007  License ID 1355

                           Analysis prepared by:

                              Fuscoe Engineering, Inc
                            16795 Von Karman Ave. Suite 100
                                Irvine, California 92606
                          PH: 949-474-1960       FAX: 949-474-5315

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

 Problem Descriptions:
  IRWD SITE
  PROPOSED OUTLET B
  2 YEAR
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.05 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)     YIELD
         1         67.23       20.00            69.       0.250        0.735

    TOTAL AREA (Acres) =     67.23

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.050

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.265
==========================================================================
```

```
**************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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            Ver. 14.0  Release Date: 06/01/2007  License ID 1355

                        Analysis prepared by:

                            Fuscoe Engineering, Inc
                          16795 Von Karman Ave. Suite 100
                              Irvine, California 92606
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**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  IRWD SITE
  PROPOSED OUTLET B
  2 YEAR
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.75
    TOTAL CATCHMENT AREA(ACRES) =   67.23
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.050
    LOW LOSS FRACTION = 0.265
    TIME OF CONCENTRATION(MIN.) =  8.36
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     6.69
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     4.80

**************************************************************************
  TIME      VOLUME        Q    0.       22.5      45.0      67.5      90.0
 (HOURS)     (AF)      (CFS)
--------------------------------------------------------------------------
  0.12      0.0068      1.19  Q         .         .         .         .
  0.26      0.0205      1.19  Q         .         .         .         .
  0.39      0.0343      1.20  Q         .         .         .         .
  0.53      0.0481      1.21  Q         .         .         .         .
  0.67      0.0620      1.21  Q         .         .         .         .
  0.81      0.0760      1.22  Q         .         .         .         .
  0.95      0.0901      1.22  Q         .         .         .         .
  1.09      0.1042      1.23  Q         .         .         .         .
  1.23      0.1185      1.24  Q         .         .         .         .
```

1.37	0.1328	1.25	Q	.	.	.	.
1.51	0.1472	1.25	Q	.	.	.	.
1.65	0.1617	1.26	Q	.	.	.	.
1.79	0.1763	1.27	Q	.	.	.	.
1.93	0.1909	1.28	Q	.	.	.	.
2.07	0.2057	1.28	Q	.	.	.	.
2.21	0.2206	1.29	Q	.	.	.	.
2.35	0.2355	1.30	Q	.	.	.	.
2.48	0.2505	1.31	Q	.	.	.	.
2.62	0.2657	1.32	Q	.	.	.	.
2.76	0.2809	1.33	Q	.	.	.	.
2.90	0.2962	1.33	Q	.	.	.	.
3.04	0.3117	1.35	Q	.	.	.	.
3.18	0.3272	1.35	Q	.	.	.	.
3.32	0.3428	1.36	Q	.	.	.	.
3.46	0.3586	1.37	Q	.	.	.	.
3.60	0.3744	1.38	Q	.	.	.	.
3.74	0.3904	1.39	Q	.	.	.	.
3.88	0.4065	1.40	Q	.	.	.	.
4.02	0.4227	1.41	Q	.	.	.	.
4.16	0.4390	1.42	Q	.	.	.	.
4.30	0.4554	1.43	Q	.	.	.	.
4.44	0.4720	1.44	Q	.	.	.	.
4.57	0.4887	1.45	Q	.	.	.	.
4.71	0.5055	1.47	Q	.	.	.	.
4.85	0.5224	1.47	Q	.	.	.	.
4.99	0.5395	1.49	Q	.	.	.	.
5.13	0.5567	1.50	Q	.	.	.	.
5.27	0.5740	1.51	Q	.	.	.	.
5.41	0.5915	1.52	Q	.	.	.	.
5.55	0.6091	1.54	Q	.	.	.	.
5.69	0.6269	1.55	Q	.	.	.	.
5.83	0.6448	1.56	Q	.	.	.	.
5.97	0.6629	1.57	Q	.	.	.	.
6.11	0.6811	1.59	Q	.	.	.	.
6.25	0.6995	1.60	Q	.	.	.	.
6.39	0.7180	1.62	Q	.	.	.	.
6.53	0.7367	1.63	Q	.	.	.	.
6.66	0.7556	1.65	Q	.	.	.	.
6.80	0.7747	1.66	Q	.	.	.	.
6.94	0.7939	1.68	Q	.	.	.	.
7.08	0.8133	1.69	Q	.	.	.	.
7.22	0.8329	1.71	Q	.	.	.	.
7.36	0.8527	1.73	Q	.	.	.	.
7.50	0.8727	1.75	Q	.	.	.	.
7.64	0.8929	1.76	Q	.	.	.	.
7.78	0.9133	1.79	Q	.	.	.	.
7.92	0.9340	1.80	Q	.	.	.	.
8.06	0.9548	1.82	Q	.	.	.	.
8.20	0.9759	1.84	Q	.	.	.	.
8.34	0.9972	1.86	Q	.	.	.	.
8.48	1.0188	1.88	Q	.	.	.	.
8.62	1.0406	1.91	Q	.	.	.	.
8.75	1.0626	1.92	Q	.	.	.	.
8.89	1.0849	1.95	Q	.	.	.	.
9.03	1.1075	1.97	Q	.	.	.	.
9.17	1.1304	2.00	Q	.	.	.	.

9.31	1.1535	2.02	Q	.	.	.	.
9.45	1.1770	2.05	Q	.	.	.	.
9.59	1.2007	2.07	Q	.	.	.	.
9.73	1.2248	2.11	Q	.	.	.	.
9.87	1.2492	2.13	Q	.	.	.	.
10.01	1.2740	2.17	Q	.	.	.	.
10.15	1.2991	2.19	Q	.	.	.	.
10.29	1.3246	2.23	Q	.	.	.	.
10.43	1.3504	2.26	.Q	.	.	.	.
10.57	1.3767	2.30	.Q	.	.	.	.
10.71	1.4034	2.33	.Q	.	.	.	.
10.84	1.4305	2.38	.Q	.	.	.	.
10.98	1.4581	2.41	.Q	.	.	.	.
11.12	1.4861	2.46	.Q	.	.	.	.
11.26	1.5146	2.49	.Q	.	.	.	.
11.40	1.5437	2.55	.Q	.	.	.	.
11.54	1.5733	2.59	.Q	.	.	.	.
11.68	1.6034	2.65	.Q	.	.	.	.
11.82	1.6342	2.69	.Q	.	.	.	.
11.96	1.6656	2.76	.Q	.	.	.	.
12.10	1.6979	2.84	.Q	.	.	.	.
12.24	1.7344	3.50	.Q	.	.	.	.
12.38	1.7749	3.55	.Q	.	.	.	.
12.52	1.8163	3.64	.Q	.	.	.	.
12.66	1.8586	3.70	.Q	.	.	.	.
12.80	1.9018	3.81	.Q	.	.	.	.
12.93	1.9460	3.87	.Q	.	.	.	.
13.07	1.9913	4.00	.Q	.	.	.	.
13.21	2.0377	4.07	.Q	.	.	.	.
13.35	2.0854	4.21	.Q	.	.	.	.
13.49	2.1344	4.29	.Q	.	.	.	.
13.63	2.1848	4.47	.Q	.	.	.	.
13.77	2.2368	4.56	. Q	.	.	.	.
13.91	2.2905	4.77	. Q	.	.	.	.
14.05	2.3461	4.88	. Q	.	.	.	.
14.19	2.4049	5.32	. Q	.	.	.	.
14.33	2.4670	5.47	. Q	.	.	.	.
14.47	2.5318	5.79	. Q	.	.	.	.
14.61	2.5995	5.97	. Q	.	.	.	.
14.75	2.6707	6.39	. Q	.	.	.	.
14.89	2.7458	6.64	. Q	.	.	.	.
15.02	2.8261	7.31	. Q	.	.	.	.
15.16	2.9131	7.80	. Q	.	.	.	.
15.30	3.0098	9.02	. Q	.	.	.	.
15.44	3.1164	9.49	. Q	.	.	.	.
15.58	3.2298	10.20	. Q	.	.	.	.
15.72	3.3566	11.82	. Q	.	.	.	.
15.86	3.5301	18.31	. Q .		.	.	.
16.00	3.7846	25.89	. .Q		.	.	.
16.14	4.4093	82.61	. .		.	. Q	.
16.28	4.9677	14.38	. Q	.	.	.	.
16.42	5.1024	9.00	. Q	.	.	.	.
16.56	5.2023	8.36	. Q	.	.	.	.
16.70	5.2902	6.91	. Q	.	.	.	.
16.84	5.3655	6.17	. Q	.	.	.	.
16.98	5.4334	5.62	. Q	.	.	.	.
17.11	5.4952	5.11	. Q	.	.	.	.

17.25	5.5514	4.66	. Q	.	.	.	.
17.39	5.6035	4.38	.Q	.	.	.	.
17.53	5.6525	4.14	.Q	.	.	.	.
17.67	5.6990	3.93	.Q	.	.	.	.
17.81	5.7432	3.75	.Q	.	.	.	.
17.95	5.7855	3.59	.Q	.	.	.	.
18.09	5.8261	3.45	.Q	.	.	.	.
18.23	5.8617	2.73	.Q	.	.	.	.
18.37	5.8924	2.62	.Q	.	.	.	.
18.51	5.9220	2.52	.Q	.	.	.	.
18.65	5.9506	2.43	.Q	.	.	.	.
18.79	5.9782	2.35	.Q	.	.	.	.
18.93	6.0048	2.28	.Q	.	.	.	.
19.07	6.0307	2.21	Q	.	.	.	.
19.20	6.0558	2.15	Q	.	.	.	.
19.34	6.0802	2.09	Q	.	.	.	.
19.48	6.1040	2.04	Q	.	.	.	.
19.62	6.1272	1.99	Q	.	.	.	.
19.76	6.1497	1.94	Q	.	.	.	.
19.90	6.1718	1.89	Q	.	.	.	.
20.04	6.1934	1.85	Q	.	.	.	.
20.18	6.2144	1.81	Q	.	.	.	.
20.32	6.2351	1.77	Q	.	.	.	.
20.46	6.2553	1.74	Q	.	.	.	.
20.60	6.2751	1.70	Q	.	.	.	.
20.74	6.2945	1.67	Q	.	.	.	.
20.88	6.3136	1.64	Q	.	.	.	.
21.02	6.3323	1.61	Q	.	.	.	.
21.16	6.3507	1.58	Q	.	.	.	.
21.29	6.3687	1.56	Q	.	.	.	.
21.43	6.3865	1.53	Q	.	.	.	.
21.57	6.4040	1.51	Q	.	.	.	.
21.71	6.4212	1.48	Q	.	.	.	.
21.85	6.4381	1.46	Q	.	.	.	.
21.99	6.4548	1.44	Q	.	.	.	.
22.13	6.4712	1.42	Q	.	.	.	.
22.27	6.4874	1.40	Q	.	.	.	.
22.41	6.5034	1.38	Q	.	.	.	.
22.55	6.5191	1.36	Q	.	.	.	.
22.69	6.5347	1.34	Q	.	.	.	.
22.83	6.5500	1.32	Q	.	.	.	.
22.97	6.5651	1.31	Q	.	.	.	.
23.11	6.5801	1.29	Q	.	.	.	.
23.25	6.5948	1.27	Q	.	.	.	.
23.38	6.6094	1.26	Q	.	.	.	.
23.52	6.6238	1.24	Q	.	.	.	.
23.66	6.6381	1.23	Q	.	.	.	.
23.80	6.6521	1.22	Q	.	.	.	.
23.94	6.6660	1.20	Q	.	.	.	.
24.08	6.6798	1.19	Q	.	.	.	.
24.22	6.6866	0.00	Q	.	.	.	.

CIVIC CENTER PROPOSED 2 YEAR HYDROLOGY AND HYDROGRAPH

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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            Ver. 13.5  Release Date: 02/06/2007  License ID 1355

                          Analysis prepared by:

                             Fuscoe Engineering, Inc
                          16795 Von Karman Ave. Suite 100
                              Irvine, California 92606
                       PH: 949-474-1960       FAX: 949-474-5315

 ************************** DESCRIPTION OF STUDY **************************
* IRWD LAKE FOREST SITE                                                   *
* PROPOSED 2 YEAR HYDROLOGY                                               *
* CIVIC CENTER / EXISTING TANK                                            *
 **************************************************************************

  FILE NAME: IRW02B.DAT
  TIME/DATE OF STUDY: 13:21 03/09/2010
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  *DATA BANK RAINFALL USED*
  *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     50.00 TO NODE     51.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   300.00
  ELEVATION DATA: UPSTREAM(FEET) =    660.00  DOWNSTREAM(FEET) =    654.00
```

```
 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.509
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.946
 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                B        3.03      0.30      0.100    56    6.51
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      5.22
 TOTAL AREA(ACRES) =      3.03   PEAK FLOW RATE(CFS) =      5.22

****************************************************************************
 FLOW PROCESS FROM NODE     51.00 TO NODE     52.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.51
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.946
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                C        6.18      0.25      0.100    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    6.18      SUBAREA RUNOFF(CFS) =   10.68
 EFFECTIVE AREA(ACRES) =      9.21   AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.27  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        9.2       PEAK FLOW RATE(CFS) =      15.91

****************************************************************************
 FLOW PROCESS FROM NODE     52.00 TO NODE     53.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   636.80  DOWNSTREAM(FEET) =   573.00
 FLOW LENGTH(FEET) =   200.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  26.83
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      15.91
 PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    6.63
 LONGEST FLOWPATH FROM NODE     50.00 TO NODE     53.00 =     500.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     53.00 TO NODE     53.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.63
 *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.925
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL GOOD COVER
```

```
"GRASS"                    C        3.19      0.25      1.000    74
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA AREA(ACRES) =     3.19      SUBAREA RUNOFF(CFS) =     4.81
EFFECTIVE AREA(ACRES) =     12.40   AREA-AVERAGED Fm(INCH/HR) =  0.08
AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.33
TOTAL AREA(ACRES) =       12.4       PEAK FLOW RATE(CFS) =      20.54

****************************************************************************
FLOW PROCESS FROM NODE     54.00 TO NODE     55.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =  1052.00
ELEVATION DATA: UPSTREAM(FEET) =    638.80  DOWNSTREAM(FEET) =    560.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   25.393
*   2 YEAR RAINFALL INTENSITY(INCH/HR) =  0.891
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 GOOD COVER
"OPEN BRUSH"               A        2.95      0.40      1.000    41   25.39
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA RUNOFF(CFS) =      1.30
TOTAL AREA(ACRES) =      2.95   PEAK FLOW RATE(CFS) =      1.30

****************************************************************************
FLOW PROCESS FROM NODE     45.00 TO NODE     46.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =   223.00
ELEVATION DATA: UPSTREAM(FEET) =    628.80  DOWNSTREAM(FEET) =    608.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   13.067
*   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.304
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 GOOD COVER
"GRASS"                    B        3.83      0.30      1.000    61   13.07
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA RUNOFF(CFS) =      3.46
TOTAL AREA(ACRES) =      3.83   PEAK FLOW RATE(CFS) =      3.46
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        3.8  TC(MIN.) =     13.07
EFFECTIVE AREA(ACRES) =      3.83  AREA-AVERAGED Fm(INCH/HR)=  0.30
AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 1.000
PEAK FLOW RATE(CFS)   =       3.46
```

==========
==========

END OF RATIONAL METHOD ANALYSIS

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                   AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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            Ver. 14.0  Release Date: 06/01/2007  License ID 1355

                          Analysis prepared by:

                              Fuscoe Engineering, Inc
                            16795 Von Karman Ave. Suite 100
                                Irvine, California 92606
                         PH: 949-474-1960       FAX: 949-474-5315

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

 Problem Descriptions:
  IRWD SITE
  PROPOSED OUTLET A
  2 YEAR
==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.05 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)     YIELD
         1         15.35       20.00            69.       0.250        0.735

    TOTAL AREA (Acres) =     15.35

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.050

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.265
==========================================================================
```

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**************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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             Ver. 14.0  Release Date: 06/01/2007  License ID 1355

                          Analysis prepared by:

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

 Problem Descriptions:
  IRWD SITE
  PROPOSED OUTLET A
  2 YEAR
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.80
    TOTAL CATCHMENT AREA(ACRES) =   15.35
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.050
    LOW LOSS FRACTION = 0.265
    TIME OF CONCENTRATION(MIN.) =  6.63
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.63
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.99

**************************************************************************
  TIME      VOLUME        Q    0.        7.5       15.0       22.5       30.0
 (HOURS)     (AF)       (CFS)
--------------------------------------------------------------------------
  0.09      0.0013      0.29  Q          .         .          .          .
  0.20      0.0040      0.29  Q          .         .          .          .
  0.31      0.0066      0.29  Q          .         .          .          .
  0.42      0.0093      0.29  Q          .         .          .          .
  0.53      0.0120      0.29  Q          .         .          .          .
  0.64      0.0146      0.30  Q          .         .          .          .
  0.75      0.0173      0.30  Q          .         .          .          .
  0.86      0.0201      0.30  Q          .         .          .          .
  0.97      0.0228      0.30  Q          .         .          .          .
```

1.08	0.0255	0.30	Q	.	.	.	.
1.19	0.0283	0.30	Q	.	.	.	.
1.30	0.0310	0.30	Q	.	.	.	.
1.41	0.0338	0.30	Q	.	.	.	.
1.52	0.0366	0.31	Q	.	.	.	.
1.63	0.0394	0.31	Q	.	.	.	.
1.75	0.0422	0.31	Q	.	.	.	.
1.86	0.0450	0.31	Q	.	.	.	.
1.97	0.0479	0.31	Q	.	.	.	.
2.08	0.0507	0.31	Q	.	.	.	.
2.19	0.0536	0.32	Q	.	.	.	.
2.30	0.0565	0.32	Q	.	.	.	.
2.41	0.0594	0.32	Q	.	.	.	.
2.52	0.0623	0.32	Q	.	.	.	.
2.63	0.0652	0.32	Q	.	.	.	.
2.74	0.0682	0.32	Q	.	.	.	.
2.85	0.0711	0.33	Q	.	.	.	.
2.96	0.0741	0.33	Q	.	.	.	.
3.07	0.0771	0.33	Q	.	.	.	.
3.18	0.0801	0.33	Q	.	.	.	.
3.29	0.0831	0.33	Q	.	.	.	.
3.40	0.0862	0.33	Q	.	.	.	.
3.51	0.0892	0.34	Q	.	.	.	.
3.62	0.0923	0.34	Q	.	.	.	.
3.73	0.0954	0.34	Q	.	.	.	.
3.84	0.0985	0.34	Q	.	.	.	.
3.96	0.1016	0.34	Q	.	.	.	.
4.07	0.1048	0.34	Q	.	.	.	.
4.18	0.1079	0.35	Q	.	.	.	.
4.29	0.1111	0.35	Q	.	.	.	.
4.40	0.1143	0.35	Q	.	.	.	.
4.51	0.1175	0.35	Q	.	.	.	.
4.62	0.1208	0.36	Q	.	.	.	.
4.73	0.1240	0.36	Q	.	.	.	.
4.84	0.1273	0.36	Q	.	.	.	.
4.95	0.1306	0.36	Q	.	.	.	.
5.06	0.1339	0.36	Q	.	.	.	.
5.17	0.1372	0.37	Q	.	.	.	.
5.28	0.1406	0.37	Q	.	.	.	.
5.39	0.1440	0.37	Q	.	.	.	.
5.50	0.1474	0.37	Q	.	.	.	.
5.61	0.1508	0.38	Q	.	.	.	.
5.72	0.1542	0.38	Q	.	.	.	.
5.83	0.1577	0.38	Q	.	.	.	.
5.94	0.1612	0.38	Q	.	.	.	.
6.05	0.1647	0.39	Q	.	.	.	.
6.17	0.1683	0.39	Q	.	.	.	.
6.28	0.1718	0.39	Q	.	.	.	.
6.39	0.1754	0.40	Q	.	.	.	.
6.50	0.1790	0.40	Q	.	.	.	.
6.61	0.1827	0.40	Q	.	.	.	.
6.72	0.1863	0.40	Q	.	.	.	.
6.83	0.1900	0.41	Q	.	.	.	.
6.94	0.1938	0.41	Q	.	.	.	.
7.05	0.1975	0.41	Q	.	.	.	.
7.16	0.2013	0.42	Q	.	.	.	.
7.27	0.2051	0.42	Q	.	.	.	.

7.38	0.2089	0.42	Q	.	.	.	.
7.49	0.2128	0.43	Q	.	.	.	.
7.60	0.2167	0.43	Q	.	.	.	.
7.71	0.2207	0.43	Q	.	.	.	.
7.82	0.2246	0.44	Q	.	.	.	.
7.93	0.2286	0.44	Q	.	.	.	.
8.04	0.2327	0.44	Q	.	.	.	.
8.15	0.2367	0.45	Q	.	.	.	.
8.27	0.2408	0.45	Q	.	.	.	.
8.38	0.2450	0.46	Q	.	.	.	.
8.49	0.2491	0.46	Q	.	.	.	.
8.60	0.2534	0.46	Q	.	.	.	.
8.71	0.2576	0.47	Q	.	.	.	.
8.82	0.2619	0.47	Q	.	.	.	.
8.93	0.2663	0.48	Q	.	.	.	.
9.04	0.2706	0.48	Q	.	.	.	.
9.15	0.2751	0.49	Q	.	.	.	.
9.26	0.2795	0.49	Q	.	.	.	.
9.37	0.2840	0.50	Q	.	.	.	.
9.48	0.2886	0.50	Q	.	.	.	.
9.59	0.2932	0.51	Q	.	.	.	.
9.70	0.2979	0.51	Q	.	.	.	.
9.81	0.3026	0.52	Q	.	.	.	.
9.92	0.3073	0.52	Q	.	.	.	.
10.03	0.3121	0.53	Q	.	.	.	.
10.14	0.3170	0.54	Q	.	.	.	.
10.25	0.3219	0.54	Q	.	.	.	.
10.36	0.3269	0.55	Q	.	.	.	.
10.48	0.3319	0.55	Q	.	.	.	.
10.59	0.3370	0.56	Q	.	.	.	.
10.70	0.3422	0.57	Q	.	.	.	.
10.81	0.3475	0.58	Q	.	.	.	.
10.92	0.3528	0.58	Q	.	.	.	.
11.03	0.3581	0.59	Q	.	.	.	.
11.14	0.3636	0.60	Q	.	.	.	.
11.25	0.3691	0.61	Q	.	.	.	.
11.36	0.3747	0.62	Q	.	.	.	.
11.47	0.3804	0.63	Q	.	.	.	.
11.58	0.3862	0.64	Q	.	.	.	.
11.69	0.3921	0.65	Q	.	.	.	.
11.80	0.3980	0.66	Q	.	.	.	.
11.91	0.4041	0.67	Q	.	.	.	.
12.02	0.4102	0.68	Q	.	.	.	.
12.13	0.4172	0.84	.Q	.	.	.	.
12.24	0.4249	0.85	.Q	.	.	.	.
12.35	0.4327	0.87	.Q	.	.	.	.
12.46	0.4407	0.88	.Q	.	.	.	.
12.57	0.4488	0.90	.Q	.	.	.	.
12.68	0.4571	0.91	.Q	.	.	.	.
12.80	0.4655	0.93	.Q	.	.	.	.
12.91	0.4740	0.94	.Q	.	.	.	.
13.02	0.4827	0.97	.Q	.	.	.	.
13.13	0.4916	0.98	.Q	.	.	.	.
13.24	0.5007	1.01	.Q	.	.	.	.
13.35	0.5100	1.02	.Q	.	.	.	.
13.46	0.5194	1.05	.Q	.	.	.	.
13.57	0.5291	1.07	.Q	.	.	.	.

13.68	0.5391	1.10	.Q	.	.	.	.
13.79	0.5492	1.12	.Q	.	.	.	.
13.90	0.5597	1.16	.Q	.	.	.	.
14.01	0.5704	1.19	.Q	.	.	.	.
14.12	0.5817	1.28	.Q	.	.	.	.
14.23	0.5935	1.31	.Q	.	.	.	.
14.34	0.6057	1.36	.Q	.	.	.	.
14.45	0.6183	1.40	.Q	.	.	.	.
14.56	0.6313	1.47	.Q	.	.	.	.
14.67	0.6449	1.50	. Q	.	.	.	.
14.78	0.6590	1.59	. Q	.	.	.	.
14.90	0.6738	1.64	. Q	.	.	.	.
15.01	0.6895	1.78	. Q	.	.	.	.
15.12	0.7061	1.87	. Q	.	.	.	.
15.23	0.7242	2.09	. Q	.	.	.	.
15.34	0.7440	2.23	. Q	.	.	.	.
15.45	0.7638	2.13	. Q	.	.	.	.
15.56	0.7843	2.34	. Q	.	.	.	.
15.67	0.8084	2.94	. Q	.	.	.	.
15.78	0.8376	3.44	. Q	.	.	.	.
15.89	0.8770	5.20	. Q	.	.	.	.
16.00	0.9341	7.31	. Q.	.	.	.	.
16.11	1.0731	23.13	.	.	.	Q	.
16.22	1.1976	4.14	. Q	.	.	.	.
16.33	1.2284	2.61	. Q	.	.	.	.
16.44	1.2511	2.36	. Q	.	.	.	.
16.55	1.2709	1.98	. Q	.	.	.	.
16.66	1.2877	1.70	. Q	.	.	.	.
16.77	1.3025	1.55	. Q	.	.	.	.
16.88	1.3161	1.43	.Q	.	.	.	.
16.99	1.3287	1.33	.Q	.	.	.	.
17.11	1.3404	1.22	.Q	.	.	.	.
17.22	1.3511	1.14	.Q	.	.	.	.
17.33	1.3613	1.09	.Q	.	.	.	.
17.44	1.3710	1.04	.Q	.	.	.	.
17.55	1.3803	0.99	.Q	.	.	.	.
17.66	1.3892	0.95	.Q	.	.	.	.
17.77	1.3977	0.92	.Q	.	.	.	.
17.88	1.4060	0.89	.Q	.	.	.	.
17.99	1.4140	0.86	.Q	.	.	.	.
18.10	1.4212	0.73	Q	.	.	.	.
18.21	1.4276	0.66	Q	.	.	.	.
18.32	1.4335	0.64	Q	.	.	.	.
18.43	1.4393	0.62	Q	.	.	.	.
18.54	1.4449	0.61	Q	.	.	.	.
18.65	1.4504	0.59	Q	.	.	.	.
18.76	1.4557	0.57	Q	.	.	.	.
18.87	1.4608	0.56	Q	.	.	.	.
18.98	1.4659	0.55	Q	.	.	.	.
19.09	1.4708	0.53	Q	.	.	.	.
19.20	1.4756	0.52	Q	.	.	.	.
19.32	1.4803	0.51	Q	.	.	.	.
19.43	1.4849	0.50	Q	.	.	.	.
19.54	1.4895	0.49	Q	.	.	.	.
19.65	1.4939	0.48	Q	.	.	.	.
19.76	1.4982	0.47	Q	.	.	.	.
19.87	1.5025	0.46	Q	.	.	.	.

19.98	1.5066	0.45	Q	.	.	.	.
20.09	1.5107	0.45	Q	.	.	.	.
20.20	1.5148	0.44	Q	.	.	.	.
20.31	1.5188	0.43	Q	.	.	.	.
20.42	1.5227	0.42	Q	.	.	.	.
20.53	1.5265	0.42	Q	.	.	.	.
20.64	1.5303	0.41	Q	.	.	.	.
20.75	1.5340	0.40	Q	.	.	.	.
20.86	1.5377	0.40	Q	.	.	.	.
20.97	1.5413	0.39	Q	.	.	.	.
21.08	1.5449	0.39	Q	.	.	.	.
21.19	1.5484	0.38	Q	.	.	.	.
21.30	1.5518	0.38	Q	.	.	.	.
21.41	1.5553	0.37	Q	.	.	.	.
21.52	1.5586	0.37	Q	.	.	.	.
21.64	1.5620	0.36	Q	.	.	.	.
21.75	1.5653	0.36	Q	.	.	.	.
21.86	1.5685	0.35	Q	.	.	.	.
21.97	1.5717	0.35	Q	.	.	.	.
22.08	1.5749	0.35	Q	.	.	.	.
22.19	1.5781	0.34	Q	.	.	.	.
22.30	1.5812	0.34	Q	.	.	.	.
22.41	1.5842	0.33	Q	.	.	.	.
22.52	1.5873	0.33	Q	.	.	.	.
22.63	1.5903	0.33	Q	.	.	.	.
22.74	1.5933	0.32	Q	.	.	.	.
22.85	1.5962	0.32	Q	.	.	.	.
22.96	1.5991	0.32	Q	.	.	.	.
23.07	1.6020	0.31	Q	.	.	.	.
23.18	1.6049	0.31	Q	.	.	.	.
23.29	1.6077	0.31	Q	.	.	.	.
23.40	1.6105	0.31	Q	.	.	.	.
23.51	1.6133	0.30	Q	.	.	.	.
23.62	1.6160	0.30	Q	.	.	.	.
23.73	1.6187	0.30	Q	.	.	.	.
23.85	1.6214	0.29	Q	.	.	.	.
23.96	1.6241	0.29	Q	.	.	.	.
24.07	1.6268	0.29	Q	.	.	.	.
24.18	1.6281	0.00	Q	.	.	.	.

UPPER RETENTION SITE HYDROGRAPH

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**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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                          Analysis prepared by:

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

 Problem Descriptions:
  IRWD UPPER SITE
  PROPOSED 2 YEAR

==========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.05 (inches)

    SOIL-COVER      AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE       (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)     YIELD
         1          10.80       20.00            69.       0.250        0.735

    TOTAL AREA (Acres) =     10.80

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.050

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.265
==========================================================================
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**************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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             Ver. 14.0  Release Date: 06/01/2007  License ID 1355

                          Analysis prepared by:

                              Fuscoe Engineering, Inc
                            16795 Von Karman Ave. Suite 100
                                Irvine, California 92606
                          PH: 949-474-1960       FAX: 949-474-5315

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

 Problem Descriptions:
  IRWD UPPER RETENTION SITE
  PROPOSED 2 YEAR

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


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.95
    TOTAL CATCHMENT AREA(ACRES) =   10.80
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.050
    LOW LOSS FRACTION = 0.265
    TIME OF CONCENTRATION(MIN.) = 14.07
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.36
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.48

**************************************************************************
  TIME      VOLUME        Q    0.        5.0       10.0       15.0       20.0
 (HOURS)     (AF)       (CFS)
--------------------------------------------------------------------------
  0.05      0.0000      0.00  Q          .         .          .          .
  0.29      0.0023      0.24  Q          .         .          .          .
  0.52      0.0071      0.24  Q          .         .          .          .
  0.76      0.0118      0.25  Q          .         .          .          .
  0.99      0.0166      0.25  Q          .         .          .          .
  1.23      0.0215      0.25  Q          .         .          .          .
  1.46      0.0264      0.25  Q          .         .          .          .
  1.70      0.0313      0.26  Q          .         .          .          .
  1.93      0.0363      0.26  Q          .         .          .          .
```

2.16	0.0414	0.26	Q	.	.	.	.
2.40	0.0465	0.26	Q	.	.	.	.
2.63	0.0516	0.27	Q	.	.	.	.
2.87	0.0568	0.27	Q	.	.	.	.
3.10	0.0621	0.27	Q	.	.	.	.
3.34	0.0674	0.28	Q	.	.	.	.
3.57	0.0728	0.28	Q	.	.	.	.
3.81	0.0783	0.28	Q	.	.	.	.
4.04	0.0838	0.29	Q	.	.	.	.
4.28	0.0894	0.29	Q	.	.	.	.
4.51	0.0950	0.29	Q	.	.	.	.
4.74	0.1007	0.30	Q	.	.	.	.
4.98	0.1065	0.30	Q	.	.	.	.
5.21	0.1124	0.30	Q	.	.	.	.
5.45	0.1184	0.31	Q	.	.	.	.
5.68	0.1244	0.31	Q	.	.	.	.
5.92	0.1305	0.32	Q	.	.	.	.
6.15	0.1367	0.32	Q	.	.	.	.
6.39	0.1430	0.33	Q	.	.	.	.
6.62	0.1494	0.33	Q	.	.	.	.
6.85	0.1559	0.34	Q	.	.	.	.
7.09	0.1625	0.34	Q	.	.	.	.
7.32	0.1692	0.35	Q	.	.	.	.
7.56	0.1760	0.35	Q	.	.	.	.
7.79	0.1830	0.36	Q	.	.	.	.
8.03	0.1900	0.37	Q	.	.	.	.
8.26	0.1972	0.38	Q	.	.	.	.
8.50	0.2045	0.38	Q	.	.	.	.
8.73	0.2120	0.39	Q	.	.	.	.
8.97	0.2196	0.40	Q	.	.	.	.
9.20	0.2274	0.41	Q	.	.	.	.
9.43	0.2353	0.41	Q	.	.	.	.
9.67	0.2434	0.42	Q	.	.	.	.
9.90	0.2517	0.43	Q	.	.	.	.
10.14	0.2601	0.44	Q	.	.	.	.
10.37	0.2688	0.45	Q	.	.	.	.
10.61	0.2777	0.47	Q	.	.	.	.
10.84	0.2869	0.48	Q	.	.	.	.
11.08	0.2963	0.49	Q	.	.	.	.
11.31	0.3060	0.50	.Q	.	.	.	.
11.54	0.3159	0.53	.Q	.	.	.	.
11.78	0.3262	0.54	.Q	.	.	.	.
12.01	0.3369	0.56	.Q	.	.	.	.
12.25	0.3486	0.65	.Q	.	.	.	.
12.48	0.3620	0.73	.Q	.	.	.	.
12.72	0.3763	0.75	.Q	.	.	.	.
12.95	0.3912	0.79	.Q	.	.	.	.
13.19	0.4066	0.81	.Q	.	.	.	.
13.42	0.4228	0.86	.Q	.	.	.	.
13.65	0.4397	0.89	.Q	.	.	.	.
13.89	0.4575	0.95	.Q	.	.	.	.
14.12	0.4763	0.99	.Q	.	.	.	.
14.36	0.4967	1.12	. Q	.	.	.	.
14.59	0.5189	1.17	. Q	.	.	.	.
14.83	0.5429	1.31	. Q	.	.	.	.
15.06	0.5692	1.40	. Q	.	.	.	.
15.30	0.5996	1.73	. Q	.	.	.	.

15.53	0.6347	1.89	. Q	.	.	.	.	
15.77	0.6777	2.55	. Q	.	.	.	.	
16.00	0.7387	3.75	. Q	.	.	.	.	
16.23	0.8939	12.26	.	.	.	Q	.	
16.47	1.0319	1.98	. Q	.	.	.	.	
16.70	1.0660	1.54	. Q	.	.	.	.	
16.94	1.0930	1.24	. Q	.	.	.	.	
17.17	1.1152	1.06	. Q	.	.	.	.	
17.41	1.1344	0.92	.Q	.	.	.	.	
17.64	1.1513	0.83	.Q	.	.	.	.	
17.88	1.1668	0.77	.Q	.	.	.	.	
18.11	1.1812	0.71	.Q	.	.	.	.	
18.34	1.1934	0.55	.Q	.	.	.	.	
18.58	1.2037	0.51	.Q	.	.	.	.	
18.81	1.2134	0.49	Q	.	.	.	.	
19.05	1.2226	0.46	Q	.	.	.	.	
19.28	1.2313	0.44	Q	.	.	.	.	
19.52	1.2395	0.42	Q	.	.	.	.	
19.75	1.2475	0.40	Q	.	.	.	.	
19.99	1.2551	0.38	Q	.	.	.	.	
20.22	1.2624	0.37	Q	.	.	.	.	
20.46	1.2695	0.36	Q	.	.	.	.	
20.69	1.2763	0.35	Q	.	.	.	.	
20.92	1.2829	0.34	Q	.	.	.	.	
21.16	1.2893	0.33	Q	.	.	.	.	
21.39	1.2955	0.32	Q	.	.	.	.	
21.63	1.3015	0.31	Q	.	.	.	.	
21.86	1.3074	0.30	Q	.	.	.	.	
22.10	1.3131	0.29	Q	.	.	.	.	
22.33	1.3187	0.28	Q	.	.	.	.	
22.57	1.3242	0.28	Q	.	.	.	.	
22.80	1.3295	0.27	Q	.	.	.	.	
23.03	1.3347	0.27	Q	.	.	.	.	
23.27	1.3398	0.26	Q	.	.	.	.	
23.50	1.3448	0.26	Q	.	.	.	.	
23.74	1.3497	0.25	Q	.	.	.	.	
23.97	1.3545	0.25	Q	.	.	.	.	
24.21	1.3592	0.24	Q	.	.	.	.	
24.44	1.3616	0.00	Q	.	.	.	.	

MIDDLE RETENTION SITE HYDROGRAPH

****
NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS

Ver. 14.0 Release Date: 06/01/2007 License ID 1355

Analysis prepared by:

Fuscoe Engineering, Inc
16795 Von Karman Ave. Suite 100
Irvine, California 92606
PH: 949-474-1960 FAX: 949-474-5315

****

Problem Descriptions:
IRWD MIDDLE RETENTI0N SITE
PROPOSED 2 YEAR

*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 2.05 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	10.00	20.00	69.	0.250	0.735

TOTAL AREA (Acres) = 10.00

AREA-AVERAGED LOSS RATE, $\overline{Fm}$ (in./hr.) = 0.050

AREA-AVERAGED LOW LOSS FRACTION, $\overline{Y}$ = 0.265

```
**************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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              Ver. 14.0  Release Date: 06/01/2007  License ID 1355

                           Analysis prepared by:

                              Fuscoe Engineering, Inc
                            16795 Von Karman Ave. Suite 100
                                Irvine, California 92606
                         PH: 949-474-1960       FAX: 949-474-5315

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

 Problem Descriptions:
  IRWD MIDDLE RETENTI0N SITE
  PROPOSED 2 YEAR

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


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =   10.00
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.050
    LOW LOSS FRACTION = 0.265
    TIME OF CONCENTRATION(MIN.) = 17.46
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.19
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.51

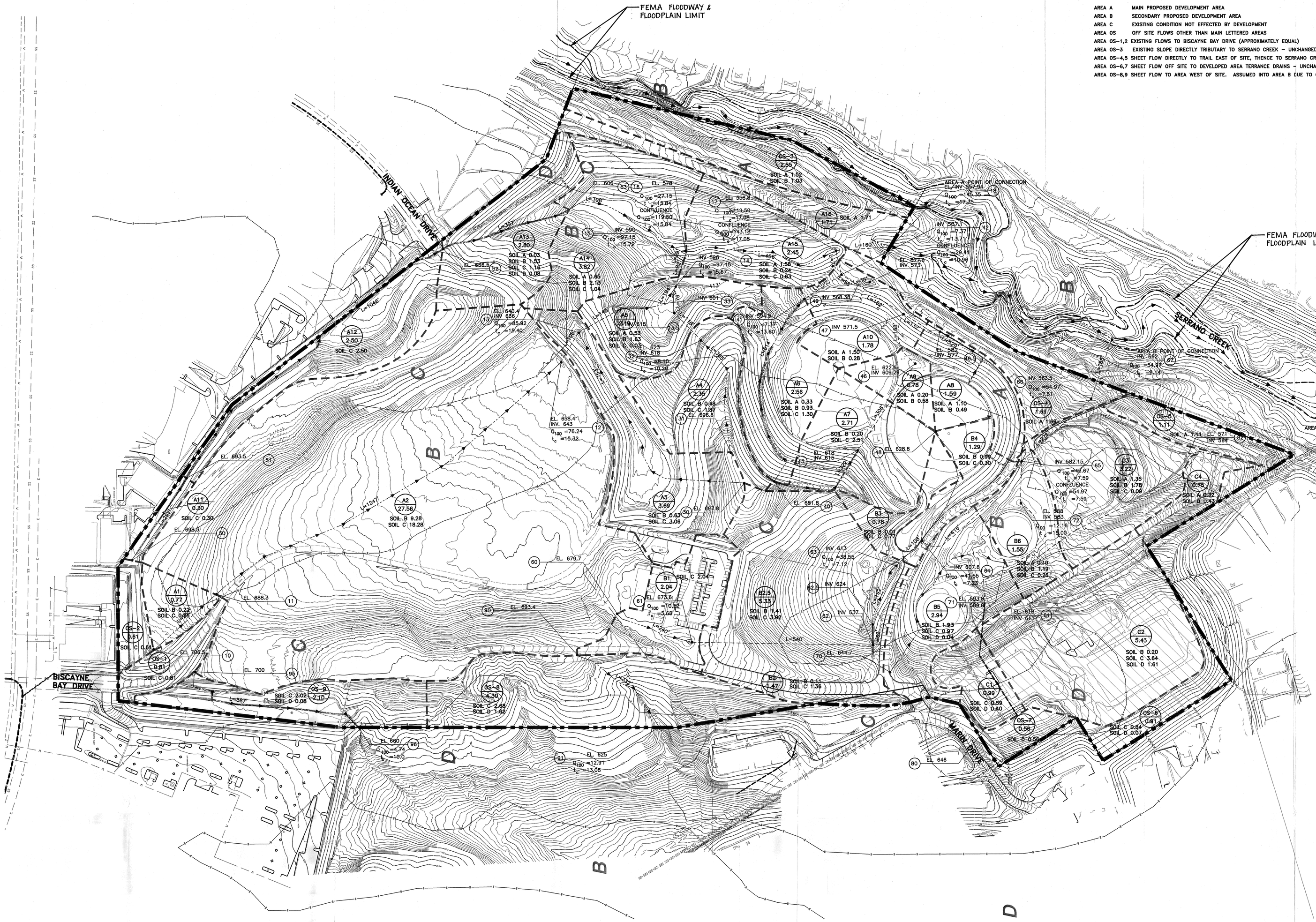
**************************************************************************
  TIME      VOLUME        Q    0.        2.5       5.0       7.5      10.0
 (HOURS)     (AF)       (CFS)
--------------------------------------------------------------------------
  0.29      0.0025      0.21  Q          .         .         .         .
  0.58      0.0077      0.21  Q          .         .         .         .
  0.87      0.0129      0.22  Q          .         .         .         .
  1.16      0.0181      0.22  Q          .         .         .         .
  1.45      0.0234      0.22  Q          .         .         .         .
  1.74      0.0288      0.23  Q          .         .         .         .
  2.03      0.0342      0.23  Q          .         .         .         .
  2.32      0.0398      0.23  Q          .         .         .         .
  2.61      0.0453      0.23  Q          .         .         .         .
```

2.91	0.0510	0.24	Q
3.20	0.0567	0.24	Q
3.49	0.0626	0.24	Q
3.78	0.0685	0.25	Q
4.07	0.0745	0.25	.Q
4.36	0.0805	0.25	.Q
4.65	0.0867	0.26	.Q
4.94	0.0930	0.26	.Q
5.23	0.0994	0.27	.Q
5.52	0.1059	0.27	.Q
5.82	0.1125	0.28	.Q
6.11	0.1192	0.28	.Q
6.40	0.1260	0.29	.Q
6.69	0.1329	0.29	.Q
6.98	0.1400	0.30	.Q
7.27	0.1473	0.30	.Q
7.56	0.1547	0.31	.Q
7.85	0.1622	0.32	.Q
8.14	0.1699	0.33	.Q
8.43	0.1778	0.33	.Q
8.73	0.1858	0.34	.Q
9.02	0.1941	0.35	.Q
9.31	0.2026	0.36	.Q
9.60	0.2113	0.36	.Q
9.89	0.2202	0.38	.Q
10.18	0.2294	0.39	.Q
10.47	0.2389	0.40	.Q
10.76	0.2487	0.41	.Q
11.05	0.2588	0.43	.Q
11.34	0.2693	0.44	.Q
11.64	0.2802	0.46	.Q
11.93	0.2915	0.48	.Q
12.22	0.3041	0.57	. Q
12.51	0.3186	0.63	. Q
12.80	0.3342	0.67	. Q
13.09	0.3506	0.69	. Q
13.38	0.3678	0.74	. Q
13.67	0.3860	0.77	. Q
13.96	0.4054	0.84	. Q
14.25	0.4263	0.89	. Q
14.55	0.4493	1.03	. Q
14.84	0.4749	1.10	. Q
15.13	0.5038	1.31	. Q
15.42	0.5376	1.51	. Q
15.71	0.5786	1.90	. Q
16.00	0.6355	2.83	.Q
16.29	0.7829	9.43	. Q
16.58	0.9161	1.65	. Q
16.87	0.9501	1.18	. Q
17.16	0.9760	0.97	. Q
17.45	0.9972	0.80	. Q
17.75	1.0155	0.72	. Q
18.04	1.0319	0.65	. Q
18.33	1.0456	0.49	.Q
18.62	1.0570	0.45	.Q
18.91	1.0675	0.42	.Q
19.20	1.0773	0.39	.Q

19.49	1.0865	0.37	.Q	.	.	.	.
19.78	1.0952	0.35	.Q	.	.	.	.
20.07	1.1034	0.34	.Q	.	.	.	.
20.36	1.1113	0.32	.Q	.	.	.	.
20.66	1.1189	0.31	.Q	.	.	.	.
20.95	1.1261	0.29	.Q	.	.	.	.
21.24	1.1331	0.28	.Q	.	.	.	.
21.53	1.1398	0.27	.Q	.	.	.	.
21.82	1.1463	0.27	.Q	.	.	.	.
22.11	1.1525	0.26	.Q	.	.	.	.
22.40	1.1586	0.25	Q	.	.	.	.
22.69	1.1645	0.24	Q	.	.	.	.
22.98	1.1703	0.24	Q	.	.	.	.
23.27	1.1759	0.23	Q	.	.	.	.
23.57	1.1813	0.22	Q	.	.	.	.
23.86	1.1866	0.22	Q	.	.	.	.
24.15	1.1918	0.21	Q	.	.	.	.
24.44	1.1944	0.00	Q	.	.	.	.

SUBAREAS

AREA A — MAIN PROPOSED DEVELOPMENT AREA
AREA B — SECONDARY PROPOSED DEVELOPMENT AREA
AREA C — EXISTING CONDITION NOT EFFECTED BY DEVELOPMENT
AREA OS — OFF SITE FLOWS OTHER THAN MAIN LETTERED AREAS
AREA OS-1,2 EXISTING FLOWS TO BISCAYNE BAY DRIVE (APPROXIMATELY EQUAL)
AREA OS-3 EXISTING SLOPE DIRECTLY TRIBUTARY TO SERRANO CREEK - UNCHANGED
AREA OS-4,5 SHEET FLOW DIRECTLY TO TRAIL EAST OF SITE, THENCE TO SERRANO CREEK - UNCHANGED
AREA OS-6,7 SHEET FLOW OFF SITE TO DEVELOPED AREA TERRANCE DRAINS - UNCHANGED
AREA OS-8,9 SHEET FLOW TO AREA WEST OF SITE. ASSUMED INTO AREA B DUE TO GRADING AND WATER QUALITY ISSUES



LEGEND

- EXISTING MAJOR WATERSHED BOUNDARY
- EXISTING SUB DRAINAGE AREA BOUNDARY
- EXISTING FLOW PATH
- SOIL TYPE BOUNDARY
- DIRECTION OF FLOW
- C17 / 70.21 — DRAINAGE AREA DESIGNATION / ACRES
- (340) NODE DESIGNATION
- L=300' LENGTH OF EXISTING FLOW PATH
- Q_{100} CALCULATED 100-YEAR STORM RUNOFF
- Tc TIME OF CONCENTRATION (100-YEAR STORM)

100' 0' 50' 100' 200'
GRAPHIC SCALE: 1" = 100'

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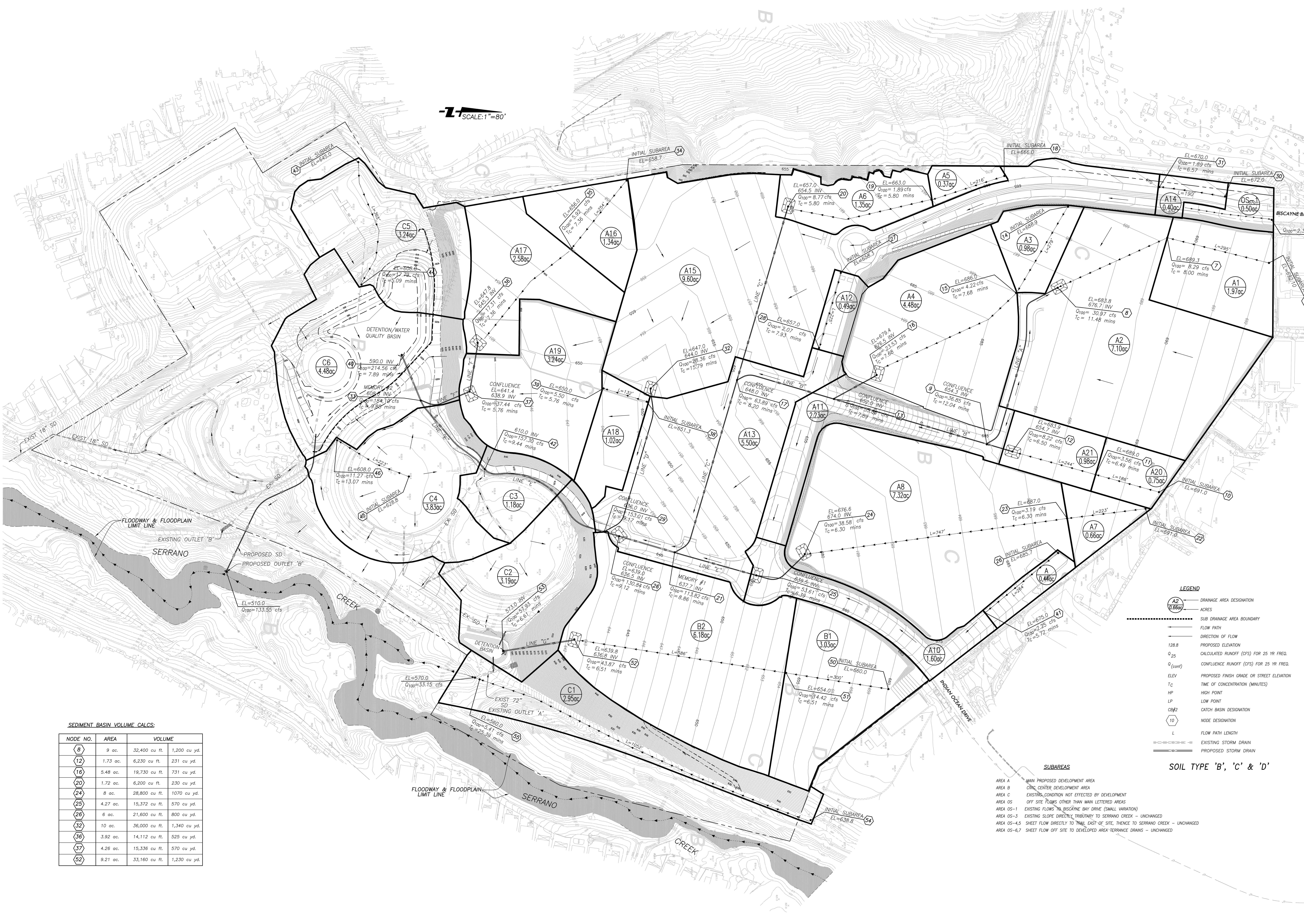
IRWD SITE
CITY OF LAKE FOREST, CA
EXISTING DRAINAGE HYDROLOGY MAP
(TRIBUTARY TO SERRANO CREEK)

SHEET 1 of 1

P:\Projects\0583\02\Eng_File Cabinet\Reports\Hydrology



SEDIMENT BASIN VOLUME CALCS:

NODE NO.	AREA	VOLUME	
8	9 ac.	32,400 cu ft.	1,200 cu yd.
12	1.73 ac.	6,230 cu ft.	231 cu yd.
16	5.48 ac.	19,730 cu ft.	731 cu yd.
20	1.72 ac.	6,200 cu ft.	230 cu yd.
24	8 ac.	28,800 cu ft.	1070 cu yd.
25	4.27 ac.	15,372 cu ft.	570 cu yd.
26	6 ac.	21,600 cu ft.	800 cu yd.
32	10 ac.	36,000 cu ft.	1,340 cu yd.
36	3.92 ac.	14,112 cu ft.	525 cu yd.
37	4.26 ac.	15,336 cu ft.	570 cu yd.
52	9.21 ac.	33,160 cu ft.	1,230 cu yd.

LEGEND

A2	DRAINAGE AREA DESIGNATION
0.66ac	ACRES
	SUB DRAINAGE AREA BOUNDARY
	FLOW PATH
	DIRECTION OF FLOW
128.8	PROPOSED ELEVATION
Q_{25}	CALCULATED RUNOFF (CFS) FOR 25 YR FREQ.
$Q_{(conf)}$	CONFLUENCE RUNOFF (CFS) FOR 25 YR FREQ.
ELEV	PROPOSED FINISH GRADE OR STREET ELEVATION
T_C	TIME OF CONCENTRATION (MINUTES)
HP	HIGH POINT
LP	LOW POINT
CB#2	CATCH BASIN DESIGNATION
10	NODE DESIGNATION
L	FLOW PATH LENGTH
	EXISTING STORM DRAIN
	PROPOSED STORM DRAIN

SOIL TYPE 'B', 'C' & 'D'

SUBAREAS

AREA A MAIN PROPOSED DEVELOPMENT AREA
AREA B CIVIC CENTER DEVELOPMENT AREA
AREA C EXISTING CONDITION NOT EFFECTED BY DEVELOPMENT
AREA OS OFF SITE FLOWS OTHER THAN MAIN LETTERED AREAS
AREA OS-1 EXISTING FLOWS TO BISCAYNE BAY DRIVE (SMALL VARIATION)
AREA OS-3 EXISTING SLOPE DIRECTLY TRIBUTARY TO SERRANO CREEK – UNCHANGED
AREA OS-4,5 SHEET FLOW DIRECTLY TO TRAIL EAST OF SITE, THENCE TO SERRANO CREEK – UNCHANGED
AREA OS-6,7 SHEET FLOW OFF SITE TO DEVELOPED AREA TERRANCE DRAINS – UNCHANGED

DEVELOPER	PREPARED BY:	PROPOSED HYDROLOGY MAP	SHEET
LEWIS COMMUNITY DEVELOPERS 1156 N. MOUNTAIN AVENUE UPLAND, CA. 91785	FUSCOE ENGINEERING 16795 Von Karman, Suite 100 Irvine, California 92606 tel 949.474.1960 ∘ fax 949.474.5315 www.fuscoe.com	I.R.W.D. - LAKE FOREST SITE SERRANO SUMMIT LAKE FOREST, CA	1 OF 1

FUSCOE
ENGINEERING

PRELIMINARY WATER QUALITY MANAGEMENT PLAN

SERRANO SUMMIT

TENTATIVE TRACT MAP NO. 17331

Lake Forest, California

Prepared For
Irvine Ranch Water District
15600 Sand Canyon Avenue
Irvine, CA 92618

Prepared By

Fuscoe Engineering, Inc.
16795 Von Karman, Suite 100
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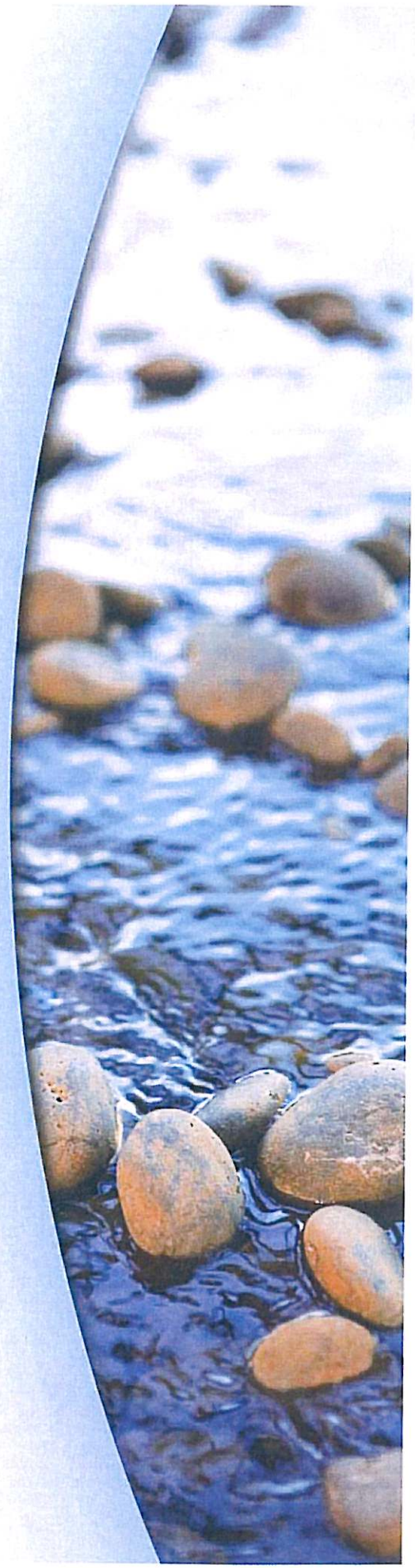
www.fuscoe.com

Project Manager:
Trevor Dodson

Date Prepared: June 12, 2009
Date Revised: November 4, 2009
2nd Revision: March 17, 2010
Job Number: 658.02.01

full circle thinking



PRELIMINARY
WATER QUALITY MANAGEMENT PLAN
(P-WQMP)

SERRANO SUMMIT

TENTATIVE TRACT MAP NO. 17331

Located south of Commercentre Drive and
Biscayne Bay Drive
in the
City of Lake Forest
County of Orange, California

Prepared for:

IRVINE RANCH WATER DISTRICT
15600 Sand Canyon Avenue
Irvine, CA 92618
949.453.5300

Prepared by:

FUSCOE ENGINEERING, INC.
16795 Von Karman Ave, Suite 100
Irvine, CA 92606
949.474.1960

Date Prepared: June 12, 2009
Revised: November 4, 2009
2nd Revision: March 17, 2010

OWNER'S CERTIFICATION

PRELIMINARY WATER QUALITY MANAGEMENT PLAN (P-WQMP)

City of Lake Forest Design Review No. _____
Tract/Parcel Number TBD

This Water Quality Management Plan has been prepared for IRWD by Fuscoe Engineering, Inc. This WQMP is intended to comply with the requirements of the City of Lake Forest, Municipal Code Chapter 15.14, requiring the preparation of a project-specific Water Quality Management Plan (WQMP).

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated cities of Orange County under the jurisdiction of the Santa Ana Regional Water Quality Control Board. A copy of this WQMP will be maintained at the project site or project office.

This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party having responsibility for implementing portions of this WQMP. At least one copy of the approved and certified copy of this WQMP shall be available on the subject property in perpetuity. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend this WQMP.

_____ _____
Signature Title

_____ _____
Name Company

_____
Address

_____ _____
Phone Date

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INTRODUCTION

This Preliminary Water Quality Management Plan (P-WQMP) has been prepared to provide specifications for the post-construction management of storm water runoff from the proposed project, Serrano Summit. Improperly managed runoff can be a significant source of water pollution causing impacts to aquatic habitat, wildlife, and water-dependent beneficial uses. The implementation of this plan ensures that such impacts are reduced to the Maximum Extent Practicable (MEP).

This P-WQMP covers the post-construction operations on Serrano Summit in the City of Lake Forest, California (see Vicinity Map in Section 6.0). It has been developed as required under State Water Resources Control Board (SWRCB) Municipal NPDES Storm Water Permit for the County of Orange and the Incorporated Cities of Orange County, and in accordance with good engineering practices. This P-WQMP describes this facility and its operations, identifies potential sources of storm water pollution at the facility, and recommends appropriate Best Management Practices (BMPs) or pollution control measures to reduce the discharge of pollutants in storm water runoff.

PROJECT CATEGORIES

In accordance with the OC DAMP and Countywide Model WQMP, a project is considered a "Priority Project" if it meets any of the following criteria:

CHECK IF APPLICABLE	PRIORITY PROJECT CATEGORY
	1. All significant redevelopment projects, where significant redevelopment is defined as the addition of 5,000 or more square feet of impervious surface on an already developed site
✓	2. New development projects that create 10,000 square feet or more of impervious surface (collectively over the entire project site) including commercial, industrial, residential housing subdivisions, mixed-use, and public projects
	3. Automotive repair shops (SIC codes 5013, 5014, 5541, 7532-7534, and 7536-7539)
	4. Restaurants where the land area of development is 5,000 square feet or more including parking area
	5. All hillside developments on 5,000 square feet or more, which are located on areas with known erosive soil conditions or where natural slope is twenty-five percent or more
	6. Developments of 2,500 square feet or more of impervious surface or more, adjacent to (within 200 feet) or discharging directly into environmentally sensitive areas, such as areas designated in the Ocean Plan as Areas of Special Biological Significance or water bodies listed on the CWA Section 303(d) list of impaired waters
	7. Parking Lots 5,000 square feet or more of impervious surface exposed to storm water runoff.
	8. Streets, roads, highways and freeways of 5,000 square feet or more of paved surface shall incorporate US EPA guidance, "Managing Wet Weather with Green Infrastructure: Green Streets" in a manner consistent with the MEP standard
	9. Retail gasoline outlets of 5,000 or more square feet with a projected average daily traffic of 100 or more vehicles per day.

The proposed Serrano Summit Project meets **Category 2**, and therefore, is considered a "Priority Project" in accordance with the OC DAMP.

1.0 DISCRETIONARY PERMIT(S) & WATER QUALITY CONDITIONS

The proposed project, designated Project/Application Number TBD by the City of Lake Forest, located in Tract Number 17331, is a subdivision of Parcels 1 & 2 of amended Parcel Map Number 89-218 in the City of Lake Forest, State of California, Office of the County Recorder, Orange County.

1.1 DISCRETIONARY PERMITS

Pending. To be documented in the Final WQMP.

1.2 RESOLUTIONS

Pending. To be documented in the Final WQMP.

1.3 CONDITIONS OF APPROVAL

Pending. To be documented in the Final WQMP.

2.0 PROJECT DESCRIPTION

2.1 FACILITY DESCRIPTION

The proposed Serrano Summit project site is an approximate 99-acre parcel located in the City of Lake Forest, CA. The project site is generally located south of Commercentre Drive, east of Biscayne Bay Drive, and west of the Serrano Creek trail. A vicinity map is provided in Section 6.0. The project site is currently owned by the Irvine Ranch Water District (IRWD); and will be developed by IRWD (herein referred to as "developer").

Under existing conditions, the majority of the project site is vacant, consisting of former agricultural fields. There are several IRWD facilities (Los Alisos Reclamation Plant) located in the southern portion of the site, including above ground and below ground storage tanks and associated facilities. In addition, there is one abandoned office building located in the center of the site with adjacent parking.

Adjacent land uses include commercial and industrial uses to the north and northwest along Commercentre Drive, Serrano Creek to the east, existing residential developments to the southeast and south, and vacant land to the west that is zoned for residential land uses in the Lake Forest General Plan.

The proposed project includes the development of a multi-use master planned community with additional park and public facility land uses. The majority of the existing IRWD storage tanks and facilities will remain in the southern portion of the site. The tank adjacent to the proposed water quality detention basin may be removed and/or relocated in order to help satisfy the infiltration/retention requirements for the proposed project. The development will include "walkable" medium density residential neighborhoods generally in the northern and western portions of the site, a Civic Center, and additional park and open space areas. The table below summarizes the proposed land uses. Refer to Section 6.0 for locations of the specific land use areas. Further details on the proposed development will be documented in the Final WQMP.

PROJECT LAND USE SUMMARY		
LOT #	LAND USE	GROSS ACREAGE
1-13	Residential	55.6 acres
14	Private Recreation Center	1.9 acres
15-17	Public Park	4.8 acres
18-19	Existing Facilities	24.1 acres
O	Open Space	3.9 acres
A-E	Private Streets	3.0 acres
--	Public Streets	5.6 acres
	Total	98.9 acres
13	Civic Center (Overlay)	11.9 acres
F-N	Landscaped Lot/Slope	8.8 acres

2.2 PROJECT FEATURES

PARKING FACILITIES

Parking will be provided throughout the project site as garages within the residential units, carports, along residential streets, and as surface lots. Further details on proposed parking will be documented in the Final WQMP.

LANDSCAPED AREAS

The project site will include landscaping along streets, sidewalks, paseos, pathways, and medians; within the residential areas; as planters within the parking lots; in addition to within the community parks, recreational areas, and Civic Center. Further details on landscaped area will be documented in the Final WQMP.

DRAINAGE AND RUNOFF ALTERATIONS

Prior to construction, approximately 10% of the site is impervious and the runoff coefficient is 0.23. After completion, the entire site will be approximately 55% impervious and the runoff coefficient will be 0.56.[1] These statistics are summarized in the figure below.

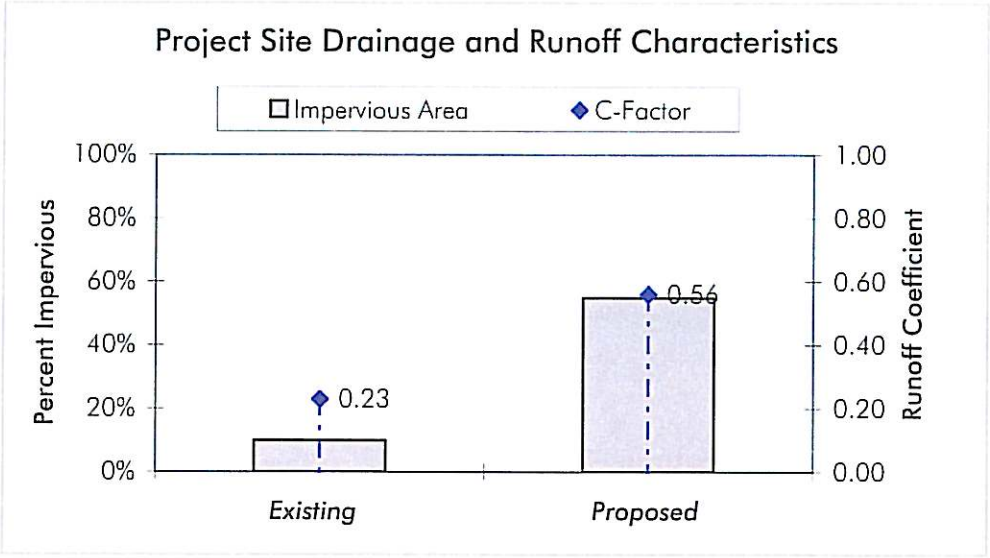

Chart 1. Changes in site drainage and the coefficient of runoff as a result of the proposed improvements.

[1] Runoff coefficients derived from Table A-1 of Attachment A of the Orange County Local WQMP (August 13, 2003).

ANTICIPATED AND POTENTIAL POLLUTANTS

As a result of the proposed project's alteration of existing conditions, the project site may create new pollutant sources, and in turn, change the makeup of pollutant constituents generated by Serrano Summit's operations. But because storm water runoff pollution is diffuse in nature, the composition, level, and cumulative effects of specific pollutants generated by the project cannot be appropriately quantified. Based on the proposed land uses for Serrano Summit, however, this P-WQMP can predict the anticipated and potential pollutants generally associated with the project's post-construction operations. With this information in hand, this will allow the project WQMP to appropriately assign BMPs to effectively mitigate storm water pollution prior to the runoff discharging off-site.

The table below, derived from the Countywide Model WQMP, summarizes the categories of land use or project features of concern and the general pollutant categories associated with them. The types of project features listed below that are proposed for Serrano Summit are: Detached Residential Development, Attached Residential Development, Commercial/Industrial Development, and Streets. As a result, anticipated pollutants include: Bacteria/Virus, Heavy Metals, Nutrients, Pesticides, Organic Compounds, Sediments, Trash & Debris, Oxygen Demanding Substances, and Oil & Grease. There are no additional potential pollutants of concern for this project.

GENERAL POLLUTANT CATEGORIES									
Priority Project Categories and/or Project Features	BACTERIA/ VIRUS	HEAVY METALS	NUTRIENTS	PESTICIDES	ORGANIC COMPOUNDS	SEDIMENTS	TRASH & DEBRIS	OXYGEN DEMANDING SUBSTANCES	OIL & GREASE
Detached Residential Development	X		X	X		X	X	X	X
Attached Residential Development	P		X	X		X	X	P(1)	P(2)
Commercial/Industrial Development	P(3)	P	P(1)	P(1)	P(5)	P(1)	X	P(1)	X
Parking Lots	P (6)	X	P (1)	P (1)	X (4)	P (1)	X	P (1)	X
Streets, Highways & Freeways	P (6)	X	P (1)	P (1)	X (4)	X	X	P (1)	X

Notes:
X = Anticipated
P = Potential
(1) A potential pollutant if landscaping or open area exist on-site.
(2) A potential pollutant if the project includes uncovered parking areas.
(3) A potential pollutant if land use involves food or animal waste products.
(4) Including petroleum hydrocarbons.
(5) Including solvents.
(6) Analyses of pavement runoff routinely exhibit bacterial indicators.

Source: County of Orange Flood Control District, *2003 Drainage Area Master Plan, Table 7-1.3*, July 1, 2003.

OWNERSHIP OF SITE

The table provided below describes the ownership of all land space within the project site once the construction of the project has been completed.

SITE FEATURE	OWNER
Private Streets	Master HOA or Sub-HOA
Recreation Center	Master HOA
Landscape (Lot H)	City of Lake Forest
Private Landscaped Areas & Lots D-G, J-M	Master HOA or Sub-HOA
Public Parks	City of Lake Forest
Public Buildings (Civic Center Site)	City of Lake Forest
Public Streets	City of Lake Forest
Public Facilities (IRWD Facilities)	IRWD
Residential Areas	Master HOA or Sub-HOA
Water Quality/Detention Basin (Lot L)	Master HOA
Detention Basin (Lot H)	City of Lake Forest

A Master Home Owners Association (HOA) will be formed upon project completion. The HOA will be responsible for inspecting and maintaining all BMPs prescribed for Serrano Summit residential areas, private recreation center, streets, and landscaping. At such time as the HOA contact information becomes available it will be incorporated into this WQMP. Until a HOA is formally established and public improvements accepted by the City, the developer shall assume all BMP maintenance and inspection responsibilities for the proposed project. The City of Lake Forest shall be responsible for inspecting and maintaining any BMPs within the public streets. Maintenance contact information is provided under Section 5.1 of this P-WQMP.

2.3 SPECIFIC INDUSTRIAL / COMMERCIAL DETAILS

The Serrano Summit project will include commercial land uses with the inclusion of a Civic Center, Recreational Center, as well as multiple neighborhood and passive parks. These uses are summarized in the table below.

COMMERCIAL DEVELOPMENT SUMMARY			
LOT	USE	GROSS ACREAGE	FEATURES
13	Civic Center	11.9	City hall, community center, sheriff/ police facilities, outdoor plaza, government offices, surface and structured parking

COMMERCIAL DEVELOPMENT SUMMARY			
LOT	USE	GROSS ACREAGE	FEATURES
14	Recreation Center	1.9	Clubhouse, restrooms, showers, swimming pool, tot lot, open play areas, parking
15	Neighborhood Park	0.5	Seating areas, volleyball and/or basketball courts, shade structures, tot lots
16	Neighborhood Park	0.5	
17	Passive/Nature Park	3.8	Tables, benches, shade structure for group activities, trails, hitching posts, watering troughs
18	Public Facilities	19.9	IRWD Facilities
19	Public Facility	8.1	IRWD Facilities
n/a	Street Rights-of-Way	8.6	Public & private streets w/ associated landscaping and infrastructure.

No outdoor storage of materials is anticipated (materials will be stored indoors). Materials anticipated to be stored on-site include those associated with residential and park developments (i.e. cleaning products, maintenance, etc.); however, no hazardous wastes will be stored on-site. The project is not anticipated to generate any wastes that would be considered hazardous. All wastes shall be collected and properly disposed of off-site (see Section 4.2 for source control BMPs related to these features).

Operations associated with the existing IRWD plant operations and reservoirs in the south and southwest portions of the site are covered under separate NPDES permits, and therefore are not discussed in this P-WQMP.

New developments and significant redevelopments generally incorporate certain site features that may potentially impact storm water runoff quality if proper site design is not considered. These features include, but are not limited to, trash enclosures, loading docks, maintenance bays, vehicle or equipment wash areas, outdoor processing areas, fueling areas, food preparation areas, and community car wash areas. The following table provides a breakdown of specific features proposed for the project site.

SITE FEATURES SUMMARY		
SITE FEATURE	NUMBER	POLLUTANTS OF CONCERN
Trash Enclosures	TBD	Trash and debris, bacteria
Loading Docks	TBD	Organic compounds, trash and debris, oil and grease, heavy metals, wash water
Maintenance Bays	TBD	Trash and debris, oil and grease, heavy metals

SITE FEATURES SUMMARY		
SITE FEATURE	NUMBER	POLLUTANTS OF CONCERN
Fueling Areas	TBD	Oil and grease, heavy metals, organic compounds
Equipment / Vehicle Wash Areas	TBD	Trash, sediment, oil and grease, washing compounds (soap)
Food Preparation Areas	TBD	Oil and grease, bacteria/virus
Outdoor Processing Areas	TBD	Trash and debris, heavy metals, oil and grease
Community Car Wash Racks	TBD	Trash, sediment, oil and grease, washing compounds (soap)

An appropriate number of trash enclosures will be located within each of the planning areas of the project site. Specific number and locations of the trash enclosures will be documented in the Final WQMP. Trash enclosures will be covered and walled on 3 sides to preclude rainfall and runoff (gate comprising the fourth side).

The proposed Civic Center will not contain any vehicle/equipment wash or maintenance areas, other than day-to-day maintenance and upkeep of City and police/sheriff vehicles. Further details will be provided in the Final WQMP.

In the event site features are added to the proposed Project that are not identified in this P-WQMP, these features will be designed in accordance with the Orange County Drainage Area Management Plan (OC DAMP, 2003) requirements and City LIP and verified during the precise grade plan check review process.

2.4 SPECIFIC RESIDENTIAL DETAILS

The Serrano Summit project will include 524 single and multi–family residential units. The following table summarizes the proposed residential units for the project.

RESIDENTIAL DEVELOPMENT SUMMARY			
LOT	USE	GROSS ACREAGE	DENSITY
1	Townhomes	6.7	12.2 du/ac
2	Rear-Loaded Duplexes	1.0	16 du/ac
3	Rear-Loaded Duplexes	2.0	16 du/ac
4	Rear-Loaded Duplexes	1.4	15.7 du/ac
5	Townhomes	7.2	18.5 du/ac

RESIDENTIAL DEVELOPMENT SUMMARY			
LOT	USE	GROSS ACREAGE	DENSITY
6	Townhomes	6.6	11.8 du/ac
7	Rear-Loaded Single Family Detached	1.7	14.1 du/ac
8	Rear-Loaded Single Family Detached	1.5	11.3 du/ac
9	Rear-Loaded Single Family Detached	1.5	12.7 du/ac
10	Stacked Flat Condos	2.1	15.7 du/ac
11	Stacked Flat Condos	3.5	17.7 du/ac
12	Motor Court/Green Court	8.5	10.6 du/ac
13	SFA/Apartments*	11.9	18.9 du/ac
** The Public Facilities Overlay allows for the development of a Civic Center in Lot 13.			

The following table provides a breakdown of specific features proposed for the project site.

SITE FEATURES SUMMARY		
SITE FEATURE	NUMBER	POLLUTANTS OF CONCERN
Trash Enclosures	TBD	Trash and debris, bacteria
Loading Docks	0	Organic compounds, trash and debris, oil and grease, heavy metals, wash water
Maintenance Bays	0	Trash and debris, oil and grease, heavy metals
Fueling Areas	0	Oil and grease, heavy metals, organic compounds
Vehicle Wash Areas	0	Trash, sediment, oil and grease, washing compounds (soap)
Food Preparation Areas	0	Oil and grease, bacteria/virus
Outdoor Processing Areas	0	Trash and debris, heavy metals, oil and grease
Community Car Wash Racks	0	Trash, sediment, oil and grease, washing compounds (soap)

As previously mentioned, an appropriate number of trash enclosures will be located within each of the planning areas of the project site. Specific number and locations of the trash enclosures will be documented in the Final WQMP. Trash enclosures will be covered and walled on 3 sides to preclude rainfall and runoff (gate comprising the fourth side).

For the locations of these site features identified above, please refer to the Site Plan Exhibit provided in Section 6.0 of this P-WQMP. In the event site features are added to the proposed Project that are not identified in this P-WQMP, these features will be designed in accordance with the Orange County Drainage Area Management Plan (OC DAMP, 2003) requirements and City LIP and verified during the precise grade plan check review process.

3.0 SITE DESCRIPTION

3.1 WATERSHED

The project site is located within the larger San Diego Creek watershed. The San Diego Creek Watershed covers 112.2 square miles in central Orange County. It includes portions of the cities of Costa Mesa, Irvine, Laguna Woods, Lake Forest, Newport Beach, Orange, Santa Ana, and Tustin. Its main tributary, San Diego Creek, drains into Upper Newport Bay. Smaller tributaries include Serrano Creek, Borrego Canyon Wash, Agua Chinon Wash, Bee Canyon Wash, Peters Canyon Wash, Sand Canyon Wash, Bonita Canyon Creek, and the Santa Ana Delhi Channel. Watershed uses are generally comprised of agricultural, vacant, developed and recreational land uses. The entire western portion of the watershed is developed, with development spreading to the east and south.

More specifically, the project drains into Serrano Creek downstream of the 241 Toll Road and upstream of Trabuco Road. The Creek is located along the south edge of the project.

303(d) LISTED WATER QUALITY LIMITED SEGMENTS

The project site ultimately drains into Serrano Creek within the larger San Diego Creek watershed. According to the California 2006 303(d) list published by the San Diego Regional Water Quality Control Board, Serrano Creek is not listed as impaired. However, Reach 2 of the San Diego Creek is listed as impaired for metals, and Reach 1 is impaired for fecal coliform, selenium, and toxaphene.

TMDLs

Once a water body has been listed as impaired, a Total Maximum Daily Load (TMDL) for the constituent of concern (pollutant) must be developed for that water body. A TMDL is an estimate of the daily load of pollutants that a water body may receive from point sources, non-point sources, and natural background conditions (including an appropriate margin of safety), without exceeding its water quality standard. Those facilities and activities that are discharging into the water body, collectively, must not exceed the TMDL.

Total Maximum Daily Loads (TMDLs) have not been set for the San Diego Creek watercourse. TMDLs, however, have been developed jointly for the San Diego Creek Watershed and the Newport Bay, of which the watercourse and the project's five other tributaries are a part. These pollutants include toxics, nutrients, and sediments.

The Santa Ana Regional Water Quality Control Board (RWQCB) established the nutrient TMDL in 1998 and the sediment TMDL in 1999. The nutrient TMDL establishes targets for reducing the annual loading of nitrogen and phosphorus to Newport Bay by 50% and meeting the numeric and narrative water quality objectives by 2012. The sediment TMDL has similar objectives, to reduce the annual average sediment load in the San Diego Creek watershed from a total of 250,000 tons per year to 125,000 tons per year, calculated over a ten year period (a 50% reduction).

Moreover, EPA Region 9 established the TMDL for toxics in 2002. It covers 14 different constituents – chlorpyrifos and diazinon (organophosphate pesticides); chlordane, dieldrin,

DDT, PCBs, and toxaphene (organochlorinated compounds); cadmium, copper, lead and zinc (metals); selenium; chromium and mercury (metals, specific to Rhine Channel only). Currently, only 2 constituents have been considered for approval by the Santa Ana RWQCB: the organophosphate pesticides.

HYDROLOGIC CONCERNS

The purpose of this section is to identify any hydrologic conditions of concern with respect to downstream flooding, erosion potential of natural channels downstream, impacts of increased flows on natural habitat, etc. Hydrologic conditions of concern are typically directed to those developments that discharge directly into receiving water bodies (natural drainage courses or partially improved channels).

The recently updated MS4 Storm Water Permit requires that the 2-year storm event be analyzed for pre- and post-condition to determine hydrologic conditions of concern (Section XII.D) Based on the requirements of the Permit, the project would not have a hydrologic condition of concern if the volume and the time of concentration of storm water runoff for the post-development condition does not significantly exceed those of the pre-development condition for a 2-year frequency storm event (a difference of 5% or less is considered insignificant).[2] The following tables provide a summary of the 2-year calculations for the existing vs post-development condition.

HYDROLOGY SUMMARY FOR OUTLET A			
Parameter	2-YEAR, 24 HOUR		
	Pre-Development	Post-Development	% Change
Q (cfs)	38.4	21.8	-43%
Volume (acre-feet)	4.02	1.63	-59%
Time of Concentration (Tc)	20.96	6.63	-68%

HYDROLOGY SUMMARY FOR OUTLET B			
Parameter	2-YEAR, 24 HOUR		
	Pre-Development	Post-Development	% Change
Q (cfs)	17.6	76.5	+434%
Volume (acre-feet)	1.0	6.7	+670%
Time of Concentration (Tc)	8.95	8.36	-6.5%

[2] Section XII.D.2.a of Order No. R8-2009-0030.

HYDROLOGY SUMMARY FOR OVERALL PROJECT			
Parameter	2-YEAR, 24 HOUR		
	Pre-Development	Post-Development	% Change
Q (cfs)	56.0	98.3	+76%
Volume (acre-feet)	5.0	8.3	+66%
Time of Concentration	N/A	N/A	N/A

Based on the analysis provided in the tables above, the results demonstrate the post-development 2-year storm event volume well exceeds the pre-development volume and does not fall within the 5% threshold. The net change in volume is approximately 3.3 ac-ft. In order to comply with hydromodification requirements, the proposed project will implement a combined system of features to either infiltrate and/or mitigate the flows to the creek in a highly controlled manner up to this design volume. Flow rates from larger storm events will also be mitigated through the use of on-site detention basins.

In order to control runoff to meet the pre-development 2-year volume conditions, the proposed project will utilize underground storage and infiltration reservoirs within the project site to reduce runoff volumes. These infiltration systems may also be designed with a drywell system to improve infiltration and decrease draw down times. During the detailed site plan design, the use of porous landscaping retention and porous pavement may also be utilized to account for a portion of the 2-year volume difference between pre- and post-project conditions. The specific amount of infiltration with each feature or facility will be determined upon site specific infiltration testing and the forthcoming infiltration criteria currently being updated in the County-wide Model WQMP (expected Fall 2010). In the event site specific soil conditions and the criteria do not allow for full infiltration of the 2-year volume difference, the remainder will be discharged to the creek under the critical rate for adverse impact as defined by forthcoming hydromodification criteria in the Model WQMP. In addition, the use of the multi-functional water quality and detention basins at the downstream end of the project will also be used to manage and control flow rates from the 100-year storm event through the use of outlet structures. Further details including basin design will be included in the Final WQMP.

3.2 SITE LOCATION

PLANNING AREA/ COMMUNITY NAME	Serrano Summit
GENERAL LOCATION	South of Commercentre Drive, west of Serrano Creek and Indian Ocean Drive, and east of Biscayne Bay Drive in the City of Lake Forest.
ADDRESS	N/A
PROJECT SIZE	~99 acres